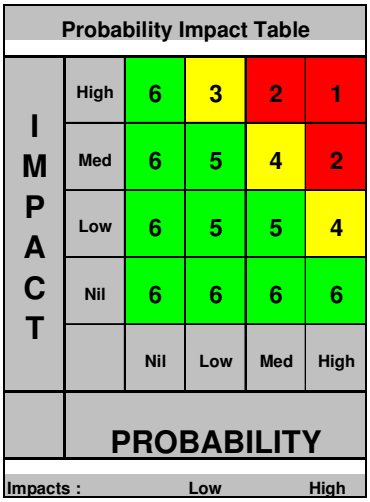
Project Risk



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1 What is Project Risk?

Risk may be defined as an event or circumstance which is perceived to have a significant impact on the project's objectives.

Projects are the principle means by which companies move forward. Since risk elimination is not always a practical proposition, effective management becomes essential.

Similarly, full advantage cannot be taken of beneficial opportunities, if these are not recognised in good time and acted upon.

No project is risk free. Risks can be managed / shared / transferred / avoided They cannot be ignored.

1.1 Why is Risk Management Important?

Because Project Management is all about dealing with the unexpected;

All Plans are Forecasts
All Forecasts are Uncertain
All decisions are based upon uncertain forecasts

<u>And Uncertainty = Risk</u>

1.2 What do we know about Risk Management

We do it all the time
Very few do it well
Everyone does it differently
Even fewer record what they do

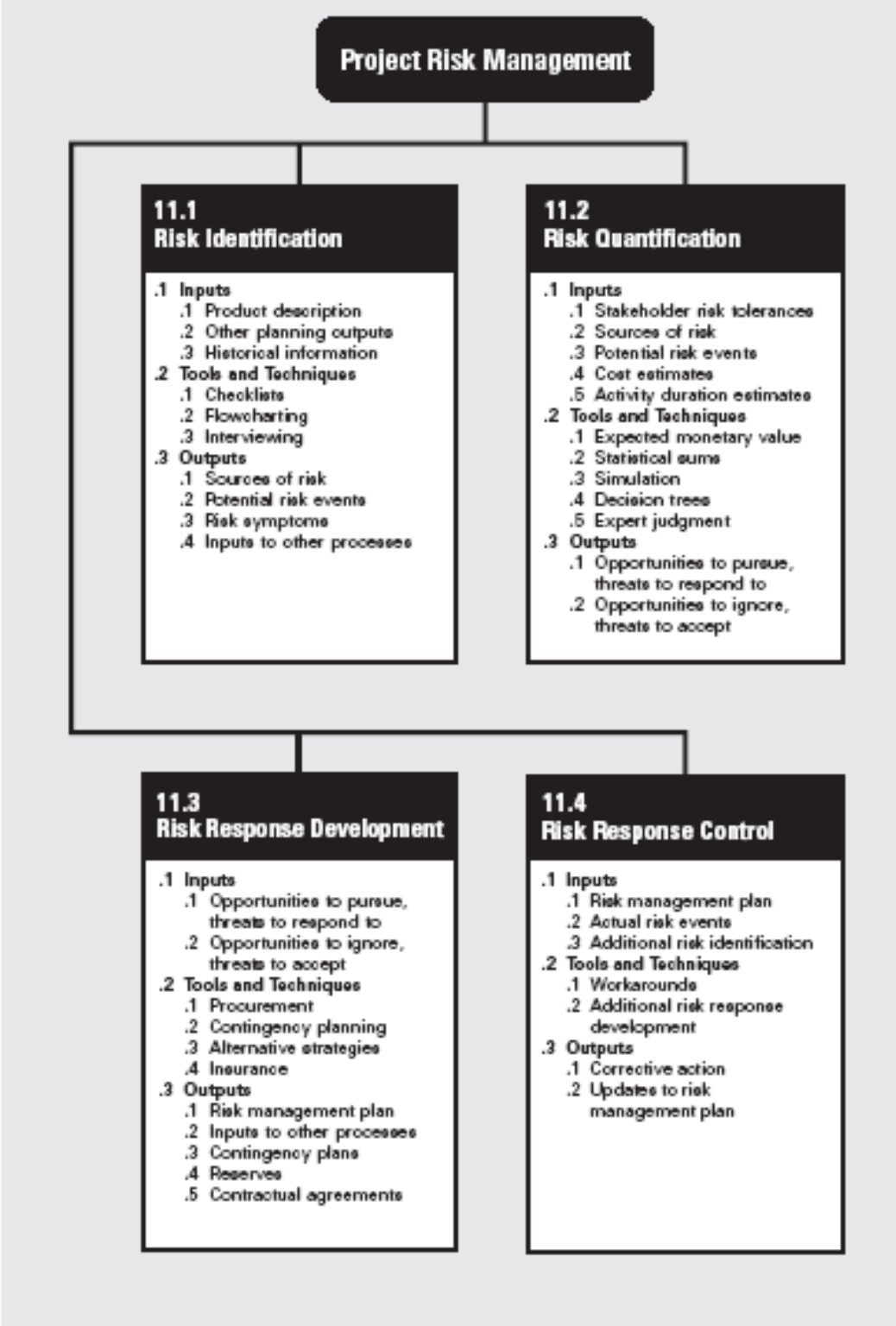
One can practice:

Risk Management
Crisis Management
Disaster Management

This paper looks at the relevant processes for formal Risk Management.

