

A THEORETICAL REVIEW OF RISK IDENTIFICATION: PERSPECTIVE OF CONSTRUCTION INDUSTRY

Renault, B. Y.¹, Agumba, J. N.² and Ansary, N.³

^{1,2&3} *Department of Construction Management and Quantity Surveying, Faculty of Engineering and the Built Environment, University of Johannesburg, Johannesburg, South Africa*
Corresponding Author's

ABSTRACT

Managing risks in construction projects has been acknowledged as an essential management process in order to accomplish the project objectives in terms of time, cost, quality, safety and environmental sustainability. However, up to now most studies have concentrated on some aspects of construction risk management rather than using a systematic and comprehensive approach to identifying risks and analyse the probability of occurrence and impacts of these risks. Risk management consists of identifying risks, assessing risks either quantitatively or qualitatively, selecting the appropriate method for handling risks, and then monitoring and documenting risks. By identifying risks in an early stage of planning and assessing their comparative significance, project managers can identify techniques employed to reduce risks and allocate the best people to mitigate them. Thus, this research focuses on risk identification, as opposed to other processes of risk management. This research is mainly a literature review and was conducted through accredited academic and Professional journals, books, the internet, theses, and dissertations. The reviewed literature revealed that the entire risk management process is not only limited to solving problem in advance but also for the occurrence of any unexpected future problems. The study further shown that issues with possible threats envisaged in a project are not only a means to reduce losses within the project, but also a means to transfer risks into opportunities, which can lead to economic profitability, environmental and other advantages. This paper is of value to managers and decision makers involved in managing risks where it is intended to boost their knowledge regarding the importance of risk identification as a crucial stage of the process to managing risks.

Keywords: *Construction Industry, Risk, Identification, Management, South Africa.*

INTRODUCTION

The construction industry (CI) is a unique sector which has been characterized by its significant contribution in terms of employment creation and social development globally. The industry practices engage enormous sums of funds which are invested by the client who may be an individual, a group of people or an organisation. The CI is imperative due to its inputs and outcomes performance. The industry contributes to national socio-economic development by providing the structures which are used in the manufacturing of all goods for the benefit of the country. In addition, the physical infrastructure, built through construction activity, is the nation's economic benchmark as it forms the channel for the facilitation of productive activity by enabling goods and services to be distributed within and outside the

renault08@yahoo.fr

Renault, B. Y.¹, Agumba, J. N.² and Ansary, N.³ (2016) A Theoretical Review Of Risk Identification: Perspective Of Construction Industry In: Mojekwu, J.N., Nani G., Atepor, L., Oppong, R.A., Adetunji, M.O., Ogunsumi, L., Tetteh, U.S., Awere E., Ocran, S.P., and Bamfo-Agyei, E. (Eds) Procs 5th Applied Research Conference in Africa. (ARCA) Conference, 25-27 August 2016, Cape Coast, Ghana. 773-782

country. The quality of the design and construction of these facilities has an impact on the efficiency with which the productive activities and provision of services can be undertaken. Therefore, the construction sector can manipulate the competitiveness of enterprises within the economy. Construction can also affect the ability of the nation to attract foreign investment. Due to the enormous financial investment involved in the construction operations it is prudent to embark on risk assessment on all such projects. Risk assessment on construction projects globally usually commence with risk identification as the first stage of risk management process (RMP). Current changes in corporate environment tied with emerging constraints as a consequence of unstable economy have exposed actors in the CI to be more and more vigilant regarding risk management (RM) as an essential part of their projects. Formulating an effective RM system is a vital challenge encountered by participants within this sector in minimising these risks. However, most literature has focused on the entire RMP with limited emphasis on risk identification (RI) from the perspective of the construction industry. It is against this background that this study seeks to review literature how risk is identified among construction firms.

REVIEW OF RELATED LITERATURE

To provide detail insight of the study, the concept of risk and uncertainty was defined by outlining numerous definitions of risk and uncertainty.

Defining Risk and Uncertainty

Risk and uncertainty are the two most used terms in the literature dealing with concepts of risk management. Even though these two terms are nearly related, many authors have made a distinction between them (Samson *et al.*, 2009). Practitioners working also have difficulty in defining and differentiating between these two. More often, definitions of risk or uncertainty are accommodated for the use of a particular project. According to Gajewska and Ropel (2011), in order to have a better understanding, literature was done and the findings of this outline numerous definitions of risk and uncertainties. These have been put together and presented in Table 1.

