ASSESSMENT OF RISK MANAGEMENT ON CONSTRUCTION PROJECT IN ABUJA, NIGERIA

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ABSTRACT

The requirements of every construction project is meeting client's need of cost, and quality which are achieved through consciousness of uncertainty and taking pro-active measures. The construction industry is overwhelmed with risks which must be mitigated as it leads to cost overruns that have negative impact on the efficiency of project that would also lead to displeasure of client. The research assessed risk management on construction project in Abuja, Nigeria. The study adopted a quantitative research approach using questionnaires to source relevant information from respondents. Data collection was done through a questionnaire survey self-administered on 60 randomly selected construction industry participants. Out of the 60 questionnaires administered, 52responses fit for analysis were received representing 87%. Data were analysed with the use of descriptive statistics such as mean item score and correlation analysis. The study revealed nine factor of effective risk management among which organization structuring and design has highest impact with MIS 4.60. Also, from the ten poor risk management factor, lack of team work had the highest impact with MIS 4.58. Likewise, from sixteen barriers of risk management, ineffective monitoring had the highest impact with MIS 4.43. The study concluded that lack of team work and ineffective monitoring were the major hindrances of risk management, while organization structuring and design were the most effective risk management factors in construction projects. It was recommended that in achieving effective project delivery, it required the best knowledge that will effectively manage project risks include material, cost, quality management and consciousness of project period which attract harmonious development in Abuja, Nigeria.

Keywords: Risk management; Construction projects management; Project delivery.

INTRODUCTION

The construction industry is one of the sectors that meaningfully contributes to every society economy and successful delivery of construction projects. Consequently, every stage of a project is face with innumerable risks due to the complex and dynamic nature of the industry (Zhao, Hwang, & Low, 2013). The rate of change in the construction industry has imposed further demands on construction project management. Risk management is a vital project administrative planning and governing tool for reducing ambiguity and improving decision-making. Risk cannot be avoided but must be recognized, assessed and managed. Construction project efficacy and effectiveness largely depends on how managers image the exterior project environment, recognize the life-threatening factors and adapt their establishments accordingly (Baloi and Price, 2003).

According to (McNamara George, Rejda and Michael, 2014), defined risk management as an attempt to identify potential threats to projects and their potential to take appropriate measure to address these threats and to verify their likelihood as consideration of these possibilities leads to action to reduce these risks. (Cagliano, Grimaldi and Rafele, 2015), maintained that there are many techniques used to control risks at the lowest probable cost, including risk avoidance methods through loss prevention, control, and/or job rejection, before the organization is exposed to further loss arising from a particular activity. Proper and systematic techniques, knowledge

and experience are required approaches to enable effective and efficient risk management. For instance, knowledge of the unanticipated events that might prevail while execution of the project is required (Serpella; Ferrada; Howard and Rubio, 2014). The performance of diagnosing and risk assessment as well as the ability to apply methods and approaches in order to reduce these risks to a tolerable extent can be referred to as risk management (Tohidi, 2011). However, the main focus of risk management is to identify, evaluate, and control the risks of project success (Lee *et al.*, 2009). Risk management is used in various fields and varies depending on the situation.

In most cases, risk is managed through the influence of contingencies or floats (respectively money or time) which are not defined depending on a comprehensive analysis of the risks that can trigger a certain project, which in many cases is insufficient to cover the outcomes of the risks that take place during the project execution (Serpella *et al.*, 2014). It has also been stressed that construction industry is risk-prone, with a poor track record of coping with risks, which clients have been enduring the unbearable outcomes of failure in the form of unnecessary delays in project completion, cost overrun and sometimes failure to meet quality standards and operational requirements (Wakjira, 2011).