2 Managing Risk

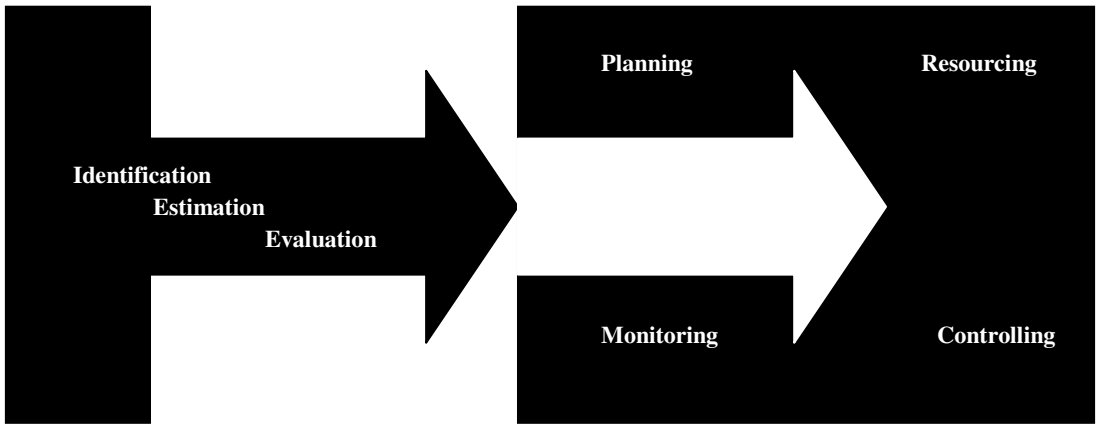
Risk Management is the process whereby responses to the risks are formulated, planned, initiated, progressed & monitored, reviewed, and (hopefully) closed. The following illustration outlined the process:-



Courtesy of PMBOK

2.1 The Risk Management Process

The management of risk process consists of two phases, risk analysis and risk management. Each phase comprises activities as illustrated below.



2.2 Analysis

2.2.1 Identification

The preparation of a list of all the potential risks which the project could face.

Task	Questions to ask
Establish focus area for identifying risks, for example, training, network, whole sub-project.	What are the risk drivers?
Gather information on risks	Is any previous information available to assist identification? Who are the experts?
Classify risks	What are the causes of risk? How can they be grouped? What are the links between them? Are there secondary risks?

2.2.2 Estimation

The determination of the criticality of each risk, based on an assessment of its probability of occurrence and its likely impact.

Task	Questions to ask
Determine probability, consequence and timing of identified risks.	What is the impact on timescales, cost and quality? How likely is it to happen? How much is uncertain, unknown?
Clarify and improve estimates.	How reliable is the data?
Prioritise risks.	What risks are significant?

2.2.3 Evaluation

An assessment of the acceptability of each risk, in order to decide what action to take.

Task	Questions to ask
Assess risk indicators.	What risk is acceptable? What is the combined effect of a group of risks?
Assess possible actions.	What are the acceptable courses of action? How much will it cost? When is action appropriat4e?
Prioritise actions.	What can go wrong?

	What are the consequences of failure? Who is accountable?

2.3 Management

2.3.1 Planning

The identification of the most appropriate action for each risk and the development of a detailed plan of action. This activity often proceeds in parallel with risk evaluation.

Task	Questions to ask
Select the most appropriate means of reducing each risk.	What actions are the most cost effective? Will contingency plans be requires? Will some actions be subject to change control?
Create a risk management plan.	How will the plan be managed?

2.3.2 Resourcing

The identification and assignment of people and other resources (e.g. money, equipment) in order to accomplish the actions. Also, confirmation of the feasibility of the plan.

Task	Questions to ask
Allocate resources and responsibilities to the risk management plan.	Who has the most appropriate expertise? What authority is required to approve resources?

2.3.3 Controlling

The management of actions against the plan.

Task	Questions to ask
Manage actions.	Has the risk changed as a result of the completion of an action? Which risks are now issues?

2.3.4 Monitoring

The checking of the effectiveness of actions taken.

Task	Questions to ask
Capture lessons learned. Monitor changes to risk status.	How effective has an action been? What is the change to the overall risk exposure?

3 The Risk Management Plan

3.1 When and why?

A risk management plan should be developed during the project identification phase. A process for receiving and reviewing risks must be established and a description of this process should be documented and communicated to the project team.

