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IDENTIFICATION AND ASSESSMENT OF KEY RISK FACTORS AFFECTING PUBLIC CONSTRUCTION PROJECTS IN NIGERIA: STAKEHOLDERS PERSPECTIVES

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ABSTRACT: *Managing risks in construction projects has been recognized as a very important management process in order to achieve the project objectives in terms of time, cost, quality, safety and environmental sustainability. However, until now most research have focused on some aspects of construction risk management rather than using a systematic and holistic approach to identify risks and analyze the likelihood of occurrence, its impacts on stakeholders and determine relative significance index score for each factor identified. This paper aims to identify and assess the key risk factors affecting public construction project delivery from project stakeholder perspectives. The research strategy was a sequential mixed-method approach. It was adopted by means of interview surveys (qualitative approach) followed by a questionnaire (Quantitative approach). Data collection was done through a questionnaire survey self-administered on 40 randomly selected construction industry participants. Out of the 40 questionnaires administered, 33responses fit for analysis were received representing 82.5%. Data were analyzed with the use of parametric and non-parametric statistics. Forty one risk factors were classified into five categories based on their source: Construction, Political, Financial and Economic, design related and environmental risks. The study reveals that these risk factors spread through the whole project life cycle and many risks occur at more than one phase, with the construction stage with risky phase. On the risk categories level all the stakeholders agreed on the finance category as the main factor threatening project completion, and the external category as having the least impact. Furthermore, clients and consultants held different perception on the impact of design category. It is concluded that clients, builders and government bodies must work cooperatively from the feasibility stage onwards to address potential risk in time, and contractors and subcontractors with robust construction and management knowledge must be employed early to make sound preparation for delivery out efficient and quality construction program.*

KEYWORDS: Project Management, Risk Management, Risk Identification, Risk Assessment, Risk Impact, Stakeholder Perspectives, and Risk Analysis.

INTRODUCTION

Construction activities in Nigeria which are mostly carried out by Government, consultants and contractors normally face different kinds of risks (e.g Management, Design, Finance, Construction, Political and External) during construction. However, most of them do not predict risks when they are considering bids and tenders. Construction risk is generally perceived as events that influence project objectives, i.e , cost , time, and quality. Some of the risks associated with the construction process are fairly predictable or really identifiable; others may be totally unpredictable (Al-Bahar, 1990). In project management terms, the most serious effects of risk can be summarized as follows:

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- Failure to keep within the cost estimate
- Failure to achieve the required completion date
- Failure to achieve the required quality and operational requirements (Mehdi Tadayon, Mastura Jaafar and Ehsan Nasri, 2012).

In recent years, intensive research and development have focused on project risk management. Risk management may be described as "a systematic way of looking at areas of risk and consciously determining how each should be treated. It is a management tool that aims at identifying sources of risk and uncertainty, determining their likely hood of occurrence, their impact, and developing appropriate management responses" (Uher, 2003). A systematic process of risk management has been divided into risk classification, risk identification, risk analysis and risk response, where risk response has been further divided into four actions, i.e. retention, reduction, transfer and avoidance (Berkeley *et al.*, 1991; Flanagan and Norman, 1993). An effective risk management method can help to understand not only what kinds of risks are faced, but also how to manage these risks in different phases of a project. Owing to its increasing importance, risk management has been recognized as a necessity in most industries today, and a set of techniques have been developed to control the influences brought by potential risks (Schuyler, 2001; Baker and Reid, 2005). Compared with many other industries, the construction industry is subject to more risks due to the unique features of construction activities, such as long period, complicated processes, abominable environment, financial intensity and dynamic organization structures (Flanagan and Norman, 1993; Akintoye and MacLeod, 1997; Smith, 2003). Hence, taking effective risk management techniques to manage risks associated with variable construction activities has never been more important for the successful delivery of a project. Previous research has mainly focused on examining the impacts of risks on one aspect of project strategies with respect to cost (Chen *et al.*, 2000), time (Shen, 1997) and safety (Tam *et al.*, 2004). Some researchers investigated risk management for construction projects in the context of a particular project phase, such as conceptual/feasibility phase (Uher and Toakley, 1999), design phase (Chapman, 2001), construction phase (Abdou, 1996), rather than from the perspective of a project life cycle. Moreover, little research has probed risks from the perspectives of project stakeholders. As part of a much larger project aiming to articulate and manage key risks associated with construction projects, this paper presents the results of a questionnaire survey and seeks to identify the potential key risks from the perspectives of stakeholders. It has already been recognized that a clear understanding of the risks born by each stakeholder leads to better risk allocation. The objective of this study is to identify risk factors associated with construction projects and find an appropriate approach to categorized them by reviewing the relevant literature. It is of particular interest to rank the risk factors based on their relative significance index score value for their negative impact on project completion from the construction stakeholder perspectives.