Table1. Definition of risk and uncertainty by various authors

Author:	Risk definition	Uncertainty definition
Winch (2002)	A stage where there is a lack of information, but by looking at past experience, it is easier to predict the future. Events where the outcome is known and expected.	Uncertainty is a part of the information required in order to take a decision. The required information consists of the amount of available information and uncertainty.
Cleden (2009)	Risk is the statement of what may arise from that lack of knowledge. Risks are gaps in knowledge which we think constitute a threat to the project.	Uncertainty is the intangible measure of what we do not know. Uncertainty is what is left behind when all the risks have been identified. Uncertainty is gaps in our knowledge we may not.
Smith <i>et al.</i>, (2006)	Risks occur where there is some knowledge about the event.	There might be not enough information about the occurrence of an event, but we know that it might occur.
Webb (2003)	Risk is a situation in which he possesses some objectives information about what the outcome might be. Risk exposure can be valued either positively or negatively.	Uncertainty is a situation with an outcome about which a person has no knowledge.

Risks in Construction Projects

The opinion that the CI is the most exposed to threats (risks and uncertainty) is an agreement among authors due to the nature of its activities (Akintoye & Macleod, 1997; and Dey, 2001). Still, we found diverse tactics in the literature regarding the factors and characteristics of projects that expose the CI to numerous risks. Dey (2001), for example, indicates the following: the complexity of planning and design, changes in the environment, resource availability, and the presence of various interest groups, climate change, economic insecurity and political and regulatory statutes. In succession, Zou *et al.*, (2007) made reference to long, complex environment, complicated process, and the need for investment-intensive, dynamic organizational structures, technological and organizational complexity and the diverse interests of stakeholders. Ghani (2009) points out as factors and essential features high life cycle design, size, complexity, location, the different parties implicated and familiarity with the performer's work to be done. Zeng *et al.*, (2007) found a persistent change of environment, direct exposure to hazards, the high pressure involved in the compliance of costs and deadlines, and increasing the complexity of construction techniques. Furthermore, Shen (1997) emphasise how the main features: A large number of people with different interests and abilities necessary to coordinate a wide diversity of interrelated activities. Likewise, in the study conducted by Chapman and Ward (2003) the changeability in the performance objectives of cost, time and quality, the ambiguity related to various aspects such as lack of clarity owing to the behaviour of participants involved, as well as the lack of evidence and detail, are listed among the critical factors.

The Concept of Risk Management

Smith *et al.*, (2006) give a comprehensive explanation of the notion of RM and how it should be used in real life. According to the authors, RM cannot be seen as a means to foresee the future since that is quite unimaginable. In lieu, the authors define it as a means to make possible the project so as to make better decisions established on the information from the investment. In this way, decisions that are built on poor information can be avoided, and this will lead to a better performance. According to Bower (2009), RM is the sum of all proactive management-directed activities within a programme that are intended to accommodate acceptable the possibility of failure in the elements of a programme; while Van Well-Stam *et al.*, (2004) defined RM as a complete set of activities and actions aimed at dealing with any risk in order to maintain control over the entire; and PMI (2000) attaches a definition to RM as the systematic process of identifying, analysing and responding to risks.

For the purpose of the study, the definition of risk was limited to the one that has an adverse impact on a project; and hence RM is defined as a process with some predefined procedures. Many authors have defined it differently; however, the key information is the same. From a multitude of definitions which can be established in the management literature, Cooper *et al.*, (2005) explanation brings the essence of this concept:

The risk management process involves the systematic application of management policies, processes and procedures to the tasks of establishing the context, identifying, analysing, assessing, treating, monitoring and communicating risks (Cooper et al., 2005).