Effective risk analysis and a determinable cost will ensure certainty of achieving project cost, quality timely delivery of project, and ensure client has value for the money spent (Awodele, 2012). Thus, it may be suggested that, in an attempt to better the risk management and project success in the construction industry, the main focus would be on the management of the influences related to organizational structure that are unlikely to the general cultural matters (Hasani *et al.*, 2017). The major causes of risk in construction include design error, estimating error, competitive tendering risk, financial risk and changes in political and economic weather among others. Schedule interval risk has many effects such as increased cost, late completion, disruption, third-party claims, loss of efficiency and quality, disagreements, and termination of contracts (Mahamid, 2012).

The increase pressure on effective project delivery suggest that it is prudent for anyone involved in a project to be concerned about the associated risks and how they can be effectively managed. Construction activities in Nigeria which are mostly carried out by Government, consultants and contractors normally face diverse kinds of risks like (Management, Strategy, Finance, Construction, Political and Peripheral) throughout construction. The need to assess risk management in the construction project delivery by the following objectives, to assess the factors of effective risk management, to examine the factors of poor risk management in the construction project delivery, investigate barrier to risk management implementation in order to improve the output and safety of work force on the task carried out by industry in Abuja-Nigeria.

The construction industry is under more risks than others since projects support their own risks, due to the fact that they involve different people or uncontrollable external factors (Khodeir and Mohamed, 2015; Peckiene, *et al.*, 2013). Notwithstanding, these risk factors are known to the Nigerian construction practitioners. The relative likelihood of occurrence and impacts in case of occurrence at pre and post contract stages is yet to be evaluated. This study inclines to assess factors that support risk management as to helps in meeting the objectives of a construction project delivery, examine the factors of poor risk management in the construction project, investigate barrier to risk management implementation in order to improve the production and safety of work force in the construction project and benefit of proper risk management to construction project and construction industry as a whole.

CONCEPT OF RISK MANAGEMENT

The pace of variation in the construction industry has enacted additional demands on construction project management. Risk management is an energetic project management planning and control tool for reducing uncertainty and improving decision-making. The risk management of a certain project is considered as one of the major roles that is undertaken by the project manager. Proper and systematic techniques, knowledge and experience are required approaches to enable effective and efficient risk management. In a simple illustration, knowledge of the unanticipated events that might prevail while execution of the project is required (Serpella *et al.*, 2014).

Projects from the construction industry are diverse in size (small, medium and, large) which involves risk of varying degrees of impact (Hwang, Bon-Gang, Zhao, and Toh, 2014). Frequently, the risk is not dealt with satisfactorily, and, as a result, the industry is facing poor performance (Iqbal, Shahid, Rafiq, Klaus, Ahsan and Jolanta, 2015). Many infrastructure projects, being massive in shape, involve huge budgets leading to huge monetary losses, and these injuries are caused by the various risks linked with such megaprojects (Deviparasath, 2007).

Some important issues to be considered in terms of risk management in the construction project are highlighted below.

i. Identification of the risk occurrence by using risk identification techniques (Tang *et al.*, 2007; Hwang *et al.*, 2014; PMI, 2017).
ii. Analyzing the risk source and risk impact (Westland, 2006; Zou *et al.*, 2007; Paek, 2009).
iii. Risk evaluation and risk response by using risk response techniques (Choudhry and Iqbal, 2012; Loosemore *et al.*, 2012; PMI, 2017).
iv. In respond to threats and opportunities of the risk event by using the risk management techniques (Faber, 1979; Choudhry & Iqbal, 2013; PMI, 2017).

Therefore, it is notable that the essential aspiration of risk management is the identification, evaluation, and controlling of the risks in order to achieve project success (Lee *et al.*, 2009). It has also been stressed that construction is a risk-prone industry, with a poor track record of coping with risks, as a result of which clients have been enduring the agonizing outcomes of failure in the form of unnecessary delays in project completion, cost overrun and sometimes failing to meet quality standards and operational requirements (Wakjira, 2011). Proper risk analysis and cost control will ensure certainty of project price cost and will be within budgets, timely delivery, predetermine quality and the added value to the client (Awodele, 2012). The phases included in construction projects during the later decades have become much more complicated in nature, which is the outcome of technological upgrading and stakeholder pressure, and are classified by an extent of riskiness that have a dissenting impact on the projects (Mohammad & Husameddin, 2018).

