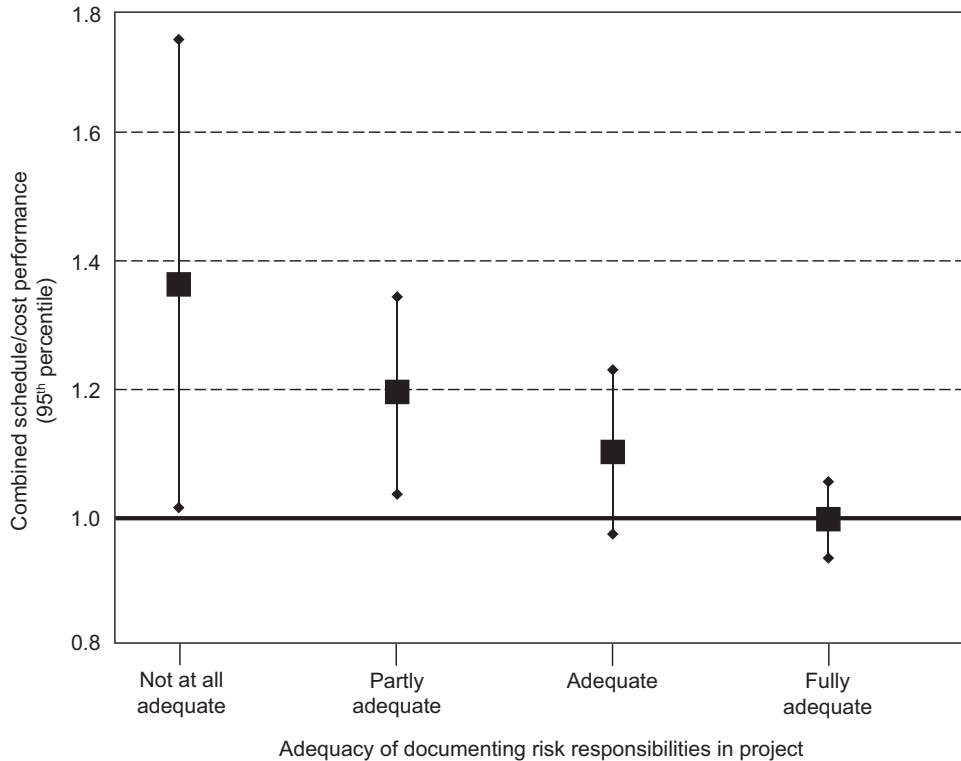**Figure 1-1:** Risk—The Definition Debate

Figure 1-2: Influence of Documenting Risk Responsibilities on
Project Performance (from Cooke-Davies 2002)

Generic benefits of risk management	
"Hard" benefits	**"Soft" benefits**
Enables better informed and more believable plans, schedules, and budgets.	Improves corporate experience and general communication.
Increases the likelihood of a project adhering to its schedules and budgets.	Leads to a common understanding and improved team spirit.
Leads to the use of the most suitable type of contract.	Helps distinguish between good luck/good management and bad luck/bad management.
Allows a more meaningful assessment of contingencies.	Helps develop the ability of staff to assess risks.
Discourages the acceptance of financially unsound projects.	Focuses project management attention on the real and most important issues.
Contributes to the build-up of statistical information to assist in better management of future projects.	Facilitates greater risk-taking, thus increasing the benefits gained.
Enables a more objective comparison of alternatives.	Demonstrates a responsible approach to customers.
Identifies, and allocates responsibility to, the best Risk Owner.	Provides a fresh view of the personnel issues in a project.
Organizational benefits of risk management	
Compliance with corporate governance requirements.	Better reputation as a result of fewer headline project failures.
A greater potential for future business with existing customers.	Better customer relations due to improved performance on current projects.
Reduced cost base.	A less stressful working environment.