RMP is the primary principle of understanding and managing risks in a project. It involves the main phases: identification, assessment and analysis, and response (Akintoye & Macleod,

renault08@yahoo.fr

Renault, B. Y.¹, Agumba, J. N.² and Ansary, N.³ (2016) A Theoretical Review Of Risk Identification: Perspective Of Construction Industry In: Mojekwu, J.N., Nani G., Atepor, L., Oppong, R.A., Adetunji, M.O., Ogunsumi, L., Tetteh, U.S., Awere E., Ocran, S.P., and Bamfo-Agyei, E. (Eds) Procs 5th Applied Research Conference in Africa. (ARCA) Conference, 25-27 August 2016, Cape Coast, Ghana. 773-782

1997). All steps in RMP should be incorporated when dealing with risks, in order to efficiently implement the process in the project. This study reviewed the details of risk identification processes. The risk management concept is depicted in Figure 1.



Figure 1. Risk Management Process, (Kishan *et al.*, 2014)

Importance of Risk Management in Construction Projects

It has become a regular tendency to learn from past undesirable outcome to protect against reoccurrences. A number of construction projects do not succeed in attaining their expected end result due to project constraints (cost, time and quality). Risk is one of the various reasons of project's failure. It is important to reduce the impact of risks to its merest minimum, so as to arrive at success in every project. Uncertainties are perceived as the principal obstacles to project success; as a result, it is indispensable for every project handling organization to alleviate against these uncertainties (Krane *et al.*, 2010). Furthermore, the success of a project is built upon the management of the risk that is related to the project, in view of the fact that a well-managed risk contributes to project success. In contemporary business practices, enterprises may not be able to alleviate completely risk but they can deal with risk in a better way. Successive risks may be different from past ones, but every risk has in it an opportunity to learn. According to Olamiwale (2014), any enterprise can become risk tolerant by initiating proper risk management practices.

RISK IDENTIFICATION AND RISK IDENTIFICATION TECHNIQUES

Risk Identification (RI)

This is the first stage in the RMP, and it involves capturing all potentials risk that might occur within the project (Okogbuo *et al.*, 2015). Risk identification (RI) forms the base for the next steps of risk analysis and control and allows organisations to learn about the areas in which it is exposed to risk. If appropriately performed, RI ensures successful risk management as unknown sources of losses escalate into unmanageable occurrences with unforeseen outcomes (Tchankova, 2012) The emphasis is not only aimed at the incapability to identify loss causing risks but also includes the incapacity to determine opportunistic events. The effect of the non-identification of positive risks equates to the effect of non-identification of negative risks (Tchankova, 2012). RI involves the identification of all possible risks and opportunities which may affect the organisation, as well as the conditions giving rise to these risks and opportunities. Risk identification, therefore, facilitates the efficient studying of

renault08@yahoo.fr

Renault, B. Y.¹, Agumba, J. N.² and Ansary, N.³ (2016) A Theoretical Review Of Risk Identification: Perspective Of Construction Industry In: Mojekwu, J.N., Nani G., Atepor, L., Oppong, R.A., Adetunji, M.O., Ogunsumi, L., Tetteh, U.S., Awere E., Ocran, S.P., and Bamfo-Agyei, E. (Eds) Procs 5th Applied Research Conference in Africa. (ARCA) Conference, 25-27 August 2016, Cape Coast, Ghana. 773-782

areas and activities where organisational resources are at risk, affecting their ability to achieve their business goals (Tchankova, 2012).

To conduct RI efficiently, primary project documentation must be in place. The project charter, scope statement, and project management plan (Including the Work Breakdown Structure) need to be available to build an exhaustive list of risks. Without these elements as a frame of reference, it is difficult to assess the risks on a project effectively. The RM plan and the organizational atmosphere also must be undoubtedly understood to carry out RI. These form the environment in which the risks will be evaluated. The RM plan may also identify specific RI practices which are either favoured or banned by the organization as part of their risk culture. According to Kuang (2011), all this information can encourage thinking about different risk issues and concerns when evaluated using the tools and techniques of RI. The tools and technology that are employed in RI are as varied as the projects they serve. Nevertheless, some groups of tool and technique types are most frequently used. These tools and techniques are discussed below.

