

REVIEW ARTICLE



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RISK AND SAFTY MANAGEMENT IN DIFFERENT PHASES OF CONSTRUCTION PROJECTS

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ABSTRACT

Construction industry is highly risk prone, with complex and dynamic project environments creating an atmosphere of high uncertainty and risk. The industry is vulnerable to various technical, socio-political and business risks. Over the year risk Management is treated as threat because it has not been dealt in structured manner. This paper is about probability of risk at initial phase and its impact during complete Project Life Cycle. (PLC) This paper discourses the problems associated with risk management in construction project. It is based on Bennett(2003) PLC frame work which consist of six phase of different length and start with pre-project phase followed by planning, design, contractor selection, Project-mobilization, operation, close-out and termination phase. Project undertaken in construction sector are widely complex and have often significant budget, where focus must be on time, cost and quality at each phase of PLC. However based on conducted interviews the research presents how risk changes during PLC. All analysis is based on theoretical background regarding risk, risk-management and PLC approach in construction sector.

Key words: Risk Management, Project Life Cycle, Construction, Contractor.

INTRODUCTION

The construction industry is of very complex and strategic nature. Therefore it is considered as a risky affair due to its peculiarity. Due to involvement of various stakeholders connected with the project, several internal and external factors the chances of risks are very high. Studies reveal that construction industry has a poor track record in risk analysis as compared to other industries. On practical grounds no construction project is risk free. Risk cannot be fully controlled in reality. However by taking adequate and timely precaution it can be reduced to some extent. There are three main aspects which should be fulfilled for any project that is time, cost and quality. If any one of them influences by any factor then the entire project will be affected. Risk management is also a factor which may be affecting the project. But if we analyze all things in project then can be minimize

the effect of risk. Risk management is a concept that is very important and needs to be handled in very efficient manner as it has various uncertainties. It is more difficult in project life cycle. Risk may be occurred in any project sector. i.e. Information technology, insurances, medical sector to Construction sector. Risk management is integral part of major as well as minor project. For infrastructure project if we carried out sources of risk in each activity of project then it can be easy to risk assessment. The analysis has also identified several factors responsible for time and cost overruns - some within the control of the enterprises and some beyond their control. Contracts are vital to the success of a project is important difficult, costly and lengthy proceedings. The contract documents can be used as a tool to manage risk by allocating risks to the various agencies through the various contracts between

them ^[1] It is said that “no business is more exacting or requires greater effort and determination than construction,” since Construction is complex and challenging process and requires interpretation of and conformance with myriad laws, codes and regulations among other activities. ^[2] Risk management plays a major role in achieving the project objectives irrespective of the size of construction project. The risks are the uncertainty of

future event and should be controlled systematically through risk management and analysis method. ^[3] A contract provides a “self-contained statement of obligations as between its own parties. ^[4]

RISK IN CONSTRUCTION: Many definitions have been given on risk by number of authors. Even well qualified person get puzzled in defining risk. A number of definitions are given below in table.

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.
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.
Cooper (2005)	Risk is exposure to the consequences of uncertainty.
Smith (2006)	Risks occur where there is some knowledge about the event
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.
Darnall and Preston (2010)	Risk is a possibility of loss or injury.

RISK ASSESSMENT

Risk analysis is the second stage in the RMP where collected data about the potential risk are analyzed. Risk analysis can be described as short listing risks with the highest impact on the project, out of all threats mentioned in the identification phase (Cooper et al. 2005). Although some researchers distinguish between terms risk assessment and risk analysis and describe them as two separate processes, for the purpose of this paper, this part of RMP will be consistent with the model provided by Smith et al. (2006) and described as one process. In the analysis of the identified risk, two categories of methods – qualitative and quantitative – have been developed.

