

APPLICATION OF RISK MANAGEMENT TECHNIQUES IN PROPERTY DEVELOPMENT PROJECTS IN NIGERIA: A REVIEW

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ABSTRACT

Property development is a multifaceted, dynamic and risky enterprise. Property development projects are fraught with risks and uncertainties spanning through the stages of the development process. Risk and uncertainty, if not well managed, could have harmful impacts on development project by affecting time, quality, and cost of such project. In Nigeria, evidences abound of property development failures and abandonments with the attendant social, environmental and economic consequences. Development projects are abandoned before completion or completed projects are not disposed over six months. In other cases, completed projects are foreclosed by development lenders due to inability of the developers to service their loans. These problems could be attributed to development companies not employing formal strategic risk management in project evaluation. The aim of this paper is to review literature and previous research on application of risk management techniques in property development industry with a view to identify the possibility for further research in Nigeria. The review used various sources such as textbooks, journal articles, reports, masters' dissertations and doctoral theses relevant to the study. The review showed that, generally, risk management is still largely handled in a subjective manner. Any notion that developers are now applying a wide range of rigorous and sophisticated risk management techniques is erroneous as this is scarcely manifested in actual practice. In the Nigerian context, there is probably no research on risk management by development companies; few risk management studies were limited to risk analysis/assessment; while others focused on building construction risk which is just one of the stages in the property development process. This paper recommends the development of an advanced risk management framework applicable to the Nigerian property development industry.

Keywords: Risk, Uncertainty, Risk Management, Property Development, Nigeria, Review

INTRODUCTION

Property development is a multidisciplinary, dynamic and risky enterprise; characterized by its complexity and inherent uncertainty (Gehner, 2008). According to Ratcliff and Stubbs (1996, p. 280), "risk is the very business of property development, and uncertainty the prevailing climate within which development takes place." The seven key features which define complexity in development process are; property markets, long-term trends, the event sequence, economy, actors, the site and government (Fisher, 2005). There are numerous risk factors that have been identified in property development literature. According to Loizou and French (2012), the main sources of development risk are; land cost, financial, construction, socioeconomic, and sale/rents. Risk and uncertainty, if not well managed, could have harmful impacts on development project by affecting time, cost, and quality of such project with the attendant economic, social, and environmental consequences. Lately, risk management has moved to another level of importance due to the increased complexity and unpredictability in the development environment, and above all after the commencement of the global financial crisis (Gehner, 2008; Doner,

2010); hence the need to apply robust and sophisticated risk management techniques in property development projects.

Despite the fact that property development companies are considered to be the greatest risk-takers (Byrne and Cadman, 1984), the industry falls behind other industries in its application of sophisticated techniques in risk identification, risk evaluation, mitigation and control. Wilkinson and Reed (2008, p.120) assert that “developers are often criticised for not sufficiently understanding and analysing risk.” The finance, insurance and banking sectors have since developed and employed sophisticated risk management techniques and methods and the quantum of research in these areas are too many to list. However, it has been established that research into property development risk is limited (Whipple, 1988). In most studies in property development, approaches to risk concentrate on evaluating property development risk without highlighting key risk factors in the development process. These approaches largely concentrate on feasibility and/or cash flow analyses (Byrne, 1996; Cadman and Topping, 1995); giving limited attention to property development risk management process. The implication of this development need not be overstressed as evident in the global economic collapses engendered by property market failures. Today, property development decision-making is increasingly challenging. Decisions are made under societal conditions characterised by large uncertainties and emergence risks. Consequently, risk analysis and management need balancing of the different risk management strategies with robust and adaptive methods (SRA, 2015).

In Nigeria, evidences abound of property development failures and abandonments with the attendant social, environmental and economic consequences. Development projects are abandoned before completion or completed projects are not disposed over six months. In other cases, completed projects are foreclosed by development lenders due to inability of the developers to service their loans; thus, leading to financial distress and ruination. The importance of risk management studies in property development projects in Nigeria cannot be overemphasised given the substantial socio-political and economic challenges currently facing the nation. It is very obvious that this volatile and unpredictable development environment will adversely impact property development projects. Therefore one question that agitates the mind is; do property development companies in Nigeria apply robust and sophisticated risk management techniques in the evaluation of property development projects? Following this query, the paper aims to review literature and previous research on application of risk management techniques by property development industry with a view to identify knowledge gaps and recommend future research areas in Nigeria. This paper adopts various sources of information such as textbooks, journal articles, reports, masters’ dissertations and doctoral theses relevant to the study. The following main topics will be discussed: risk conceptualisation; risk analysis and management; the property development process; an overview of property development in Nigeria; application of risk management techniques; and the future of risk management in property development projects.