Purpose of Risk Identification

The purpose of identifying risks is to obtain a list of potential risks to be managed in a project (PMI, 2004). RM is not only concerned with a solving problem in advance but also being prepared for the occurrence of any unexpected future problems. Dealing with possible threats is not only a means to reduce losses within the project, but also a means to transfer risks into opportunities, which can lead to economic profitability, environmental and other advantages (Winch, 2003). Its purpose is to compile a list of risks necessary for a particular project. To form a list of potential risks, it is first important to research the possible sources of risk, adverse events that include risk, and the unfortunate effects of an undesirable scenario. For example, the weather is a source of risk, the extremely bad weather is an adverse event, and its effect is working running behind schedule due to extremely severe weather conditions. RI generally depends on the manager's experience. If his experience with particular methods and techniques of RI is right, the manager will continue to use them, whereas bad experience leads to avoiding approaches prepared earlier (Kishan *et al.*, 2014).

Risk Identification Techniques

Risk identification can be defined as the process of enlightening, knowing or approving the existence of risk in a project. At the identification phase, the sources, features, causes and effects of risk on a project are established. Once risk is identified in a project, it may be apparent that the problems associated with the said risk are half solved because it is almost impossible to access or respond to an unidentified risk.

As mentioned above, RI aims at gathering a list of potential risks to be managed in a project. In order to identify all potential risks which might impact on a particular project, various techniques are used. It is always essential to apply the method that is well known by the project team and profitable to the project itself. The following serves as the more usual risk identification techniques (Lester, 2007; and Kishan *et al.*, 2014):

Brainstorming: This is one of the most known risk identification techniques. According to PMI (2013), this technique is usually performed with a multidisciplinary set of experts, not on the team. The goal being to obtain a comprehensive list of project risks. Here, all relevant persons associated with project gather at one place. There is only one facilitator who is

renault08@yahoo.fr

Renault, B. Y.¹, Agumba, J. N.² and Ansary, N.³ (2016) A Theoretical Review Of Risk Identification: Perspective Of Construction Industry In: Mojekwu, J.N., Nani G., Atepor, L., Oppong, R.A., Adetunji, M.O., Ogunsumi, L., Tetteh, U.S., Awere E., Ocran, S.P., and Bamfo-Agyei, E. (Eds) Procs 5th Applied Research Conference in Africa. (ARCA) Conference, 25-27 August 2016, Cape Coast, Ghana. 773-782

briefing about different aspects of the participants and then after note down the factors. Before closing it the facilitator review, the factors eliminate the inessential ones. This technique appears to be a well-organised risk identification technique because it entails an open discussion which is attended by project teams and other project participants. Therefore, it creates an opportunity to discuss the existence of risks as well as the potential impacts thereof. However, it is predisposed to be influenced by stronger parties if not monitored (Khalafallah, 2002).

Interviews/Expert Opinion: Experts or interviewing experienced participants in a project can be a great help in avoiding or solving similar problems over and over again. All project members or the relevant persons can be interviewed in order to identify the factors affecting risk (PMI, 2013; and Khalafallah, 2002).

Questionnaires: The risk identification questionnaire technique can be used to detect potential risks in a project. The questions are well structured and handed out to project team members by the project manager. It allows for consistency and short response periods as well as open disclosure of risks. The major disadvantage is that the final results are based on the ideas of individuals (Khalafallah, 2002).

Delphi technique: This method is identical to brainstorming but here the projects participants do not know each other, and they are not at the same place. They will identify the factors without consulting other project participants. Like in brainstorming, the facilitator sums up the identified factors. This method may be appropriate to the identification of risks, but it is more suitable to attaching possibility of occurrence and potential impacts of previously identified risk events. This technique of RI is supported by structured knowledge, experience and creativity from an expert (Jayasudha & Vidiwelli, 2014).

Expert systems: This technique makes use of the past experiences of experts to identify potential risks in a construction project. The disadvantage of this technique is that it tends to out rightly ignore any risk that was previously omitted, and it only relies on knowledge (Khalafallah, 2002).

Past Experience: Previous experience from the similar project, the analogy can be formed for identification of the factors. When comparing the characteristics of projects will provide insight about the common factors (Gajewska & Ropel, 2011).

Checklists: These techniques can be quick and simple; it is impossible to build exhaustive ones. The checklist can be developed based on historical information and knowledge that has been accumulated from previous similar projects and from other sources of information (Gajewska & Ropel, 2011). Serious attention should be taken to explore items that do not appear on the checklist. Further, the checklist should be re-examined during project closure to improve it for future projects.

Documentation review: A planned and detailed documentation reviews need to be performed on a project from time to time, taking into cognisance all the assumptions, plans and previous project files. These can serve as indicators that reveal entrenched risks in the project (PMI, 2013).