The risk management plan serves five main purposes:-

- It provides a list of identified significant risks.
- It states the actions and responsibilities required to mitigate or avert risk, including the development of contingency plans and alternative courses of action.
- It communicates to all parts of the project how risks are being averted and by whom.

- It aids the monitoring and control of risk by recording comparatively whether risks have increased or decreased in effect, and whether the risk reduction measures are producing any benefit
- It records risk details for historical purposes.

3.2 Suggested contents of a risk management Plan

The following suggests the contents of a typical Risk Management Plan:

1 Introduction
Scope and purpose
Overall approach to risk management (techniques used, assumptions made)

2 Risk analysis
Risk analysis approach,(techniques and tools used, evaluation assumptions)
Risk Survey Results, (list of risks: description, probability of occurrence, impact, risk indicators)
Risk Evaluation (evaluation results, range of possible courses of action)
Analysis of risk inter-dependencies

3 Risk management
Risk planning (risk reduction recommendations and options)
Risk resourcing (recommendations for allocation of resources, responsibilities for risk aversion)
Risk controlling information
Risk monitoring mechanisms

4 Detailed plans
Schedule
Control points or milestones
Review points

4 Risk Management Techniques

There are various techniques for managing risk. The following table illustrates typical techniques and the risk activity for which they are best suited.

Technique	identification	estimation	evaluation	planning	resourcing	controlling	monitoring
cause and effect diagrams	X	X	X				
cost/benefit analysis			X	X		X	X
critical success factors and key focus areas	X		X	X			
decision trees	X	X	X	X			
insurance premium approach		X	X	X	X		
library of previous experience	X	X	X				
monte carlo simulation		X	X	X	X	X	
probability/impact grids		X	X		X	X	
radar charts						X	X
risk checklists	X						
risk identification workshops	X	X					
risk management plan	X	X	X	X	X	X	X
risk management workshop			X	X	X		
risk register	X	X	X	X	X	X	X

5 Working Sample Of A Risk Management Process.

This section illustrates a Risk Management Plan that the author produced and implemented on the Light Rail Project (LUAS) in Dublin.

5.1 Introduction
A Risk Management Process shall be used on the Programme. This document describes the process and defines the procedures to be adopted.

5.2 The Risk Management Process
A diagram showing the top level process model of how the Project will manage risk is shown in figure 1 below. The model consists of risk management related activities, shown in circles, and documents, shown as boxes. The shaded boxes show the feed into Senior Management.

