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WHY DO WE NEED RISK MANAGEMENT?

The short answer is because risks are a part of business and not managing them would be a failure of good governance and because unexpected events do occur. Sometimes unexpected events bring benefits, other times they do harm. A more rigorous approach to risk management at all levels of the business can help:

- Secure project/business objectives
- Improve business performance
- Facilitate improved customer service
- Learn from past experiences
- Focus on due diligence
- Address changing markets
- Fulfil corporate governance regulations

While risks can be opportunities as well as have negative impacts, we know that most of the effort of business and project management is focused on the elements for success. We propose that spending time focusing on failure can yield benefits, as illustrated in Fig 1.

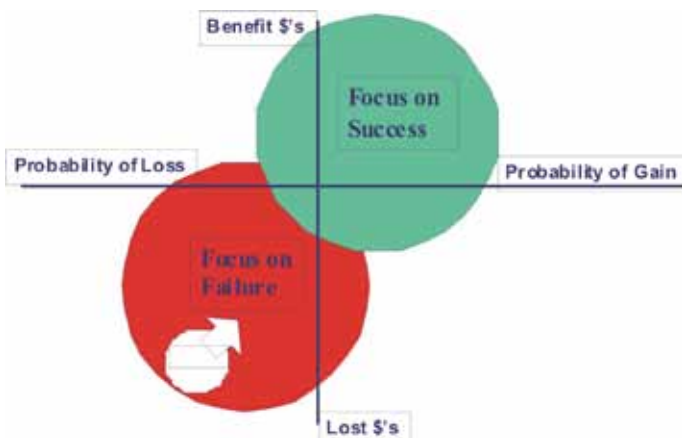


Fig 1 Focus on shrinking the probability of failure to minimize losses.

This paper's focus is on capital investment project risks. A definition of risk from Project Management Institute (PMI), Risk Management by Anthony D Cohen, is "The chance of certain occurrences adversely affecting project objectives, typically: scope, quality, time and cost". It is this aspect of risk that's explored here.

AMEC's Total Risk Management (TRM) was first developed to manage risk on design/build projects. It follows similar steps to the PMI model. However, TRM considers risk as having either upside or downside potential and defines risk as "an uncertain event, feature, activity, or situation that can have a positive or a negative effect on objectives".

SOURCES OF RISK



Fig 2 TRM Risk Framework

PMI's special interest group for risk, RiskSig, makes research papers available that provide checklists of sources. Active Risk Manager, one of the over 100 software programmes devoted to risk, classifies sources of risk under strategic, financial and operational headings.



Fig 3 AMEC's Functional Risk Management

PROJECT RISK MANAGEMENT FEATURES

Project Risk Management allows for the promotion of original thinking while at the same time ensuring that risks and actions generated are evaluated objectively and the best options to mitigate risk are selected to increase the likelihood of success.

Effective risk management should:

- Consider both downside (threat) risk and upside (opportunity) risk
- Challenge project participants and draw from their expertise
- Promote innovative thinking
- Focus management attention on key areas of risk
- Incorporate a standard risk management framework that is meaningful to decision makers while remaining flexible in order to adapt to project specific issues and best applicable methods.
- Allow for the ongoing management of risk with continuity through all phases of project development leading to and including the ongoing operations of the facility

AMEC risk management techniques and processes are together known as Total Risk Management (TRM). The main features are:

- It targets cultural and behavioural change by focussing on people and the way they approach and manage all aspects of uncertainty.
- It is not based upon a particular tool or software package, but involves the application of practical, hands on, common sense processes that can be applied at all levels of the organisation.
- It identifies risks as uncertain events that if they occur will have an effect on project or organisational objectives.

- It allocates ownership of risk to the individual or party best able to deal with it.
- It focuses on a successful project outcome above any other consideration.

Benefits of Risk Management

The impact of Risk Management on performance has been benchmarked and discussed in various forums. General correlations between various project processes and their outcomes have been investigated. While the quantification of the benefits of risk management is a matter of some debate, there is general agreement that best practice risk management is among the most influential processes for providing benefit in terms of project time, cost, and quality.

THEORY OF RISK MANAGEMENT

A formal, well-documented Risk Management Plan should be part of the overall Project Management Plan. The philosophy of the Risk Plan is that all risk issues will be proactively managed by the party best able to do so, with management actions focused on achieving the project objectives.

The Risk Plan should include:

- Clear definition of project objectives so that all participants become totally aligned to the objectives and critical success factors for the project.
- An analysis of the work scope of each party as it relates to Risk
- Development of a Risk Management Plan stating clearly defined project objectives, and strategies and how it is to be applied to the specific project in question.
- Project team awareness and training to effectively communicate risk-planning information across the total project organisation.
- Deployment of effective risk management techniques in order to facilitate a proactive approach.
- Ongoing monitoring and review to ensure risk issues are included within project processes for monitoring, updating and review throughout the life of the project.
- Deployment of specific 'risk' activities such as quantitative risk analysis, risk decision support tools and other techniques as required

Due to the cyclical nature of the process, project objectives, work scope responsibilities, the project risk register and the risk management plan are revisited and updated as necessary to ensure that the management of risk remains proactive, focussed and appropriate throughout the project lifecycle.

