Task Oriented Risk Assessment - A Risk Assessment Tool

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---**Abstract**---
It is a well known fact that projects get delayed and sometimes they fail due to insufficient knowledge regarding the causes of the failure as well as because of not identifying the critical points which require special attention. A proactive exercise is very important in order to identify and find those aspects which need more attention in order to avoid delays and failures. In this paper an attempt is made to explain the Task Oriented Risk Assessment concept as a tool which can assist in identifying those tasks and events which require more attention. A detailed description of the Risk Exposure assessment of tasks using Risk Exposure assessment of failure events, assessment of precedence tasks and position of the tasks in the network schedule is proposed. The risk assessment for a particular issue forms the foundation for making a decision about future actions which may lead to additional analyses, perform activities that reduce the risk, or do nothing at all. This assessment is based on identifying the tasks and subtasks in a project and then identifying the events which are responsible for the failure of the tasks which may alternatively be termed as the reasons which are the causes for the failure of the task.

KEYWORDS : *Event, Impact, Project, Risk Assessment, Task*

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I.   INTRODUCTION

To complete a project or a task it is necessary to cope up with the uncertainties it may face. Events for which the organisation is not prepared for can cause a negative impact like time overrun, cost overrun etc. Therefore, formal methods are essential to identify these uncertainties which can assist the decision making process and minimise loss [7]. The problem is to identify the cause-effect relationship between the events, their triggers, their effects and severity of the impact and then propose a feasible solution to combat the situation. Further it is also important to identify which method or technique should be used for which problem and in which industry. Projection and Quantification of risk is a major challenge in the area of risk analysis and management which requires detailed description of the tasks associated with every objective and then identify the factors which may have a positive or negative effect on the task. Finally, design a formal procedure for identification of the factors, analyse them and initiate proactive measure to minimize the negative effects.Risk assessments also enable risk response and mitigation strategies to be expressed.Cost/benefit analysis can be used to compare risk mitigation strategies and understand howeffectively the money would be spent[1].To assist in this proactive exercise we propose TORA (Task Oriented Risk Assessment) [10] as a tool for risk assessment in order to contribute to the success of a project.

II.   BACKGROUND

There are various approaches to riskmanagement in the literature on risk management. These approaches vary among researchers, and preference for a certain approach mostly depends on the type of the project and the environment [6]. Two approaches that can be distinguished are: an evaluation approach and a management approach [2].The evaluation approach consider risk management as an analysis process that aims at determining the risk factors [2]. Information about project failure and its causes are collected andthis information is used in checklists for risk identification. The contribution of risk management to project success is indirect, because the information collected is used in future projects. The management approach considers risk management to be a management instrument by which information is collected and analysed to support the decisionmaking process in a particular project. This approach does not look for generic risks, but instead focuses on managing the risks that are relevant in the project in question. Concentrating on the management approach here we are trying to use the task based concept for assessing risk which in turn will act as a security net in the decision making process. Risk assessment fully discloses the sensitivity of the project to its participants to

ensure that all threats are fully understood [3] . As a result, accurate understanding of potential challenges, and risk mitigation strategies can also be created in advance.

III. CONCEPT OF TORA

Task Oriented Risk Assessment starts from the point when a work breakdown structure of the project is made[10]. The Work Breakdown Structure provides the base for identification of the tasks and subtasks. Next step is to identify the events that are responsible for the failure of these tasks. After identification of the events, the Risk Exposure of each of the event is to be ascertained. There are two parameters that contribute to this calculation of Risk Exposure: i) frequency of occurrence of the event and ii) impact [5]. Frequency of occurrence is classified into five classes and impact is classified into four classes. Frequency of occurrence is classified as Frequent, Occasional, Seldom and Unlikely. Impact is classified as Catastrophic, Critical, Marginal and Negligible. Based on the combination of these two parameters, Risk exposure of each event is classified as Very High, High, Moderate and Low. The following tables represents the conditions when a task or event's Frequency of occurrence is classified into five categories and when an Impact is to be considered as Catastrophic, Critical, Marginal or Negligible.