RISK IDENTIFICATION

Winch (2002) claims that the first step in the RMP is usually informal and can be performed in various ways, depending on the organization and the project team. It means that the identification of risks relies mostly on past experience that should be used in upcoming projects. In order to find the potential risks, an allocation needs to be done. This can be decided and arranged by the organization. In this case, no method is better than another, since the

only purpose is to establish the possible risks in a project. Risks and other threats can be hard to eliminate, but when they have been identified, it is easier to take actions and have control over them.

FACTORS AFFECTING RISK:

- Staff Expertise and Experience
- Resource Availability
- Team Size
- Complexity
- Management Stability

CLASSIFICATION OF RISK

- Environmental Risk
- Design Risk
- Physical Risk
- Financial Risk
- Legal Risk
- Political risk
- Management Risk
- Construction Risk

REVIEW AND LITERATURE

Akintola et al. 2013[3] studied risk analysis and management in construction. Paper presented on basis of survey which did on questionnaire. Organization always gains profit when risk

management uses during project. Risk defined as couple of scourge which coincide when two conditions intersected. Analysis of risk in construction depends on judgment, intuition and experience. Most of the management does not use risk management process because of lack of knowledge, extra cost, and resources.

Louzi et. al. 2013[4] has worked on "The impact of risk management on construction projects success from the employees perspective" main aim of this research was to affect the risk management on success of infrastructure project. A survey was done in between participants and collected data from that. Survey developed on the basis of design, data and approach. Survey has two sections. First one based on technique using to minimizing the risk, and in second survey attempts to specify if the project they experienced achieved the success criteria.

Kolhatkar et. al. 2013[5] study of risk in construction project. He stated that in any construction project risk management is a very important management. He defined risk as losses which impact at all involved parties. In this sector risk reduction is very important; its result is negative always. Main motto of this study to identify different level and type of risk, sources of risk in project, advantage and disadvantage of risk, risk assessment process in infrastructure sector. He divides risk in four type financial risk, technology risk, project risk, and political risk. He concluded that deficiency of risk management procedure and systems result is enhanced and distressed the continuation of work. There should be improving in collection data, conduct research, causes and develop model and profile. So that result can be better.

Surjith et. al. 2014 [6] has discussed about "Risk Assessment and Management in Construction Projects". This research aimed to identify the risk factors that affect the performance of bridge projects as a whole and analyze by using appropriate tools and technique and to develop a risk management framework. The main aim is to eliminate potential impact and to improve the level of control of risk. This paper contains various risk factors in construction of bridge projects and analyzes the sources of risk factors arising in the bridge projects. The continuous studies were

conducted from various reputed companies. The risk will be solved using the software like SPSS.

Gholamali et. al. 2014 [7] has discussed about Risk Management in Construction Projects. The aim of the paper is to discuss the aspects that are more important for the success of the project and search causes that increase the risk of the project. It is also attempted to arrive at some suggestions by referring to various cases and their judgments delivered in the past. Here is some Construction Risk area discussed: - Construction Risks & Exposures, Construction Defect Mitigation, Construction Quality Problem Areas and Claims & Litigation. Risk Management Strategies are as follows:-Risk Transfer, Risk Financing and Understanding the legal system. Risk Management requires an identification of the particular risks as well as an examination of the engineering and legal responses to allow the risk to be redirected or avoided or transferred to a particular project participant.

Alrashed et. al. 2014 [8] developed research on topic of risk assessment for construction project. Infrastructure projects in the residential sector are more positive than commercial sector, however, data on the actual percentage of success rate and vital risk factors in aforementioned projects are still limited. This paper based on research on identification of risk and risk controlling method for construction. This study also contained recent risk management techniques applied in infrastructure sector. A lot of researcher analyzes risk performance of risk management in initial stage as well as construction stage during the project but does not examine during all project life cycle.

MATERIALS AND METHODOLY

The purpose of this study, the research methodologies are used in order to collect data, analysis data and report on findings and results. The research methodology selected for this risk management project comprised comprehensive literature review, followed by open interviews and distributing questionnaire surveys to the various agencies i.e. client, contractors, consultants of the projects. For data analysis purposes in this study, methods used qualitative risk analysis. {QRA}. QRA ascertains function of risk response and specific risk. It assists to objective of project. It helps to understanding the problem or risk of project.

