

Analysis of Risk in Construction Industry

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Abstract- Risk management can be directly related to the successful project completion. Project management literature describes a detailed and widely accepted risk management process, which is constructed basically from four iterative phases: risk identification, risk estimation, risk response planning and execution, often managing the risk management process is included. Construction project planning is an essential element in the management and execution of construction projects which involves the definition of work tasks and their interactions, as well as the assessment of required resource and expected activity durations. The study, therefore, examined the awareness of professionals in construction industry of the various types of planning techniques and tools used on construction sites, Questionnaires were administered on selected building professionals (Project Managers, Engineers, Architects), and Contractors and Sub-contractors directly involved in construction work on sites in planning and the use of planning tools and techniques as major tools for successful project execution.

Keywords- risk management, questionnaire

INTRODUCTION

Risk analysis and management are an important part of the decision-making process in construction industry. Risk management is an important field of construction industry and has gained more importance internationally due to the latest researches carried out on a large scale. However, this relatively new field requires more attention to bring some benefit.

Construction projects are facing a number of risks which have negative effects on project objects such as time, cost and quality. Two types of risk management techniques were considered: preventive techniques which can be used before the start of a project to manage risks that are anticipated during the project execution; and remedial techniques that are used during the execution phase once a risk has already occurred.

I. UNCERTAINTY AND RISK

The distinction and relationship between uncertainty and risk may be described as the risk being measurable uncertainty whereas uncertainty is unmeasurable risk. It is

the interaction of uncertainty on objectives that gives rise to risk, which means that only relevant uncertainties that have the potential to affect project objectives can become risks. In other words, a risk is an uncertainty that matters and the importance is defined in relation to the particular objectives in question (Hillson, 2004).

Project Risk Classification:

Risks can be divided into different types or classifications or categories, the important aspects of these are as follows:

Known risks: these risk events are frequently occurring in all construction projects and are inevitable, thus including minor fluctuations in material costs and productivity (Smith et al., 2006). It is the cognitive condition of risk, where the identification of the risk source has been made and the probability of occurrence regarding the risk event has been assigned (Winch, 2010). Known unknowns, these risk events are somewhat predictable meaning there is some knowledge regarding either the probability of occurrence or their effect (Smith et al., 2006).

Unknown unknowns, it is the cognitive condition of uncertainty in which somebody might have knowledge about the risk source and probabilities but keeps the information private. The risk source is not identified and the risk event can therefore not be known (Winch, 2010). Thus, these risk events are incidents whose effect and probabilities of occurrence are unforeseeable, even by the most knowledgeable and experienced members of a project (Smith et al., 2006).

In project risk management, events or risks with a low impact can be divided into the elements of trivial and expected as presented in fig 2. The illustration compares the probability of occurrence of an event compared with its impact on the construction project. Hence, risks with both high impact and a high likelihood of occurring depend on risk management (Ibid.).