Figure 1-3: Benefits of Risk Management (adapted from APM PRAM Guide 2004)

|	Important	Important
	but	and
	Not Effective	Effective
Important	236 responses (42%)	228 responses (41%)
Not Important	Not Important	Not Important
	and	but
	Not Effective	Effective
	93 responses (17%)	4 responses (1%)
	Not Effective	Not Effective

IMPORTANCE

EFFECTIVENESS

Figure 2-1: Importance and Effectiveness of Risk Management

| Common excuses	Proposed solutions
Process takes time and costs money.	Proper application saves time and money. Use the same argument as for quality management.
Responses cost money.	Explain that responses are an investment in the future—spending to save or spending to gain.
Risk management doesn't work.	Do it properly and demonstrate its effectiveness through example or pilot projects.
Risk management is just scare-mongering.	Find the real risks (uncertainties that matter) and always include the positives—opportunities.
Managing issues is more fun.	Develop KPIs that measure the effectiveness of risk management and reward those who do it properly.
It's too late.	Remind everyone that it is never too late; failing to identify risks doesn't make them go away.
Too busy dealing with issues.	Risk management will prevent issues so starting the process will make for a better future.
It's just common sense.	Unfortunately it isn't to all. The framework of risk management will help those with less common sense.
Can't prove it works.	Demonstrate the benefits; perhaps by emphasizing the management of opportunities. Seek evidence from outside.

Figure 2-2: Excuses and Solutions

Supportive organization	Competent people
• Clear objectives for risk management	• Shared understanding of the key concepts and principles of risk management
• Availability of adequate resources	• A common language and agreement of key risk management terms
• Buy-in from all stakeholders	
• A culture that recognizes that uncertainty is inevitable	• Recognize the need for continuous training of staff
• Accept the need to change in response to risk management	• Skilled and competent staff
• Suitable contractual framework to support the risk process	• Combination of theoretical knowledge, effective behaviors, and appropriate attitudes
Appropriate methods, tools, and techniques	**Simple, scaleable process**
• Required level of infrastructure and software tools to support appropriate level of implementation	• Recognize that "one size fits all" is the wrong approach
	• Efficient procedural framework
• Training in the selected methods, tools, and techniques	• A documented process
• Integrated toolkit, both internally coherent, and interfacing with project management and business tools	• Clear instruction on "what to do"