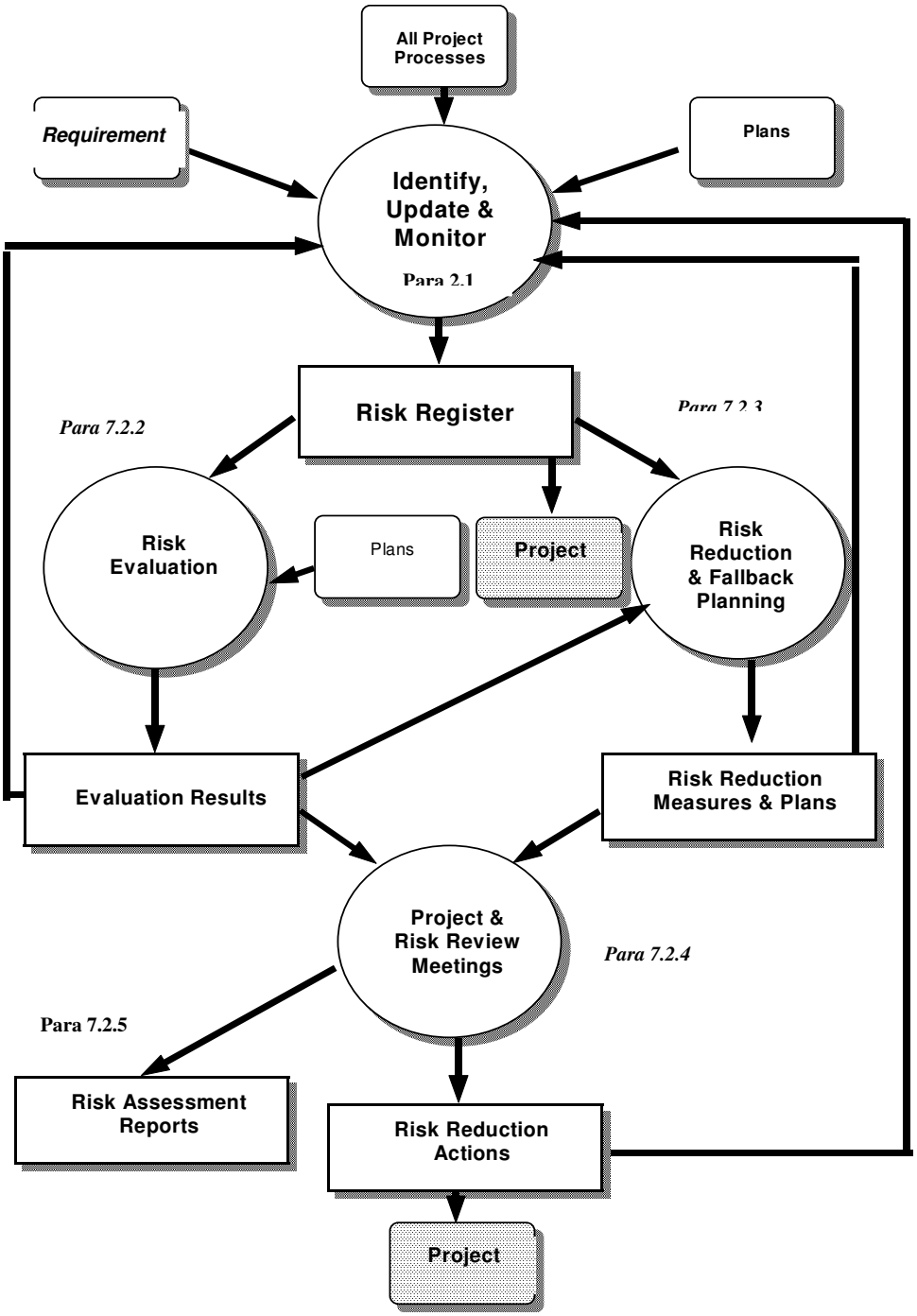


Fig. 1: Risk Management Process Model

5.2.1 Identify, Update and Monitor Risks
Scope: the process by which risks are captured, and previously identified risks updated and progress against them recorded.

Responsibility: All Project Team Members

Inputs: All project processes. New risks and updates to existing risks may be input to the risk management process by the project team members. The Risk Manager will be responsible for entering risks on the Risk register; the Project Manager shall ensure that risk identification remains a continuous process throughout the project life cycle. The Contractors programme plans, and progress reports also provide source information for risks.

Output: The Risk register

Activity Details:
This process includes the identification of new risks, the maintenance or update of existing risks logged, and the monitoring of risk reduction progress. The data may be captured using the qualitative risk assessment questionnaire (see appendix A1) or entered directly in the Risk register. In either case the guidance given in appendix A2 shall be used. The Risk Manager shall regularly issue Project Managers with the current risk register for their area, the frequency being determined by the project size.
Formal methods for risk identification include interviewing team members using either a structured bottom up process of identification or a top down 'brain storm'. Risks identified relating to the key risk areas will be delegated to the relevant level directly to ensure immediate action is taken to mitigate such risks. In this manner risks that could seriously impact the project, which are being managed at an inappropriately low level of the project due to ignorance of the high level ramifications of the problem, will be captured and managed effectively.

5.2.2 Risk Evaluation
Scope: To undertake the evaluation of the risks comprising the risk register to identify key risks, critical activities, probability distributions of time to events, major sources of risk, key dependencies and emergent escalation of risk.

Responsibility: Project Manager or Risk Manager.

Inputs: Project Plans and Risk register.

Outputs: Evaluation Results.

Activity Details:
The Project Risk Evaluation process has two primary functions. These are quantitative analysis of the high level networks using a Monte Carlo simulation, and the qualitative analysis of the risks held in the risk register

Qualitative Evaluation - Qualitative evaluation of the project risks will be undertaken using the programme plans. The analysis shall seek to identify escalation of risk through logical grouping of risks and identify key dependencies and critical activities. Secondary risks will also be evaluated at this stage to ensure that the risk reduction strategy does indeed have a lower impact to the project than the original risk. This management activity will include prioritisation of the risks using probability-impact grids and the net concern indicator to identify key risks.

Quantitative Evaluation - this analysis will involve population of the plans with the risks associated with the activities to produce a consolidated evaluation of the risk to the high level (i.e. Level 1 or 2) activities. Using this information pessimistic and optimistic estimates of activity timescale will be derived from the risks and the duration assigned to the activity. The network will then be analysed using a Monte Carlo simulation (See section 2.5 for a sample) to identify the major sources of risk.
The outputs of both the qualitative and quantitative evaluation processes provide an understanding of the current situation with regard to risk and provide a key input to the development of risk reduction strategies and contingency plans. Identifying the Key Risks will focus management attention and risk reduction action.

5.2.3 Risk Reduction and Fallback Planning

Scope: Consideration of the risks and evaluation results to identify and develop effective risk reduction measures and contingency plans.

Responsibility: Project Manager & Section Leaders

Input: Risk register.

Output: Risk Reduction Measures and Fallback Plans.

Activity Details:

The reduction of risk through contingency planning, the focusing of management effort and risk reduction activities. All risks will be assigned owners who shall bear management responsibility for them and their progress monitored by Risk Reviews.

This activity will mainly be confined to new risks and the subset of key risks most demanding management attention. This activity is therefore responsible for the updating the Risk register with actions placed to reduce risks. The Risk register provides a mechanism for progressing actions placed to reduce risk items and reports are available showing the progress made. The Risk Reduction Measures identified through this process will be also entered on the Risk register for progressing by Project and Risk Reviews. The reduction of risk will be sought through continual Risk Evaluation of the network by the Risk Manager

5.2.4 Risk Review Meetings

Scope: the process by which the proposed amendments and additions to the Risk register are reviewed, actions sanctioned and progress checked.