All risks are connected to cultural differences either by corporation or by matters of imperative direct or indirect impacts. Thus, it may be recommended that, in an attempt to better the risk management and project success in the construction industry, the main focus would be on the management of the factors related to the cultural diversity in contrast to the general cultural matters (Hasani *et al.*, 2017). Construction risk is generally perceived as events that influence project objectives, that is, cost, time, and quality. Some of the risks associated with the

construction process are fairly predictable or really identifiable; others may be totally unpredictable (Luka & Ibrahim, 2016). In project management terms, the most serious effects of risk can be concise as, Failure to keep within the estimated cost, time, quality and operational requirements (Mehdi *et al.*, 2012). According to (Mubarak, 2010), "lack of time" could be seen as a common factor that lead poor risk management as (Akintoye and MacLeod, 1997; Lyons and Skitmore, 2004) found that this factor was a critical reason for poor Risk Management in the construction project.

Factors of Effective Risk Management Implementation in the Construction Project Delivery.

Risk is an event that is having an impact on the organization's objectives and may affect the performance of the organization in relations with low productivity, poor quality, and an increase in the budget (Akintoye and MacLeod, 1997; Loosemore *et al.*, 2012). Effective risk management necessitates doing the accurate job with respect to risk management process. Top management needs to embark on critical success factors of effective risk management as means of minimizing or eliminating risks in their organizations. Studies worldwide have documented critical success factors of effective risk management which serve as a basis for dealing with risks as shown in Table 1.

Table 1: factors of effective risk management in the construction project delivery

	Factors	Source
1	Organization structuring and design	(Robert *etal*, 1990; Geraldine, 2018)
2	Communication	(Roberts et al, 1990; (Geraldine, 2018; Ranong and Phuenngam 2017; Agyakwa-Baah & Chileshe 2010; Lundqvist, 2014; Kamau & Mohamed 2015)
3	Organizational culture	(Roberts *etal* 1990; Geraldine 2018; Ranong and Phuenngam 2017; Yaraghi et al. 2011, and Mikes *etal*. 2014)
4	Responsibility	
5	Information technology infrastructure	
6	Measurement	(Oztas & Okmen 2004) (Hasanali 2016)
7	Trust	(Ranong and Phuenngam 2017; Zhao *etal*. 2017)
8	Training	
9	Commitment and support from top management	

Source: Researcher (2019)

Factors of Poor Risk Management in the Construction Project

Management of risk is considered to be the most important part of the execution in construction management (Tang *et al.*, 2007). It is mostly concerned with the triple constraints (time, cost, and quality) of the project, the integration of the project, communication, Human Resources (HR), and the procurement process (Sathishkumar *et al.*, 2015). In achieving the goal and objectives of a project, the following factors of poor risk management in the construction project from inception to completion stage are shown in Table 2.

Table 2: Factors of poor risk management in the construction project

	Factors	Source
1	Lack of team work	(Firaskhairy Jaber 2015; Sathishkumar *etal.* 2015)
2	Poor relation and dispute with partners	
3	No past experience in similar project	(Tang *etal.* 2007; Sathishkumar *etal.* 2015)
4	Improper project planning and budgeting	
5	Change of top management	
6	Sub-contractor related problem	
7	Poor relation with government department	
8	Internal management problem	
9	Project delay	(Tang *etal.* 2007)
10	Time constraint	(Tang *etal.* 2007; (Sathishkumar *etal.*2015; Mubarak, 2010),

Source: Researcher's (2019)

Barriers Affecting Risk Management Implementation in the Construction Industry

There are a number of barriers affecting the adoption and implementation of risk management in the construction project. However, the majority of these barriers in the implementation of risk management have been within the context of developing countries inclusive of Nigeria. From the literature review the barriers affecting risk management implementation may have direct/indirect effect on the productivity of the project are shown in Table 3.