LITERATURE REVIEW

Risk and Uncertainty

The term risk is defined in many ways. A comprehensive risk that incorporates the two aspects (threat and opportunity) is the project risk. Project risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives such as scope, schedule, cost, and quality (Project Management Institute, 2013, p.310). Risk and uncertainty are two common terms in risk

management literature. These two terminologies have been extensively defined, and these depend on the setting in which they are examined. Attempts have been made to distinguish them. Sloman (1995) defines uncertainty and risk as follows:

- Uncertainty – when an outcome may or may not occur and its probability of occurring is not known.
- Risk – when an outcome may or may not occur, but its probability of occurring is known.

Also, Enever and Isaac (2002) state that “in statistics, risk relates to a situation where a probability or weight can be assigned to a possible outcome arising from a decision, while uncertainty is the situation when the likelihoods of the outcome are unknown, and hence no measure of probability can be made.” In other words, risk concerns situations with considerable data and well-defined boundaries for its use; while uncertainty, is synonymous with lack of knowledge and poor/imperfect information (Hargitay and Yu, 1993; SRA, 2015). Although the difference between risk and uncertainty is widely acknowledged, both terms are used interchangeably in property development literature (Adair and Hutchison, 2005). For the purpose of this review, the focus is on the management of uncertainty in property development projects.

The Risk Management Process

In general literature, there are many definitions of risk management. According to Berg (2010, p. 81), a generally accepted description of risk management is that: risk management is a systematic approach to setting the best course of action under uncertainty by identifying, assessing, understanding, acting on and communicating risk issues. Fundamental to this review is the definition by Wiegelmann (2012, p. 61), quoting DeLoach (2000) – “Risk management is a structured and disciplined approach that aligns strategy, processes, people, technology and knowledge with the purpose of evaluating and managing the uncertainties a real estate development organisation faces as it creates value.” A fundamental idea in this definition is that risk management is a systematic process. Risk management process include all organisational regulations and procedures for the identification, analysis, assessment and control of all potential risks in addition to the control and supervision of the profitability and efficiency of any measures taken. There are many risk management standards and guidelines (for eg. IRM Standard, ISO 31000, BS 31100, and the COSO ERM framework) but the most widely accepted is the The Committee of Sponsoring Organisations of the Treadway Commission (COSO) ‘Enterprise Risk Management (ERM) – Integrated Framework’ published in 2004. The COSO standard is a comprehensive guide to efficient ERM (Wiegelmann, 2012). COSO (2004, p.4) defines ERM as “Enterprise risk management is a process, effected by an entity’s board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity’s objectives.” There is no established risk management standard in Nigeria.

The risk management standards/frameworks differ in their composition of stages/steps in the risk management process models. The COSO ERM model consists of eight interrelated components: Internal environment, objective setting, event identification, risk assessment, risk response, control activities, information and communication, and monitoring. From the project management perspective, PMI (2013) project risk management framework consists of the following steps: Risk management planning, risks identification, qualitative risk analysis, quantitative risk analysis, risk response, and risk control. In consideration of the different types of risk management techniques used in the various stages of the risk

management process, the general consensus in extant literature incorporates four core steps in the process of risk management (Makui, et al., 2010). These are: risk identification and classification, risk analysis, risk response, and risk monitoring. Risk identification and classification is a significant step in the process of risk management, as it attempts to ascertain the source and type of risks (Banaitiene et al., 2011). Risk factors could be identified using a qualitative or quantitative approach. The most common risk identification techniques are interviews, brainstorming, checklist, stakeholder analysis, cause-and-effect diagram, and a SWOT analysis (Gehner, 2008). Many methods have been suggested in property development literature for effective project risk management (Newell and Steglick, 2006; Khumpaisal and Chen, 2009). Risk identification establishes the basis for risk analysis, risk response and risk control.

There are generally two broad approaches to risk analysis, namely; qualitative and quantitative. Qualitative risk analysis is the procedure by which the probability and impact of identified risks are assessed in qualitative terms so as to prioritise the effects on the project objectives. Examples of qualitative risk analysis techniques are influence diagrams or a probability/impact risk rating matrix. Quantitative risk analysis is a process that attempts to appraise the frequency of risks and the magnitude of their consequences by different methods such as sensitivity analysis, scenario analysis, expected monetary value-method, decision tree analysis, and probabilistic simulation processes, e.g. Monte Carlo simulation (Byrne and Cadman, 1984; Raftery, 1994; Modarres, 2006). Risk response and risk monitoring have not been substantially developed and often the weakest aspects of the risk management process. Risk responses include avoidance, transfer, mitigation, and acceptance. In summary, Cagliano et al. (2015), posit that risk management techniques have been extensively developed and implemented in both literature and practice; hence, the need to know under what circumstance each of them could be adopted. They suggest three criteria for selecting project risk management technique which include: the phase of the risk management process; the phase of life cycle of a project; and the corporate maturity towards risk.