Responsibility: Management Team, Project Manager and Risk Manager.

Inputs: Risk register
Risk Reduction Measures and Fallback Plans
Evaluation Results.

Output: Risk Reduction Actions

Activity Details:

The review of risk will be carried out periodically (to be defined). The reviews will consider the Risk Reduction Measures and Contingency Plans and will concentrate on new risks and the reduction actions for risks at the level being considered.

The meetings should add value by the timely identification of risks and by actively reducing the probability and impacts of each risk. As a result of each review the relevant entries in the Risk register will be updated and review minutes circulated so that risk owners can pursue their risk reduction actions. This together with management support and directives will act as a promulgation of the risk reduction measures

5.2.5 Risk Management Reports

A risk Management report will be compiled at regular periods (to be defined), this will contain
An executive summary detailing the major risks affecting the project with an overview of the mitigation strategies.

1 An executive summary detailing the major risks affecting the project with an overview of the mitigation strategies.

2 A copy of all new risk Questionnaires raised during the period

3 A copy of the risk register showing outstanding risks.

4 A list of the major milestones with forecasted completion dates, criticality index, and confidence factors in achieving the forecasted dates. Where confidence factors are below 100% the potential slip in the programme will be shown for both 50% and 100% confidence factors. This will be supported by

copies of the results of the Quantitative Monte Carlo simulation illustrating histogram and cumulative curves for each milestone.

5 A copy of the Primavera risk parameters used for the Monte Carlo simulation.

The risk report will be used as a review and update document at the risk management meetings.

Appendix A1 Risk Identification Form Sample

1. Contract/Category		Risk No.	
2. Date		3. Risk Identified by	

4. Description of Risk

5. Activities Affected (P3 ID if applicable)	6. Areas Affected

7. Probability of Occurrence (Po)	H M L

8. Impact on Programme (Is)	H M L N
9 Impact on Cost (Ic)	H M L N
10 Impact on Quality/Performance (Ip)	H M L N

11. Reasons for above assessment levels

12. Risk Reduction Strategy

BOXES 13 AND 14 TO BE COMPLETED BY FIRST LINE MANAGER

13. Effectiviness of RRS (Eff 1-5)	1 2 3 4 5

14. Ownership (Organisation/Area/Individual)	

Appendix A2 Guidelines for filling in the Risk Identification Form

Risk No This is allocated by the risk manager and comprises Operational Department/Contract/Serial Number. Operational Groups are AR-Architectural, CM-Construction Management, FA-Finance & Accounts, OA-Architectural, OC-Civil, OM-M&E, PA-Property & land Acquisition, PC-Project Controls, PL-Planning, PM-Project Management, PO-Procurement, QA-Quality, SA-Safety & Health and UT-Utilities.

1. **Contract/Category:** the Contract Number and Category i.e (Tech)nical, (Comm)ercial, (Prog)ramme, (Oper)ational, (Cont)ractual or (PR.) e.g. A600-Oper
2. **Date:** the month and year in which the risk was identified.
3. **Risk Identified By:** the name of the person who identified the risk .
4. **Description:** giving as much detail as possible of the nature of the risk.
5. **Activities Affected:** the Activity ID in P3.IF APPLICABLE (See Appendix B)
6. **Areas Affected:** the names of the work areas affected by the risk.
7. **Probability of Occurrence (P_O):** the criteria for assessing the probability of occurrence of a risk are defined as:

• High	$P_O \geq 50\%$	More likely to happen than not.
• Medium	$20\% \leq P_O < 50\%$	Fairly likely to occur.
• Low	$P_O < 20\%$	Low likelihood, but not impossible.
• Nil	$P_O = 0\%$	Risk has been eliminated.

8. **Impact on Schedule (I_S):** the criteria for assessing the impact of a risk on schedule, in terms of a percentage increase to the planned project duration, are defined as:

• High	$I_S \geq 30\%$	Large delay to the activity/programme.
• Medium	$10\% \leq I_S < 30\%$	Significant delay to the activity/programme.
• Low	$I_S < 10\%$	Small slip to the activity/programme.
• Nil	$I_S = 0$	No affect on programme.

9. **Impact on Project Cost (I_C):** the criteria for assessing the impact of a risk on project cost, in terms of a percentage increase to the total project cost, are defined as:

• High	$I_C \geq 30\%$	Large increase to the total project cost.
• Medium	$10\% \leq I_C < 30\%$	Significant increase in the total project cost.
• Low	$I_C < 10\%$	Small increase in total project cost.
• Nil	$I_C = 0$	No affect on total project cost.