Figure 2-3: Critical Success Factors for Effective Risk Management
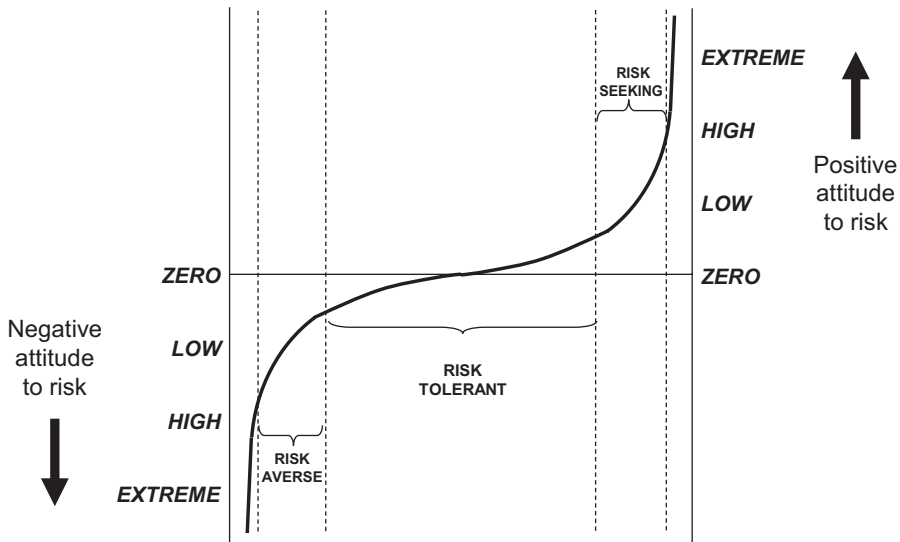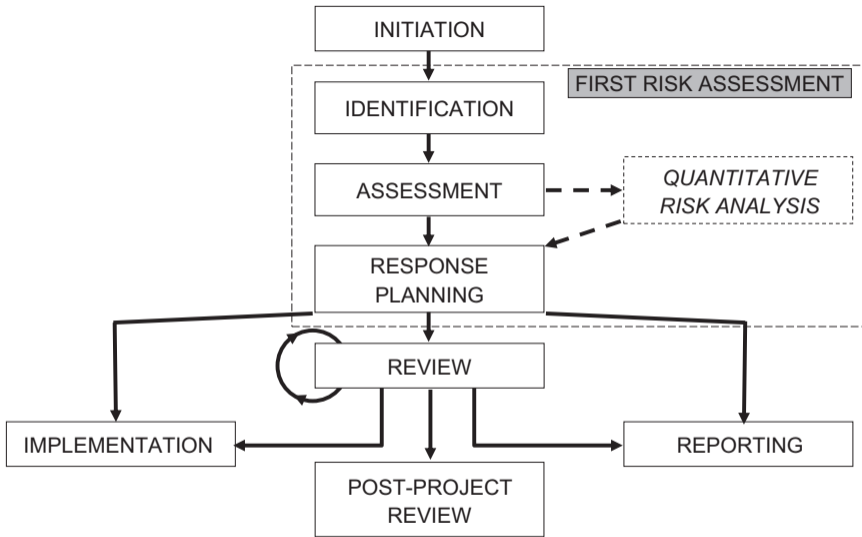
Figure 2-4: Range of Organizational Risk Cultures
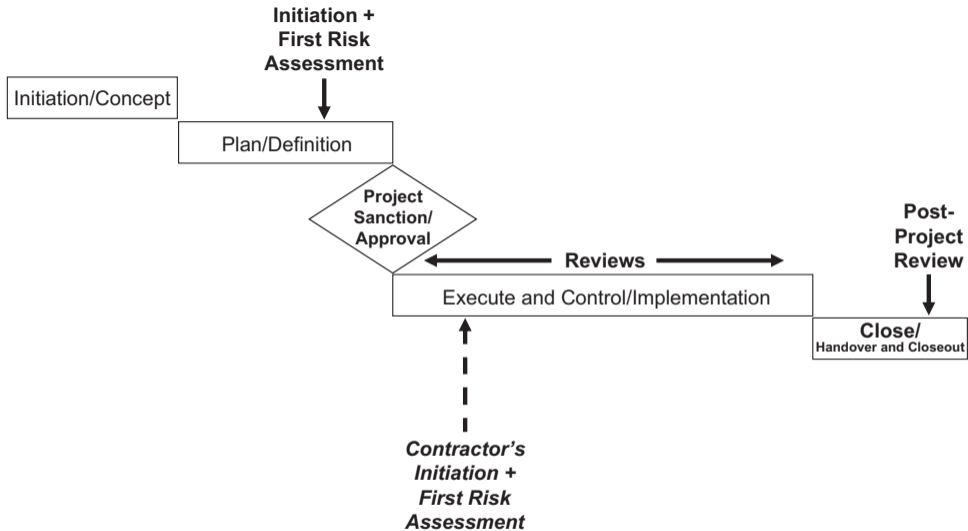(based on Hillson and Murray-Webster 2007)
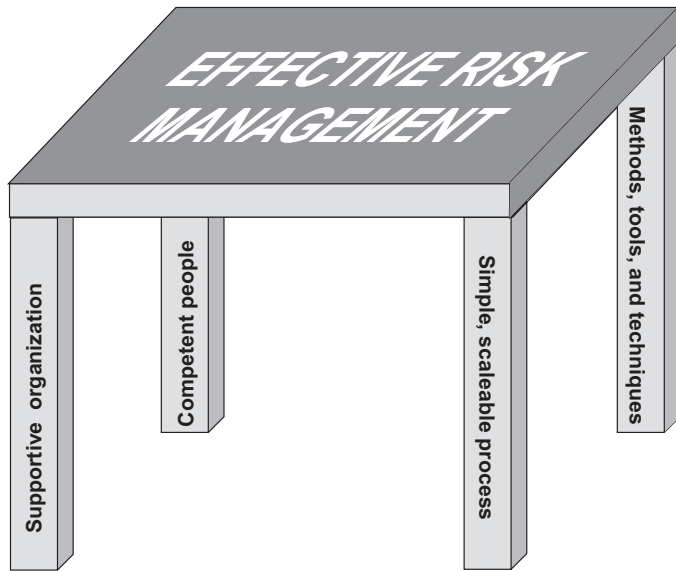
Figure 2-5: Critical Success Factors to Support Effective Risk Management