Table 3: Barriers to risk management implementation in the construction project.

	Barriers	Source
1	Complexity of analytical tools	(Hwang *etal.* 2013)
2	Lack of potential benefits	
3	Lack of budget	
4	Low profit margin	
5	Lack of government legislation	
6	Lack of knowledge	(Aliyu, 2013; Hwang *etal.* 2013)
7	Lack of time	

8	Lack of holistic approach to risk management	(Kikwashi 2011)
9	Reluctance of consultant to pear head	
10	The risk management process not being a priority in the client requirement.	
11	Lack of information	(Chileshe *etal*. 2012)
12	Lack of coordination between the parties involved	
13	Availability of specialist risk management consultants	
14	Lack of joint management mechanisms by parties involved	(Aliyu, 2013), (Tang *etal*. 2007)
15	Ineffective implementation of risk control strategies	
16	No incentive for better risk management	

Source: Researcher's (2019)

The ultimate goal of project risk management is to improve project performance and this study assessed the significant of risks management on the construction projects delivery in Abuja Nigeria.

METHODOLOGY

The research methodology selected for this study comprised of a comprehensive review of relevant literature, 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 60 randomly selected construction practitioners involved in Abuja. The location was selected as a result of frequent construction activities carried out within the metropolis. The research covers stakeholders in construction industries, and primarily Project manager, Contractor, Consultants and other workers such as skilled labour but not professionals in the location. The research specifically assess data 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 bearing 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 five sections. Where section A, deals with the general information and issues relating to the characteristics of respondents, while questions in Section B-D focused on the assessment of risk management on construction projects delivery. Data collected were analyzed through descriptive method of analysis. Mean Item Score was used for all the objectives. Data analysis was carried out using statistical software package SPSS 16.

Data Analysis and Result

Mean Item Score was employed as a tool for descriptive statistics in the study to rank the significance level of Risk Management on the Construction Project Delivery.

Respondents' Demography

This section shows the demographic characteristics of respondents that contributed to the research. Highlight of the respondents' demographics are given below:

The Respondents Profession were Quantity Surveyors 19, followed by Builders 17 and the Architects 16.

Respondents Designation includes: Project Manager (PM) 16, Consultant 12, Contractor 11 and Workers (none professionals) 13.

The respondents' years of experience ranged from 4-5 years 38%, 6-10 years 29%, 11 years and above 14%, less than 1 year 11% and 1-3 years 8%.

The number of projects executed in the respondent industry for the last five years. Less than 5 project response to the study with 54%, 5-10 project response to the study with 31%, 11-20 project response to the study with 9%, and 21 project and above response to the study with 6%.

Table 4: Factors that support risk management in the construction project delivery.

Factors	MIS	Rank
Organization structuring and design	4.60	1st
Commitment and support from top management	4.48	2nd
Information technology infrastructure	4.44	3rd
Training	4.40	4th
Organization culture	4.37	5th
Communication	4.33	6th
Measurement	4.27	7th
Responsibility	4.21	8th
Trust	4.17	9th

Source: Researcher's Analysis (2019)

Table 5: Factors of poor risk management in the construction project delivery.

Factors	MIS	Rank
Lack of Team Work	4.58	1st
No Past Experience in the similar project	4.35	2nd
Improper project planning and budgeting	4.33	3rd
Internal management problem	4.33	3th
Poor relation and dispute with partner	3.98	5th
Time constraint	3.96	6th
Poor relationship with government department	3.94	7th
Project delay	3.87	8th
Change of top management	3.83	9th
Sub-contractor related problem	3.81	10th

Source: Researcher's Analysis (2019)

Table 6: Common barriers to risk management in the construction project.