10. **Impact on Quality or Technical Performance (I_P):** the criteria for assessing the impact of a risk on technical performance are defined as:

• High impact	Major shortfalls in key parameters.
• Medium impact	Some shortfalls in one or two areas.
• Low impact	A few shortfalls in secondary parameters.
• No impact	System will fully meet the requirement.

11. **Reasons for the above assessments:** a clarification of the thinking behind the levels given for probability of occurrence and impact on schedule, cost and performance.
12. **Risk Reduction Strategy:** a description of the measures, if any, available to prevent or contain the risk to a minimum.
13 **Perceived Effectiveness:** an indication of the likely success of the risk reduction strategy on a scale of 1 to 5, where 1 is ineffective and 5 is highly effective.

14 **Owner:** initially the organisation responsible for the risk; later the individual made responsible for managing the risk.

Appendix A3 Draft Risk Register

The text below describes each column.

Line/Contract: e.g. A600

I/E: Identifies if the risk is with CIE (**I**)nternal or a Contracter (**E**)xternal

Ref: A unique identifier for each risk, gaps will occur when risks are closed (filtered out, not deleted)

Critical Date: The date the decision about how to deal with the risk has to be made

Description: The nature of the risk the Activity ID in P3.IF APPLICABLE (See Appendix B)

Activities Affected: Those activities contained within the P3 plans which are impacted by the risk.

Areas Affected: High Level Cost Breakdown Structure (CBS)

Po: The possibility of occurrence, may be (H)igh, (M)edium, (Low) or (Nil)

Trend: The risk owners perception of the change in Po since the last review, may be (S)table, (U)p or (D)own

Is: The impact to schedule may be (H)igh, (M)edium, (Low) or (Nil)

Ic: The impact to cost, may be (H)igh, (M)edium, (Low) or (Nil)

Ip: the impact to technical performance, may be (H)igh, (M)edium, (Low) or (Nil)

Reduction Strategy: The method(s) employed to mitigate risk.

Status: Actions placed at Risk Reduction Meeting and current status

Owner/Responsibility: The organisation or the individual asked to manage the risk reduction activities.

Remarks/Comments: This is a blank column to allow RMT to produce notes at meetings

Effectiveness: The level of confidence in the risk reduction strategy to mitigate the risk on a scale of 1 to 5

1: Very poor or no risk reduction strategy

3: Adequate risk reduction strategy

5: Will almost certainly mitigate the risk

Degree of risk: A measure of the severity of the risk given its likelihood and impact.

Net Concern: A measure of the degree of risk given the effectiveness of the risk reduction strategy

RoM Minimum: Lowest rough order of magnitude if the risk occurs.

RoM Maximum: Highest rough order of magnitude if the risk occurs.

Appendix A4- Quantitative Analysis

The Primavera to Monte Carlo Interface.

B1-A Quantitave Analysis will be carried out using the Primavera Risk Management Module (PRM). A template has been designed in Primavera to accommodate the transfer of data into PRM to allow a simulation to be run.