The Property Development Process

Byrne and Cadman (1984, p. 4) define property development as “The process by which development agencies, together or on their own, seek to secure their social and economic objectives by the improvement of land and the construction or refurbishment of buildings for occupation by themselves or others.” Also, Wilkinson and Reed (2008, p. 3) define property development as “a process that involves changing or intensifying the use of land to provide buildings for occupation.” The above definitions point to the fact that property development is a process. The development process is an integrated process that links different phases or stages that offer a plan for action and for unlocking property value (Costello and Preller, 2010). It is a complex, dynamic and expensive process that combines land, labour, materials, finance, management and entrepreneurship; and which requires the input of different stakeholders to achieve set objectives. The property development process is divided into phases/stages and sub-phases.

In the property development literature, different number of phases/stages and sub-phases with different headings of the development process have been suggested by different authors depending on the context in which they are examined. Byrne and Cadman (1984) split the process into three major parts; acquisition, production, and disposal for the purpose of investigating uncertainty. Also, Long (2012) suggests three main phases of development as; pre-development, development, and close-out. For a more detail list comprising 14 phases, see Birrell and Gao (1997). Particularly convenient for the purpose of

this paper vis-à-vis risk management in property development, is the ‘Eight Stages of Property Development’ (Miles, et al., 2000) which are:

- i. Inception of an idea
- ii. Refinement of the idea
- iii. Feasibility
- iv. Contract negotiation
- v. Formal commitment
- vi. Construction
- vii. Completion and formal opening
- viii. Property asset and portfolio management

The key players in the in the development process (Wilkinson and Reed, 2008) are; landowners, developers, statutory bodies, financial institutions, building contractors, professional advisers and objectors. The key player in the development process is the developer; Schmitz and Brett (2001, p. 11) reasoned that, “the developer’s role is to orchestrate the development process to bring the project to completion. Developers are the central actors in the development process.” There are different categories of developers but for the purpose of this review, the private sector development companies are considered. These companies are in different forms and sizes ranging from a sole-owner to multinationals. The foremost goal of a property development company is to make a direct monetary profit from the development process. Basically, the development companies operate as either trader or investor (Wilkinson and Reed, 2008). Developers are risk-takers given the complex and multi-disciplinary nature, and, the risks that span through the various stages of the property development process. Risk management is the very business of the developer.

The Property Development Industry in Nigeria – An Overview

Worldwide, the property sector is one of the most profitable enterprises of every economy and an index for measuring the economic growth and development of a nation. The real estate/property industry develops, invests, supports, and maintains the built environment, and other services it clients, is of crucial importance to policy makers. Besides other factors that influence the well being of the citizen of a nation, a performing property sector provides the essential platform for all these other factors to deliver their full potential, and for economy to thrive and remain competitive. Businesses and society cannot operate without the services of commercial property, including the provision of shops, offices, factories, housing and many other types of property (EPRA and INREV, 2012). Mouzugh, et al. (2014, p. 1710), quoting DisPasquale and Wheaton (1996) states that property is defined as; “The economy’s stock of buildings, the land on which they are built, and all vacant land. These buildings are used either by firms, government, non-profit organisations and so on, as workplaces, or by households as places of residence.” In line with the above definition, it could be deduced that property make up the largest single composition of a nation’s assets, which combined with its financial assets constitute the gross assets of a national wealth (FRBSF, 2000), hence has a substantial bearing on a nation’s economy and its development.

Property development plays a very crucial role in the Nigerian property industry and economy. The industry consists of a wide range of organisations, individuals, and the State involved in developing and managing property to meet the commercial, housing, employment and the social needs of the citizens. Property development projects in Nigeria encompass residential properties, commercial properties,

industrial complexes, sporting and leisure facilities, parking facilities, etc. Nigeria is a developing nation which economy has been in transition since the return of democracy in 1999 amid growing socio-political and economic challenges facing the nation. Presently, the Nigerian economy is in recession (NBS, 2016) and when an economy is in recession, the real estate sector is the first casualty. According to IMF (2016) report, key risk factors in the Nigeria's environment include low oil prices, shortfall in non-oil revenue, ongoing security concerns, decline in foreign reserve, contracted growth, and lengthy period of policy uncertainty. These developments have compounded an already challenging development environment characterised by inadequate infrastructure, high unemployment rate and a high poverty rate. Furthermore, inflation rate is double digit, interest rate is above 20% with erratic and high exchange rate. The cost of development has increased as a result of the devaluation of naira being that most building materials used for building construction are imported. A large percentage of the building materials used in the construction of buildings are imported. This severe volatile and unpredictable environment has negatively impacted property development projects as evidenced by abandoned projects and property overhang; hence there is no better time than now to investigate how property development companies have been and presently managing risks in Nigeria.

Application of Risk Management Techniques in Property Development Industries

The following studies have investigated the application of risk management techniques in the construction and real estate industries.