Steps in a Risk Management Plan

AMEC incorporates seven steps in a risk management plan.

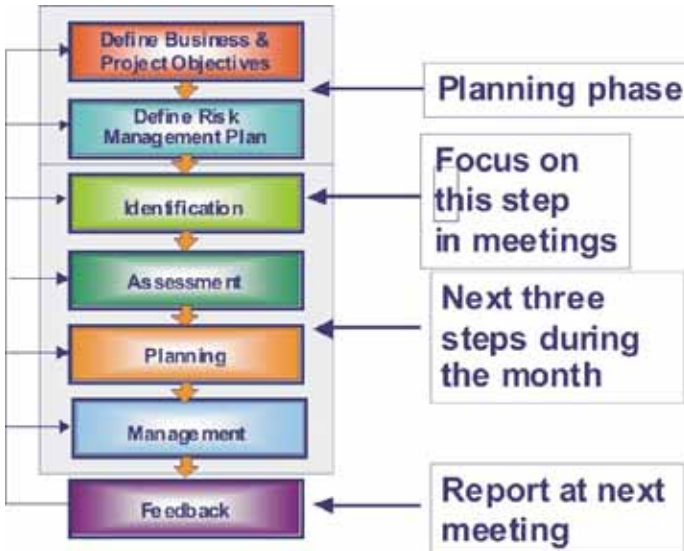


Fig 4. Steps in Risk Management

Step 1 - Defining Objectives

This is a key step as it forms the basis for all risk management activities on the project. It is important that the project objectives are recorded and understood by all participants. This involves identifying project requirements, stakeholders, and developing an understanding of the success criteria for the project. Requirements must be assessed and challenged at this point to ensure they are realistic and understood by all team members. At this point, base assumptions relating to the project and key constraints must also be reviewed.

Step 2 – Risk Management Plan

The purpose of the Risk Management Plan (RMP) is to formalize the risk management process for the project. It is a single document that contains the definition of the chosen risk management process to be undertaken. It includes; The scope and objectives of the risk process; the organisation, roles and responsibilities of participants; the tools and techniques to be implemented; deliverables; review and reporting cycle. The RMP provides a document for all to relate to.

Step 3 – Identification

The Identification of project risks can use a variety of identification techniques such as brainstorming, interviewing, fish bone diagrams, mind mapping etc. It should be comprehensive and consistent and identified risks should be given names that are meaningful to anyone whether they have intimate knowledge or not. It will be impossible to avoid all risk on any given project. However the key objective of comprehensive risk identification is that risks are undertaken knowingly rather than unwittingly.

Step 4 – Assessment

Risks must be assessed objectively so that key risks can be prioritised and effective strategies to deal with them developed. This focuses management attention on the key issues. Two assessment methods can be employed.

- Qualitative assessment provides a descriptive result and allows the relative ranking of risk issues. This is applicable to any project of any size and is always undertaken first.
- Quantitative assessment provides a mathematical description of risk and produces a numerical result (risk estimate). Quantitative assessment is undertaken to address specific issues that warrant a detailed analysis.

Step 5 – Planning

Once the risks have been identified, it is important that the responses to be implemented to deal with them be thought out in some detail to achieve appropriate, achievable & affordable action plans. Risks are assigned to risk owners who are individuals best placed to deal with given issues. Each action owner must then develop a management plan with review dates. This establishes who is going to do what and by when to mitigate the risks.

Step 6 – Management

Effective management of risk requires ongoing review of the action plans and adjustment of strategies to respond to risk in response to the fluid situation as the project progresses. It requires ongoing diagnosis of the current position with respect to risk, identifying the best alternatives and generally sustaining the process.

Step 7 – Feedback

Effective feedback is a key vehicle for others to learn from successes and mistakes. During the project, it allows for continuous re-evaluation of the situation with respect to risk and adjustment of the responses to ensure a successful outcome. Over the course of many projects, it allows businesses to continuously improve their performance, their planning and estimating, and the risk management process itself.

