

ANALYSIS OF RISK MANAGEMENT IN RESIDENTIAL BUILDING USING PRIMAVERA WEB SOFTWARE

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ABSTRACT

Risk Management is a concept which doesn't comes only in construction industry but has become very popular in all kind of business. Risk management is one of the key element in effective project implementation and success. The risk management process are seen in different ways right from planning, identification, classification, analysis, response, monitoring and controlling. The main objective of risk analysis is to evaluate the impact of risk from particular consideration or task or activity and decide what action need to be taken. This report deals with "Analysis of Risk Management in Construction of Residential Building using Primavera Web" in this risk is analysed using Probability Impact Matrix method. This report also deals how to mitigate the risk using risk response plan using Primavera Web.

Keywords: Risk Management, Risk Issues, Probability Impact Matrix.

1. INTRODUCTION

The economic and financial effects has undesirable impact in construction sector. Construction sector, are one of the engines in economic growth over the past decades, which is facing with serious challenges as companies closures, increase in unemployment and even investment cancel. They have transformed the clients and construction industry behaviour. Due to increase in competition among different companies of the construction sector increases the pressure to improve the quality, efficiency and reduce cost is necessary for project strategies and management which can appropriately and effectively manage project risk. Construction projects can be extremely complex and fraught with uncertainty. Risk and uncertainty can potentially be a damaging consequence for the construction project. It is always unique and risk arise from a number of the different sources. They are extremely difficult and dynamic involving in huge multiple processes. Lots of individuals, workers in construction industry, organisation are actively involved in the construction projects participation may be positively and negatively affects the result of project completion. Which naturally ends with risk like time, cost and quality outcomes. Present challenges and economic development is highly competitive in construction sector which require contractors to manage risk by their own.

The various types of risk in construction project are as mentioned below

- Pure and particular risk
- Fundamental risk

- Speculative risk

Pure and particular risk - Which includes adverse affect or damage to person (individuals, labours, workers) and assets through fire ,water, collapse ,vibration, subsidence, storm etc. Therefore it becomes responsibility of contract to often make it a contractual requirement for taking out the insurance cover beside these risk.

Fundamental risk - Risk includes factors that are harm by the war, pollution, government policy over taxes, employee safety, other malicious harm and industrial disputes. These incident shows the issue of statutory problem and has no insurance cover which can be normally obtainable or required.

Speculative risk - It is capable of doing apportionate in advance as determined by these parties to the contract. That includes losses in time and money that ends in unpredicted ground condition remarkably unfavourable weather, unforeseeable shortages of workers or material, communication, delay in payment and delay in disputes.

1.1 RISK AT DIFFERENT STAGES OF PROJECT

The following are risk which are seen at various at stages of project :

- Financial risk
- Political risk
- Legal risk
- Environment risk
- Force major risk
- Operating risk

Political risk - The risk of planned, financial loss for a organization, because of such non market factors such as macroeconomic and social policies. It includes risk such as vary in law, payment failure by government, increase in taxes and change in government.

Financial risk - This is risk which involves the totality of the risk related to financial development. Apart from the project which are not in the control of the project developer. This results in the adverse economic effect.

Legal risk - This is risk which something non fulfilment with regulatory needs. Most laws are generally applicable by the organisation such as health law, safety law, employment law. Others may be depends on organisation specific such as covering detailed transportation services like railways and airlines. Various legal issue which are generally faced in construction project are delay in financial development, lease of site, ownership of assets.

Environment risk- These risks is mainly due to environment incident during the course of implementation of project. The main environment risk associated

- Loss of fertile land
- Loss of flora and fauna
- Rehabilitation and resettlement problem

Force major risk- These are risks generally happens beyond the control of quite a few party and cannot be convincingly prohibited by concerned party. It arises due to the causes of irrelevant to the project. The major risk includes natural force major risk and direct or indirect political force major risk. Natural force major risk includes all the activity which can be attributed to the natural condition and act of god such as cyclones, tsunami, earthquake etc. Risk must be shared evenly within the parties. Direct political force with majeure risk events that are attributed political events which are particular to project itself which are exploration, nationalisation. Indirect political force major risk are procedures that has its own origin in political events which are not project limitation.