Akintoye and MacLeod (1997) conducted a study on risk analysis and management using a sample of 100 top firms in UK construction industry. The study achieved 43% response rate comprising 30 general contractors and 13 project management practitioners. Findings show that 77% of contractors and 100% of project management practices use intuition/judgement/experience in risk analysis. This is followed by sensitivity analysis, where 53% and 38% of contractors and project management practices apply the technique respectively. Only 3% of contractors apply Monte Carlo simulation. Uher and Toakley (1999) surveyed a sample of 713 Australian firms in the construction industry with a response of 200 companies of which 37 are property developers. The study examined the skill levels and attitudes of key players to risk management in the conceptual phase of the construction project development. It was found that the most frequently used risk analysis technique was subjective judgement, followed by sensitivity analysis. Knowledge of probability analysis, risk adjusted discount rate, and decision tree is inadequate. Risk identification techniques most commonly applied include brainstorming, checklists and flow charts. Impediments to application of risk management were poor knowledge and skill base and lack of understanding of its possible advantages. Baker, Ponniah, and Smith (1999) investigated the risk management practices of over 100 companies within the construction industry and oil and gas operators in the United Kingdom. The response was 40 construction companies and 12 oil and gas firms. Techniques of risk analysis used by the construction firms are scenario analysis, break-even analysis, and monetary value method; oil companies in addition to those mentioned, use algorithms, decision matrix, expected net present value, decision tree, and simulation; an indication that oil companies use more quantitative risk analysis techniques than construction industries. Non use of these techniques is attributed to not seeing the benefits, lack of familiarity, lack of expertise, lack of sound data, and giving priority to experience.

Lyon and Skitmore (2004) conducted a survey on the usage of risk management techniques by Queensland engineering construction industry with a sample of 200 organisations comprising; owners, property developers, consultants (project managers, quantity surveyors and engineers) and contractors. A response of 6 developers, 10 owners, 11 consultants and 17 contractors was achieved. Findings indicate that risk identification and risk analysis are the most often used risk management components ahead of risk response and risk document. The most frequently used risk identification techniques are brainstorming, the case-based approach and checklists. Among the risk assessment techniques available, intuition, experience and judgement are the most frequently used, followed by sensitivity analysis and risk premium; while the least use are Monte Carlo simulation, decision analysis techniques and expected monetary value (EMV) method. Risk reduction is the most frequently used risk response method, closely followed by risk transfer, risk elimination and risk retention. The above outlined studies focused on construction industry in general with none particularly describing the application of risk management techniques by property development companies.

In Gehner, Halman and de Jonge (2006), a sample of 31 of the largest real estate developers in Netherlands was surveyed comprising independent real estate development companies, financier related, contractor related, investor related and other categories (owner-user, housing corporation). A total of fifteen developers responded, comprising 7 independent developers, 3 financier related, 3 contractor related, 1 investor related and 1 remaining categories. Results show that 100% of the developers use intuition/experience, qualitative description (100%), scenario/sensitivity analysis (80%), risk premium (27%), checklist (20%), assessment of total risk exposure (13%) and probabilistic techniques (0%) for risk analysis. These results indicate that the most used techniques the by developers are intuition/experience and qualitative description; followed scenario/sensitivity analysis. No single developer use probabilistic techniques. This study fully concentrated on property developers, unlike the previous studies. However, the study did not consider the organisational setting of decision making process by the firms. The study by Gehner (2008), "Knowingly taking risk: investment decision making in real estate development" describes how development decision are made in property development organisations. Only three firms were examined because of the descriptive and in-depth character of the study. Findings show that the use of explicit risk analysis techniques in the investment decision making process in property development from an organisational perspective is low. The review of boardroom decision making gave the understanding that decision makers implicitly and always analyse different scenarios by asking 'what-if' questions. These scenarios are usually not quantified unless in extreme cases. The three Dutch case studies is a limitation to the study in view of generalisation and insight.

Wiegelmann (2012) investigated the application of risk management techniques in leading European property development organisations. The study offers organisation decision-making process largely based on the Committee of Sponsoring Organisations of the Treadway Commission (COSO) Risk Management Framework (2004) given its wide acceptance in the European context. The study filled the knowledge gap identified in Gehner's (2008) study vis-à-vis generalisation and insight by investigating 69 prominent property development companies in UK, Germany, Italy, France, Switzerland, Spain and Austria. The study achieved 43.7 per cent response rate. The results of the survey show that 69.9% of the property development organisations approach risk assessment primarily in subjective and intuitive manner. Other established methods are sensitivity analyses and scenario techniques with each 45%. The inclination to use these approaches is because they are practical comparatively straightforward to apply. Probabilistic techniques are the least use; Monte Carlo simulation (10.1%), value at risk (7.2%) and decision tree

procedures (4.3%). None of the preceding studies formulated any risk management model with advanced risk analysis/assessment techniques, more so, one that can be applied in a developing country's context like Nigeria.

