

A Study of Risk Factors Affecting Building Construction Projects

Patel Kishan¹

¹Student of Final Year, M.E
(Construction Engineering & Management),
B.V.M Engineering College, Vallabh Vidyanagar,
Gujarat, India,

Dr. Rajiv Bhatt²,

²Head of the Department,
Civil Engineering Department,
A.D.I.T Engineering College, Vallabh Vidhyanagar,
Gujarat, India,

Prof. J. J. Bhavsar³

³Associate Professor and PG Coordinator
(Construction Engineering & Management),
Civil Engineering Department,
B.V.M. Engineering College, Vallabh Vidyanagar,
Gujarat, India

Abstract - Construction projects are initiated in complex and dynamic environments resulting in circumstances of high uncertainty and risk, which are compounded by demanding time constraints. As the most common and typical project types, construction projects have several characteristics such as time limit, specific objects, financial constraints and economic requirements, special organizational and legal conditions, complexity and systematic characteristics, For that each construction project itself is a complex system. Risks always exist in construction projects and often cause schedule delay or cost overrun. Risk management is a process which consists of identification of risks, assessment with qualitatively and quantitatively, response with a suitable method for handling and control risks. Risk management concept becomes very popular in a number of businesses. Many companies often establish a risk management procedure in their projects for improving the performance, minimizing losses and increases the profits. Study of this paper involves finding of 47 factors which are responsible for risk in construction projects. Findings are based on literature review, structured interview with construction professionals and present scenario of construction industry.

Keywords:- Construction projects, Risk management, Risk identification, Risk assessment, Risk response.

I. INTRODUCTION

The track record of construction industry is very poor in terms of managing with risks, resulting in the failure of many projects to meet time schedules, targets of budget and sometimes even the scope of work. As a result, a lot of suffering is inflicted to the clients and contractors of such projects and also to the general public. Risk in the construction adversely affects the project objectives of time, cost, scope and quality. Some risks in construction processes can be easily predicted or readily identified; still some can be totally unforeseen. Construction risks can be related to design, physical, logistics, legal, environmental, management, financial, construction, political. 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, terrible environment, financial intensity and dynamic organization structures (Flanagan and Norman, 1993; Akintoye and MacLeod, 1997; Smith, 2003).

Risk is considered to be a major factor that influences project success and Risk Management is an important process in any capital project (Krane, 2010), particularly construction projects. Thus, Risk Management is currently one of the main topics of interest for both researchers and construction practitioners (Raz, 2002). 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 impact, and developing appropriate management responses” (Uher, 2003). The aim of each organization is to be successful and Risk Management can facilitate it. However it should be underlined that Risk Management is not a tool which ensures success but rather a tool which helps to increase the probability of achieving success. Risk management is therefore a proactive rather than a reactive concept.

Managing risks involves identifying, assessing and prioritizing risks by monitoring, controlling, and applying managerial resources with a coordinated and economical effort so as to minimize the probability and/or impact of unfortunate events and so as to maximize the realization of project objectives (Douglas, 2009). Risk management, which has been practiced since the mid-1980s, is one of the nine main knowledge areas of the project management institute’s project management body of knowledge (Tuyszet, 2006). Effective Risk Management may lead the project manager to several benefits such as identification of favorable alternative course of action, increased confidence in achieving project objective, improved chances of success, reduced surprises, more precise estimates (through reduced uncertainty), reduced duplication of effort (through team awareness of risk control actions), etc. (Bannerman, 2008). Systemic Risk Management has an effect on the project success. It is found that there is a strong

relationship between the amount of Risk Management efforts undertaken in a project and the level of the project success (Elkington & Smallman, 2002).

II. OBJECTIVE OF STUDY

The main objective of this study is to identify key risk factors that affect the building construction projects.

III. LITERATURE REVIEW

A number of studies have been carried out to determine the factors of risk in construction project:

P.J.Edwards (1998) conducted research on risk and risk management in construction. They primarily classify risk into two main categories natural risk and human risk. Natural risk occurs outside human system, while human risks arise within humanly organized system. The sub categories of human risk relating to construction and project risks include social, political, economical, financial, legal, health, managerial, technical and cultural risks.

