

A Life-Cycle Framework for Managing Risks in Public Private Partnership Housing Projects

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Abstract: Public private partnership projects have been adjudged to contain more risks than traditionally procured projects due to more number of parties involved and their varying interests. These risks affect the achievement of projects objectives and therefore need to be identified and treated to guarantee project success. This paper developed a life cycle framework for managing risks in PPP housing projects in Nigeria. The respondents were selected using purposeful sampling technique. The data used for the study were obtained through semi-structured questionnaire and were analysed using mean rating. Risk transfer was found to be the widely used measure for responding to risks in PPP housing projects. The criteria mostly used for risk allocation were party with the best ability to manage specific risks should they occur and ability of the party to foresee risks. A four-stage life cycle framework was developed, evaluated and validated by experts in the built environment to ascertain its reliability. The framework is recommended for PPP housing projects in Nigeria.

Keywords: Life-cycle, framework, risk management, housing, public private partnership.

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1. Background to the study

In many countries of the world, the public sector has been responsible for the delivery of infrastructure and housing through direct funding (Abd-Elkawy, 2017). However, increasing housing demand in the face of government budgetary constraints has led many countries including Nigeria to seek for alternative strategies for housing provision. One of such strategies adopted is the public private partnership (PPP) which is a collaborative effort between the public agencies and the private organisations hinged on shared responsibilities and benefits for the purpose of providing the needed housing to the populace. The expected benefits of adopting PPP include increased private sector participation in housing and infrastructure development, reduced burden of debt on governments, ensure development of local capital markets. Other benefits include cost efficiency in housing development and provision, foster best practices in sharing and transferring of risks, assure superior value for money, streamline contracts and simplify procurements, facilitate innovation through public-private cohesion, eradicate bureaucratic and political processes, encourage technology

transfer and act as vehicles which adopt life cycle approaches to delivering public infrastructure and services (Quartey, 1996; Capital, 2010).

Despite the array of benefits associated with the adoption of PPP in housing, quite a number of such projects failed to achieve the desired objectives due to inherent risks associated with PPP projects. PPP projects are unique and complex in nature due to number of parties involved. This distinct nature and complexity, in addition to intrinsic risky nature of construction projects and the increasing demand from clients increases project risks which require robust risk management practice (Ahmad et al., 2018). Risk refers to any factor, event or influence that threatens the successful completion of a project. Although scholars have argued that the influence could be negative or positive, Maslova and Sokolov (2017) stressed that even though successful events during PPP project may influence the project, it will not be a problem for project participants and should not be the subject of efforts to manage. Hence risk management is seen as integrated process aimed at addressing events that would have adverse effect on project objectives if they occur.

Risks in PPP housing may stem from the project environment (internal) such as construction risks, technical risks, and design risks; and external sources such as legal risks, political risks, force majeure, and partner selection risks among others. These risks vary from one place to another and between projects depending on the economic, political and socio-cultural conditions where the projects are undertaken (Carbonara et al., 2011). These risks affect project objectives of cost, time, quality, clients' satisfaction, safety environmental sustainability, and accessibility to housing units by the target group; thus proper risk management in PPP projects becomes a necessity to ensure that the desired objectives are attained (Ahmad et al., 2018). However, most project managers are ill prepared when it comes to identifying or adequately addressing potential risks in PPP projects (El-Sayegh, 2007). There is the need for stakeholders in the housing sector to imbibe the culture of implementing risk management in executing PPP housing projects.

Despite of the recognition of risk management as an important strategy for achieving success in PPP projects, it has been reported that in Nigeria, the adoption of formal risk management in construction projects is very low and stakeholders lack the basic knowledge of risk management process (Ojo, 2010); in addition, project managers rarely develop and implement comprehensive risk management plans in PPP housing projects. Consequently, risk management in PPP projects in Nigeria has been found to be highly variable, intuitive, subjective and unsophisticated with overreliance on past experience, personal skills and comparisons of analyses of similar projects (Ng and Loosemore, 2007; Adeleke et al., 2018). Moreover, risks in construction projects including PPP are dealt with arbitrarily by adding 10% contingency unto the estimated cost of the project in order to accommodate the effect of unforeseen circumstances (Chileshe and Yireny-Fianko, 2011; Tipili and Ilyasu, 2014). The adoption of informal as against holistic approaches to risk management in PPP have not been effective thereby resulting into project time and cost overruns, low quality of housing units. Studies have reported that improper risk assessment and treatment are among the major reasons for failure of PPP projects and ineffective project delivery in the construction industry in Nigeria (Dada and Jagboro, 2007; Awodele et al., 2009).