Operating risk- During operation and maintenance services in construction project these risks are faced. Operating risk are said as risk of loss resulting in inadequate or fail in internal processes, people and system. Risks include:

- Operation cost overruns
- Performance risk

- Operating contractor default

From decades, construction sector in both developing and developed countries have approached risk management. Risk management is one of the important area of project management. It is a positive and proactive processes that reduce the likelihood of unsatisfactory consequence for project in different stages of design, construction and operation. It is one among nine knowledge area propagated by the project management institute (PMI). Apart from this in construction project management it is a systematic and comprehensive way in identifying analyzing and responding for risk to achieve the project objectives. The benefits of the risk management process include identifying and analyzing risk and improvement of construction project management processes and effective use of resources. All the possible uncertainties or risks of the project is identified using SWOT analysis, documentation reviews checklist analysis and assumption analysis.

1.2 ABOUT PRIMAVERA WEB SOFTWARE

Primavera P6 Web a Project Management tool that as a web browser interface. We should have internet access and a web browser in order to plan, schedule and manage the project which allows the project teams to have anytime, anywhere access to project information through the flexible web based user interface facility. By utilizing the Oracle Primavera Web tool to plan tasks, keep up time in the mission, for keeping up cost and tracking of activities in industry. Development, vitality, aviation, data innovation. The tool may seem overwhelming in extent of its capacities. Incorporates undertaking asset arranging framework, content management framework, announcing framework, and application servers and innovation, to describe only a couple. With a specific end goal to guarantee that they likewise possessed the best of breed in project scheduling software. The range of a project may be overwhelming.

Oracle Primavera Web allows projects into smaller, attainable projects, tasks and activities. Enhanced communication especially if project spans for large geographic areas, requires hundreds of workers and involves many different parties. Primavera Web offers many complex analysis and processes. However accessing and managing the schedule remains simple. It helps in categorize & mitigate risks in track of planning, supervision and finishing a project there by reducing expenses in project.

1.3 OBJECTIVES

1. To rank the different risks as per significance of activities and probability of event utilizing Primavera software.
2. To recognize and organize different risks happening in project that attempt, from utilizing Probability Index tool.
3. By providing the chance to the stakeholders and contractors.
4. Handing over the risk appraisal activity for accomplish the risk.
5. By investigating old methods of risk management for updation.
6. For getting great consideration to task and activity oriented process.
7. Examination of risk factors for mitigation purpose.
8. The main backbone for fruitfully completing the project is core management.

2. RISK MANAGEMENT

Risk management is one of the knowledge area propagated by the project management institute. Apart from this, the construction project management framework is a comprehensive and systematic way for identifying, analysing and responding to accomplish the project objectives. The use of risk management process includes identification, analysing risk and improvement of construction project management processes and successful use of the resource. Risk conditions that may includes different projects or organizations environment that are provides for the project risk, which have improper management practices, required incorporated management systems, several projects or over dependence on external practise of the project.

2.1 Risk Management Process

For increasing productivity of risk management, it must be continuously developed during whole project. Along these lines, risk will be found and managed throughout the phases.

Risk management processes in part of construction organisation involves:

Primary stages

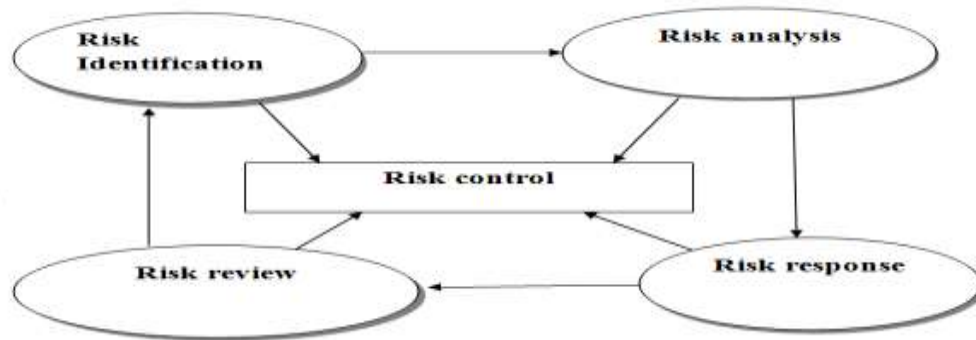
- Risk identification

Secondary stage

- Risk assessment
- Risk analysis

Tertiary stage

- Risk mitigation



Flow chart 1 : Process of risk management

2.1.1 Risk Identification

Identifying risk is the one important stage in risk management. Risk arises from different outsets of the project. Therefore we have to identify what it is, where uncertain arises, when it is arised and affect they might causes and how necessary measure has been taken to overcome uncertain risk. There are some techniques to identify risk which are mentioned below:

- Checklists or questionnaires
- Expert system
- Interviews
- The Delphi technique

Checklists or questionnaires : It is usually done by combining of earlier experience and detailed project criteria. There is two forms of questionnaires, one is a general form with non specific questions and other one is complete as it is required by the particular project.

Expert system: After being done with lot of research in simulated intelligence and specialist system. Explicitly, it is the accurate model which has been developed for it by making use of its information based system. It involves logical thinking and intuitive thinking of managers.

Interviews : This technique that has been used in the past by personnel departments and consultants to take out information. The interview may be one to one basis or many to one basis which is time consuming to carry out the interview.

Delphi Technique : This methodical interactive gauging technique that depends on the panel with autonomous experts. It might be suitable for identification of risk however more suited to joining probability event and potential impacts that are previously identified risk. These kind of group discussion and produce objective results from subjective discussion.

2.1.2 Risk Assessment

It can be depicted as short posting risks for the high impact in the project out of all dangers said in the identification phase.

There are two kinds of risk analysis

- Quantitative Risk
- Qualitative Risk

Quantitative Risk : Quantitative method requires a great deal of task in which exploration has to be performed. This efforts must be seen along with advantages and results of its chosen strategy, in small projects may now and again requires identification proof and taking action on recognized risk, where bigger projects requires more depth analysis. It estimates the effect in risk of the project. Which is more reasonable in intermediate and expensive projects which as quality of the necessary assets such as composite programming and talented staff.

Qualitative Risk:

This method is for evaluation of risk which depend on scales and utilized for explaining the probability and effects of risk. Moderately straight forward procedure apply when quick evaluation is required when variation is there in size of the projects. In addition this technique can regularly be utilized as a part of inadequate, limited or unavailable numerical information and restricted assets of time and money.

Techniques to Carry out the Qualitative Risk Analysis

- Probability and Impact Assessment

By using this technique called risk probability and impact assessment, probability of risk occurrence can be seen. Besides the effect of a project objective is observed in regards to beneficial outputs for opportunities and additional negative impacts that results from dangers with the end of the assessment, probability impact has to be characterized & costumed to a specific project. Impact range differs from very low to very high. In addition the table showing impact of project components such as time, cost or quality requires definitions to every degree in scale. Risk listed in the detection proof stage is assessed as far as the probability and impact of its events.

- Probability / Impact Risk Matrix

Probability and impact that are evaluated on the earlier stages were used in basic of quantitative analysis and risk response. It is the main reason for finding of the assessment is organized by using different ways for calculation. The range score is the mean for the probability and impact. The scope of priority score, the rating and shadings are allocated to indicate the importance of such risks. Keeping in mind the priorities, a impact are multiplied by probability. Completed results are shown in matrix in the table. These combination of variable indicates which risk is low, moderate or have high priority. Despite the calculation method chosen, such as mix of data shows the need of already recognised risk in previously identified risk that is having corresponding colours are numerical system which allocate the risk response. For example, risk having high impact and probability are recognized as high risk and may need quick reaction, whereas low priority score threats may be checked with action being made only when it is necessary.