LITERATURE REVIEW

Risk management is the systematic process of identifying, analyzing and responding to projects risk. It includes maximizing the likelihood and the impact of positive events and minimizing the likelihood and the impact adverse events to meet the project objectives (PM, 2000). According to Al Bahar and Cranddall (1990), risk identification is defined as the process of

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systematically and continuously identifying**,** categorizing and assessing the initial significance of risk associated with construction projects.

Risk Assessment Strategies

Managing changes has led to the introduction of techniques for risk assessment as a major part of the planning process. Risk assessment concentrates on quantifying identified risks by using statistical analysis, since the identified risk in most cases can be either quantitively or subjectively assessed factors (Lockyer and Gordon, 1996).

The risk management cycle (the risk assessment phase) can be viewed in three stages

(Smith, 2008), (Maylor, 2003) and (Zayed et al., 2008): risk identification, risk analysis and risk response. Figure 2.1 (below) illustrates the risk management cycle.

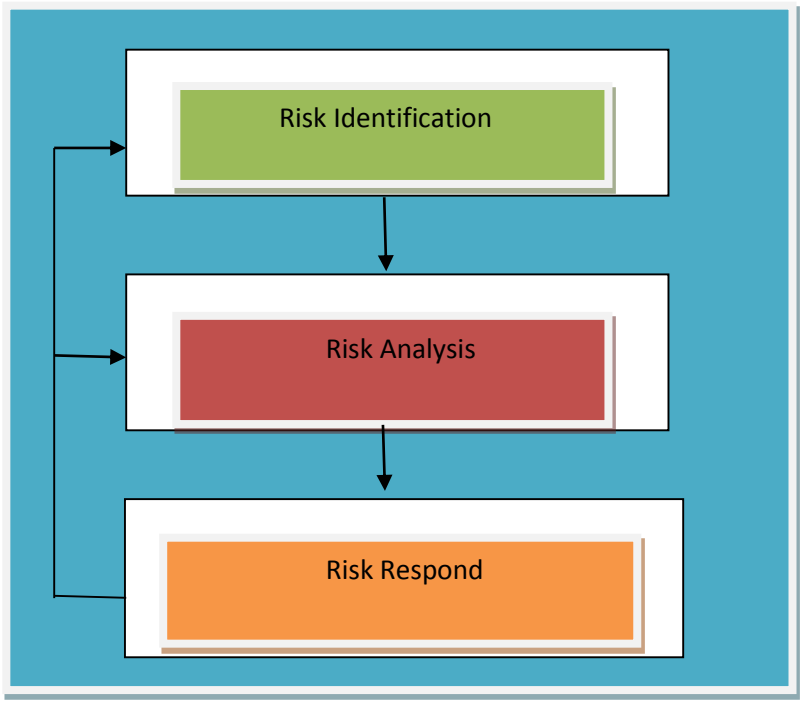

Figure 2.1 Risk assessment Source: (Smith, 2008) and (Maylor, 2003)

RISK IDENTIFICATION

Risk identification is a process for uncovering any risks that could potentially affect a process. This step is of considerable importance as other processes such as risk analysis and response can only be undertaken on the potential risks that have been identified (Oluwaseyi, A.A. 2012). Risk identification is a simple but difficult task as there are no absolute procedures that may be used to identify risks in a project. Managers often rely heavily on their experience and on the insight of other key personnel involved in the process (Oluwaseyi, A.A., 2012). Depending on the process documentation available and the nature of the process, a variety of considerations may prompt risk discovery. Regarding risk, Smith and Merritt (2002) note that managers need to focus on the interface between the consultant and the client, between departments of the

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client organization, between phases or tasks of a client process, or between geographic areas. They further suggest that the project schedule should clearly show dependencies between tasks in order to help pinpoint risk-prone areas. Alternatively, managers may use process maps that show interfaces between processes or tasks. At the stage of risk identification it is important to identify the risk source and its effect (Raftery, 1999).