Risk management should be done proactively and consistently throughout projects' life cycle in order to help in preventing expected risks and to mitigate the impact of threats should those risks occur. Researchers have argued that, addressing project risks earlier than later in the project life cycle can minimize the negative impact of risk on project objectives; hence effective risk management would be possible if these risks are managed from the perspective of project life cycle (Ward and Chapman, 1995; Smith, 2003; Zou et al., 2014). In order to facilitate success in PPP projects, Bao et al. (2018) opined that stakeholders should continue to observe PPP life cycle, identify potential issues that would affect the projects and provide solutions. This entails that, probable risks should be identified at the conceptual and planning stage while keeping track of events for possible eventualities during the implementation of the projects; risks owners needs to be identified and risks allocated to parties that can manage them best to ensure that these risks are addressed at the lowest possible costs; adopting appropriate measures for treating those risks

during the project implementation and continuous review of the risk management plan to ensure actions taken match with set objectives to ensure effectiveness of the risk management process.

Researchers have attempted at addressing risks using life-cycle perspective by developing frameworks for managing risks covering the entire project life-cycle. Pohle and Girmscheid (2007) developed a four-stage model for managing risks in PPP maintenance projects; Zou et al. (2014) developed a three-stage framework for managing risks in PPP infrastructure projects, for efficient allocation of risks among contracting parties, but it has been criticized for its inefficiency (Kurniawan, 2013). A four-stage whole life-cycle framework for managing risk in privately financed market in Nigeria has also been developed by Awodele (2012). Due to the peculiarity of housing and its political relevance in many countries in addition to variability of risks between projects, existing frameworks do not adequately address risks in housing projects. For instance, in PPP infrastructure projects, contractors recoup their capital through user charges and government budgetary allocations, while in PPP housing projects such costs are borne by households who are often the beneficiaries of these projects. There is therefore the need for a framework for addressing the specific risks in PPP housing projects from the inception to the commissioning of such projects. This study therefore fills in this gap by developing a step-by-step life cycle framework for managing risks in public private partnership housing projects in Abuja, Nigeria with the view to improve risk management practices toward effective housing provision. To achieve this aim, the study seeks to provide answers to the following questions: how do stakeholders respond to risks in PPP housing projects? What are the criteria used in risk allocation among contracting parties? And what is the pattern of risk allocation in PPP housing projects? This framework is part of a completed PhD research on managing risks in public private partnership housing projects in Abuja, Nigeria.

2. Methodology

The purpose of this research is to improve risk management practice which will involve the development of a framework for managing risks in PPP housing projects in Nigeria. Since PPP is known to be a collaborative arrangement between public agencies and private organizations, the population for the study comprised the major role players in the execution of PPP projects for housing - government officials in housing related departments, contractors, consultants and sponsors/financiers. Questionnaire was used to obtain data for the study. Determining the total population from lists of registered professionals obtained from their respective professional bodies proved challenging as they were rarely updated. Consequently, the total population was not known. In determining a study sample from unknown population where the data is quantitative in nature, Napierala (2014) had suggested the use of the formula shown in Eq. (1) below:

$$n = \frac{Z^2 * S^2}{\delta^2} \quad (1)$$

where: n = minimum sample size; Z = value of distribution function denoted by $0.1 = \pm 10$ at 90% confidence level; S = population standard deviation denoted by 1.64 at 90% confidence level and δ = acceptable standard error as set in the study; this study adopted 1 as used by other researchers (Zou et al., 2014).

Using the above formula, the determined sample for the study was 269 respondents. The study sample was selected using purposive random sampling. A total of 269 questionnaires administered, 131 were returned out of these, 24 were considered invalid due to inability of the respondents to supply the required information; 107 were duly completed and used for the study indicating a response rate of 40% which is above the response rate of 20-30% suggested by Akintoye et al. (2000) for questionnaire survey in construction management studies. The compositions of the respondents were contractors 33, consultants 26, government officials 26 and sponsors 22. The data were analysed using mean rating and the results presented in tables and figures.