Patel Kinnaresh (2013) conducted study on Risk assessment and its management in India according to them it is safe to say that the majority of construction projects in India have no systematic procedure to deal with risks from the obtained results. It is also found out that financial, construction, and quality risks were associated with construction projects in India. Indian construction projects generally have been practiced with an informal approach of risk management. Hence there is a thriving need to have a well-documented procedure which should be a one stop solution to all the risks that are likely to be faced during project life cycle.

Pejman Reza khani (2012) classify construction project risks into external, operational, project management, engineering and financial in their study of classifying risk factors in construction projects

Pinkerton and Federation of Indian Chambers of Commerce and Industry (FICCI) 2013 generate Indian Risk Survey 2013 according to them Strikes, Closures and Unrest' emerged as the number one risk In the year 2012

Shen (1997) identified eight major risks accounting for project delay and ranked them based on a questionnaire survey with industry practitioners. Shen also proposed risk management actions to cope with these risks and validated their effectiveness through individual interview surveys

Bhandari M.G. (2014) conducted study on management of risk in construction. Thy classify risk into technical risk, logistical risk, management related risk, Environmental risks, Financial risks, socio-political risks

Mulholand and Christan (1999) explains that due to the complexity and dynamic environments of construction projects, certain circumstances are created which result in a high degree of uncertainty and risk. Often these risks are compounded by demanding time constraints

According to Prof. Shakil S. Malek, (2013) Risk management ultimately minimizes the project losses & increase the likelihood that the project in completed on schedule & within the budget. Risk management is a proactive management tool used for early visibility of

potential problem areas & possible mitigation measures. Risk management includes the entire project, including the design, engineering, business, contracts, finance, purchasing, estimating, & project management.

IV. RISK MANAGEMENT PROCESS

Risk management process consists following step:



Figure 1: Risk Management Process

1. RISK IDENTIFICATION

Risk management always starts with risk identification, which may be considered the most important phase of the risk management process (Baker, Ponniah and Smith, 1998). Its purpose is to compile a list of risks important for a particular project. To form this list, it is first necessary to research the potential sources of risk, adverse events that include risk, and the unfavorable effects of an undesirable scenario. For example, weather is a source of risk, extremely bad weather is an adverse event, and its effect is work running behind schedule due to extremely bad weather conditions. Risk identification greatly depends on the manager's experience. If his experience with particular methods and techniques of risk identification is good he will continue to use them, whereas bad experience leads to avoiding approaches prepared earlier. Managers use various techniques for risk identification, the best-known of which are:

- Brainstorming
- Interviews
- Questionnaires
- Delphi technique
- Expert systems, etc.

2. RISK ANALYSIS

Risk analysis, a component of the risk management process, deals with the causes and effects of events which cause harm. The aim behind such analysis is a precise and objective calculation of risk. To the extent that this is possible, it allows the decision making process to be more certain. The essence of risk analysis is that it attempts to capture all feasible options and to analyze the various outcomes of any decision. For building projects, clients are mainly interested in the most likely price, but projects do have cost over-runs and, too frequently, the 'what if' question is not asked (Flanagan & Norman, 1993).

Risk analysis involves assessing the identified risks. This first requires that the risks are quantified in terms of their effect on cost, time or revenue. They can be analyzed by measuring their effects on the economic parameters of the project or process. The use of risk analysis gives an insight into what happens if the project does not proceed according to plan. When active minds are applied to the best available data in a structured and systematic way, there will be a clearer vision of the risks than would have been achieved by intuition alone (Flanagan & Norman, 1993).

Table1. Various risk analysis techniques

Risk Analysis	
Qualitative	Quantitative
a. Direct judgment	e. Probability analysis
b. Ranking option	f. Sensitivity analysis
c. Comparing options	g. Scenario analysis
d. Descriptive analysis	h. Simulation analysis

(Source: Ward and Chapman, 1997)

3. RISK RESPONSE PLANNING

Risk Response Planning process is the third stage in the risk management process.