Despite the modest advancement made in these advanced economies, unfortunately, not much research is being done to study and implement risk analysis and risk management techniques in property development projects in Nigeria. In the Nigerian context, there are very few studies on risk management in the real estate sector (Nnamani, 2016; Otegbulu et al., 2012 and Ogunba, 2002). Ogunba (2002) investigated the application of risk analysis by development surveyors, corporate developers, and development lenders in pre-development appraisal in Southwestern Nigeria. The study surveyed 193 surveying firms, 111 development lenders and 18 corporate developers; a total of 113, 32 and 10 responses were actualized for surveyors, lenders and corporate developers respectively. Findings show that none of the surveyed group applies probabilistic risk analysis techniques in pre-development appraisal. Otegbulu et al. (2012), surveyed risk assessment techniques applied in property development project in Abuja, Nigeria. The study investigated 80 estate surveying and valuation firms. A total of 69 firms responded comprising 23 project managers, 20 developers, 14 feasibility consultants and 12 that engage in the above three functions. The study disclosed that economic, political and social risks are the most predominant risks encountered in property development project. The most often used risk analysis techniques by the firms are qualitative description and scenario/sensitivity analysis.

The study by Nnamani (2016), investigated the "Application of quantitative risk analysis techniques in the investment appraisal of residential properties in Enugu Urban, Nigeria." The study surveyed the frequency of risk analysis techniques used by estate surveying and valuation firms in the appraisal residential property investment. The study investigated 44 estate surveying and valuation firms in Enugu Urban, with a response rate of 84.09 %. The results show that the rate of application of subjective assessment is 88%, sensitivity analysis (60%) and risk-adjusted discount rate (36%). No firm use probabilistic methods for risk analysis. Also, lack of familiarity, degree of sophistication, non availability of sound data/information, lack of expertise, and lack of local software packages are the key factors limiting the application of quantitative risk analysis techniques by the firms. These studies mainly focused on risk identification and risk analysis/assessment by mainly estate surveying and valuation firms, ignoring other aspects of risk management process; while others covered risk management on building construction without considering other aspects of the property development process (e.g., Odimabo and Oduoza, 2013). There seem to be no study on application of risk management techniques by property development companies in Nigeria; hence, the need to fill this knowledge gap by providing a model for effective risk management in the Nigeria's property development industry.

The above reviewed studies in Europe, Australia and Nigeria, show that, generally, risk analysis and management is still generally handled in a subjective manner. Any notion that developers are now applying robust and sophisticated risk management techniques is erroneous as this is scarcely manifested in actual practice. Also, as compared to other industries such as oil and gas, risk management has, up till now, not been adequately adapted to property development industry. The most commonly applied risk identification techniques include; checklist, brainstorming, and risk matrix; for risk analysis; subjective assessment, scenario/sensitivity analysis and risk-adjusted discount rate. Very few developers most especially in some parts of Europe and Australia apply Monte Carlo simulation, decision tree procedure and value at risk techniques. The most frequently used risk response techniques are; risk reduction, risk

transfer, risk elimination, and risk response. Factors predominantly responsible for the state of affairs include; lack of expertise in the techniques, lack of familiarity with the techniques, lack of sound information, and lack of accepted industry model for risk analysis. The overall conclusion that could be drawn from review of the current use of risk analysis and management techniques in the property development industry is that probability risk analyses are not established in the property development sector, rather risk management is assessed in an extensively qualitative manner.

THE FUTURE OF RISK MANAGEMENT IN PROPERTY DEVELOPMENT PROJECTS: MEETING THE CHALLENGES

The risk management function has shifted to another level of importance as a result of the global financial crises, although risk management was already widely used in many industries. Recent studies have shown that risk management thus far has not been sufficiently adapted to the property industry in comparison with other industries. Property development companies frequently assess risk associated with development projects using DCF models, scenario and sensitivity analyses while seldom or not apply sophisticated quantitative methods at all (Donner, 2010). Presently the development environment is highly unpredictable and volatile; it seems to become more complex by the day; therefore, there is need for development companies to adopt robust, resilient, and adaptive risk management techniques to confront severe uncertainties and emergence risks. Special attention is on confronting large/deep uncertainties, surprises and the unforeseen in property development projects.

The consideration of future risk management in property development project is provoked by the recent reviews and discussions of Aven (2016) and SRA (2015) on the future of risk assessment and management. The main issue raised in the references is how to manage large/deep uncertainties in relation to the events occurring and the consequences of these events. In addition are the well known challenges associated with specifying utility functions to reflect the decision maker preferences. The contention according to SRA (2015, p.12) is that “Today risk analysis is well established in situations with considerable data and clear defined boundaries for its use. Statistical and probabilistic tools have been developed and provide useful decision support for many types of applications. However, risk decisions are, to increasing extent, about situations characterised by large uncertainties and emergence. Such situations call for different types of approaches and methods, and it is a main challenge for the risk analysis field to develop suitable frameworks and tools for this purpose.” Large/deep uncertain situations are characterised by poor background knowledge, lack or inadequate information/data; and the inability to justify probabilities that may be assigned to such situations. Probabilistic simulation tools has proven to be a useful tool in a wide range of applications, but to handle the challenges of large uncertainties and emergent risks, the probability-based approaches for assessing risk is not adequate. A robust and adaptive method that combines probability and qualitative approaches provide genuine breakthroughs for improving predictions and decision in such cases (Aven, 2016; Cox, 2012). Aven (2016) in line with SRA (2015) propose interval probabilities, possibilistic measures, and qualitative methods.