In validating the framework, a closed-ended questionnaire was designed and administered to 32 respondents purposefully selected from the respondents of the main study; academics were involved because of their role in the design process. A total of 21 validating instrument were duly completed and returned consisting of government officials (04), sponsors (03), contractors (04), consultants (02) and academic Staff (08). The respondents were asked to rate some key aspects of the framework and the data was analysed using the mean score after which the percentages were obtained in order to determine the validity and reliability of the framework.

3. Results and Discussion

In order to develop a framework that provides a comprehensive and coherent guide for managing risks in PPP housing projects, there is the need to assess the risk allocation/treatment practices in the area of study. This study therefore examined the risk response measures used in PPP housing projects, the criteria for risk allocation in PPP housing projects and the pattern of risk allocation pattern among the major stakeholders in PPP housing projects.

3.1. Risk Response in PPP Housing Projects

Risk management becomes effective only when appropriate response measures are adopted which will adequately address the identified and estimated risks. These response measures are used to ameliorate the impact of risk factors on project objectives. The respondents were required to indicate risk response measures they frequently adopt in mitigating risks in PPP housing projects and the result is shown in Fig. 1. The result revealed that Risk Transfer is used by 58% of the respondents, 23% used Risk Reduction, 11% use Risk Acceptance while 08% preferred Risk Avoidance. This therefore means that all the four measures are being used by stakeholders in PPP housing projects. However, the most widely used method is Risk Transfer. One of the key rationales for PPP arrangements is transferring risks to the party that can handle it best at a lower cost. This explains high rank accorded to risk transfer by the respondents.

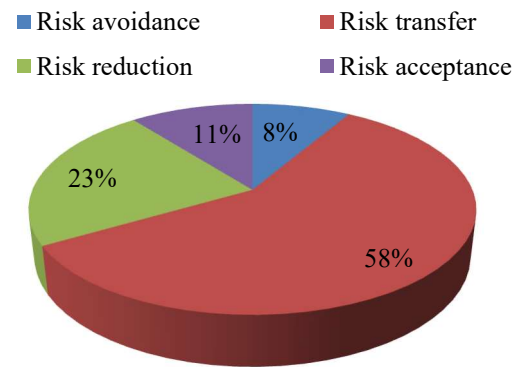


Fig. 1. Measures of responding to risks in PPP housing projects

3.2. Criteria for Risk Allocation in PPP Housing Projects

Cardinal to PPP arrangement is the allocation of project risks among the contracting parties. It is therefore imperative that the various risk factors are properly allocated to the major stakeholders using the most suitable criteria. Various criteria for risk allocation were identified from the literature and the respondents were required to rate them in order to determine the criteria mostly adopted in determining who bears what risk (Table 1). The results in Table 1 indicate that the criteria often adopted in allocating risks among contracting parties in PPP housing projects were: the Party with the best ability to manage the risk in case it occurs (27%), Ability of the party to foresee the risk (23%) and the Party with the ability to control the chance of the risk occurring (17%). This shows that ability to manage risks at lowest possible cost and ability to foresee risks are the main criteria used in risk allocation. Risk allocation is one of the crucial factors for risk management and it is an important prerequisite to the successful development and implementation of PPP projects (Karim, 2011). Owing to its technical expertise and managerial skills, the private partner is in better position to foresee and manage project risks than the public sector. This underscores the transfer of project risks to the private party which is a key characteristic of PPP arrangements.

3.3. Risk Allocation Pattern in PPP Housing Projects

Effective risk management entails that identified risks must be assigned to an owner who is in better position to handle such risks. Using the risk allocation criteria, the risk allocation pattern among contracting parties in PPP housing projects were investigated and the result is presented in Table 2. Risk factors that should be allocated to the private party were: Financial risk (51%), Construction risks (71.0%) and Technical/ design risks (65.4%). The public sector, according to the survey should be responsible for Partner selection risk (50.5%), Political risks (62.6%) and Legal/regulatory risks (62.6%). Risk factors to be shared between the two major parties were Economic risks (70.1%), Revenue/demand risks (70.1%) and Force majeure (85.0%) (Table 2).

These findings corroborated the report of Jin (2009) suggesting that design risks, construction risks and financing risks should be allocated to the private partner stressing that the private sector is better placed in

managing financing and design related risks than the public partners. Similarly, the public partner has the machinery to better handle political related risks such as corruption and partner selection than the private party. Consequently, such risks should be allocated to the public

party. The burden of risks that are rarely the fault of any of the parties (force majeure) such as epidemics, excessive whether condition and war/civil unrest, should be shared between contracting parties.