Figure 3-1: Steps in the ATOM Process
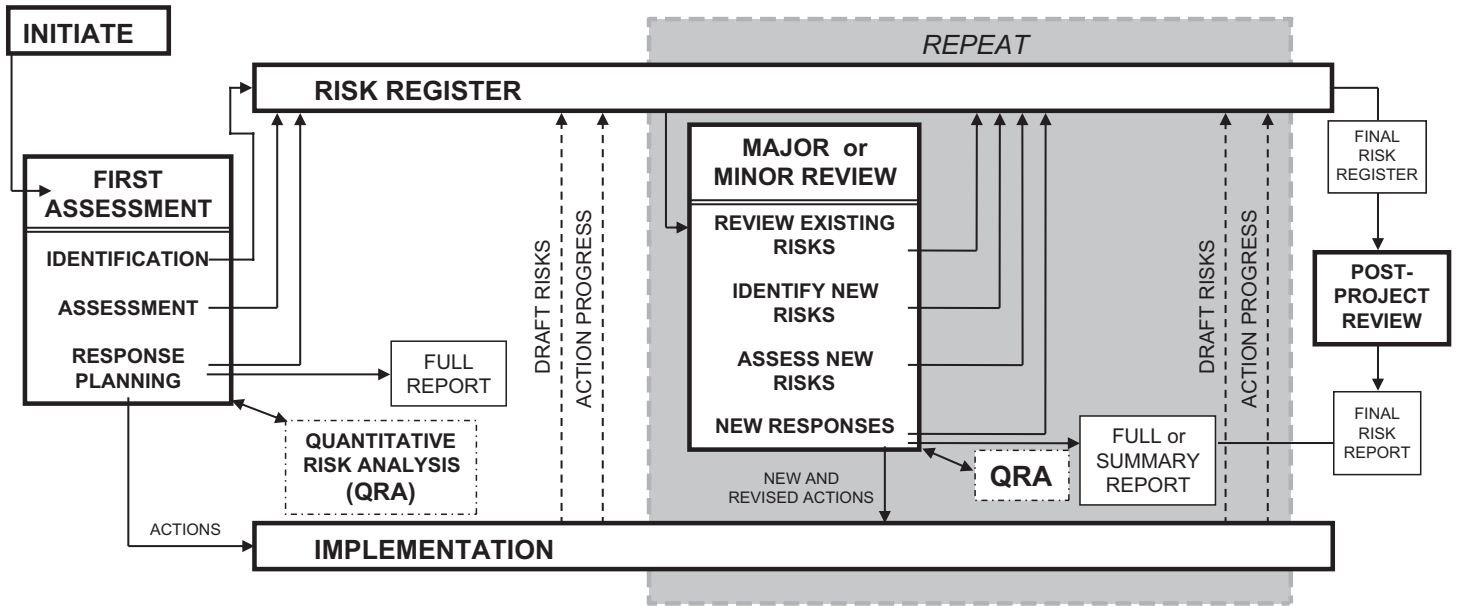
Figure 3-2: ATOM Steps through the Project Life Cycle