- Action is taken to deal with the risks. Higher priority risks need more attention.
- Risk Response Planning covers both preventive actions to prevent the risk from occurring as well as a suitable response in case the risk actually occurs.
- At times, responding to a risk can give rise to a new or "secondary" risk so care should be taken when choosing a risk response.
- The five most common responses that are used to deal with risks are:
 - Risk Avoidance
 - Risk Transfer
 - Risk Mitigation (reduction)
 - Risk Share
 - Risk Acceptance

4. RISK CONTROL

- This is the last process of risk management and it involves the implementation of risk response to the risk
- All responses that are made to risks must be monitored and reviewed to ensure they are effective.
- Responses taken to risks should also be fully documented for future reference and project plans need to be updated accordingly. Any changes required in schedule, budget etc. due to the risk should be documented and updated in the project plans.
- Risk Control should be an on-going process in which the impact of the risk is again evaluated and assessed.

❖ PRINCIPLES OF RISK MANAGEMENT

The International Organization for Standardization identifies the following principles of risk management: (Zenghua Kuang)

- Risk management should create value.
- Risk management should be an integral part of organizational processes.
- Risk management should be part of decision-making.
- Risk management should explicitly address uncertainty.
- Risk management should be systematic and structured.
- Risk management should be based on the best available information.
- Risk management should be tailor-made.
- Risk management should take into account human factors.
- Risk management should be transparent and inclusive.
- Risk management should be dynamic, iterative and responsive to change.
- Risk management should be capable of continual improvement and enhancement.

❖ BENEFITS WITH RISK MANAGEMENT

- Risk management contributes to a better view of possible consequences resulting from unmanaged risks and how to avoid them.
- Another benefit of working with risk management is increased level of control over the whole project and more efficient problem solving processes which can be supported on a more genuine basis. It results from an analysis of project conditions already in the beginning of the project.
- The risk management also provides a procedure which can reduce possible and sudden surprises.
- Different attitudes towards risk can be explained as cultural differences between organizations, where the approach depends on the company's policy and their internal procedures.

V. WORK METHODOLOGY

The work methodology included a literature search and interviews. The literature review was conducted through book, internet and journals. As the outcome of this, 47 risk factors for building construction projects were identified. These factors were categorized in ten main groups such as: design, physical, logistics, legal, environmental, management, cultural, financial, construction and political. Framework of the factors is given in Table2.

VI. CONCLUSION

Risk management is rarely used by the participants in construction projects. The participants generally use to handle the risks with an informal approach. This technique is not employed because of less knowledge and awareness

among the construction industry. The risk management technique should be applied into any construction project at the initial stage of the project to get maximum benefit of the technique. Hence, there is thriving need to have a well-documented procedure which should be a one stop solution to all hazards that are likely to occur during project life cycle. This study was carried out particularly to identify construction project risk and outcome is a list of 47 number of risk factors under the category of design, physical, logistics, legal, environmental, management, cultural, financial, construction and political. Based on above factors analysis future study can be carried out to understand criticality of each factor. That kind of study will help the construction industry to work on certain important and most critical factors so that risk can be properly managed.

VII. ACKNOWLEDGEMENT

The Author thankfully acknowledge to Dr. C. L. Patel, Chairman, Charutar Vidya Mandal, Er. V. M. Patel, Hon. Jt. Secretary, Charutar Vidya Mandal, Dr. F. S. Umrigar, Principal, B.V.M. Engineering College, Vallabh Vidyanagar, Gujarat, India for their motivations and infrastructural support to carry out this research.