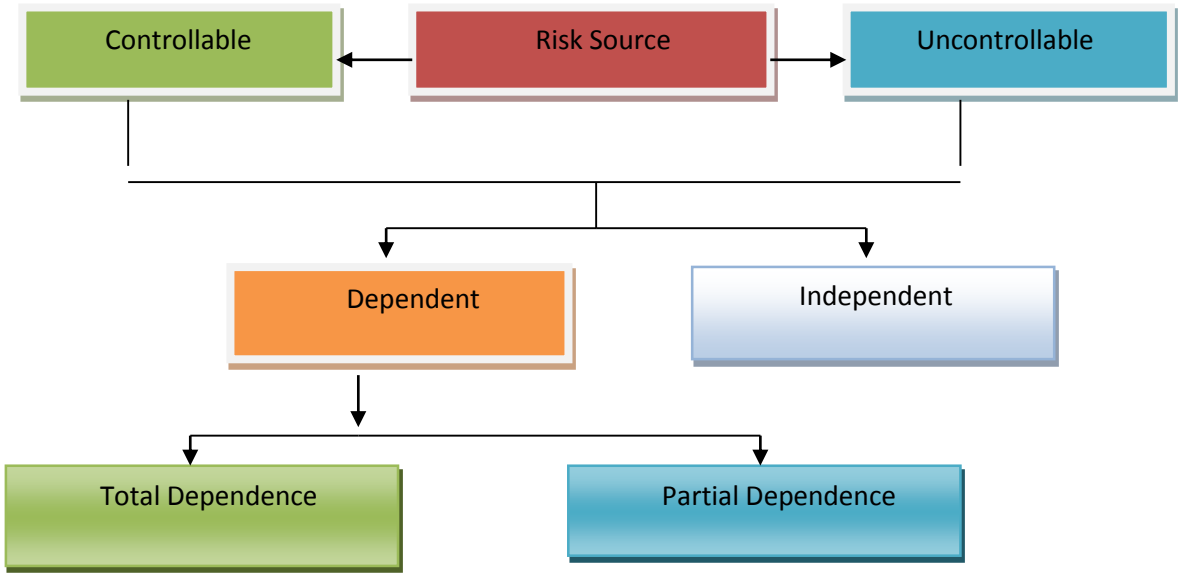

Figure 2.2 Risk classification, Source: (Flanagan, 1993)

Controllable risks are those for which the outcomes are within the control and influence of the decision makers. Uncontrollable risks are those where the decision makers have no control or influence over them, and they usually stem from external sources (Flanagan, 1993) and (Chapman, 2001)

One of the effective tools for indentifying potential risks is the work breakdown structure (WBS) which reduces the chance of missing risk event (Gray and Larson, 2003).

Work Breakdown Structure (WBS) refers to identifying activities required to deliver the design needed to construct the project, in addition to what resources will be needed to carry out the work (Smith, 2008) and (Maylor, 2003).

It is useful to seek an answer to the three essential questions in the risk identification phase which are; what could go wrong?, how likely is it?(probability), and how it will affect the project?(impact). Project manager and the team could use the experience and lessons learnt from the past, use a simulation model to present possible risks in addition to brainstorming in order to recognize the potential risk factors (Lockyer and Gordon, 1996).

Risk analysis is the intermediate process between risk identification and risk response.

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Risk Analysis

Risk analysis techniques are grouped into qualitative and quantitative methods (Oztas and Okmen, 2004). The potential risks are analyzed using a qualitative or quantitative method to evaluate their potential impacts (Zou et al., 2007). Another way of defining risk analysis is estimating what could happen if an alternative action or response were selected (Smith, 1999).