Barriers	MIS	Rank
Ineffective monitoring	4.43	1st
Complexity of analytical tools	4.40	2nd
Lack of budget	4.37	3rd
Ineffective implementation of risk control strategies	4.33	4th
Lack of information	4.33	4th
Lack of knowledge	4.27	6th
No incentive for better risk management.	4.20	7th
Lack of potential benefits	4.17	8th
Lack of joint management mechanisms by parties	4.13	9th
Lack of coordination between the parties involved	4.07	10th
Lack of government legislation	4.03	11th
Reluctance of consultant to pear head the risk management process	4.03	11th
Lack of holistic approach to risk management	4.03	11th
Availability of specialist risk management consultants	4.03	11th
Not being a priority in the client requirement	3.87	15th
Lack of time	3.83	16th

Source: Researcher's Analysis (2019)

DISCUSSION OF RESULT

The factors that support risk management are revealed: "Organization structuring and design" was ranked 1st highest as to the agreement by the audience in regards to the effectiveness of Risk Management in the construction project delivery, 'Commitment and support from top management" was ranked 2nd highest on the effectiveness of Risk Management, "Information technology infrastructure" was ranked 3rd highest in regards to the agreement to effectiveness of Risk Management in the construction project delivery, "Training" was ranked 4th highest in the effectiveness of Risk Management, "Organization culture" is being ranked 5th amongst the factors revealed in regards to the agreement with the effectiveness of Risk Management, and "Communication" "Measurement" "Responsibility" and "Trust" was also ranked 6th, 7th, 8th, and 9th ranked respectively aid the effectiveness of risk management in four steps Risk Identification, Risk Assessment, Risk Management, Risk Monitoring. Therefore, Risk management can be seen as a systematic application of management policies, procedures and practices to assess and manage risk in construction project execution.

The factor that lead to poor risk management in the construction project among which are: "Lack of team work" was ranked 1st in the course study with the agreement by the audience as a most factor that lead to poor risk management, "No past experience in the similar project' was ranked 2nd as the second most factor that lead to poor risk management, "Improper project planning and budgeting" and "Internal management problem" was ranked 3rd as third most factors that lead to poor risk management. "Poor relation and dispute with partner" "Time constraint" "Poor relation with government department" "Project delay" "Change of top management" "Sub-contractor related problem" was ranked between 5th and 10th respectively as is the remaining factors that

lead to poor risk management in the construction project delivery. According to (Mubarak, 2010), "lack of time" could be seen as a common factor that lead to poor risk management as (Akintoye and MacLeod, 1997; Lyons and Skitmore, 2004) found that this factor was a critical reason for poor Risk Management in the construction development. "Lack of budget", "low profit margin", and "not economical", which were all related to the expense of poor Risk Management, were the remaining three impactful factors of poor risk management.

The common barriers to implement risk management in the construction project amongst which are: "Ineffective monitoring" was ranked 1st as the most common barrier in the implementation of risk management in construction project, "Complexity of analytical tools" was ranked 2nd as the most common barrier, "Lack of budget" was ranked 3rd as the most common barrier of risk management implementation in the construction development, while the following are the other impactful barriers and challenges of risk management implementation in the construction project "Ineffective implementation of risk control strategies" "Lack of information" "Lack of knowledge" "No incentive for better risk management" "Lack of potential benefits" "Lack of joints management mechanisms by parties" "Lack of coordination between the parties involved" "Lack of government legislation" "Reluctance of consultant to pear head the risk management process" "Lack of holistic approach to risk management" ''Availability of specialist risk management consultants" "Not being a priority in the client requirement" "Lack of time" respectively.

According to (Milad, 2014), "lack of time" could be seen as a common barrier to Risk Management implementation form the previous research it obtained highest mean score and rank 1st as overall common barrier. In addition, "lack of potential benefits" and "lack of manpower" were ranked fifth and sixth. Previous studies indicated that lack of sufficient knowledge would hinder Risk Management implementation in small projects (Ho and Pike, 1992; Smith and Bohn, 1999), "lack of knowledge" obtained a low mean score and least ranked.