REFERENCES

- [1] Akintoye, A.S. and MacLeod, M.J. "Risk Analysis and Management in Construction," International Journal of Project Management, 1997, 15(1), 31-38.
- [2] Baker, S., Ponniah, D. and Smith, S. "Risk response techniques employed currently for major projects," Construction Management and Economics, 1999, 17, 205-13.
- [3] Bannerman P.L., Risk and Risk Management in Software Projects: A Reassessment J. of Syst. a. Software, 2008, 81, 12, 2118-2133.
- [4] Bhandari M.G., "Management of Risk in Construction Projects in Maharashtra," International Journal of Engineering Science Invention vol.3 (1), 2014, pp.14-17.
- [5] Chapman C. & Ward S., "Project Risk Management: Processes, Techniques and Insights" 1997.
- [6] Douglas, Hubbard, "The Failure of Risk Management: Why it's Broken and How to Fix It". J.Wiley & Sons, NY, 2009, 46.
- [7] Elkington P, Smallman C. "Managing project risks: a case study from the utilities sector", International Journal of Project Management 2002; 20(1):49-57.
- [8] Flanagan, R. and Norman, G. "Risk Management and Construction", Victoria: Blackwell Science Pty Ltd, Australia, 1993.
- [9] Krane H.P., A. Rolstadas and N.O.E. Olsson. Categorizing risks in seven large projects Which risks do the projects focus on? Project Manage. J., 2010, 41: 81-86. DOI: 10.1002/pmj.20154
- [10] Mulholland, B. and Christan, J. "Risk Assessment in Construction Schedules," Journal of Construction Engineering & Management, Vol. 125(1), 1999, pp.8 - 15.
- [11] P.J.EDWARDS, "Risk and risk management in construction: a review and future direction for research" Engineering construction and management, 1998.
- [12] Patel Kinnareesh, "A study on risk assessment and its management in India" American Journal of Civil Engineering, 2013, 1(2): 64-67
- [13] Pejman rezakhani, "Classifying key risk factors in construction projects," 2012.
- [14] Prof. Shakil S. Malek, "Risk Management in Construction Industry", IJAR, 2013.
- [15] Raz Z, Shenhar A J, Dvir D. "Risk management, project success and technological uncertainty", R&D Manage 2002; 32 (2):101-109.
- [16] Shen, L.Y. "Project Risk Management in Hong Kong", International Journal of Project Management, 1997, 15(2), 101-105.
- [17] Smith, N.J. "Appraisal, Risk and Uncertainty (Construction Management Series)", London: Thomas Telford Ltd, UK, 2003.
- [18] Tuysuz, Kahreman, "Project Risk Evaluation Using a Fuzzy Analytic Hierarchy Process: An Application to Information Technology Projects", Internat. J. of Intell. Syst., 2006, 21, 559-584.
- [19] Uher, T. "Programming and Scheduling Techniques", UNSW Press, Sydney, 2003.
- [20] Zenghua kuang "risk management in construction projects", Via University College Horsens Campus, Denmark 2011.

Table 2: CONSTRUCTION RISKS AFFECTING BUILDING PROJECTS

A. DESIGN	A1. Defective design (incorrect)
	A2. Inaccurate quantities
	A3. Not coordinated design (structural, mechanical, electrical, etc.)
	A4. Rush design
	A5. Awarding the design to unqualified Designers
	A6. Lack of consistency between bill of quantities, drawings and specifications
B. PHYSICAL	B1. Occurrence of accidents because of poor safety procedures
	B2. Supplies of defective materials
	B3. Security of material and equipment
	B4. Public security
	B5. Varied labor and equipment productivity
C. LOGISTICS	C1. Improper site investigation
	C2. Inaccurate project program
	C3. Unavailable labor, materials and equipment
	C4. High competition in bids
	C5. Undefined scope of working
	C6. Poor communications between the home and field offices (contractor side)
D. LEGAL	D1. Ambiguity of work legislations
	D2. Difficulty to get permits
	D3. Delayed disputes resolutions
	D4. Legal disputes during the construction Phase among the parties of the contract
	D5. No specialized arbitrators to help settle fast
E. ENVIRONMENTAL	E1. Adverse weather conditions
	E2. Difficulty to access the site (very far)
	E3. Environmental factors (floods, earthquakes, etc.)

F. MANAGEMENT	F1. Poor communication between involved Parties
	F2. Ambiguous planning due to project Complexity
	F3. Changes in management ways
	F4. Information unavailability (include uncertainty)
	F5. Resource management
G. CULTURAL	G1. Religion
	G2. Cultural custom
H. FINANCIAL	H1. Delayed payments on contract
	H2. Unmanaged cash flow
	H3. Inflation
	H4. Financial failure of the contractor
	H5. Exchange rate fluctuation
	H6. Monopolizing of materials due to closure and other unexpected political conditions
I. CONSTRUCTION	I1. Gaps between the Implementation and the specifications due to misunderstanding of drawings and specifications
	I2. Actual quantities differ from the contract Quantities
	I3. Design changes
	I4. Lower work quality in presence of time Constraints
	I5. Rush bidding
	I6. Undocumented change orders
J. POLITICAL	J1. New governmental acts or legislations
	J2. Inflation
	J3. Unstable security circumstances (Invasions)

IJERT