According to Gray and Larson (2003), analyzing risks could be qualitative or quantitative.

Qualitative analysis represented in experts opinion and it could carry serious errors based on the respondents or the decision maker judgment skills. On the other hand, the qualitative method is more reliable and it requires serious data collection and more detailed analysis.

To identify the potential risk factors (RF) and investigate their impact on construction projects completion, a classification that covers all types of presented potential risk factors is needed (Tchankova, 2002).

Risk Response

The risk identification and analysis process helps decision makers to make judgment before problem occur. There are many forms of reaction to identified risks, such as risk avoidance, risk reduction or risk transfer (Raftery, 1999)

All projects are at risk to potential problems in the form of events or factors called risks, and it is known that they influence the time frame, budget and quality of projects (Santoso et al., 2003), however, all risks involve both threats and opportunities (Chapman and Stephen, 2002).

As mentioned earlier, a few researchers and decision makers like to make a distinction between uncertainty and risk. Uncertainty is not insurable and is found in situations where it is not possible to attach a probability to the likelihood of the occurrence of a problem (Raftery, 1999), or where the uncertainty could lead to risk events, threats and opportunities (Chapman and Stephen, 2002). Kartam and Kartam (2001), identify risk as the prediction of a project's success based on the probability of uncertainties occurring.

Project risks increase with the level of uncertainty; according to (Kindrick, 2003), any event associated with work can represent risk. Risks can be positive, which means the result is better than anticipated, or negative, where the result is worse (Raftery, 1999).

Many options are available for responding to risk, such as avoidance, sharing, transfer, reduction, insurance, deference, mitigation and acceptance (Staveren, 2006).

Thus, the field of risk management (RM) has developed to analyse and manage these uncertainties and risks (William, 1995), Although evaluating the risk and opportunity can be affected by uncertainty, however it is important to know that both have different mindsets and different data (Smith, 2008) . According to El-Sayegh (2008), there is a need for risk management processes to be used to manage construction risks. The impact of risk can be reduced by several ways such as obtaining more information, running more tests, allocating more resources, improving communications and allocating risk to parties who can control it (Smith, 2008).

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Various paths can be followed to respond to risks, based on the degree of severity. To avoid obstacles project objectives can be modified if the difficulties are severe enough, find alternative methods for managing the project, increase management strength, reduced dependence of one task on another, increase resources or increase flexibility (Lockyer and Gordon, 1996).

Larson and Gray (2011) stated that decisions must be made after identifying and assessing risks by choosing the appropriate solution to the risk event. Risk responses can be grouped as follows:

- Mitigate
- Avoid
- Transfer
- Share
- retain

Methods of Risk Identification in Construction Projects

Four techniques are commonly used to identify risks in construction projects (Smith, Merna and Jobling 2006; Kendrick, 2009):

1. Industrial checklists are typically prepared by a documentation specialist for various project and product documents. Checklists often key into potential failure points in past projects and thus are very useful in identifying risks. Interviewing project personnel from each discipline and staff within the organization who have experience of similar projects ensures that corporate knowledge and personal experience are utilized in the process of identifying risks. This technique allows project personnel to identify the risks that they can see in the project and gives them a feeling of involvement in the process and ownership of the identified risks, which should then lead to a greater acceptance of any measures implemented to reduce the risks.

2. Interviews with key project participants or analysis of historical data for similar projects and examining similar current or previous projects, risk assessments, lessons learned or project evaluations are other means of obtaining feedback about risks.

3. Examining historic data from previous similar projects utilizes corporate knowledge. However, an organization may not have carried out a similar project, or the data from a previous similar project may not have been recorded; thus, this technique can only be successful in a limited number of cases. Database systems that actively manage and report the progress of projects may be a useful source of information. However, such systems are often limited in terms of the useable or relevant data that are stored.

4. Brainstorming with the project team may be valuable for projects involving new or unusual risks, innovative management arrangements or to develop initial checklists. This technique may be a useful element of risk management workshops.