Table 1 : Shows the Probability and Impact Matrix Chart

Probability	Threats					Opportunities				
0.90	0.03	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.03
0.70	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04
0.50	0.03	0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03
0.30	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02
0.10	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01
	0.05/Vary Low	0.10/Low	0.20/Moderate	0.40/High	0.80/Very High	0.80/Very High	0.40/High	0.20/Moderate	0.10/Low	0.05/Vary Low

- Risk Categorization

Risk categorization method for systematizing a risk as identified by source, so as to recognize the area of project that are most exposed to those risk.

- Risk Urgency Assessment

For this process the urgency for which risk should be mitigated is evaluated on a risk which is probably going to effect the task. More need is provided for risk which is going to effect the task.

2.1.3 Risk Response

The strategy and approach picked depends upon sort of risks concerned. The low impact effect of risk as to be managed. The normal procedure for risk response were prevention, reduction, transfer and maintenance. Further these types of reactions that occupy hard to make a choice based on the information. Which might be avoided by holding up till proper information is obtained in order to manage risk.

2.1.4 Monitoring

The continuous supervision over the risk management project finds new risks, monitor, keep track of known risk and get rid of past risks through risk evaluation in task. The additional assumptions of monitoring, controlling have to regulate the significance of risk and take remedial measures if necessary.

3. METHODOLOGY

Basically there is no law available specifically only for construction industry. No construction project is totally risk free. A considering amount of risk can be minimized by carefully over viewing the document. For minimizing the risk it requires the function of project management body of knowledge and has best practices in organizational standards operating procedures to evaluate risk and get a good outcome of it.

3.1 Step By Step Method to Identify Risk in Primavera Web



Flowchart 2: Shows step by step process of identification of risk in Primavera Web

4. ANALYSIS DONE

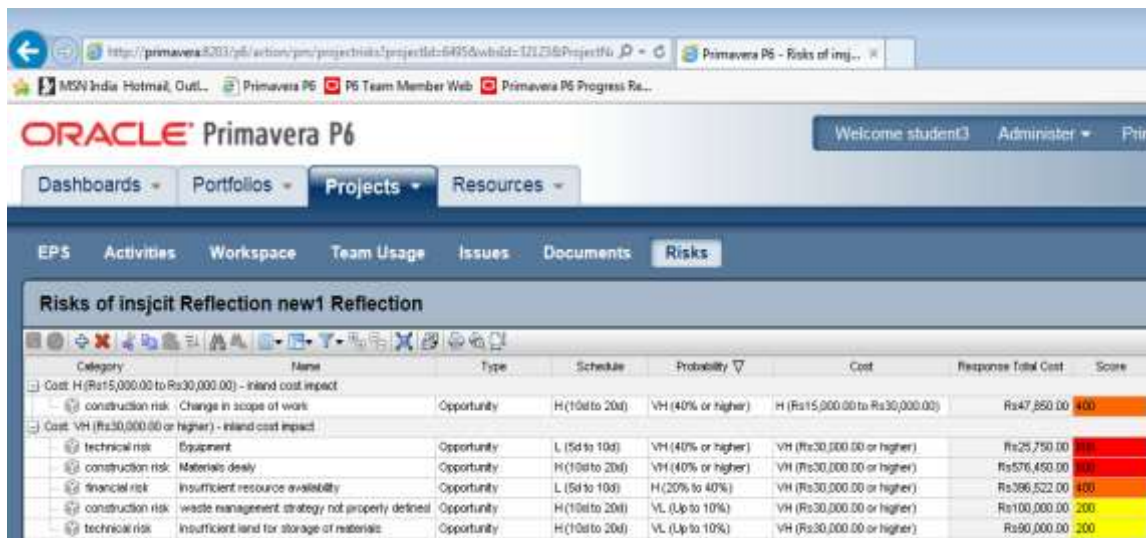
Considering the Risk which has been identified in various activities, resources, duration, cost and schedule in construction project. To depict the risk in construction project, case of residential building (G+4) Inland Edilon has been taken. Probability and Impact matrix method is used to overcome the identified risk in this project. Analysis is done in Primavera Web as per the available data and results are generated.