Figure 3-3: The Full ATOM Process

This Project Sizing Tool divides projects into three categories (Small, Medium, and Large) to indicate the appropriate level of risk management process. Two shortcuts are used: projects with value <$50K are automatically defined as Small, and projects valued at >$5M are defined as Large. Projects valued between $50K–$5M are assessed against the ten criteria below. For each criterion the closest description is selected, and the corresponding criterion score is recorded at the right of the row (one of 2, 4, 8, or 16). Criterion scores are totaled to give an overall project score, indicating project size as follows:

≥75	*Large project*	An extended ATOM risk management process is required.
35–74	*Medium project*	A standard ATOM risk management process is required.
<35	*Small project*	A reduced ATOM risk management process is required.

Criterion	Criterion value = 2	Criterion value = 4	Criterion value = 8	Criterion value = 16	Criterion score
Strategic importance	Minor contribution to business objectives	Significant contribution to business objectives	Major contribution to business objectives	Critical to business success	
Commercial/ contractual complexity	No unusual commercial arrangements or conditions	Minor deviation from existing commercial practices	Novel commercial practices, new to at least one party	Groundbreaking commercial practices	
External constraints and dependencies	None	Some external influence on elements of the project	Key project objectives depend on external factors	Overall project success depends on external factors	
Requirement stability	Clear, fully defined, agreed-upon objectives	Some requirement uncertainty, minor changes during project	Major requirement uncertainty, major changes during project	Requirements not finalized and subject to negotiation	
Technical complexity	Routine repeat business, no new technology	Enhancement of existing product/ service	Novel product/ project with some innovation	Groundbreaking project with high innovation	
Market sector regulatory characteristics	No regulatory requirements	Standard regulatory framework	Challenging regulatory requirements	Highly regulated or novel sector	
Project value	Small project value (<$250K)	Significant project value ($250K–$1M)	Major project value ($1–$3M)	Large project value (>$3M)	
Project duration	Duration <3 months	Duration 3–12 months	Duration 1–3 years	Duration >3 years	
Project resources	Small in-house project team	Medium in-house project team	Large project team including external contractors	International project team or joint venture	
Post-project liabilities	None	Acceptable exposure	Significant exposure	Punitive exposure	
OVERALL PROJECT SCORE					

Figure 3-4: Example Project Sizing Tool

|	Definition of risk	Risk management process	Unique aspects and emphasis
ATOM	**Any uncertainty that, if it occurs, would have a positive or negative effect on achievement of one or more objectives.**	**A** **Initiation** **B** **Identification** **C1** **Assessment** **C2** **(Quantitative risk analysis)** **D** **Response planning** **E** **Reporting** **F** **Implementation** **G** **Review** **H** **Post-project review**	• **Totally scalable** • **Can be used on all projects** • **Practical "how to" method**
Management of Risk— Guidance for Practitioners (M_o_R), Third Edition (2010)	An uncertain event or set of events that, should it occur, will have an effect on the achievement of objectives. A risk is measured by a combination of the probability of a perceived threat or opportunity occurring and the magnitude of its impact on objectives.	A Identify—context B Identify—identify the risks C1 Assess—estimate C2 Assess—evaluate D Plan F Implement ? Embed and review ? Communicate	• Entire chapters on risk principles and embedding and reviewing management of risk • Applicable to strategic, program, project, and operational risk • Part of a larger suite of methods, including Managing Successful Programs and PRINCE2