PRACTICE OF RISK MANAGEMENT

A typical pulp or paper mill project scope for risk management could be developed from the corporate and project areas listed in Fig. 5 below:

Scope for Owners and Corporate

Owners Strategy Marketing & Sales Legal Funding Insurance Public Relations Investor Relations	Operations Management Strategic Planning Organization Operations Maintenance Material Supply Infrastructure Insurance Community Relations Government Relations Public Relations Social Projects Environment Safety & Health Security	Forestry Nursery Reforestation Plantations Extraction Transportation Environment
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Scope for the Project Team

Project Management - Strategic Analysis - Planning and Monitoring - Project Controls - Reporting - Insurance - Permits and Approvals - Safety and Health - Security	Pulp or Paper Mill - Project Scope - Procurement - Contracting - Engineering - Site Preparation - Manufacturing - Inspection - Commissioning - Ramp-Up - IT Systems - Spares - Shipping and Logistics - Schedule - Data/Documents - Environmental - Safety and Health - Security	Financial/Accounting - Finances - Capital Cost - Commitments - Cash Flow - Cost Control - Claims - Taxes - Currency - Economy - Accounting - Payments
Mill Infrastructure - Site - Communications - Central Services - Electric Power Tie - Water Supply - Marine and Dock - Camps - Safety and Health - Security	Human Resources - Organization - Training - Project Staff - Operations Staff - Contractors - Transportation - Accommodation - Safety and Health - Security	

Fig. 5 Scope of Risk Management for Projects

If identification of risks uses a brainstorming approach, the risks listed on flip charts or white cards can be organized under the scope, area or activity headings in a risk register similar to that shown in Fig 6.

Risk Register

Risk Meeting Worksheets
 Risk Management - Typical Register
 Date:

Item	Risk Description	Mitigating Action	P ¹	I ¹	By/Who
1	NAME OF PROJECT/ACTIVITY				
2					
3					
4					
5					
6					
Probability and Impact					

Done

Notify	By/When	Status

Fig. 6 Risk Register for Qualitative Input and Follow Up

If relating the various risks to each other to show relationships between each and the most important outcome, helps understanding and deciding on action plans then one way of graphically showing those relationships is a fishbone diagram. A typical fishbone is shown in Fig 7.

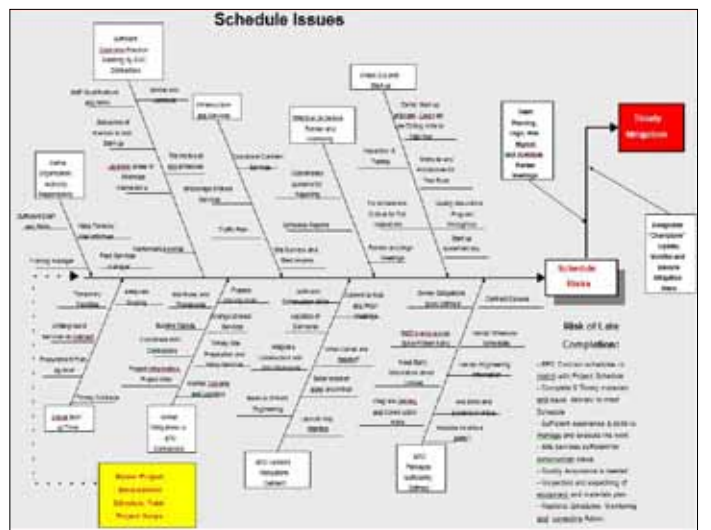


Fig. 7 Fishbone of Completion Risk

A simple, subjective way to prioritise and track the effects of mitigating actions is to assign a numerical value to the probability and impact of an opportunity or threat of failure. One such grid, also using colours and terminology to indicate severity is shown in Fig. 8.

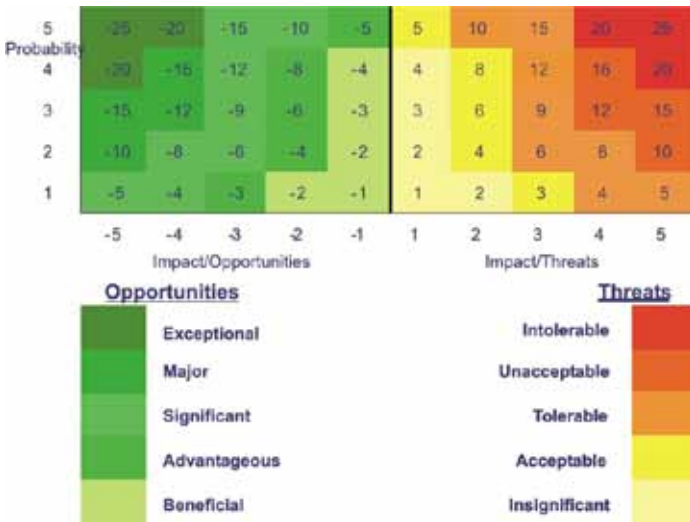


Fig. 8 Example of a Subjective P & I Grid

A risk register, complete with risk descriptions, mitigation action plans, P & I's, action owners, target completion dates with reminders and follow up functions in a web-based format was developed by a client for managing risk on his greenfield pulp mill project. A typical Risk Analysis web page is shown in Fig. 9. It was available to all client project staff, vendors and contractors on the project to view, and for selected staff to add and modify the content. Commercially available software such as Active Risk Manager (ARM) has similar capability and interconnectivity.