Table 1. Criteria for allocating project risks to contracting parties in PPP housing

Criteria for allocating risks	Freq.	%	Cumulative %
Ability of the party to foresee risk	24	23	23
Ability of the party to assess the possible magnitude of the consequences of risk	12	11	34
Party with the ability to control the chance of risk occurring	19	17	51
Party with the best ability to manage the risk in case it occurs	29	27	78
Ability to sustain the consequences of the risk if it occurs	09	08	86
Whether the party will benefit from the risk	11	10	96
Acceptability of the premium charged by the risk-receiving party to the owner	03	04	100
Total	107	100	

Table 2. Risk allocation among stakeholders in PPP housing projects

Risk Factors	Public Partners		Shared		Private Partners		Allocation
	Freq.	%	Freq.	%	Freq.	%	
Financing risks	02	1.9	50	46.7	55	51.0	Private
Construction risks	04	3.7	27	25.2	76	71.0	Private
Economic risks	20	18.7	75	70.1	12	11.2	Shared
Technical/design risks	06	5.6	31	29.0	70	65.4	Private
Revenue/demand risks	18	16.8	75	70.1	14	13.1	Shared
Partners selection risks	54	50.5	37	34.6	16	15.0	Public
Political risks	67	62.6	39	36.4	01	0.9	Public
Legal/regulatory risks	67	62.6	37	34.6	03	2.8	Public
Force majeure	14	13.1	91	85.0	02	1.9	Shared

4. Development and Validation of the Proposed Framework

Risk management requires comprehensive planning as well as the implementation and monitoring of a risk management plan. For effective risk management in construction projects, Zou et al. (2008) posited that risk identification and assessment should be conducted from a life cycle perspective starting at the planning and feasibility stage and carried out right through the operation and transfer stage with continued monitoring. This paper attempts at providing a holistic approach to risk management by developing a framework for managing risks in PPP housing from the perspective of project life cycle. In the development of the framework, risk management processes were explored and linked to PPP implementation stages to ensure that the entire project life cycle is covered by the framework.

4.1. Framework Development

The risk management framework was patterned along the basic processes of risk management and it addressed the risks associated with PPP housing projects based on project stages. The framework is in four stages and is iterative in nature which presents risk management as a continuous process. Although the framework has been presented in stages based on the risk management processes and PPP implementation stages, it is intended that identified risks should be subjected to the entire stages of the framework for proper treatment. The life-cycle framework for managing risk in PPP housing projects is shown in Fig. 2.

4.1.1. Project planning and feasibility phase

Project planning which precedes the constitution of project team entails need identification, scoping, screening, risk assessment and budget refinement of a particular project. Once the need has been established, the public agency must determine whether such need would be addressed by refurbishing the existing facility or constructing a new one. At this phase the public sector turns ideas into projects, identifies goals to be achieved, partners to be involved and how risks should be shared (Abdullahi, 2014). In addition, value for money (VfM) and affordability testing of different procurement options are carried on selected individual projects (Awodele, 2012). Once the preferred option is found suitable it is then defined in form of a project to be executed through PPP arrangement (Canadian Council for Public Private Partnership [CCPPP], 2011).

The basic risk management activities at this stage (Fig.1) are the identification and estimation of the risk factors that could affect the proposed project plan as well as the project objectives. The public sector needs to identify the risks of undertaking the project while the private sector determines the probable risks to be encountered for venturing into the project. Once the risks have been properly identified, there is the need to estimate the criticality of those risks factors in relation to the project objectives by subjecting them to qualitative assessment and quantitative analysis. The criticality of identified risk factors must therefore be determined at this level by combining the likelihood of occurrence of risk events and their impact on the projects. This serves as a pointer to the contracting party on the type of risks to bear based on their ability to handle such risks. The outcome of this stage helps in developing a risk profile and preferred risk allocation

pattern among the contracting parties for risk allocation in the next phase of the project.

This phase consists of three stages which include request for qualification (RFQ), request for proposal (RFP) and finalising the project/commercial and financing issues.