Most of the aforementioned techniques are based on separating a process into its essential components for analysis. This reductionist perception fails to consider the interactions between components and new risks that may arise as a consequence of the interaction with the internal and external environment (White, 1995). Risk finding contemplates all exposures, including direct losses such as the need to replace stolen property and indirect losses such as loss of important employees as a result of death or retirement (Hollman & Forrest, 1991). RI is not an invariable process, but should be the attention of perpetual evolution. Changes in the

renault08@yahoo.fr

Renault, B. Y.¹, Agumba, J. N.² and Ansary, N.³ (2016) A Theoretical Review Of Risk Identification: Perspective Of Construction Industry In: Mojekwu, J.N., Nani G., Atepor, L., Oppong, R.A., Adetunji, M.O., Ogunsumi, L., Tetteh, U.S., Awere E., Ocran, S.P., and Bamfo-Agyei, E. (Eds) Procs 5th Applied Research Conference in Africa. (ARCA) Conference, 25-27 August 2016, Cape Coast, Ghana. 773-782

environment are owing to the macroeconomic frame, changes in the political dispensation, social changes, etc., involve continuous identification of new risks (Smit, 2012). The identification of risks is thus not only limited to existing risks impacting the organisation at present but also anticipated new risks that the organisation may face in the future (Williams *et al.*, 1998; and Tchankova, 2002). For each identified risk, the following should be captured in a key risk register (Bowden *et al.*, 2001):

- A short description of the risk identified.
- The various possible causes of the risk and the consequences if realised.
- The main organisational area where the risk may occur.
- The critical success factors that may be affected if the risk does realise.
- An assessment of the likelihood of occurrence and the predicted impact.
- The department or person accountable for managing the risk.

It is indispensable to recognise that no single RI technique is sufficient to identify all risks. A combination of techniques is accordingly proposed to ensure that the identification is as encompassing as possible. Moreover, the various RI techniques have been developed in response to industry-specific problems with certain techniques more appropriate for some industries than others. From the above the analogy can be drawn that risk identification should not be undertaken in isolation, but as an advice-giving approach with involvement of as many people as possible (Valsamakis *et al.*, 2000).

RESEARCH METHODOLOGY

The work methodology included a literature search. The research was conducted with reference to existing literature, published and unpublished literatures. This study is mainly a literature review and looks at the literature relating to risk management and risk identification in the construction industry. This is because the concepts of risk and risk management have been on agenda for many years. The literature search was based on systematic keyword combination search in the following databases namely; Compendex, InterScience, JSTOR, Web of Science and Science Direct, Taylor and Francis Online, and Emerald. The authors used advanced search for the database engines and basic search for Google. The keywords used for the data search were; “risk management” (in the first string) and “risk identification techniques” (in the second string). The basic search used was “risk management in construction”. The criteria for including the article were; the article/report should be peer-reviewed, be written in English, it should indicate the objective of the study, the method employed; report the results to the objective of this literature and a conclusion. This led to the rejection of papers not strictly related to risk management in construction and risk identification techniques used in construction.

LESSONS LEARNED FROM LITERATURE REVIEW

This study has revealed that risk identification involves establishing a list of all potential risks to be managed in a project. In additional, the reviewed literature also stressed that the entire risk management process is not only limited to with solving problem in advance but also for the occurrence of any unexpected future problems. The study further shown that issues with possible threats envisaged in a project are not only a means to reduce losses within the project, but also a means to transfer risks into opportunities, which can lead to economic profitability, environmental and other advantages as postulated by Winch (Lester, 2007).

renault08@yahoo.fr

Renault, B. Y.¹, Agumba, J. N.² and Ansary, N.³ (2016) A Theoretical Review Of Risk Identification: Perspective Of Construction Industry In: Mojekwu, J.N., Nani G., Atepor, L., Oppong, R.A., Adetunji, M.O., Ogunsumi, L., Tetteh, U.S., Awere E., Ocran, S.P., and Bamfo-Agyei, E. (Eds) Procs 5th Applied Research Conference in Africa. (ARCA) Conference, 25-27 August 2016, Cape Coast, Ghana. 773-782

Undoubtedly, this study has as well shown that compiling of a list of risks necessary for a particular project is prudent and proactive activity to be embarked by a project team. This implies that if risk attached to a project is not firstly identified it will be almost impossible to respond to it thereby affecting the entire project. Risk identification as revealed by the study must not be a standalone activity rather a coordinated and integrated task that should involve all the project team to enable a successful risk management. Also, not all risks on projects are entirely of negative influence; some are an opportunity to explore into other segments of that would create profitability to the firm.