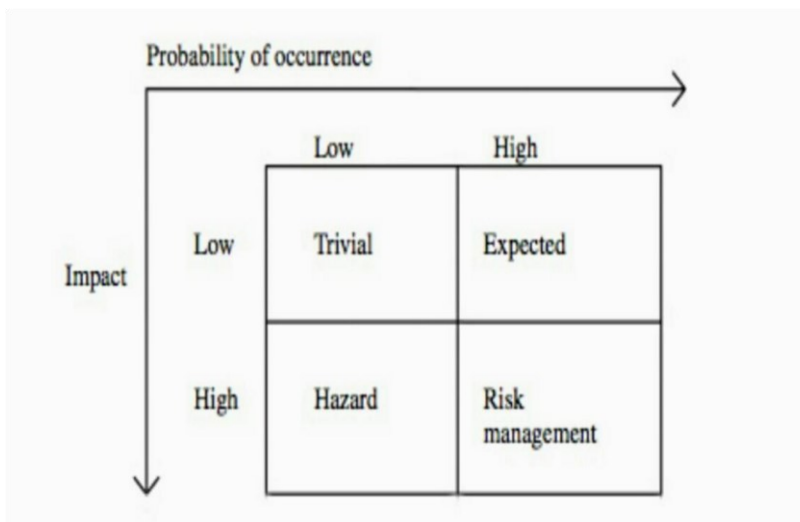


Figure: - 1.1. Risk classification in relation to probability and impact

II. RESEARCH APPROACH

There are two types of basic approaches to research, the quantitative and the qualitative approach. The former includes the generation of data in quantitative form which can be subjected to quantitative analysis in a rigid fashion. This type of research approach can further be categorized into following sub-classes; inferential, experimental and simulation approaches to research. The purpose of the inferential approach is to gather a data base from which to infer characteristics of population. The usage of questionnaires is a way to study a sample of population to determine its characteristic, inferring that the population has the same characteristics. In contrast, the qualitative approach is used for any data collection technique or analysis procedure that generates nonnumeric data, such as structured, semi-structured or unstructured interviews.

III. RISK CONCEPTS

Risk is a multi-facet concept. In the context of construction industry, it could be the likelihood of the occurrence of a definite event/factor or combination of events/factors which occur during the whole process of construction to the detriment of the project a lack of predictability about structure outcome or consequences in a decision or planning

situation, the uncertainty associated with estimates of outcomes - there is a chance that results could be better than expected as well as worse than expected etc. In addition to the different definitions of risk, there are various ways for categorizing risk for different purposes too. Some categorize risks in construction projects broadly into external risks and internal risks while others classify risk in more detailed categories of political risk, financial risk, market risk, intellectual property risk, social risk, safety risk, etc. The classification is shown in the Figure-1.1. The typology of the risks seems to depend mainly upon whether the project is local (domestic) or international.

IV. RISK MANAGEMENT PROCESS

The risk analysis and management techniques have been described in detail by many authors. A typical risk management process includes the following key steps:

- A. Risk identification
- B. Risk assessment
- C. Risk response
- D. Risk monitoring

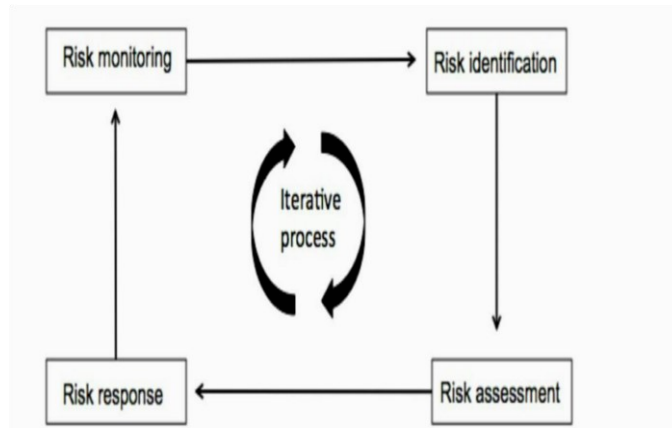


Figure: - 4.1. Risk Management Process

V. RISK IDENTIFICATION

The identification of risk is arguably recognized as the most crucial step within the risk management process (Banaitene&Banaitis, 2012). The aim is not to obtain perfect predictions of future events, rather it is the recognition of potential risk sources with high impact on a particular project, should they occur. It is impossible to identify all potential risks and the purpose should not be to do so (Smith et al., 2006). Thus, the intention of identifying and assessing the risks is to ensure that potential risks are assessed and managed in a manner, which allows for the overall objectives to be achieved. Due to the constant changing nature of risks throughout a projects life cycle the management of risk must be an ongoing process (Potts,2008). Before risks can be managed they must be identified, and knowledge from previous experiences might apply to the current project (Karimiazari et al., 2010).

VI. RISK ASSESSMENT

The objective in risk assessment and analysis is to describe the risk situations as completely as possible and to prioritize them (Schieg, 2006). In general, there are two major categories distinguished in the literature on risk assessment, specifically qualitative and quantitative analysis. The former is a process that consists of interviews, checklists and brainstorming while the latter is performed through a data driven methodology (Banaitene&Banaitis, 2012). Risk assessment through quantitative analysis defines the impact of each risk in the spectrum of highland low and the probability of occurrence. Whereas qualitative risk assessment often involves the evaluation of impact and the development of lists in order to further analyze the highlighted risks (X.W Zou et al., 2007). The assessment of risks through both types of analysis should transpire on an

individual level as well as include the interrelationship of their effects (Schieg, 2006).

