

Risk Assessment and Analysis Using Primavera

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Abstract: Construction projects mandatorily have different types of risk factors involved during the process of start to end of a project in various WBS levels from planning to execution level. Risk management is a key domain area to be considered. The process of risk management involves risk identification, quantifying and risk mitigation which has a procedural set up based on the type of project. Identifying the risks at earlier stage and having a proper action plan to resolve is the best project management practice. The Probability and Impact values can be calculated by various risk management techniques. This project involves all the process of Risk management where using features of Primavera in defining the P*I (Probability*Impact) matrix which will give us a clarity on the impact of the risk on the total cost of the affected activities.

Keywords: Exposure cost, Impact, Probability, Risk identification, Risk mitigation, Risk response.

1. INTRODUCTION

Risk is an uncertain event which can either be a threat or an opportunity. If the risk is a threat, then there will be a negative impact on the project and if the risk is an opportunity, then there will be a positive impact on the project. Every construction projects do face some risk factors which may be of lower intensity or higher intensity. Analyzing the possible risk before the start of the project saves lot of money.

Change is inherent in construction work. For years, construction industry has had a very poor reputation for coping with the adverse effects of change, with many projects failing to meet deadlines and cost and quality targets. Change cannot be completely eliminated, but by applying the principles of risk management, engineers are able to improve the effective management of this change. Change is normally regarded in terms of its adverse effects on project cost estimates and programmes. In extreme cases, the risk of these time and cost overruns can invalidate the economic case for a project, turning a potentially profitable investment into a loss making venture.

A risk event implies that there is a range of outcomes for that event which could be both more and less favorable than the most likely outcome and that each outcome within the range has a probability of occurrence. The accumulation or combinations of risks can be termed project risk. This will be usually be calculated using a probability and impact table.

The main purpose of this paper is to analyze the risks affecting the project and the possible impact on the cost and provide mitigation measures to reduce the impact on cost. In this paper, probability and impact assessment is made to get an idea on the probability of the risks and their impact on cost using a project management software Primavera.

2. METHODOLOGY

2.1. Risk identification:

Some of the risks involved in the project are identified by interviews with individuals or groups. The following risks have been identified:

- Risk 1 - Vendor procurement of tiles – Delay in the procurement of tiles from the factory due to financial issues.
- Risk 2 - Vendor procurement of door shutters – Delay in the procurement of door shutters from the factory due to financial issues.
- Risk 3 - Customized changes in the plan – Some of the design alterations are carried out as per the customers demand.
- Risk 4 - Labour attrition – Some of the labours left the site for some reasons which lead to the delay of the project.

- Risk 5 - Labour productivity – Many unskilled labours were working in the project. That lead to the delay in the work.
- Risk 6 - Unexpected risk – Demonetization – Demonetization of Rs. 500 and Rs. 1000 currency notes declaring as invalid in India has affected the construction and industrial sector a lot. This impacted on the cost of the project.

2.2. Probability and impact assessment:

Risk probability assessment investigates the likelihood that each specific risk will occur. Risk impact assessment investigates the potential effect on a project objective such as schedule, cost, quality or performance, including both negative effects for threats and positive effects for opportunities. In this paper, the effect on cost of the project has been considered. Probability and impact are assessed for each identified risk. Risks are assessed in interviews with participants selected for their familiarity with the risk categories. The level of probability for each risk and its impact on cost is evaluated during the interview. The projection on how these above mentioned risks impacts the project cost when the risk response is Accept, Reduce and Avoid.

2.3. Risk mitigation:

Some of the risk mitigation measures have been suggested to reduce the impact on cost due to these risks. The mitigation measures for each risk are shown below:

2.3.1. Vendor procurement of tiles:

- Follow up and confirmation of the tiles from the vendor 2 weeks prior.
- To send the quality inspection team 2 weeks prior to the vendor.
- To ensure that the logistics/transportation team of the supplier is been informed.
- To improve 30% of the penalty in the purchase order to the vendor on delivery not on date.
- To plan for vendor B and C if the current vendor backs up for some reasons.

2.3.2. Vendor procurement of door shutters:

Same mitigation measures can be considered as in case of 2.3.1.

2.3.3. Labour attrition:

- Recruitment of skilled labours with minimum commitment of 2 years bond.
- To source more than 2 agencies who supply human resource and replace them within 1 week.
- To provide incentives and provide motivational trainings.
- To set wages as per their skill level.
- To provide growth to the resources.

2.3.4. Labour productivity:

- Incentive the resource based on the skill level.
- Periodic promotion and motivational training.
- Provide them responsibility of critical jobs.
- Arranging training programmes for labours.

2.3.5. Customized changes in the plan:

- Option of customization should not be encouraged
- Changes should be limited to maximum of 3 to 4 based on the cost feasibility.
- The change should be controllable within the scope of the activity or project.

3. RESULTS AND DISCUSSIONS

The comparative study is made to analyse the impact on cost with different response types. i.e. impact on the cost when the risk response is accept, reduce and avoid. The below shown figures are the histogram of the cost when the risk response is accept, reduce and avoid.