In the property development context, simulation is seen to be one of the most powerful analytical tools available for decision-makers under the conditions of uncertainty and risk (Byrne, 1984; Hargitay and Yu, 1993) when there is ample knowledge and quality information/data. However in a situation of deep/large uncertainties characterised by poor knowledge and lack of information, the simulation approach becomes unsuitable. There are substantial literature that criticise the use of simulation as a technique, and in the

property development context (Loizou and French, 2012). For instance, Loizou and French (2012) citing Reutlinger (1970) and Johnson (1985) outline the disadvantages of Monte Carlo simulation as follows:

- non-reliability of historic information;
- continuous distribution of inputs gives rise to an infinite number of outcomes which is unrealistic;
- there is correlation between variables (economic, organisational, technical) so that when independent variable are aggregated for risk assessment purpose the effect of the variation of one may be compensated by a variation of another in the opposite direction;
- subjective (estimates and guesstimates);
- easier to forecast capital cost item than effective demand thus more appropriate question of cost effectiveness rather than profitability (NPV) of project;
- need to know probability distributions for each outcome of choice;
- the continuous probability outcome may make data inadequacies and obscure causative relationships;
- may distract attention for radical policy and project alternatives; and
- more staff time for data collection and analysis.

The above disadvantages is an indication that Monte Carlo simulation regarded as a potent tool for risk analysis is not capable of handling severe uncertain development situations since there is need to know the probability distributions for each outcome of event. The argument has been that if background knowledge is rather weak, then it will be difficult to assign a subjective probability with some confidence. Consequently, there is need for substantial research and development to obtain adequate modelling and analysis methods beyond purely probabilistic ones to handle complex development situations. The adaptation of probability and qualitative approaches to risk analysis and management in property development has become imperative in that uncertainty lies at the root of property development. Interval probability, possibilities theories, and qualitative methods as suggested by Aven (2016) and SRA (2015) are the way to go. Interval probability is suitable for complex situations with sparse data, imprecise probability, and incomplete and possibly inconsistent knowledge. In this approach, interval numbers are use to represent the probability measures in order to capture fuzziness and incompleteness in a relatively simple manner (Cui and Blockley, 1990; Hall et al., 1998; Weichselberger, 2000). The technique has since been used to model complex processes in the fields of earthquake engineering and petroleum exploration (Hall et al., 1998); and could be adjusted to property development risk management.

CONCLUSIONS AND RECOMMENDATIONS

This review paper has evaluated a considerable number of literature in the application of risk management techniques in property development projects. Presently, the complexity and uncertainty in property development have increased as a result of several trends; consequently risk management has become more important. Regrettably, the property industry lags behind other industries in the application of sophisticated risk management techniques as a result of lack of apt in research and development by the industry. Overall, property developers predominantly handle risk management in a subjective manner – using experience and ‘gut feeling’ followed by DCF models, sensitivity analysis and scenario analyses; while simulation-bases approaches are seldom used or not applied at all as in the case of Nigeria. The continuous application of these approaches will continue to negatively impact property development leading to development failure and financial distress. The importance of adopting a strategic risk

management approach cannot be overemphasised in that it permits development companies to constantly produce superior performance while tactically managing uncertainty. In the property development industry, there is potential for further development of advanced risk management tools such as interval probabilities, possibilistic measures, qualitative methods, and risk early warning system to confront the present-day and future socio-political, economic and environmental challenges, especially those related to severe uncertainty and emerging risks. All hands must be on deck; stakeholders and most importantly the academia have major contributions to make towards developing a robust and resilient risk management system.

Recommendations based on the identified knowledge gaps are; a study should be conducted in Nigeria which will investigate the perception and practice of property development in risk management since there are few studies on risk management in the real estate sector; and also, it seems no study has investigated the application of risk management techniques by property development companies in Nigeria. The study should aim at developing a risk management model integrating advanced risk management techniques such as interval probabilities, possibilistic measures, and risk early warning system. This model should be developed in a manner that will contribute to the general debate on risk management and not only to the Nigerian context. The justification of using Nigeria as the case for exploring the concept of risk management and its application is that Nigeria is currently facing substantial socio-political, economic, and environmental challenges of great magnitude; besides there are very few studies in property development risk management.