Brainstorming sessions involve getting the key project stakeholders together to identify and prioritize the risks in the project. This technique enables the stakeholders to hear what the other

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members of the project team see as risks and to use these ideas to inspire them in identifying additional project risks. It is important to choose the people who comprise the brainstorming group carefully because the right mix of project personnel with appropriate experience and seniority is needed to ensure a successful session.

METHODOLOGY

The research methodology selected for this study was comprised of a comprehensive review of relevant literature, face to face interview with construction stakeholders as well as the use of historical project data which will assist in providing an insight into current problem of risk in the construction projects through the examination of what has happened in the past. Data collection was done through a questionnaire survey self-administered on 40 randomly selected construction practitioners involved in Abuja, Kaduna, Kano and Plateau state. These places were selected because of frequent construction activities carried out in these regions. The research covers stakeholders in construction project, and primarily Contractors/Builders, Clients, and Consultants in the mentioned states. The research specifically collect information from the above mentioned stakeholders relating to their academic qualification, years in service, the likely number of projects they have handled with the value of the project. Other data that was collected includes information about their awareness of risk factors, likelihood of occurrence of risk factors and its impact on the performance of the projects. The simple random sampling method was chosen so as to give equal chances to all the listed professionals and contractors in the study areas. A well structured close- ended questionnaire was designed for the research and directed to the selected targets. The questionnaire was divided into two sections. The first section (Section A) deals with the general information and issues relating to the characteristics of respondents, while questions in Section B (the second section) focused on the assessment of the likelihood of occurrence and the impacts of risk factors on projects performance.

DATA ANALYSIS METHOD

Thus according to Shen (2001), risk significance, denoted by RS, can be described as the function of these two attributes as follows:

$RS = f(\alpha, \beta)$ ----------(1)

A survey questionnaire was design to collect a required data about these two attributes. In other to assess the important of each factor, a risk significance index was established by calculating a significance score for each factor. An alternative for calculating a significance score is to multiply the likelihood of occurrence by the degree of impact (Shen 2002). Thus the significance score for each risk assessed by each respondent can be calculated through Eq.2

$S_j^i = \alpha_j^i \beta_j^i$ ----------(2)

Where

S_j^i is the significance score for risk i, as acknowledge by respondent j

α_j^i is the lilelihood of occurrence for risk i, as acknowledge by respondent j

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β_j^i is the level of degree of impact for risk i as acknowledge by respondent j

(Shen, 2001)

Thus the RSIS can be calculated through the following model:

$$RSIS^i = \left(\frac{\sum_{j=1}^{N} S_j^i}{N}\right) \text{ ----------(3)}$$

Where

$RSIS^i$ is the relative significance index score for risk i

S_j^i is the significance score for risk i, as acknowledge by respondent j

N is the number of the respondent

For the purpose of calculating$S_{j,}^i$ the following numerical conversion for the rating was used.

Questionnaire and Responses Survey

The questionnaire survey identified 41 risk factors from literature and from discussion with other researchers in the field of risk management in construction projects as well as discussion with construction practitioner. These risk factors were perceived to have potential impact on construction project performance in terms of cost, time, and quality as well as project success. The questionnaire was then administered on projects stakeholders mainly, the clients, contractors and consultants. The stakeholders were asked to score on Likert-type scale on the likelihood of occurrence of risk factors and the degree of impact of such risk on recently completed and ongoing projects.

Table I: Designation of Respondents

Position	Frequency	Percentage	Cumulative %
Clients	5	15.15	15.15
Contractors	8	24.24	39.39
Consultants	20	60.61	100
Total	33	100	

Table II: Academic qualification of Respondents

Qualification	Frequency	Percentage	Cumulative %
B.Sc./B.Eng/M.Tech.	18	54.55	54.55
HND	10	30.30	84.85
OND	5	15.15	100
Total	33	100	

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Table III: Professional qualification of Respondents

Qualification	Frequency	Percentage	Cumulative %
Fellow membership, e.g Fniqs,Fciob,Fnia	8	24.24	24.24
Full membership e.g Mniqs, Mniob, Mnia	20	60.61	84.85
None	5	15.15	100
Total	33	100	

Table IV: Construction experience of Respondents

Years	Frequency	Percentage	Cumulative %
1-5	5	15.15	15.15
6-10	8	24.24	39.39
11-20	10	30.30	69.69
21-30	6	18.19	87.88
Over 30	4	12.12	100
Total	33	100	

In this study, two dimensional approaches to measurement of risk have been adopted in which case the likelihood and the impact in case of occurrence have been considered.