VII. RISK RESPONSE

The third step in the process of risk management signifies what actions should be taken towards the various risks and threats previously identified (Mhetre et al., 2016) The planning process of risk response is defined by PMBOK as the development of options and determining actions to enhance opportunities as well as reduce threats to the project objectives. This process involves the assignment of parties to take responsibility for each agreed risk response, and the efficiency of this phase will determine if the risks increase or decrease for the project. Literature suggests that there are mainly four risk mitigation strategies that can be implemented in order to reduce exposure to the risks associated with a project.

VIII. RISK MONITORING

Continuous monitoring and review of potential risks is an important in regards to the implementation of the risk management process. It guarantees new risks are detected and managed. The project manager should monitor a list of the major risks that have been identified for risk treatment action, which should be a primary tool used management meetings (Cooper et al., 2005). This is the final phase of the process and it is equally important as the others. Given that more information emerges one can reassess the probability and impact of the risks, and once the potential risk event has been passed they can be removed from the risk register (Winch, 2010).

PROPOSED WORK TECHNIQUES

The proposed work techniques consist of several method/techniques which have been use by various authors in their research works:

1. Brain Storming
2. Checklists Analysis
3. Risk Probability & Impact Matrix
4. SWOT Analysis

1. BRAINSTORMING:

Brainstorming is one of the oldest and most used tools to identify new risks as well as to obtain any kind of collection of ideas as it was developed by Alex Osborn in 1953 (Symanowitz 2014,24). A rather small group of people gathers to find ideas about a clear topic with explanation from the moderator who also guides the discussion. The time frame for this meeting should be rather short and limited as the concentration shrinks the longer it takes (Coyne and Coyne 2011, Gobble 2014, 64). The main purpose of this team is to generate a massive amount of ideas in an as short time period as possible, so to state it in other words “Focus on Quantity, not Quality” (Symanowitz 2014, 24). In this process the advantage of Brainstorming is the group diversity to generate ideas. These ideas tend to be superior to individually generated ones (Gobble 2014, 64).

2. CHECKLISTS ANALYSIS :

It is a technique use to systematically review different materials using a list to determine the accuracy and completeness of the project. The checklist analysis provides an avenue in determining the risks involved in a particular project management plan. The checklist is usually developed

based on the knowledge obtained from previous projects that are similar to the current one as well as historical information. Checklist analysis is one of the simplest and quickest ways to identify risks processes. One of its advantages is that it is suitable for team members who have fewer experiences. While it is simple, building an exhaustive checklist can be challenging as projects, albeit similar, can still have their own unique and different risks. It is also crucial for the team members to review and prune the related items when they are no longer appropriate for the checklist. Lastly, the checklist should be reviewed during the closure of the project to improve future projects by incorporating valuable lessons learned.

3. RISK PROBABILITY & IMPACT MATRIX:

Probability and Impact Matrix is a tool for the project team to aid in prioritizing risks . Probability and Impact Matrix uses the combination of probability and impact scores of individual risks and ranks/ prioritizes them for easy handling of the risks. In other words, the probability and impact matrix helps to determine which risks need detailed risk response plans. It is vital to understand the priority for each risk as it allows the project team to appreciate the relative importance of each risk.

		Impact				
		Trivial	Minor	Moderate	Major	Extreme
Probability	Rare	Low	Low	Low	Medium	Medium
	Unlikely	Low	Low	Medium	Medium	Medium
	Moderate	Low	Medium	Medium	Medium	High
	Likely	Medium	Medium	Medium	High	High
	Very likely	Medium	Medium	High	High	High

Figure: - 8.3.1. Probability Matrix Chart

SWOT ANALYSIS:

The SWOT-Analysis has its origin in the military sector and in the 1960s when the Harvard Business School has suggested using the SWOT-Analysis in the entrepreneurial competition (Pelz 2012, 6). This tool is a frequently used strategic analysis method, which divides the environment of an entity into internal and external sections, the former includes strengths and weaknesses and the later consists of opportunities and threats. This tool is used to identify impediments and advantages and exploiting opportunities in a wide variety of situations. An entity can determine how to leverage its strength, reduce weaknesses, seize opportunities and avoid potentially harmful threats or at least monitor them through more consistent environmental scanning. The SWOT Analysis also can be used to assess product evaluation, an innovative business idea, mergers and acquisitions decisions, outsourcing options etc.