CONCLUSION

Success in a construction project is repeatable, and there is a great value in developing a protocol to improve risk management in construction activities. The identification of construction project delivery factors can furnish project participants with an indicator to attain project success. This has brought us the following areas:

i. The knowledge in achieving effective project delivery by adopting effective risk management factors, organization structuring and design, commitment and support from top management and information are highly ranked factors.
ii. The knowledge on poor risk management factors menace on construction project delivery which include, lack of team work, no past experience in the similar project, and improper planning and budgeting. It was also revealed that poor relation and dispute with partner, time constraint, poor relation with government department, and sub-contractor related problem which must to be confronted in project
iii. The knowledge on the barriers to risk management such as ineffective monitoring, complexity of analytical tools, and lack of budget attract knowledgeable personnel in order to be mitigated
iv. The knowledge on factor to be adopted in achieving an effective project delivery which include, scope and work definition and planning efforts, Adequate risk analysis and

specification and Effective project briefing, Adequacy of plans and specification and Effective project briefing.

v. Moreover, impact of risk management can provide participants with a focus of what they should be aware of in order to ensure the success of construction project. More also it aids the understanding to be exploited by project managers or construction professional to select efficient strategies to alleviate the root causes of poor performance.

RECOMMENDATIONS

Based on the findings in this research, the following recommendations were made;

i. Organization structuring and design has been the major effective factor of risk management in the construction industry which required maximum attention and improvement in organization structuring and design as the driver of effective risk management.

ii. Lack of team work is the major factor of poor risk, So the best way to improve risk management in the construction industry is by adopting team work, Ineffective monitoring as the major barrier to risk management implementation in the construction project therefore effective monitoring has to be adopted in order to enhance proper risk management in the construction industry.

iii. Management course will help upcoming building professionals to adopt organization structuring and design, team work, effective monitoring and scope of work definition of risk management. Which will aid in adopting and participating in the background knowledge of risk management is properly transferred than to be introduced during the projects which may not be fully understood.

CONTRIBUTION TO THE BODY OF KNOWLEDGE

The research premised on the basis of bringing about effective measures to mitigating Risk in the construction industry therefore findings from the study will assist construction professionals and other stakeholders in the following aspect;

i. To understand the bearing of risk management in the construction project execution.

ii. To develop better risk management strategy on how to mitigate risk during and after project execution

iii. To provide necessary information required on project to be embarked upon.

REFERENCES

Aliyu, B. A. (2013). Risk Management in Nigerian Construction Industry,

Akintoye, A. S. and Malcolm, J. M. (1997). Risk analysis and management in construction. *International Journal of Project Management 15: 31–38.*

Awodele, O. (2012). Framework for Risk Management in Privately Financed Market Projects in Nigeria, Ph.D Thesis, Hariot-watt University, School of Built Environment, UK.

Baloi, D. and Price, A. D. (2003). Modelling Global Risk Factors Affecting Construction Cost Performance. *International Journal of Project Management, 21, pp. 261-269.*

Choudhry, R. M., & Iqbal, K. (2013). Identification of risk management system in construction industry in Pakistan. *Journal of Management in Engineering, 29,42-49.*

Cagliano A.C., Grimaldi S. and Rafele, C. (2015). Choosing project risk management techniques.A theoretical\ framework. *Journal of risk research, vol. 18 n. 2, pp. 232-248*

Deviparasath (2007). Risk Assesement and Analysis in Construction Projects. Chennai: Anna University industry in Pakistan. *Journal of Management in Engineering 29: 42–49.*

Faber, W. (1979). Protecting Giant Projects: A Study of Problems and Solutions in the Area of Risk and Insurance. Ipswich: Willis Faber.

Hasani, M., Tularam, G. & Regan, M. (2017). Impacts of cultural risk factors on project success in the UAE construction industry. Australia: Modellling & Simulation Society of Australia & New Zealand.