Table 1: Frequency of occurrence categories

Frequency of occurrence	Condition
Frequent	Occurs very often in the life time of the project
Very Likely	Will occur several times during the life time of the project
Occasional	Will occur during the life time of the project
Seldom	May occur during the life time of the project
Unlikely	Can consider that it will not occur during the life time of the project

The following table represents the conditions when an Impact is to be considered as Catastrophic, Critical, Marginal or Negligible.

Table 2 : Impact categories

Impact	*Condition*
Catastrophic	Project failure, loss of life or system
Critical	Major project setback, permanent disability or severe injury to human or major system damage
Moderate	Minor setback to the project, minor injury and occupational illness and minor system damage
Negligible	No considerable damage to project, human or system

After categorising the Frequency of Occurrence and Impact the following table reflects the corresponding Risk Exposure depending on the two parameters.

Table 3: Table representing the Risk Exposure of an Event

Impact / **Frequency of Occurrence**	*Catastrophic*	*Critical*	*Marginal*	*Negligible*
Frequent	Very High	Very High	High	Moderate
Very Likely	Very High	High	Moderate	Low
Occasional	High	High	Moderate	Low
Seldom	High	Moderate	Low	Low
Unlikely	Moderate	Low	Low	Low

Sometimes a task may be directly assessable based on the study of closure reports or from expert judgements. In those cases it may not be necessary to go for listing of events and further analysis. For those tasks risk may be assessed directly by the two aforesaid parameters i.e. its frequency of failure and the impact that may happen in

case of its failure. In case a task needs to be assessed using the Risk Exposure results of the events that may lead to its failure, the following section presents a detailed illustration on this.

IV.   CRITERIA FOR RISK ASSESSMENT

Those tasks that cannot be assessed for its Risk Exposure directly are proposed to be assessed based on the following three parameters. This step is an addition to the concept introduced against TORA [10] :
i)   Risk Exposure of the task based on failure events
ii)   Number of precedence tasks with their Risk Exposure, and
iii) The position of the task and the precedence task/tasks in the Network diagram.

4.1. ILLUSTRATION

Consider a task T with five failure events E1,E2,E3,E4 and E5 and each have been evaluated with a specific Risk Exposure Value depending on its probable frequency of Occurrence and the Impact intensity in case the event becomes a reality. For example:

Table 4 : Risk Exposure of each event of task T.

Event Name	Frequency of Occurrence	Impact	Risk Exposure
E1	Frequent	Critical	Very High
E2	Occasional	Marginal	Moderate
E3	Seldom	Catastrophic	High
E4	Occasional	Negligible	Low
E5	Very Likely	Marginal	Moderate

To assess the risk exposure of the task we have calculated the number of events in each category of risk exposure. For the given case it is : Very High – 1, High – 1, Moderate – 2 and Low – 1.

4.2. RULES TO ASSESS RISK EXPOSURE OF A TASK BASED ON EVENTS
The following rules are considered to assess the Risk Exposure of the task :
Rule I : If 50% or more of the events fall under Very High category or 70% or more of the events fall under High category, then the Risk Exposure of the task is considered to beVery High
Rule II : If less than 50% but more than 25% of the events fall under Very High category or less than 70% but more than 40% event fall under High category, then the risk exposure of the task is considered to be High.
Rule III: If less than 25% of the events fall under Very High and less than 40% of the events fall under High, then risk exposure is High.
Rule IV: If less than 25% of the events fall under Very High and 50% or more events fall under Moderate then risk exposure is High
Rule V: If less than 40% of the events fall under High and more than 70% of the events fall under Moderate then risk exposure is High.
Rule VI: If more than 70% of the events fall under Moderate then risk exposure is Moderate.
Rule VII: For all other combinations risk exposure is assumed to be Low
Assessing the given task the events are grouped into categories as follows :