CONCLUSION

While most studies have focused on some aspects of construction risk management, this paper has examined literature relating to construction risk identification with the accomplishment of all project objectives in terms of cost, time, quality, environment and safety. To achieve the objective of this study, the concepts of risk, risk management and risk identification were elaborated according to literature. The literature review showed that risk identification is a crucial phase in any RMP. According to literature, risks must identify before they can be controlled or mitigated. Accordingly, this study concludes that risk identification should be considered as the single most significant activity of the risk management on a project and should be tackled in a systematic way. Risk identification techniques as concluded from this study includes the following techniques namely: Brainstorming, Interviews/Expert Opinion, Questionnaires, Delphi technique, Expert systems, Checklists and Documentation review.

The study further concludes that issues with possible threats envisaged on a project are not only a means to reduce losses within the project, but also a means to transfer risks into opportunities, which can lead to economic profitability. Formulating an effective risk management system is a vital challenge encountered by participants tasked on a project in minimising these risks. Risk management should be applied at the initial stage of any construction project in order to gain extreme benefit of the risk identification technique employed. Therefore, there is flourishing need to have in place a well-documented procedure which should be a one stop solution to all threats that are likely to occur during project life cycle. There should be more wholesome approach towards risk management instead of the present sporadic approach towards risks.

REFERENCES

- Akintoye, A.S., & Macleod, M. (1997). Risk analysis and Management in construction, *International Journal of Project Management*, 15 (1): 31- 38.
- Bowden, A.R., Lane, M.R. & Martin, J.H. (2001). *Triple Bottom Line Risk Management. Enhancing Profit, Environmental Performance, and Community Benefits*. New York: John Wiley & Sons.
- Bower, P. (2009). *Risk Management Options*. Available from: <http://www.projectsart.co.uk/risk-management-options.html>. [Accessed 26/08/ 2015]
- Chapman, C., & Ward, S. (2003). *Project Risk Management: Processes, Techniques and Insights*, 2nd ed. West Sussex.
- Cleden, D., (2009). *Managing project uncertainty*. Abingdon: Ashgate Publishing Group
- Community Benefits*. New York: John Wiley & Sons.

renault08@yahoo.fr

Renault, B. Y.¹, Agumba, J. N.² and Ansary, N.³ (2016) A Theoretical Review Of Risk Identification: Perspective Of Construction Industry In: Mojekwu, J.N., Nani G., Atepor, L., Oppong, R.A., Adetunji, M.O., Ogunsumi, L., Tetteh, U.S., Awere E., Ocran, S.P., and Bamfo-Agyei, E. (Eds) Procs 5th Applied Research Conference in Africa. (ARCA) Conference, 25-27 August 2016, Cape Coast, Ghana. 773-782