Hwang, B., Zhao, X. and Toh, L. P. (2014). Risk management in small construction projects in Singapore: Status, barriers and impact. International *Journal of Project Management 32: 116–124.*

Ho, S. S. M. and Pike, R. H. (1992). Adoption of probabilistic risk analysis in capital budgeting and corporate investment. *Journal of Business Finance and Accounting 19 (3), 387–405.*

Iqbal, S., Rafiq, M. C., Klaus, H., Ahsan, A. and Jolanta, T. E. (2015). Risk management in construction projects. *Technological and Economic management management 21: 65–78.*

Lee, J. and Chun, J. (2009). Risk response analysis model for construction method using the forced-decision method and binary weighting analysis. *Journal of Asian Architecture and Engineering,* No.1:205-12.

Loosemore, Martin, John Raftery, Charles Reilly, and David Higgon. (2012). Risk Management in Projects. London: Routledge.

Luka, G. T. and Ibrahim, Y. (2016). Identification and assessment of key risk factors affecting public construction projects in nigeria: stakeholder's perspectives. *International Journal of Engineering and Advanced Technology Studies Vol.4, No.2, pp.20-32.*

Lyons, T. and Skitmore, M. (2004). Project Risk Management in the Queensland Engineering construction industry: A Survey. 2004 22, 51–61.

Mahamid, I.; Bruland, A. and Dmaidi, N. (2012). Causes of Delay in Road Construction Projects. *J. Manag. Eng. 2012, 28, 300–310.*

McNamara, George., Rejda, Michael (2014). Principles of Risk Management and Insurance (12th Edition, Pearson Series in Finance.

Mehdi, T., Mastura, J. and Ehsan N (2012). An Assessment of Risk Identification in Large Construction Projects in Iran. *Journal of Construction in Developing Countries, Supp. 1, 57–69.*

Milad, A. (2014) Risk Management in Small Construction Projects in Kermanshah Province. *International Journal of Research in Social Sciences 4(5): 30-40.*

Mohammad, A. and Husameddin, H. (2018). An overview of risk management in the construction projects. *Academic Research International Vol. 9(2).*

Paek, F., Guang, X. and Joon, H. (2009). A study on the risk management based on the procedure for high-risemulti-purpose building projects in Korea. *China Civil Engineering Journal 12: 028.*

Patel, K. (2013), "A study on risk assessment and its management in India" *American Journal of Civil Engineering, 2013, 1(2): 64-67.*

PMI (2017). A Guide to Project Management Body of Knowledge. Newtown Square:PMI

Serpella, A., Ferrada, X., Howard, R. and Rubio, L. (2014). Risk management in Construction projects: A Knowledge-based Approach. Procedia - Soc. Behav. Sci., Selected papers from the 27th IPMA (International Project Management Association), World Congress, Dubrovnik, Croatia, 2013 119, 653–662. doi: 10.1016/j.sbspro.2014.03.073

Tang, Wenzhe, Maoshan Qiang, Colin F. Duffield, David M. Young, and Youmei Lu. (2007). Risk management in the Chinese construction industry. *Journal of Construction Engineering and Management 133: 944–56.*

Tang, W., Qiang, M., Duffield, C.F., Young, D.M. and Lu, Y. (2007) Risk Management in the Chinese Construction Industry, *Journal of Construction Engineering and Management, 133, 944-956.*

Tohidi, H. (2011). The role of risk management in IT systems of organizations. Procedia *Computer Science Journal, 3, 881-887.*

Smith, G. R. and Bohn, C. M. (1999). Small to medium contractor contingency and assumption of risk. *Journal of Construction Engineering Management 125 (2), 101–109.*

Wakjira, T. (2011). Risk Factors Leading to Cost Overrun in Ethiopian Federal Road Construction Projects and its Consequences, M.Sc. Thesis, Civil Engineering Department, Addis Ababa University Ethiopia.

Westland, J. (2006). The Project Management Life Cycle. London: Kogan Page.

Zhao, X., Hwang, B. G. & Low, S. (2013). Developing fuzzy enterprise risk management maturity model for construction firms. *Journal of Construction Engineering and Management., 139: 1179-1189.*