Figure 3-5: Comparison of Different Standards *(continues)*

	Definition of risk	Risk management process	Unique aspects and emphasis
ISO 31000:2018 Risk Management— Guidelines (2018)	Effect of uncertainty on objectives.	A Scope, context, and criteria B Risk identification C Risk analysis C Risk evaluation D Risk treatment G Monitoring and review E Recording and reporting ? Communication and consultation	• Applicable to all levels of risk management • Includes risk principles and a risk management framework • Lists communication and consultation as distinct elements of the process
PMI Standard for Risk Management in Portfolios, Programs and Projects (2019)	An uncertain event or condition that, if it occurs, has a positive or negative effect on one or more enterprise, portfolio, program, and project objectives.	A Plan risk management B Identify risks C1 Perform qualitative risk analysis C2 Perform quantitative risk analysis D Plan risk responses F Implement risk responses E/G Monitor risks	
Guide to the Project Management Body of Knowledge [PMBOK® Guide]—Sixth Edition (2018)	An uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives.	A Plan risk management B Identify risks C1 Perform qualitative risk analysis C2 Perform quantitative risk analysis D Plan risk responses F Implement risk responses E/G Monitor risks	• Strong process orientation (inputs/tools and techniques/outputs) • Addresses opportunities as well as threats

Figure 3-5: *(continues)*

	Definition of risk	Risk management process	Unique aspects and emphasis
Risk Analysis and Management for Projects [RAMP]—Third Edition (2014)	A possible occurrence that could affect (positively or negatively) the achievement of the objectives for an investment.	A Process launch B Plan and initiate risk review B Identify risks C Evaluate risks D Devise measures for responding to risks D Assess residual risks and decide whether to continue D Plan responses to residual risks E Communicate risk response strategy and response plan F Implement strategy and plans G Control risks H Process close-down	• Considers opportunities as well as threats • Focus on whole life assets with emphasis on capital projects
Project Risk Analysis and Management [PRAM] Guide—Second Edition (2004)	**Risk event** An uncertain event or set of circumstances that, should it or they occur, would have an effect on the achievement of one or more of the project's objectives. **Project risk** The exposure of stakeholders to the consequences of variations in outcome.	A Initiate B Identify C Assess D Plan responses E Implement responses ? Manage process	• Includes chapters on benefits of managing risks (2), establishing a risk management organization (5), behavioral aspects (6), and implementation/ application issues (7) • Addresses threats and opportunities • Defines risk at two levels: risk event and project risk
BS IEC 62198:2014—Managing Risk in Projects—Application Guidelines (2014)	Combination of the probability of an event occurring and its consequences on project objectives.	A Establishing the context B Risk identification C Risk analysis C Risk evaluation D Risk treatment G Monitoring and review	• Originated as part of dependability standard • Focus on projects with technological content

Figure 3-5: *(continued)*
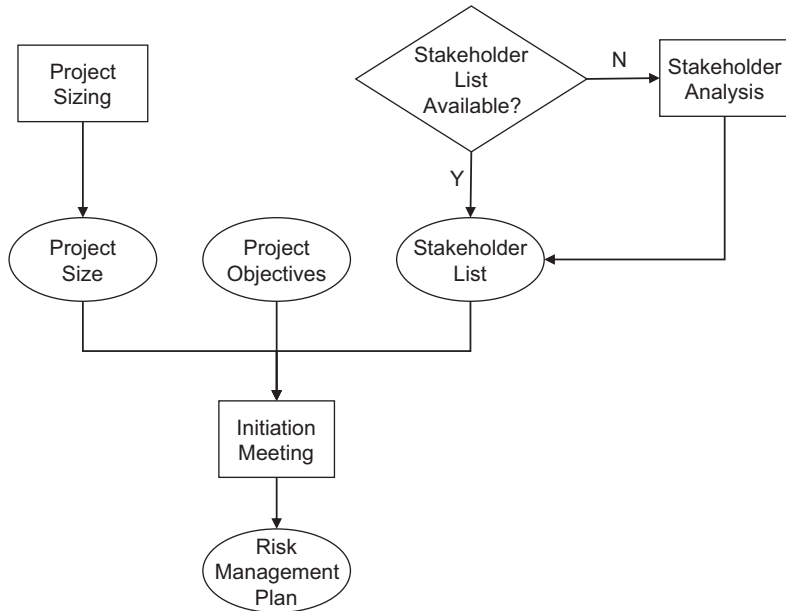
**Figure 4-1:** Flowchart for the Initiation Step

Stakeholder	Area of interest	Attitude (+/−)	Power (+/−)	Interest (+/−)	Stakeholder type

Instructions:

- List all key stakeholders and their interest (or stake) in the project in the left-hand two columns.
- For each stakeholder, identify whether their attitude toward the project is supportive or resistant (+ or −), whether their power to influence the project is high or low (+ or −), and whether their level of interest in the project is high or low (+ or −).