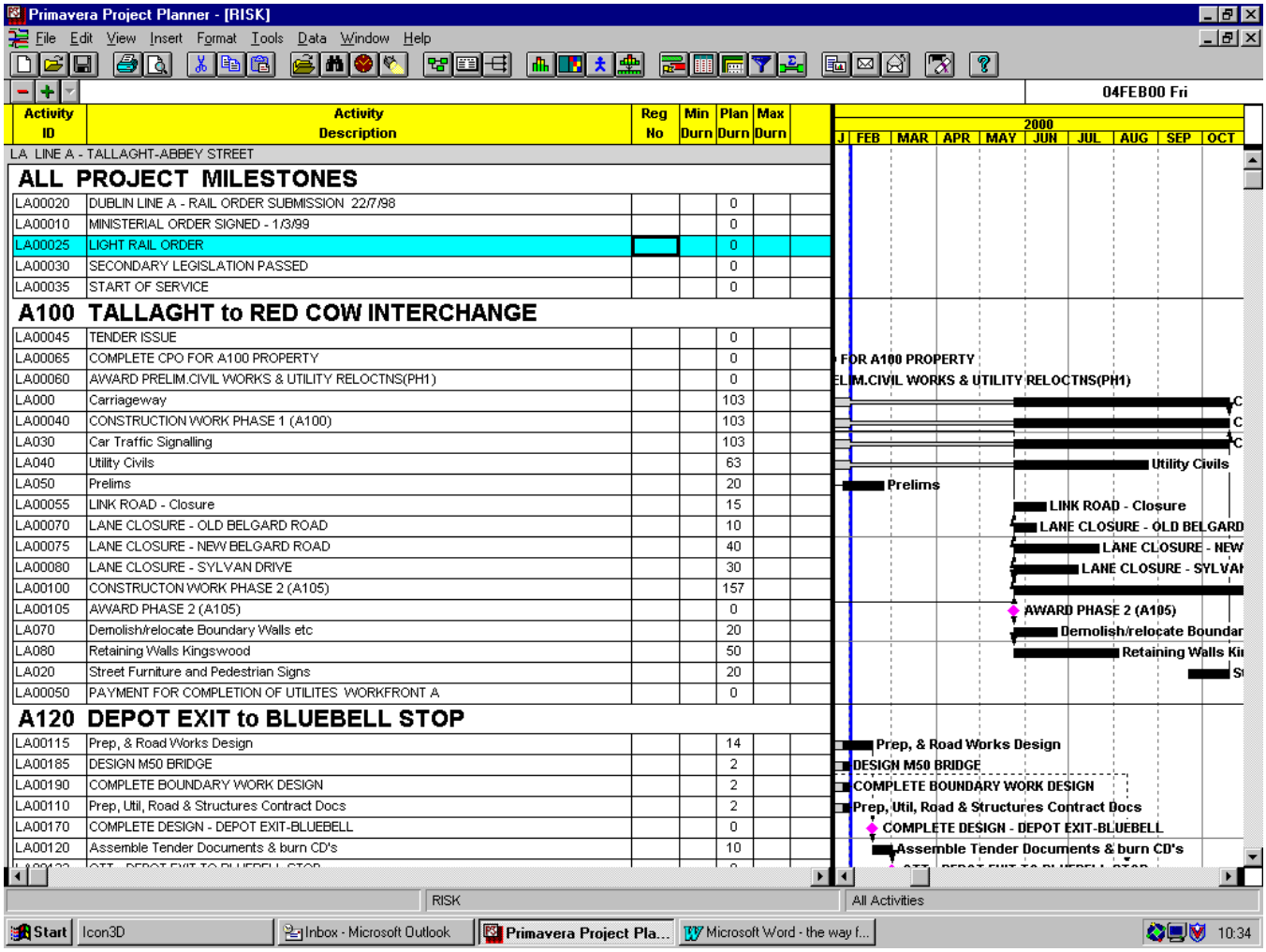


Fig 3-P3 Risk Analysis Template

The fields in Primavera are as follows:-

Reg No This refers to the risk number contained in the risk register, the Activity ID is entered into the risk register to maintain an audit trail.

Min Durn This contains the project managers estimate of the most *optimistic* duration of the task

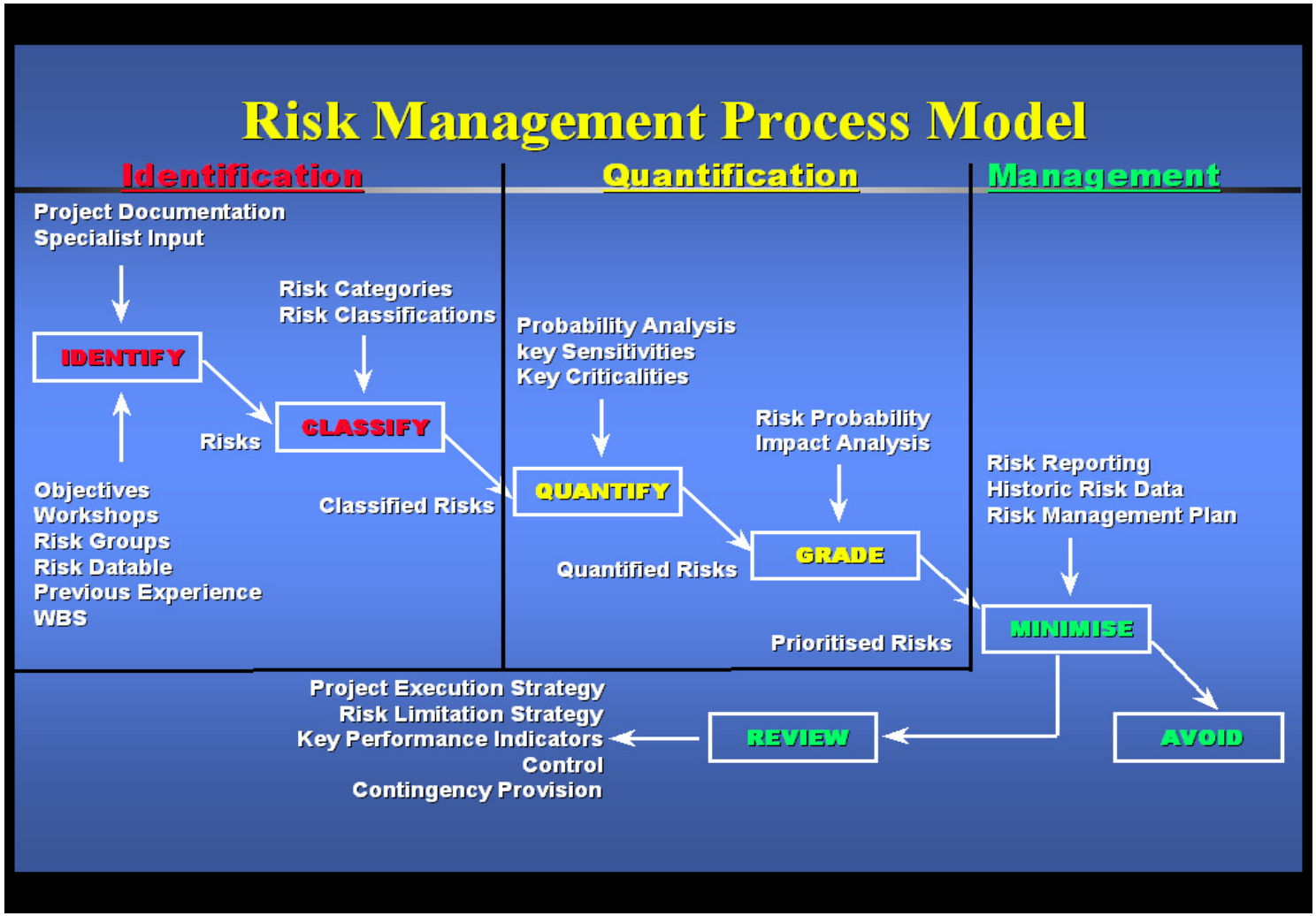
Plan Durn The planned duration is derived by running a global change to pull in the planned remaining duration from the current schedule.