Out of the 40 questionnaires administered, 33 responses fit for analysis were received, representing a response rate of 82.50%. The questionnaire identified from literature and based on discussions with industry practitioners, various risk factors encountered at the pre and post contract stages of construction.

RESULTS AND DISCUSSION

Table V: The Relative significance index scores (RSIS) for different risk Factors

Risk Classification	**RSIS**	**Std. Dev**	**Rank**
Construction Risks			
Quality problems	0.2343	0.0987	1
Failure of on completion test	0.2126	0.0997	2
Different site conditions	0.1954	0.1041	3
Poor site condition	0.1480	0.0758	4

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Poor productivity	0.1320	0.0953	5
Equipment breakdown	0.0663	0.0452	6
Political Risks			
Problems of licenses	0.1257	0.0658	1
Changes in Law and regulations	0.1206	0.0664	2
War and civil disorder	0.0492	0.0288	3
Financial and Economical Risks			
Inadequate cash flow	0.3154	0.1280	1
Underestimation of direct costs	0.2931	0.1778	2
Inflation, Availability of Foreign Currency & Exchange Rate Change	0.1006	0.0503	3
Design Related Risks			
Insufficient detailing	0.3114	0.01051	1
Default by Subcontractors	0.2486	0.08870	2
Design changes	0.1811	0.0643	3
Environmental Risk			
Inadequate program schedule	0.1840	0.0898	1
Variation of construction program	0.0372	0.0275	2
Serious noise pollution	0.0326	0.0270	3
Low management competency	0.0297	0.0132	4

Table VI: Average level for negative impact of risk factors

Risk Classification	**Negative impact**	**Std. Dev**	**Rank**
Construction Risks	**of risk factors**		
Incorrect contract time estimates	0.6057	0.2400	1
Poor productivity	0.5886	0.2948	2

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Equipment breakdown	0.5257	0.1821	3
Quality problems	0.4914	0.2077	4
Poor site safety & security	0.4514	0.2241	5
Labour strikes	0.1771	0.1516	6
Political Risks			
War and civil disorders	0.4914	0.2884	1
Changes in Law and regulations	0.4343	0.2589	2
Problem with licenses	0.4047	0.2543	3
Financial and Economical Risks			
Underestimation of direct cost	0.7314	0.2166	1
Inadequate cash flow	0.7086	0.2020	2
Default by subcontractor & supplier	0.5543	0.2914	3
Design Related Risks			
Insufficient detailing	0.5314	0.1451	1
Design errors	0.2486	0.4057	2
Design changes	0.3600	0.2265	3
Environmental Risk			
Environmental impact of the Projects	0.4571	0.2453	1
Changes in climate condition	0.3714	0.2750	2
Stiff environmental regulations	0.3257	0.2704	3
Healthy working environment for the Workers	0.2971	0.1317	4

Further analysis was carried out to evaluate the relative significant index score of the likelihood and the impact of occurrence of risk factors at the post contract stage. Table V and Table VI summarizes the results of the analysis. From these tables it is evidence that the risk factor ranking highest in impact is the underestimation of direct cost which is classified under

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financial and economical risk while the risk factor rank highest under RSIS is inadequate cash flow which is still classified under financial and economical risk factors.

CONCLUSION

The complexity and risk of building projects is increasing by the day as more ideas are emerging. The primary aim of every construction project is to achieve project goals within available cost, with best possible quality and within a specified period of time. This means meeting client's requirement with minimum possible cost, with required quality and within the specified time. Any action or event that may affect the achievement of these goals or objectives is a project risk. Majority of building participants are familiar with risk management in relation to safety measures against hazards.