- Cooper, D., Grey, S., Raymond, G., & Walker, P., (2005). *Project Risk Management Guidelines: Managing Risk in Large Projects and Complex Procurements*. Chichester: John Wiley & Sons, Ltd. England
- Dey, P.K. (2001). Decision support system for risk management: a case study, *Journal of Management Decision*, 39(8): 634-649.
- Gajewska, E. & Ropel, M. (2011). *Risk management practices in construction project: a case study*. Master of Science Thesis, Chalmers of Technology, Goteborg, Sweden
- Ghani J.A (2009). *Construction Risk Management*. Punjab Information Technology Board. Available from
- Hollman, K.W. & Forrest, J.E. (1991). Risk Management in a Service Business. *International Journal of Service Industry Management*, 2(2):49-65.
- Jayasudha, K. Vidivelli, B. (2014). A Study on Risk Assessment in Construction Projects, *International Journal of Modern Engineering Research (IJMER)*, 4(9): 20-23
- Khalafallah, A.M.G.E.I. (2002). *Estimating cost contingencies of residential building project using belief networks*. Master of Science Thesis, Cairo University Giza, Egypt.
- Kishan, P., Bhavsar, J.J. & Bhatt, R. (2014). A Study of Risk Factors Affecting Building Construction Projects, *International Journal of Engineering Research & Technology (IJERT)*, 3(12): 832. B.V.M. Engineering College, Vallabh Vidyanagar, Gujarat, India.
- Krane, H.P., Rolstadas, A. & Olsson, N.O.E. (2010). Categorizing risks in seven large projects: which risks do the projects focus on? *Project management journal*, 14, 81-86.
- Kuang, Z. (2011). *Risk Management in Construction Projects: Application of Risk Management in Construction Period*. Bachelor of Architectural Technology and Construction Management. Via University College, Horsens Campus, Denmark.
- Lester, A., (2007). *Project management, planning and control*, 5th edition. Oxford: Elsevier Ltd Light Press.
- Okogbuo, F., Ubani, Chinenye, E., Amade, Benedict, Okorocho, Aku., K., & Agwu, A. (2015). Project Risk Management Issues in the Nigerian Construction Industry, *International Journal of Engineering and Technical Research (IJETR)*, 3(1): 217-232.
- Olamiwale, I.O. (2014). *Evaluation of Risk Management Practices in the Construction Industry in Swaziland*. Master of Quantity Surveying Thesis, Tshwane University of Technology, Pretoria, South Africa.
- Project Management Institute (PMI). (2000). *A Guide to the Project Management Body of Knowledge: PMI*. 2000 edition. Pennsylvania: Project Management Institute, Inc.
- Project Management Institute (PMI). (2004). *A Guide to the Project Management Body of Knowledge: PMI*. 3rd edition. Pennsylvania: Project Management Institute, Inc.
- Project Management Institute (PMI). (2013). *A Guide to the Project Management Body of Knowledge (PMI® Guide) – Fifth (5) Edition*
- Samson, S., Reneke, J.A, and Wiecek, M.M, (2009). *A review of different perspectives on uncertainty and risk and an alternative modelling paradigm*. Reliability Engineering and System Safety, 94, 558– 567
- Shen, L.Y. (1997). Project risk management in Hong Kong, *International Journal of Project Management*, 15(2): 101-105.
- Smit, Y. (2012). *A structured approach to risk management for South African SMEs*. Cape Peninsula, University of Technology: Cape Town, South Africa.
- Smith, N.J., Merna, T., & Jobbling P., (2006). *Managing Risk in Construction Projects*. 2nd edition Oxford: Blackwell Publishing

- Tchankova, L. (2002). *Risk identification: basic stage in risk management*. *Environmental Management and Health*, 13(3):290-297.
- Towers Perrin. 2008. *Towers Perrin Risk and Opportunity White Paper*. [Online]. Available from: <http://www.towersperrin.com> [Accessed 05/04/2015].
- Valsamakis, A.C., Vivian, R.W. & Du Toit, G.S. (2000). *Risk Management, 2nd Edition*. Sandton: Heinemann Higher and Further Education
- Van Well-Stam, D., Lindenaa, F., Van Kinderen, S., & Van den Bunt, B. (2004). *Project Risk Management: An essential tool for managing and controlling projects*. London: Kogan Page
- Webb, A., (2003). *The project manager's guide to handling risk*. Aldershot: Gower Publishing Limited
- White, D. (1995). Application of systems thinking to risk management: a review of the literature. *Management Decisions*, 33(10): 35-45.
- Williams, J.R., Smith, M.L. & Young, P.C. (1998). *Risk Management and Insurance, 8th Edition*. Singapore: Irwin McGraw-Hill.
- Winch, G. (2003). Models of Manufacturing and the Construction Process: the genesis of re-engineering construction, *Building Research and Information*, 31(2): 107-118.
- Winch, G., (2002). *Managing construction projects, an information processing approach*. Oxford: Blackwell Publishing
- Zeng, J.A.N.M., & Smith, N.J. (2007). Application of fuzzy based decision-making methodology to construction project risk assessment, *International Journal of Project Management*, 25, 589-600.
- Zou, P.X.W., Zhang, G., & Wang, J. (2007). Understanding the key risks in construction projects in China, *International Journal of Project Management*, 25, 601-614.