Max Durn This contains the project managers estimate of the most *pessimistic* duration of the task.

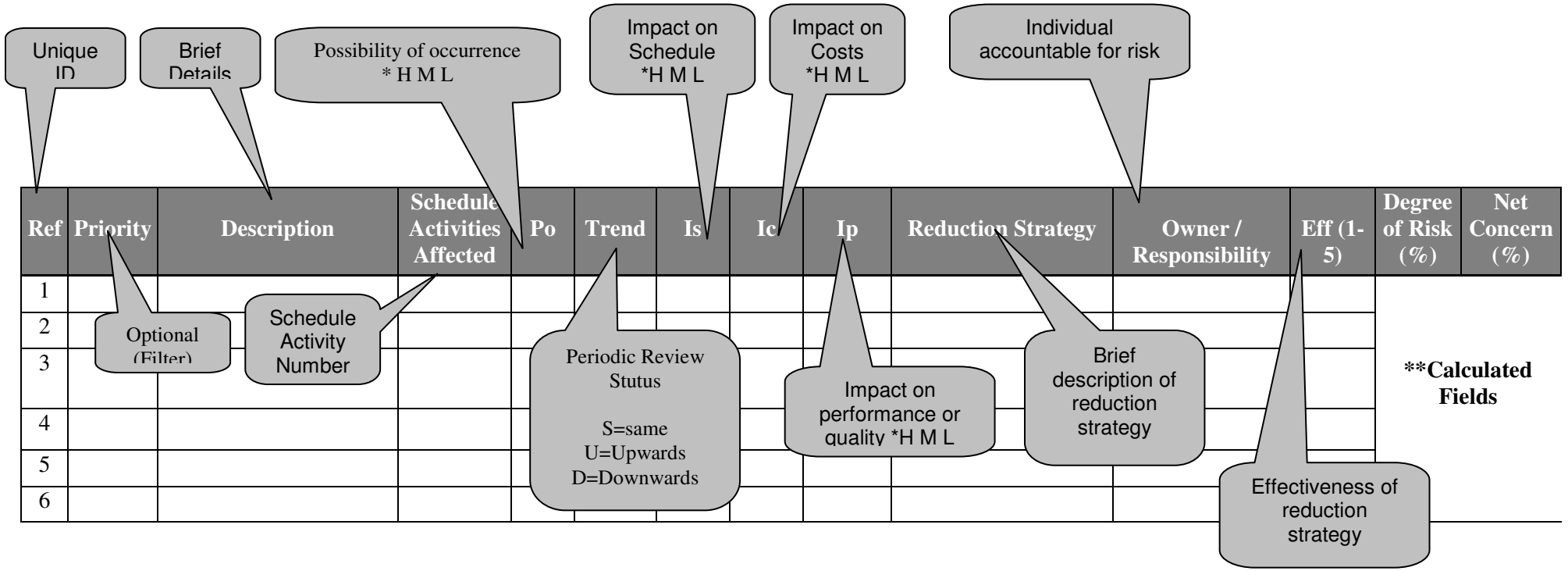
The Update Cycle

During the risk review meeting the project manager (or nominated representative) will review the optimistic and pessimistic duration's of the activities, this information will be used to run a Monte Carlo simulation. The results of the simulation will be reviewed by the project manager prior to inclusion in the next periods risk analysis report.

Appendix B Risk Management Process



Appendix C Sample Risk register



Ref	Priority	Description	Schedule Activities Affected	Po	Trend	Is	Ic	Ip	Reduction Strategy	Owner / Responsibility	Eff (1-5)	Degree of Risk (%)	Net Concern (%)
1													
2													
3													
4													
5													
6													

* H=High, M=Medium, L=Low

** Calculated in accordance with IRM guidelines (formula built in to database)

This sample database was designed by the author of the report and was certified as compliant by independent RM auditors.