Very High : 1/5 = 20%   High : 1/5 = 20%
Moderate : 2/5 = 40%   Low : 1/5 = 20%

The assessment falls under Rule III and hence the risk exposure of the task is classified as High. For the second parameter it is proposed to consider the Risk Exposure of the tasks preceding to the given task T. The number of preceding tasks along with their Risk Exposure value is considered to have an impact on the Risk Assessment of the task T that is to be assessed. In case there are more than one task preceding the task T similar Rules applicable in case of the events may be applied to get a single risk exposure value of the precedence tasks. In the given case of task T, we have considered two precedence tasks whose risk exposure is High and Moderate. Referring to the rules it is apparent that it fulfils Rule II by which we assess the risk exposure of precedence tasks to be High. For the third parameter it is considered that if a task is a part of the critical path, it has greater contribution to Risk Exposure than the tasks which do not fall in the critical path.Critical path includes those activities which determines the duration of a project. A network schedule of the tasks is prepared and calculation of the earliest finish and latest finish time at each node helps in determining the critical path [8]. This is an exercise performed by the project Managers in the project planning phase to determine the duration of the project. For this parameter,

if the task to be assessed or even if any of the precedence tasks fall in the critical path the response is to be considered as YES or else NO. For the task T which is the task to be assessed it is assumed that the precedence tasks or even T is not a part of the critical path.

4.3. FINAL ASSESSMENT OF THE TASK

For the Final assessment of the task, five categories of risk are considered which can be ranked from 1 to 5 in ascending order of its severity. The categories are Extremely High, Very High, High, Moderate and Low. Here Low corresponds to 1 and Extremely High corresponds to 5. The table represents the combination of the parameters for which an assessed risk category is proposed considering the individual parameter values. In case of the example considered for illustration i.e.task T, the values of the parameters as assessed in previous section are High, High and No. This combination can be matched with the corresponding entry to get the final assessment result.The Final assessment of the example considered i.e. task T is Very High (according to the proposed table).

Table 5: Table representing the Risk Exposure of a task

RE of the task based on failure Events	RE of precedence tasks	Part of Critical Path	Assessed Risk for the task
Very High	Very High	Yes	Extremely High
		No	Extremely High
	High	Yes	Extremely High
		No	Very High
	Moderate	Yes	Very High
		No	High
	Low	Yes	High
		No	High
High	Very High	Yes	Extremely High
		No	Extremely High
	High	Yes	Extremely High
		No	Very High
	Moderate	Yes	Very High
		No	High
	Low	Yes	High
		No	Moderate
Moderate	Very High	Yes	Very High
		No	High
	High	Yes	Very High
		No	Moderate
	Moderate	Yes	High
		No	Moderate
	Low	Yes	Moderate
		No	Low
Low	Very High	Yes	High
		No	Moderate
	High	Yes	Moderate
		No	Low
	Moderate	Yes	Moderate
		No	Low
	Low	Yes	Low
		No	Low

V. CONCLUSION

Projects are an inevitable part of every system and successful completion of a project is considered to be the goal and objective of every project manager. For this objective to be fulfilled, it is understood that every project needs some measure to identify those aspects which may take the form of a threat in successful completion of the project. Risk assessment provides a valuable input for the project managers to identify those tasks or events that may convert into a threat. Moreover, risk assessment does not only contribute to the successful completion of the project, but also aims to assist in identifying those points where risk monitoring and control measures need to be directed so as to avoid loss of human life or system as well as minimise the extent of loss with regards to all the resources, be it man, money, machine or material. The proposed task assessment takes into consideration the events related to the task that is to be assessed as well as the events that are related to the preceding tasks.

In this case the risk associated with the preceding task is also influencing the risk assessment of the task to be assessed. In case the task to be assessed or any of the tasks fall in the critical path, the proposed method considers this aspect as a contributor to the risk category. The risk assessment results can be further refined to produce risk prioritization depending on the risk acceptance level of the organisations' risk management policy.

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