REFERENCES

- Adair, A. and Hutchison, N. (2005) 'The reporting of risk in real estate appraisal property risk scoring', *Journal of Property Investment & Finance*, 23(3), pp. 254-268. [Online] DOI: 10.1108/14635780510599467 (Accessed: 13 August 2016).
- Akintoye, A. S., and MacLeod, M. J. (1997). Risk analysis and management in construction. *International Journal of Project Management*, 15(1), 31-38. [Online] DOI: 10.1016/S0263-7863(96)00035-X (Accessed: 8 September 2015).
- Aven, T. (2016) 'Risk assessment and risk management: review of recent advances on their foundation', *European Journal of Operational Research*, 253(2016), pp. 1-13. Available at: <http://dx.doi.org/10.1016/j.ejor.2015.12.023> (Accessed: 8 August 2016).
- Baker, S., Ponniah, D., and Smith, S. (1999) 'Survey of risk management in major U.K. companies', *Journal of Professional Issues in Engineering Education and Practice*, 125(3), 94-102. [Online] DOI: 10.1061/(ASCE)1052-3928 (Accessed: 2 June 2016).
- Banaitiene, N., Banaitis, A., and Norkus A. (2011) 'Risk management in construction projects: peculiarities of Lithuanian construction companies', *International Journal of Strategic Property Management*, 15(1), pp. 60-73. [Online] DOI:10.3846/1648715X.2011.568675 (Accessed: 14 July 2016).
- Berg, H. (2010) 'Risk management: procedures, methods and experiences', *RT & A*, 1(June), pp. 79-95. Available at: http://www.gnedenko-forum.org/Journal/2010/022010/RTA_2_2010-09.pdf (Accessed: 10 July 2016).

- Birrel, G. and Gao, S. (1997) 'The property development process of phases and their degree of importance', The RICS Cutting Edge Conference. Dublin. Available at: <http://www.rics-foundation.org.uk> (Accessed: 5 January 2013).
- Byrne, P. (1996) *Risk, uncertainty and decision-making in property development*. London: E. & F. N. Spon.
- Byrne, P. and Cadman, D. (1984) *Risk, uncertainty and decision-making in property development*. London: E. & F. N. Spon.
- Cadman, D., and Topping, D. (1995) *Property development*. London: E. & F. N. Spon.
- Cagliano, A. C., Grimaldi, S., and Rafele, C. (2015) 'Choosing project risk management techniques. A theoretical framework', *Journal of Risk Research*, 18(2), pp. 232-248. [Online] DOI: 10.1080/13669877.2014.896398
- COSO (2004) *Enterprise risk management – integrated framework: executive summary*. Durham: Committee of Sponsoring Organisations of the Treadway Commission (COSO).
- Costello, G. and Preller, F. (2010) 'Property development principles and process – an industry analysis', *Pacific Rim Property Research Journal*, 16(2), pp. 171-189. [Online] DOI: 10.1080/14445921.2010.11104300
- Cox, L. A. T. (2012) 'Confronting deep uncertainties in risk analysis', *Risk Analysis*, 32, pp. 1607-1629.
- Cui, W. and Blockley, D. I. (1990) 'Interval probability theory for evidential support', *International Journal of Intelligent Systems*, 5(2), pp. 183-192. [Online] DOI: 10.1002/int.4550050204 (Accessed: 5 July 2016).
- Deloach, J. W. (2000) *Enterprise-wide risk management: strategies for linking risk and opportunity*. New Jersey: Financial Times Prentice-Hall.
- DisPasquale, D. and Wheaton, W. C. (1996) *Urban economics and real estate*. New Jersey: Prentice Hall.
- Donner, S. M. (2010) 'Risk management in the aftermath of Lehmann Brothers – results from a survey among German and international real estate investors', *Journal of Property Research*, 27(1), pp. 19-38. [Online] DOI: 10.1080/09599916.2010.499016 (Accessed: 13 May 2016).
- Enever, N. and Isaac, D. (2002) *The valuations of property investments*. 6th edn. London: Estate Gazette.
- EPRA and INREV (2013) *Real estate in the real economy: supporting growth, jobs and sustainability*. Europe: The European Public Real Estate Association and the European Association for Investors in Non-listed Real Estate Vehicles. Available at: http://www.epra.com/.../Real_estate_in_the_real_economy-EPRA_INREV_report13535... (Accessed: 9 July 2016).
- Fisher, P. (2005) 'The property development process: case studies from Grainger Town', *Property Management*, 23(3), pp. 158-175. Available at: <http://dx.doi.org/10.1108/02637470510603510> (Accessed: 6 July 2016).

FRBSF (2000) *How do you calculate a nation's wealth and why might different methods be used to estimate wealth?* Available at <http://www.frbsf.org/education/publications/doctor-econ/2000/October/national-wealth/> (Accessed: 9 July 2016).

Gehner, E. (2008) *Knowingly taking risk investment decision making in real estate development*. Delft: Eburon Academic Publishers.

Gehner, E., Halman, J. I. M., and de Jonge, H. (2006) 'Risk management in Dutch real estate development sector: a survey', The 6th *International Postgraduate Research Conference in the Built and Human Environment*. University of Salford

Hall, J. W., Blockley, D. I., and Davis, J. P. (1998) 'Uncertain inference using interval probability theory', *International Journal of Approximate Reasoning*, 19(3-4), pp. 247-264. [Online] DOI: 10.1016/S0888-613X(98)10010-5 (Accessed: 8 August 2016).