Technique of QRA is very simple and used for immediate response for assessment. QRA can use with deficiency of data, time and money. Main motto of QRA is identifying the most scourges which may be affect mostly on project and concentrate that scourge, increases project performance. Risk management carried out by arrangement of questionnaire in different companies with qualified person. Main aim to be focus on identification of risks impact and probability matrixes. Scale for estimation takes from PMI book. Represented in table:

Probability	Very Low	Low	Medium	High	Very High
Risk A	0.1	0.3	0.5	0.7	0.9

RESULT FROM INTERVIEW:

PLC		PHASE NO	TYPE OF RISK	RESPONSE	
				TYPE OF RESPONSE	DESCRIPTION
Pre-project phase	Identifying business opportunity	1	Misunderstand the client	Mitigate	Frequent discussion with the client
			Miscalculation[1]	Mitigate	Detailed discussion with the client
			Miscalculation[2]	Mitigate	Checklists
	Choosing not the right consultants[1]		Mitigate	Check up on the companies	
	Choosing contract type		Retain	Biding process is regulated by law and they have no impact on it	
Planning and design phase	Establishing project objectives and draw up of project brief	2	Lack of cooperation between actors in project	Mitigate	Facilitate cooperation by organizing project team meeting
			Shortage of resources	Mitigate	making adjustments in a number of resources used in order to fit in the schedule
			Cheap, not efficient solutions which can be more expensive over time	Mitigate	By being active in the project and questioning unclear issues

Table3.4 Probability

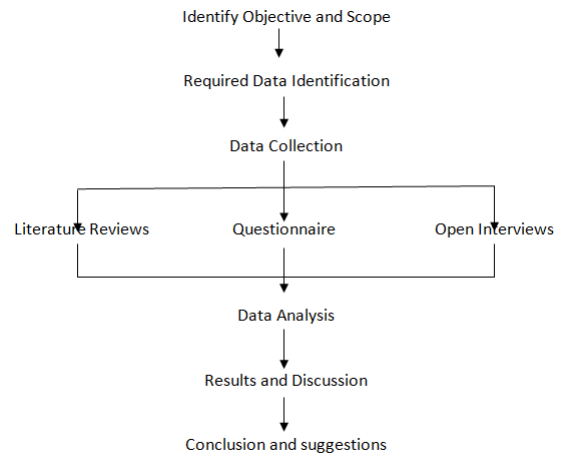


Fig. 1 Research Methodology Flow Chart

	Actual design	3	Problems with design		Transferring risk by involving experts in the process
			Users do not take decisions necessary for work progress	Mitigate	Make a pressure for decisions make on time
	Preparing contract documents		Not achieve a good final result	Mitigate	Highlight all potential risks or problems on the workshop or a meeting
			Gap of knowledge	Mitigate	Being active in the process and take an action when problem occurs
Contractor selection phase	Setting tender conditions by the owner	3	Not finding the right contractor[1]	Avoid	Make sure that the contractor has enough knowledge & resources to perform the project
	Contractor decisions whether to bid or not		Not finding the right contractor[2]	Mitigate	Check up on the companies
	Submitting offers		Not finding the right contractor[3]	Mitigate	Well prepared bidding requirements
Contractor mobilization phase	Preparation for construction Phase				
Project preparation phase	Monitor and control	4	Contractor has not enough knowledge or experience	Avoid	Well prepared procurements
	Resource management		Moisture	Mitigate	Involve specialist from the field
			Losing control over the project	Mitigate	Using quality system and self control
	Documentati on and management		Delays in construction schedule	Mitigate	Being active in the process and take an action when any problem occurs
			Delays in construction schedule	Transfer	Transfer risk to the project team
Project close out and	Final inspections	5 5			

EVALUATION OF RESULT:

IDENTIFIED RISK	PROJECT OBJECTIVE	PROBABILITY	IMPACT	MATRIX
Misunderstand the client	COST	0.3	0.10	0.030
	TIME		0.10	0.030
	QUALITY		0.20	0.060
Lack of cooperation between actors in the project	COST	0.7	0.20	0.140
	TIME		0.20	0.140
	QUALITY		0.05	0.035
Not finding the right contractor[1]	COST	0.3	0.10	0.030
	TIME		0.40	0.120
	QUALITY		0.05	0.015
Contractor has not enough knowledge or experience	COST	0.1	0.10	0.010
	TIME		0.40	0.040
	QUALITY		0.05	0.005
Miscalculation[1]	COST	0.3	0.40	0.120
	TIME		0.20	0.060
	QUALITY		0.05	0.015
IDENTIFIED RISK	PROJECT OBJECTIVE	PROBABILITY	IMPACT	MATRIX
Shortage in resources	COST	0.5	0.20	0.100
	TIME		0.20	0.100
	QUALITY		0.05	0.025
Delay in construction schedule[1]	COST	0.5	0.80	0.400
	TIME		0.80	0.400
	QUALITY		0.40	0.200
Cheap, not efficient solution which can be more expensive over time	COST	0.9	0.80	0.720
	TIME		0.80	0.720
	QUALITY		0.40	0.360
Delay in construction schedule[2]	COST	0.5	0.05	0.025
	TIME		0.40	0.200
	QUALITY		0.20	0.100
Gap of knowledge	COST	0.5	0.10	0.050
	TIME		0.10	0.050
	QUALITY		0.05	0.025
IDENTIFIED RISK	PROJECT OBJECTIVE	PROBABILITY	IMPACT	MATRIX
Miscalculation[2]	COST	0.5	0.20	0.100
	TIME		0.80	0.400
	QUALITY		0.10	0.050
Problems with design	COST	0.3	0.10	0.030
	TIME		0.10	0.030
	QUALITY		0.05	0.015
Choosing not the right consultants[1]	COST	0.5	0.40	0.020
	TIME		0.40	0.020

	QUALITY		0.80	0.400
Users do not take decisions necessary for work progress	COST	0.5	0.20	0.100
	TIME		0.80	0.400
	QUALITY		0.80	0.400
Not finding right contractor[2]	COST	0.7	0.40	0.280
	TIME		0.80	0.560
	QUALITY		0.80	0.560
IDENTIFIED RISK	PROJECT OBJECTIVE	PROBABILITY	IMPACT	MATRIX
Moisture	COST	0.5	0.80	0.400
	TIME		0.40	0.200
	QUALITY		0.80	0.400
Choosing not the right consultants[2]	COST	0.3	0.20	0.600
	TIME		0.10	0.300
	QUALITY		0.20	0.600
Not achieving the good final result	COST	0.3	0.20	0.060
	TIME		0.10	0.030
	QUALITY		0.20	0.060
Not finding the right contractor[3]	COST	0.1	0.20	0.020
	TIME		0.10	0.040
	QUALITY		0.10	0.010
Losing control over the project	COST	0.1	0.05	0.005
	TIME		0.05	0.005
	QUALITY		0.10	0.010

CONCLUSION

The paper described, on the basis of questionnaire survey of general contractor and project management, the construction industry perceptions of risk coupled with its manners and the extends to which the industry uses risk examination and management techniques. Risk examination and management during PLC depends mainly on suspicion, judgement and experience. Professional in the construction industry are using techniques but are not aware of it. Risk is managed every day in the industry, but not in structured way and knowledge of risk management is close to zero, even though risk management is becoming popular in the construction sector. Formal risk examination and management techniques are rarely used due to lack of knowledge and to doubt on the suitability of these techniques for construction industries activity. There are many things that can go wrong during PLC and has a negative impact on time, cost and quality. In order to manage unforeseen events that have adverse impact, most of the large company wants to involve in risk management method/techniques but

no one is available to guide them for betterment of organization.

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