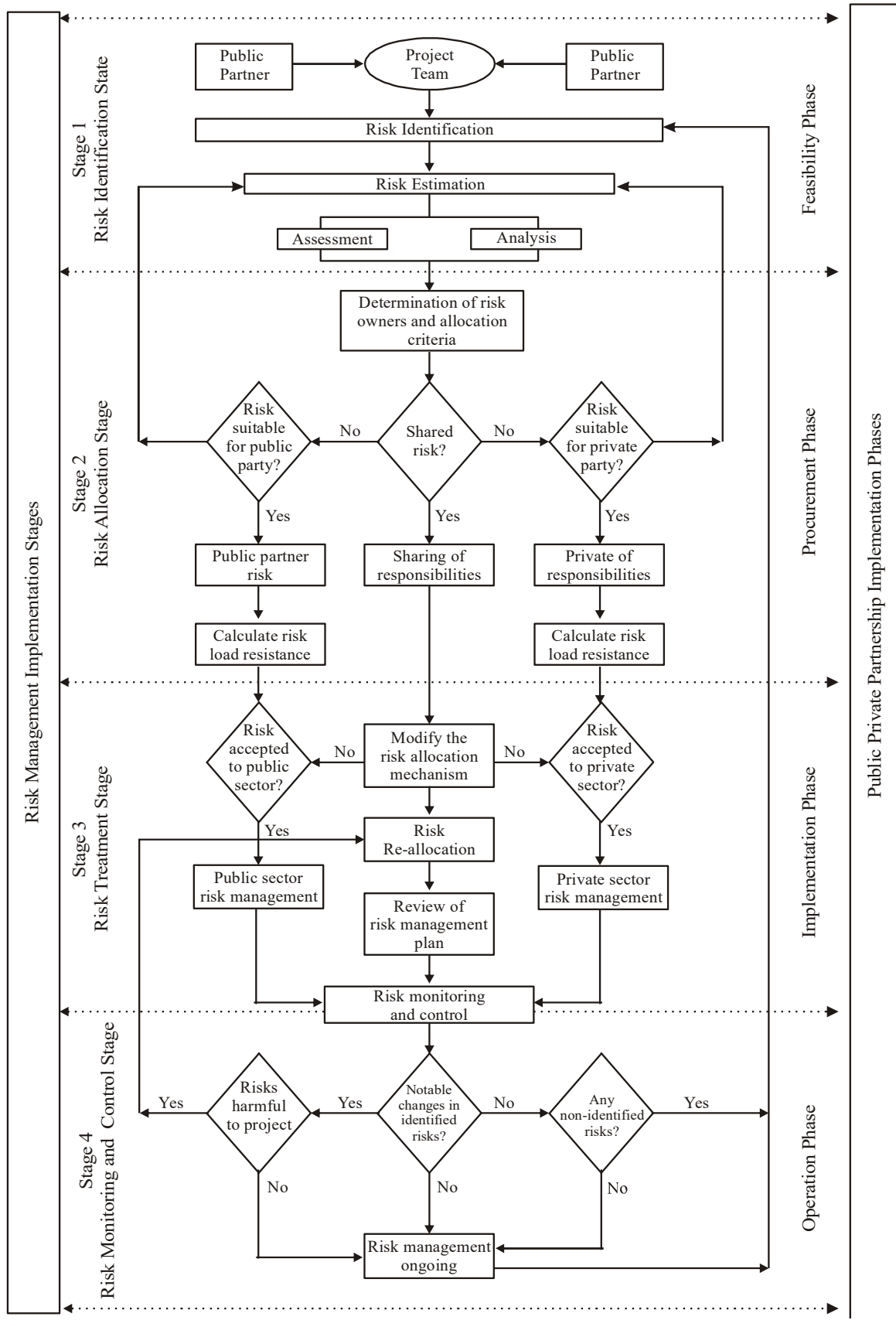


Fig. 2. A Life-cycle framework for managing risks in ppp housing projects

4.1.2. Project procurement phase

This stage is centered on selection of partners for the proposed PPP housing project. There is the need for

adequate regulatory framework and transparency in the selection process to ensure competent contractors are selected. Once a preferred bidder has been identified, the government and the private partner will finalise the project agreement, which in most cases include making final adjustments to reflect the financing structure of the successful bidder (CCPPP, 2011). Ideally, the bulk of the contract should be sorted out during the bid process; however, final contract negotiations present the last opportunity to discuss any final issues between the two sides.

The private sector partner at this stage assess the opportunities and probable risks associated with the proposed project, estimates the risks and decides on the measures to best address those risks.