IMF (2016) *IMF Country Report No. 16/101*. Washington, D. C.: International Monetary Fund. Available at: <https://www.imf.org/external/pubs/ft/scr/2016/cr16101.pdf> (Accessed: 20 July 2016).

Khumpaisal, S. and Chen, Z. (2009) 'An analytic network process for risks assessment in commercial real estate development', *Journal of Property Investment & Finance*, 27(3), pp. 238-258. Available at: <http://dx.doi.org/10.1108/14635780910951957> (Accessed: 10 April 2016)

Loizou, P. and French, N. (2012) 'Risk and uncertainty in development: a critical evaluation of using Monte Carlo simulation method as a decision tool in real estate development projects', *Journal of Property Investment & Finance*, 30(2), pp. 198-210. Available at: <http://dx.doi.org/10.1108/146357811211206922> (Accessed: 13 August 2015).

Long, C. A. (2012) *Fundamental skills for real estate development professionals I: site selection and due diligence*. Washington D. C.: Urban Land Institute. Available at: <http://archive.uli.org/fallmeeting2012/wed/Siteselection-CharlesLong.pdf> (Accessed: 27 August 2016).

Lyon, T. and Skitmore, M. (2004) 'Project risk management in Queensland engineering construction industry: a survey', *International Journal of Project Management*, 22(1), 51-61. [Online] DOI:10.1016/S0263-7863(03)00005-X (Accessed: 22 July 2016).

Makui, A., Mojtahedi, S. M., and Mousavi, S. (2010) 'Project risk identification and analysis based on group decision making methodology in a fuzzy environment', *International Journal of Management Science and Engineering Management*, 5(2), 108-118.

Miles, M. E., Berens, G. L., and Weiss, M. A. (2000). *Real estate development: principles and process*. 3rd edn. Washington D. C.: Urban Land Institute.

Modarres, M. (2006) *Risk analysis in engineering – techniques, tools, and trends*. Boca Raton: CRC Press

- Mouzughi, Y., Bryde, D., and Al-Shaer, M. (2014) 'The role of real estate in sustainable development in developing countries: the case of the Kingdom of Bahrain', *Sustainability*, 6, 1709-1728. [Online] DOI: 10.3390/su6041709 (Accessed: 9 July 2016).
- NBS (2016) 'Nigerian gross domestic product report q2 2016'. Available at: <http://www.nigerianstat.gov.ng/report/434> (Accessed: 5 September 2016)
- Newell, G. and Steglick, M. (2005) 'Assessing the importance of property development risk factors', *Pacific Rim Property Research Journal*, 12(1), pp. 22-37
- Nnamani, O. C. (2016) *Application of quantitative risk analysis techniques in the investment appraisal of residential properties in Enugu Urban, Nigeria*. MSc dissertation. University of Nigeria Nsukka.
- Odimabo, O. O., and Oduoza, C. F. (2013). Risk assessment framework for building construction projects' in developing countries. *International Journal of Construction Engineering and Management*, 2(5), 143-154.
- Ogunba, O. A. (2002) *Pre development appraisal and risk adjustment techniques in southwestern Nigeria*. PhD thesis. Obafemi Awolowo University, Ile-Ife, Nigeria.
- Otegbulu, A. C., Mohammed, M. I., and Babawale, G. K. (2011). Survey of risk assessment techniques applied in real estate development in Nigeria: a case study of Federal Capital Territory, Abuja. *Journal of Contemporary Issues in Real Estate*, 1(1), 189-202.
- PMI (2013) *A guide to the project management body of knowledge*. 5th edn. Pennsylvania: Project Management Institute, Inc.
- Raftery, J. (1994) *Risk analysis in project management*. London: E & FN Spon
- Ratcliffe, J. and Stubbs, M. (1996) *Urban planning and real estate development*. London: UCL Press.
- Schmitz, A. and Brett, D. L. (2001) *Real estate market analysis: a case study approach*. Washington D. C.: Urban Land Institute.
- Sloman, J. (1995) *Economics*. 2nd edn. London: Prentice-Hall.
- SRA (2015) *Risk analysis foundations*. McLean, Virginia: Society for Risk Analysis.
- Uher, T. E., and Toakley, A. R. (1999) Risk management in conceptual phase of a project. *International Journal of Project Management*, 17(3), pp. 161-169
- Weichselberger, K. (2000) 'The theory of interval-probability as a unifying concept for uncertainty', *International Journal of Approximate Reasoning*, 24(2-3), pp. 149-170. [Online] DOI: 10.1016/S0888-613X(00)00032-3 (Accessed: 5 August 2016).
- Whipple, R. T. M. (1998) Evaluation of development projects. *Journal of Valuation*, 6(3), pp. 253-286.

Wiegelmann, T. W. (2012) *Risk management in the real estate development industry: investigations into the application of risk management concepts in leading European real estate development organisations*. PhD thesis. Bond University, Australia.

Wilkinson, S., and Reed, R. (2008) *Property development*. 5th edn. Abingdon Oxon: Routledge

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