4.1 Risk Identified

Various Risk Identified in this project are

1. Construction Risk
 - Waste Management Strategy
 - Material Delay
 - Change in Scope of Work
2. Technical Risk
 - Equipment
 - Insufficient Land for Storage of Materials
3. Financial Risk
 - Insufficient Availability of Resource.

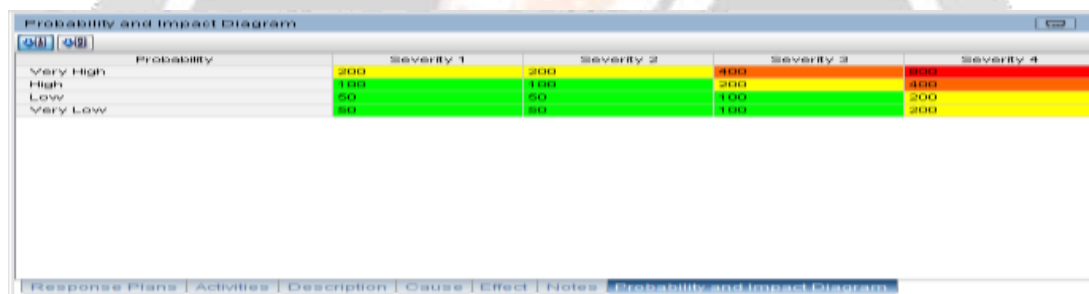
4.2 Risk Analysis Done in Primavera Web



Category	Name	Type	Schedule	Probability	Cost	Response Total Cost	Score
Cost: H (Rs15,000.00 to Rs30,000.00) - inland cost impact							
construction risk	Change in scope of work	Opportunity	H (10d to 20d)	VH (40% or higher)	H (Rs15,000.00 to Rs30,000.00)	Rs47,850.00	400
Cost: VH (Rs30,000.00 or higher) - inland cost impact							
technical risk	Equipment	Opportunity	L (5d to 10d)	VH (40% or higher)	VH (Rs30,000.00 or higher)	Rs25,750.00	200
construction risk	Materials delay	Opportunity	H (10d to 20d)	VH (40% or higher)	VH (Rs30,000.00 or higher)	Rs576,450.00	400
financial risk	Insufficient resource availability	Opportunity	L (5d to 10d)	H (20% to 40%)	VH (Rs30,000.00 or higher)	Rs396,522.00	400
construction risk	waste management strategy not properly defined	Opportunity	H (10d to 20d)	VL (Up to 10%)	VH (Rs30,000.00 or higher)	Rs100,000.00	200
technical risk	Insufficient land for storage of materials	Opportunity	H (10d to 20d)	VL (Up to 10%)	VH (Rs30,000.00 or higher)	Rs90,000.00	200

Fig 2 : Shows the risk analysis table in Primavera Web

Table 2 : Shows the Probability and Impact Diagram in Primavera Web



Probability	Severity 1	Severity 2	Severity 3	Severity 4
Very High	200	200	400	400
High	100	100	200	400
Low	50	50	100	200
Very Low	50	50	100	200

Table 3: Shows the Type of Risk, Estimated Budget, Total Impact Budget, Impact Cost And Impact Percentage