Figure 4-2: Stakeholder Analysis Template
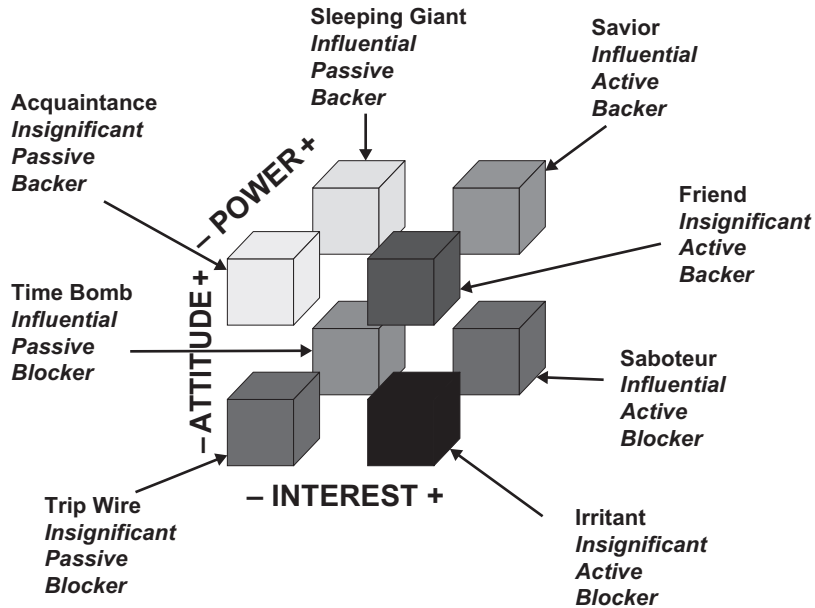
Figure 4-3: Stakeholder Mapping Cube (from Murray-Webster and Simon 2006)

Type	Attitude	Power	Interest	Description
Savior	+	+	+	These are powerful, with a high-interest level and a positive attitude toward the project. It is important to pay attention to these stakeholders, harnessing their support and doing whatever is necessary to keep it.
Friend	+	−	+	With low power but high interest and positive attitude, these stakeholders can be used as a confidant or sounding board. Their support should be maintained in case they gain additional power within the organization.
Sleeping Giant	+	+	−	Powerful stakeholders who support the project but display low levels of interest need to be awakened in order to raise their commitment to the project and maximize their positive input.
Acquaintance	+	−	−	Low-power, low-interest backers should be kept informed but need not be a top priority unless their levels of power or interest increase.
Saboteur	−	+	+	People who are powerful and have a high interest level in the project, but who display a negative attitude must be actively engaged in order to prevent them causing significant disruption to the project. The aim is to convert their attitude to be more supportive of the project, using their influence to benefit the project.
Irritant	−	−	+	These are very interested in the project but do not support it, though they have little power to influence things. Their negative attitude needs to be contained and countered where possible.
Time Bomb	−	+	−	Stakeholders who are powerful but have low-interest levels and a negative attitude toward the project should be understood so they can be "defused before the bomb goes off." Efforts should be made to transform their attitude to be more positive and to engage their active input.
Trip Wire	−	−	−	Low-power, low-interest, negative-attitude stakeholders are likely to act as a hindrance to the project, and their interaction with the project should be minimized as far as possible.