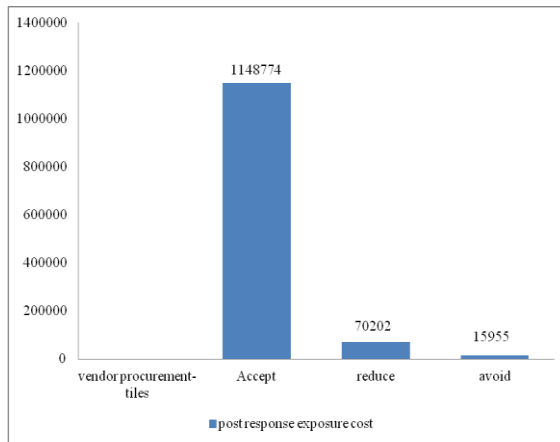


Figure 1 Vendor Procurement of Tiles

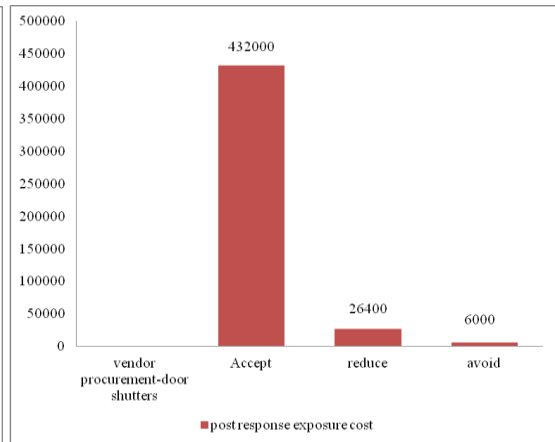


Figure 2 Vendor Procurement of Door Shutters

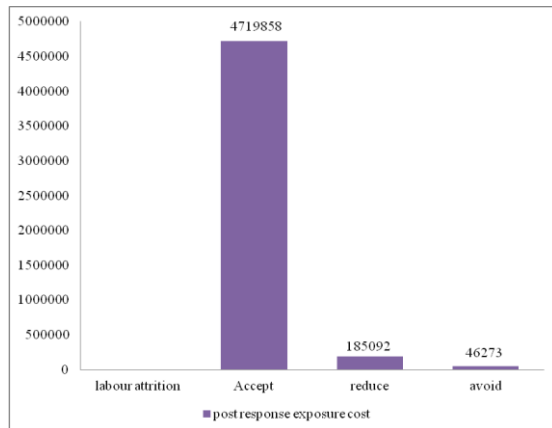


Figure 3 Labour Attrition

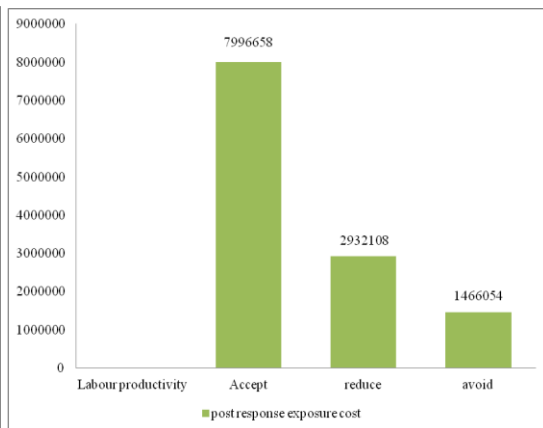


Figure 4 Labour Productivity

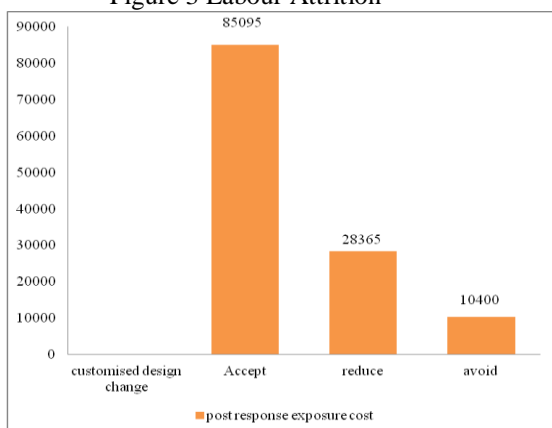


Figure 5 Customized Changes in the Plan

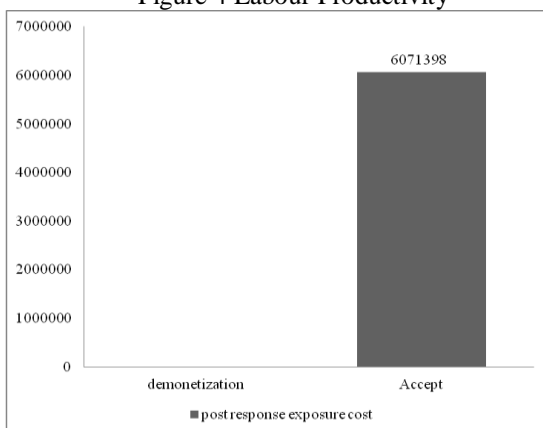


Figure 6 Demonetization

Table 1 Cost Savings

Name of the Risk	Actual cost	Post Response Exposure Cost in Rupees			Cost Savings in percentage
		Accept	Reduce	Avoid	
Vendor procurement of tiles	63,82,080	11,48,774	70,202	15,955	77 – 98%
Vendor procurement of door shutters	24,00,00	4,32,000	26,400	6000	93 – 98%
Labour attrition	61,69,750	47,19,858	1,85,092	46,273	96 – 99%
Labour productivity	13,32,77,640	79,96,658	29,32,108	14,66,054	63 – 81%
Customized changes in the plan	9,45,500	85,095	28,365	10,400	66 – 87%

Table 1 shows the possible savings in the cost when the mitigation measured are followed.

4. CONCLUSIONS

The above 6 parameters have been considered based on the input given by the project manager. Our scope of work involves the study on impact of these risks on cost and give projection to the company and provide mitigation plan. So that the company can decide and take necessary measures.

We then conclude that the proposed projection of risks impact and analysis will help the company in saving the cost and timelines on implementation. We can estimate at least 20% of cost saving if they implement even to 70% of one proposed suggestion. For the project manager, it is very helpful to take decisions and consider these risk factors during the planning process of the similar projects thus by avoiding the extra expenses due to the risks.

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