Type of Risk	Estimated Budget	Total Impact Budget	Impact Cost	Impact Percentage
Waste Management Strategy	87,59,875/-	88,59,875/-	1,00,000/-	1.14%
Material Delay	85,21,562.86/-	90,98,012.86/-	5,76,450/-	6.76%
Change in scope of work	8,82,810/-	9,30,810/-	47,850/-	5.42%
Equipment Delay	2,09,762.96/-	2,35,512.96/-	25,750/-	12.27%
Insufficient of Land for Storage of Materials	7,59,875/-	8,49,875/-	90,000/-	11.84%
Insufficient Availability of resource	2,32,97,497/-	2,36,94,019/-	3,96,522/-	1.7%

Note:

Impact Cost = Total impact cost – Estimated budgeted cost

Impact Percentage = Impact cost / Estimated budgeted cost

If the Impact Percentage is <6 then impact cost will be added to the total budget of the project, if >6 then the impact cost will be taken by the company.

5. CONCLUSION

Analysis carried through primavera web with the following statements. Through primavera web the various type of risk in project was analysed based on the Probability Impact matrix method. Based on the outcomes obtained from primavera depends on probability impact percentage which can be reduced upto 15% and maximum to 40% based on the response frame work implemented by the project management team. These response frame implementation is done only through experience from previous projects and preventive measures can be set up to maintain a strategy to avoid risk. Project risk management should be utilised for improved execution at every phase of project and manage the risk effectively and efficiently.

Table 3: Risk Response Plan.

Type of Risk	Risk Impact Cost Rs.	Risk Response Plan in %	Reduce in Cost after applying Response plan%
Waste Management Strategy	1,00,000.00	25%	25,000.00
Insufficient land for storage of materials	90,000.00	25%	22,500.00
Insufficient resource availability	3,96,522.00	30%	1,18,956.6
Equipment	25,750.00	15%	3,862.5
Change in scope of work	47,850.00	35%	16,747.5
Material Delay	5,76,450.00	20%	1,15,290.00
Total	12,36,572.00/-		3,02,356.6/-

As per the analysis the total risk impact cost (Waste management strategy, Insufficient land for storage of materials, Insufficient resource availability, Equipment, Change in scope of work, Material Delay) is **Rs.12,36,572.00/-**. After the risk response strategy taken by project risk management team and implemented on the project for minimizing the risk response plan we have achieved is **Rs. 3,02,356.6/-**. Therefore after all the analysis done in risk response plan we have saved **Rs.3,02,356.6/-**.

6. REFERENCE

- [1]. Alfredo Serpell, Ximena Ferrada, Larissa Rubio, Sergio Arauzo, "Evaluating Risk Management practices in Construction Organization", 28th IPMA World Congress, IPMA 2014, 29th September-1st October 2014, Rotterdam, Netherlands.
- [2]. Akintola S Akintoye, Malcolm J Mac Leod, "Risk Analysis and Management in Construction", International Journals of Project Management, Volume 15.
- [3]. Daniel Baloi, "Risk Analysis Techniques in Construction Engineering Project", Journal of Risk Analysis and Crisis Response, Volume.2, August 2012.
- [4]. Ewelina Gajewska, Mikaela Ropel, "Risk Management Practices in a Construction Project", Chalmers University of Technology, Goteborg, Sweden 2011.
- [5]. Fouzi A Hossen, "Project Cost Risk Assessment", An application of project risk management process in Libyan Construction Project.

[6]. K Jayasudha, Dr B Vidivelli and E R Gokul Surjith, "Risk Assessment and Management in Construction Project", International Journal of Scientist and Engineering, Research, Volume 5, August-2014

[7]. Satish K Kamane, Sandip A Mahadik, "Risk Management in Construction Industry", IOSR Journal of Mechanical and Civil Engineering, ISSN : 2278-1684, PP:59-65.

[8]. Seyed Hossein Abedian Kalkhoran, Gholamali Iiravi, Fereshte Rezagholi, "Risk Management in Construction Project", IJETT, Volume 10, Number 3 –April 2014.

[9]. PMBOK Guide 5th Edition. Project Management Institute, Boulevard Newtown Square, Pennsylvania.

[10]. ORACLE Primavera Prime, "Risk Management" Users Guide 15R2, September 2015.