Fig 9. Example of a Risk Analysis Web Page

During the course of the project, as mitigating actions are taken and the risks are minimized, the probability and perhaps the impact of those risks are reduced resulting in ongoing reduction of project risk. The reduction in risk can be tracked and presented graphically as the example shown in Fig 10.

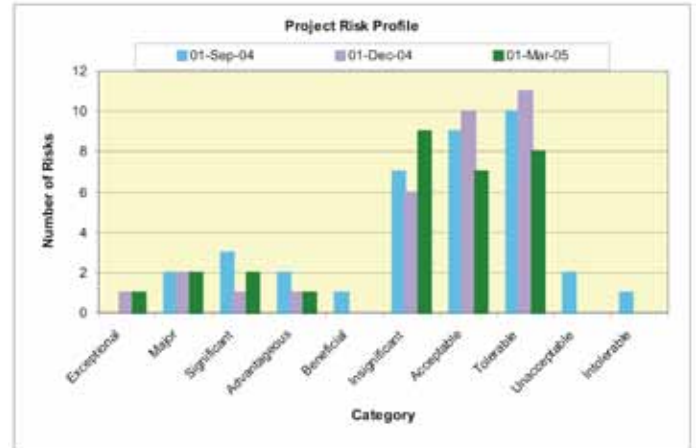


Fig 10. Tracking Risk Distribution over the life of the Project

Outline of Quantitative-type Risk Analysis

Quantitative assessments of the potential for cost impact of risks could use a probability distribution function to describe the range of frequencies of possible costs for a given risk event. Monte Carlo can be applied using this frequency distribution or other appropriate distributions, to assess the potential impact of individual risk events to give statistical results for the overall project. Quantitative Risk Analysis is most often used to help develop Contingency however it can be used in any situation where a risk estimate is required.

In a Monte Carlo type analysis, values for various inputs are assigned based on probability distributions. Using these values, a snapshot result or output is then calculated using some type of model (e.g. an Excel Spreadsheet). Re-running this process thousands of times generates thousands of different outcomes with a distribution empirically based on the probabilities that are defined for the various inputs and the likelihood of achieving a given project outcome can be assessed.

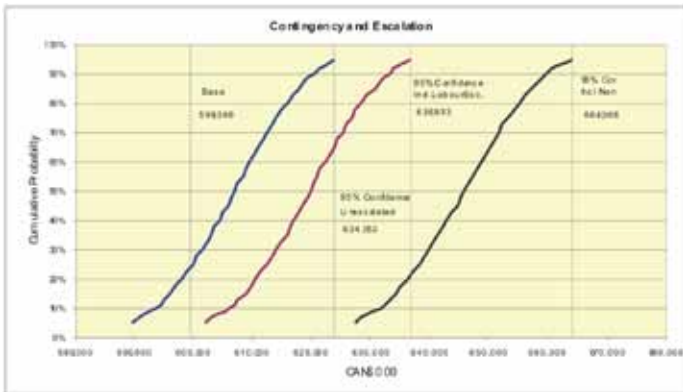


Fig. 11 Frequency - Cost Profile from Monte Carlo Analysis

Using such an approach to assessing the costs of selected risks to achieving guaranteed performance on a project, we have been able to quantify cumulative potential cost of say 90% chance of the risks occurring and making provision for these risks in the project contingency.

A similar approach can be undertaken to look at schedule risk. In this type of assessment, schedule uncertainty is entered as probability distributions for durations of various activities.

In a similar manner as that described above for cost, the schedule model is run thousands of times to develop a distribution of the likelihood of achieving schedule objectives, an example of which is shown in Figure 12. Additional information such as the percentage of runs that resulted in an activity falling on the critical path is also generated in such models.



Fig. 12 Frequency - Schedule Profile from Monte Carlo Analysis

RECOMMENDATIONS

Unexpected events that surprise management are not tolerated in business or projects today. Risk management can be developed as a good practice technique that becomes embedded as part of a company's culture. We suggest that a company reinforce this by applying the technique throughout the organization, from the corporate office to the engineering teams and mill maintenance shop.

Using web-based systems and proprietary software allows interconnectivity of systems and users, within and outside the company to minimize the ramp-up time and to formalize the plans.

As with any technique, the usefulness is a direct result of the commitment, attention and actions that result. With successful mitigating actions, confidence will build. With management attention and support, the actions have a high probability of success.

Without a risk management plan, the risks are there but perhaps hidden, or not well considered. You are taking the risk, so why not try to mitigate them. The return on the time, effort and costs of risk management can be substantial.