There is the need to identify the risk owners, determine the risk allocation criteria and pattern at this level. The pertinent questions at this stage are what risk is likely to occur? What risk would have high impact on the project if it occurred? What risk would have less impact on the project? What are the criteria for allocating these risks to the contracting parties? What is the pattern of risk allocation among the contracting parties? Who has the ability to prevent or mitigate the risk at the lowest possible cost? These could be arrived at after calculating the cost of bearing those risks and the load resistance capacity or ability of the contracting parties to address the risk. The results of the analysis for this study, indicated, that the criteria frequently adopted in allocating risks among contracting parties was the ability to manage the risks at the lowest possible cost and ability to control the chance of risk occurring (Table 1). Following the determination of the risks allocation criteria and pattern, the actual risk allocation is carried out at this stage using the load resistance of respective parties. Responsibilities and benefits for risks factors that both public and private parties have equal opportunities to prevent and fairly equal ability to manage are shared; otherwise they are allocated to the party with better advantage. Based on the established criteria, respondents submitted that financing risks, construction risks and technical/design risks should be allocated to the private partner; political risks, partners selection risks and legal and regulatory risks should be allocated while economic risks, revenue/demand risks and force majeure are to be shared between the public and private sector parties. Risk owners are therefore expected to take responsibility of addressing those risks allocated to them during the project implementation phase.

4.1.3. Project implementation phase

This phase covered the actual construction of the housing units as specified in the contract agreement. In this stage of the project, allocated risks are re-evaluated and re-assessed to determine their suitability to the parties allocated. Decision would have to be made as to whether those risks allocated at the procurement stage are acceptable to the parties they were allocated to. The calculated risk cost is compared against the risk bearing capacity of the risk owner to determine the ability to accept such risk. Risks that are adjudged suitable are retained; where such risks are not suitable to the party allocated to, there is the need to re-estimate the risks for further re-allocation. Similarly, the risk management plan is also implemented at this stage in which parties to the contract identify best measures for responding to the risks identified, estimated and allocated.

This stage requires utmost cooperation of the stakeholders in order to achieve the desired success. However, it has been established, that in a typical agency relationship such as PPP, conflict of interest among stakeholders is inevitable (Mu, 2008). It is therefore required that adequate regulatory framework be put in place to guide the activities of the contracting parties for the smooth execution of PPP housing projects.

Regardless of the sophistication of the regulatory framework, no contract arrangement is perfect and risk free. Studies have shown that parties to PPP contract engage in sharp practices so as make profit. For instance, the private partner may substitute specified materials with substandard ones. This therefore underscores the need for continuous review of projects as well as the risks management plan to ensure the effectiveness of the risk management exercise. The outcome of this exercise results into periodic negotiations which could lead to modification of the risk allocation mechanisms and subsequent risk re-allocation. The entire risk management plan is also reviewed at this stage to ensure that risks are properly re-allocated and that relevant and adequate treatment measures have been adopted in treating those risks. Risk monitoring and control which span through project commissioning and occupation phase, help to ascertain whether new risks have emerged and to ensure the plan does not deviate much from reality.

4.1.4. Project commissioning and occupation phase

At this stage, the housing project is near completion or has been completed and commissioned. Risk management at this phase centres on the evaluating the success of the entire risk management exercise. Risks need to be monitored to ensure the changing environments do not alter risk priorities and to ensure the risk management process is effective in both design and operation. In the course of the project, it is highly likely that, the list of risks as well as the associated management strategies will change as the project proceeds. New risks may emerge, anticipated risks may disappear, the project environment may change or new and better information may be discovered that will render the original assessment out of date thereby triggering the need for reassessment. For instance, a party may fail to perform its responsibility assigned in the contractual arrangement resulting into changes in the risk management plan which must be adequately addressed to guarantee project success.

These changes can only be tracked through continuous monitoring. The Risk management team at this stage needs to re-identify, re-analyse and make plans for newly arising risks. Risk monitoring and control at this phase of the project is not aimed at solving any particular problem but rather to provide adequate information on possible gray areas that could affect the project objectives for the purpose of taking remedial actions in the future projects. Risk monitoring therefore is to ascertain whether the risk management plan is adequately implemented and the assets developed complied with the required standard. Questions that need to be answered at this stage are whether there are appreciable changes in the identified risks and whether there are emerging or non-identified risks. In events of notable changes in the earlier identified risks, it is needful to determine the degree of impact of such risks on the project objectives. Where such risks are harmful to the project objectives, there is the need for re-

allocating such risks for proper treatment before final handing over of the project. This can be addressed by compensating the party that wrongly bore the risk. Where the results of risk monitoring indicate the possibility of non-identified risks, such risks must be re-identified and subjected through the entire risk management process.