This research have explored the application of risk management in Nigeria, the barriers of risk management or factors that limit its application and also the factors that will influence risk management development. An innovative attempt to analyze these key risk factors from the perspectives of the stakeholders presented the following insight- client, contractor and consultant should work cooperatively from feasibility phase onwards to address potential risks effectively and in time; contractors and subcontractors with robust construction and management knowledge must be employed early to make sound preparation for carrying out safe, efficient and quality construction activities.

According to findings in this research, cash flow has been the major problem of construction activities in Nigeria and improvement in cash flow problems will reduce disputes, cost overrun, time overrun, claims etc. Many of the construction stakeholders in the country are not familiar with risk management in relation to project objectives rather they thought it has to do with safety hazard. Risk management workshops will help many of the project stakeholders to understand what risk management is all about and how to apply it in construction projects.

REFERENCES

Abdou, O.A (1996) Managing Construction Risks, *Journal of Architecture Engineering*, **2(1)**, 3-10

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

Aminu,A.B. (2013) Risk Management in Nigerian Construction Industry, Unpublished M.Sc. in Civil Engineering Thesis, Mediterranean University Gazimagusa, North Cyprus

Berkeley, D, Humphereys, P.C and Thomas, R.D (1991) Project Risk Action Management, Construction Management and Economics, 9(1), 3-17

Chapman R.J (2001) Controlling Influences on Effective Risk Identification and Assessment for Construction Design Management, *International Journal of Project Management*, 19, 147-160

Chapman, B. & Stephen, W. (2002) Managing Project Risk and Uncertainty, A constructively Simple approach to Decision Making, Chichester, New York, Wiley & Sons, Ltd, (UK)

ISSN 20535783(Print), ISSN 20535791(online)

Chen, H. Hao, G. Poon, S.W. and Ng. F.F. (2004) Cost Risk Management in West Rail Project in Hong Kong, 2004 *AACE International Transactions*

Flanagan,R & Norman, G. (1993) Risk Management and Construction, Victoria: Blackwell Science Pty Ltd, Australia

Gray, C.F. and Larson, E.W. (2003) *Project Management*, USA, McGraw-Hill

Kartam, N.A. & Kartam, S.A. (2001) Risk and its Management in the Kuwaiti Construction Industry, a Contractors Perepective, *International Journal of Project Management*, 19, 325-335

Kindrick, T. (2003) Identifying and Managing Projects Risk, Essential Tools for Failure-Proofing Your Project, NewYork AMACOM Books

Lockyer, K. & Gordon, J. (1996) Project Management and Project Network Techniques, London Financial Times-Pitman Publishing

Maylor, H. (2003) Project Management, Essex, Pearson Education Limited

Oluwaseyi A.A. (2012) Framework for Managing Risk in Private Finance Market projects in Nigeria, Ph.D Thesis, Heriot-Watt University, School of Built Environment, United Kingdom

Oztas, O. Okmen,O. (2004) Risk analysis in fixed- price design build construction projects, *Journal of Building and Environment*, 39, 229-237

Raftery, J. (1999) Risk analysis in Project Management, London, E&FN Spon

Schuyler, J. (2001) Risk and Decision Analysis in Projects (2nd Edition), Pennsylvania, Project Management Institute, Inc, USA

Shen, L.Y (1997) Project Risk Management in Hong Kong, *International Journal of Project Management* 15(2), 101-105

Smith, N.J (2008) Engineering Project and Management, Oxford, Blackwell Publishing Ltd

Staveren, M.V. (2006) Uncertainty and Ground Condition, A Risk Management Approach, Oxford, Elsevier Ltd

Tam, C.M. , Zeng, S.X. and Deng, Z.M. (2004) Identifying Elements of Poor Construction *Safety Management in China*, Safety Science, 42, 569-586

Tchankova, L. (2002) Risk Identification- Basic stage in Risk Management, *Environment Management and Health*, 13, 290-297

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

Uher T.E. and Taokley, A.R. (1999) Risk Management in the Conceptual Phase of a Project, *International Journal of Project Management*, 17(3), 161-169

Zou, P., Zhang, G. & Wang, J.(2007) Understanding the key Risks in Construction Projects in China, *International Journal of Project Management*, 25, 601-614

ISSN 20535783(Print), ISSN 20535791(online)