IX. RISK REDUCTION MEASURE**RISK RESPONSE:**

This third step of the RMP indicates what action should be taken towards the identified risks and threats. The response strategy and approach chosen depend on the kind of risks concerned (Winch, 2002). Other requirements are that the risk needs to have a supervisor to monitor the development of the response, which will be agreed by the actors involved in this risk management process. (PMI, 2004)

Winch (2002) claims that the lower impact the risk has, the better it can be managed. Most common strategies for risk response are: avoidance, reduction, transfer and retention (Potts, 2008). Beyond those types of responses, Winch (2002) describes that sometimes it is difficult to take a decision based on too little information. This may be avoided by waiting until the appropriate information is available in order to deal with the risk. This way of acting is called "Delay the decision" but this approach is not appropriate in all situations, especially when handling critical risks. Those need to be managed earlier in the process.

AVOIDANCE/PREVENTION:

Cooper et al. (2005) List of some activities that can help to avoid potential risk:

1. More detailed planning
2. Alternative approaches
3. Protection and safety systems
4. Operation reviews
5. Regular inspections
6. Training and skills enhancement
7. Permits to work
8. Procedural changes
9. Preventive maintenance

REDUCTION/MITIGATION:

Mitigation strategies include: according to Cooper et al. (2005),

1. Contingency planning
2. Quality assurance
3. Separation or relocation of activities and resources
4. Contract terms and conditions
5. Crisis management and disaster recovery plans
- 6.

Those risks which should be reduced can also be shared with parties that have more appropriate resources and knowledge about the consequences (Thomas, 2009). Sharing can also be an alternative, by cooperating with other parties. In this way, one project team can take advantage of others resources and experience. It is a way to share responsibilities concerning risks in the project transfer.

If a risk can be managed by another actor who has a greater capability or capacity, the best option is to transfer it. Potts (2008) states that the risk should be transferred to those who know how to manage it. The actors that the risks can be transferred to are, for example, the client, contractor, subcontractor, designer etc, depending on the risk's character. As a result this could lead to higher costs and additional work, usually called risk premium (Potts, 2008). It must be recognized that the risk is not eliminated; it is only transferred to the party that is best able to manage it (PMI, 2004). Shifting risks and the negative impacts they bring is also an option when the risks are outside the project management's control, for example political issues or labor strikes (Darnall and Preston, 2010). The situation may also consist of catastrophes that are rare and unpredictable in a certain environment. (Winch, 2002) Such risks that are beyond the management's control should be transferred through insurance policies.

Retention

When a risk cannot be transferred or avoided, the best solution is to retain the risk. In this case the risk must be controlled, in order to minimize the impact of its occurrence (Potts, 2008). Retention can also be an option when other solutions are uneconomical (Thomas, 2009).

CONCLUSIONS

As far as India is concerned risk management is still a new word in the construction sector and this should be changed as soon as possible. Currently the Government of India has proposed a risk rating system will help the developers to develop projects at a faster pace by taking quick decisions. Each rating agency will have its own methodology to rate projects. The system will help government to

develop a strategy to mitigating risk. This will encourage more response from developers and investors for public-private partnerships projects. It could make the bidding projects more competitive. The system will enable bankers to take quick decisions for lending finances, which could lead to the financial closure of the project at a faster pace. Third party risk rating would certainly raise critical points, which are not normally raised during finalisation of project.

This study should assist management in identifying activities where there is a risk of Financial, Time and Construction aspects and hence provide a basis for management to take objective decisions on the reduction of risk to an agreed level. These findings are very important for implementing further effective measures to ensure the right direction of future development. Risk management should be considered a primary tool to assess the project. Data collected was subjected to 5-scale Impact Grid with Scores of Risk. Those scores were the used to determine difference in perceived risks of, General Manager, Project managers, Project Engineers and Site Engineers which was then analyzed by using the software of SPSS.

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