4.2. Framework Validation

Frameworks are developed to address specific problems in real life situations; however, they cannot be used with confidence to solve such problems unless they are validated. Validators were required to rate key aspects of the framework and the result is presented in Table 3. The percentage scores indicated that none of the items of validation was scored poor and each received at least one

excellent score. For instance, 76% respondents rated the framework as good in terms of logical structure while comprehensiveness of the framework was rated good by 48%. Similarly, clarity of the framework and applicability to construction management were rated excellent by 24% each while 05% of the respondents opined that the framework would excellently contributes to the success of PPP housing projects. A further look at the individual scores indicates that only two validators rated the comprehensiveness of the framework as fair which showed that the framework is valid and credible. Based on the results of the validation, it can then be concluded that the framework can be applied with confidence in addressing risks in PPP housing projects.

Table 3. Percentage scores of key aspects of the framework

Key aspects of the framework	1 Poor	2 Fair	3 Satisfactory	4 Good	5 Excellent
Clarity of the framework	-	-	14%	62%	24%
Logicity of the framework	-	-	05%	76%	19%
Comprehensiveness of the framework	-	09%	24%	48%	19%
Applicability to Construction management	-	-	19%	57%	24%
Practical Relevance to the concept of risk management	-	-	19%	62%	19%
Overall contribution to success of PPP housing projects	-	-	38%	57%	05%

5. Conclusion

Regardless of the variant of PPP adopted in the execution of housing projects, the objectives of the project should not be compromised. In the process of implementing those projects, unforeseen events (risks) occur that influences the outcome of project objectives which need to be addressed. These risks must be considered and treated from project life cycle perspective. Risk must be clearly identified, quantified and allocated to the right owners who can best address them at lower possible cost. On the basis of survey, criteria as well pattern of risk allocation were determined and risk response measures used in PPP housing project were identified. The outcome of the survey was used to develop a life-cycle framework for managing risks in PPP housing projects which presents a step-by-step process of addressing project risks. The framework is seen as an innovative attempt to address key project risks from the perspective of project life cycle. The structure of the framework which consists of four stages specifies what should be done at each stage, how it should be done, who should be responsible for doing it and when it should be done throughout the entire life-cycle of any PPP housing project. The framework is iterative in nature with various options for making decision which gives the risk manager/practitioners the opportunity to determine the best route for effective implementation of the framework in addressing project risks. The framework has been validated and found to be credible and acceptable to the construction industry. The framework is recommended for managing risks in PPP housing in order to enhance the performance of the initiative towards improved supply and access to decent and affordable housing by Nigerians.

References

Abd-Elkawy, A. A. M. (2017). Principles of Public Private Partnership Approach for Providing Sustainable Social Housing Projects in New Egyptian Cities (Case Study: Experience of Orascom Social Housing Project in 6

October City. *International Journal of Community and Cooperative Studies*, 5(1), 1-21.
 Abdullahi, A. (2014). *The politics of public housing policies in Nigeria: a case study of PPP in Sokoto State*. Unpublished doctoral thesis, Usman Danfodio University, Sokoto.
 Adeleke, A. O., Bahaudin, A. Y., Kamaruddeen, A. M., Bamgbage, J. A., Salimon, M. G., Waris, M., and SaooShian, S. (2018). The Influence of Organisational External Factors on Construction Risk Management among Nigerian Construction Companies. *Safety and Health at Work*, 9, 115-124.
 Ahmad, U., Ibrahim, Y., and Minai, M. S. (2018). Malaysian Public Private Partnership: Risk Management in Build, Lease, Maintain and Transfer Projects. *Cogent Business and Management*, 5, 1-25.
 Akintoye, A., McIntosh, G., and Fitzgerald, E. (2000). A survey of supply chain collaboration and management in the U.K. construction industry. *European Journal of Purchasing and Supply Management*, 6, 159-168.
 Awodele, O. A. (2012). *Framework for Managing Risk in Privately Financed Market Projects in Nigeria*. Unpublished Thesis in Construction Management, School of the Built Environment, Heriot-Watt University.
 Awodele, O. A., Ogunlana, S. O., and 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, Scotland.
 Bao, F., Chan, A. P. C., Chan, C., and Darko, A. (2018). Review of Public Private Partnership Literature - A Project Life Cycle Perspective. *Journal of Infrastructure System*, 24(3), 1-12.
 Canadian Council for Public Private Partnership. (2011). *Public private partnerships: a guide for municipalities*. Canada.
 Capital, A. (2010). *Public private partnerships - the answer to Nigeria's infrastructure problems? How We*

Made in Africa. Retrieved from <http://www.howwemadeitinafrica> on December 12, 2016

- Carbonara, N., Costantino, N., Sciancalepore, R., and Pellegrino, F. (2011). Risk Management in PPP: Real Option Theory. *Symposium: Public Private partnerships in Transport: Trends & Theory - Research Roadmap*.
- Chileshe, N. and Yirenkyi-fianko, A. B. (2011). Perceptions of threat risk frequency and impact on construction projects in Ghana: opinion survey. *Journal of Construction in Developing Countries*, 16(2), 115-149.
- Dada, J. O. and Jagboro, G. O. (2007). An Evaluation of the Impact of Risk on Project Cost Overrun in the Nigerian Construction Industry. *Journal of Finance Management of Property and Construction*, 12, 37-44.
- El-Sayegh, S. M. (2007). Risk Assessment and Allocation in the UAE Construction Industry. *International Journal of Project Management*, 26, 431-438.
- Jin, X. H. (2009). Allocating risks in public private partnerships using a transaction cost economics approach: a case study. *The Australian Journal of Construction Economics*, 9(1), 19-26.
- Karim, N. A. A. (2011). Risk Allocation in Public Private Partnership (PPP) Project: A Review on Risk Factors. *International Journal of Sustainable Construction Engineering and Technology*, 2(10), 8-16.
- Kurniawan, F. (2013). *An Integrated Project Evaluation Tool for Public Private Partnership Projects*. Doctoral dissertation, School of the Built Environment, Heriot-Watt University.
- Maslova, S. V. and Sokolov, M. Y. (2017). Risk Management in Public Private Partnership Housing Project in Health Care. Application of Current Approach and its Improvement. *Academy of Strategic Management Journal*, 16(4), 1-17.
- Mu, R. (2008). Public Private Partnerships and the Management of Expressways in China: An Agency Theory Approach. Engineering and Analysis. The Netherlands: Delft University of Technology.
- Napierala, T. (2014). *How can we determine the sample size from unknown population?* Researchgate: Tylor's University. Retrieved on August 8, 2018 from <https://www.researchgate.net>
- Ng, A. and Loosemore, M. (2007). Risk allocation in the provision of public infrastructure. *International Journal of Project Management*, 25(1), 66-76.
- Ojo, G. K (2010). An assessment of the construction site risk-related factors. *Proceedings of the 40th Annual General Meeting/Conference of the Nigerian Institute of Building*, 9-4.
- Pohle, T. and Girmscheid, G. (2007). Risk Management in PPP Maintenance Projects of Communal Street Networks. *CIB World Building Congress 2007*, Cape Town, South Africa, 75-87.
- Quarte, J. E. (1996). Development projects through build-operate schemes: their role and place in developing countries. *International Journal of Project Management*, 14(1), 47-52.
- Smith, N. J. (2003). *Appraisal, Risk and Uncertainty (Construction Management Series)*. London, UK: Thomas Telford Ltd.
- Tipili, L. G. and Ilyasu, M. S. (2014). Evaluating the impact of risk factors on construction project cost in

Nigeria. *The International Journal of Engineering and Science*, 3(6), 10-15.

- Ward, S. C. and Chapman, C.B. (1995). Risk Management Perspective on the Project Life Cycle. *International Journal of Construction Management*, 13(3), 145-149.
- Zou, X. W., Wang, S., and Fang, D. (2008). A Life-Cycle Risk Management Framework for PPP Infrastructure Projects. *Journal of Financial Management of Property and Construction*, 13(2), 123-142.
- Zou, X. W., Zhang, G., and Wang, J. Y. (2014). Identifying the Key Risks in Construction Projects: Life Cycle and stakeholder Perspective. *International Journal of Construction Management*, 9(1), 1-14.



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