Figure 4-4: Descriptions of Different Stakeholders

Time allowance (hours)	Content
½	1. Introductions
¼	2. Background to the project
½ – 1	3. Clarification of project objectives: Scope, time, cost, quality, other objectives?
¼	4. Scope and objectives of the risk management process
¼	5. Application of the ATOM risk management process
¼	6. Tools and techniques to be used
½	7. Roles and responsibilities for risk management
¼	8. Reporting and review requirements
¼	9. Definitions of scales for probability and impacts (P-I Scales)
¼	10. Risk thresholds
¼	11. Potential sources of risk to this project
¼	12. Next steps

Figure 4-5: Typical Agenda for an Initiation Meeting

	Project sponsor	Project manager	Risk champion	Risk owner	Action owner	Project team members	Other stakeholders
Produce and maintain Risk Management Plan	C	A	R	I	I	I	I
Facilitate risk process (workshops, interviews, risk review meetings, etc.)		A	R				
Identify risks	R	R	A	I		R	R
Assess risks		R	A	I		R	R
Develop responses		A	C	R	C	C	I
Implement responses		I	I	A	R	C	I
Report progress on actions (individual risks)		I	A	R	R		
Produce and maintain Risk Register	I	A	R	C	I	I	I
Produce and maintain Risk Reports	I	A	R	C	I	I	I
Key:							
R = Responsible **A** = Accountable/Approve **C** = Consult **I** = Inform							

Figure 4-6: Example RACI Chart

Project Sponsor—has overall accountability for the project and for delivering its promised benefits, and as such is by many considered to be the ultimate risk taker and perhaps Risk Owner. The Project Sponsor must ensure that resources and funds are provided to the project for risk management. The role of the Project Sponsor in relation to risk management will include

• Actively supporting and encouraging the implementation of a formal risk management process on the project.
• Setting and monitoring risk thresholds and ensuring these are translated into acceptable levels of risk for the project.
• Attending risk workshops, identifying risks, and owning risks.
• Reviewing risk outputs from the project with the Project Manager to ensure process consistency and effectiveness.
• Reviewing risks escalated by the Project Manager that are outside the scope or control of the project or that require input or action from outside the project.
• Taking decisions on project strategy in light of current risk status to maintain acceptable risk exposure.
• Ensuring adequate resources are available to the project to respond appropriately to identified risk.
• Releasing "management reserve" funds to the project where justified to deal with exceptional risks.
• The regular reporting of risk status to senior management.

Project Manager—has overall responsibility for delivering the project on time, within budget, and to the agreed level of quality such that the project's outputs will allow the promised benefits to be achieved. The Project Manager is accountable for the day-to-day management of the project, and as part of this must make sure that risk management takes place and that risks are identified and managed through effective risk management. The role of the Project Manager will include

• Determining the acceptable levels of risk for the project by consultation with the Project Sponsor.
• Approving the Risk Management Plan prepared by the Risk Champion.
• Promoting the risk management process for the project.
• Chairing risk workshops and review meetings when not facilitated by the Risk Champion or an external facilitator.
• Participating in risk workshops and review meetings when facilitated by the Risk Champion, and identifying and owning risks.
• Approving risk response plans and their associated risk actions prior to implementation.
• Applying project contingency funds to deal with identified risks that occur during the project.
• Overseeing risk management by subcontractors and suppliers.
• The regular reporting of risk status to the Project Sponsor and project board/steering committee with recommendations for appropriate strategic decisions and actions to maintain acceptable risk exposure.
• Highlighting to senior management any identified risks that are outside the scope or control of the project, or that require input or action from outside the project, or where release of "management reserve" funds might be appropriate.
• Monitoring the efficiency and effectiveness of the process in conjunction with the Risk Champion. The Project Manager reports to the Project Sponsor.

Figure 4-7: Roles and Responsibilities within ATOM *(continues)*

Risk Champion—(this might be a full-time role or a part-time role) has responsibility for overseeing and managing the risk management process on a day-to-day basis. The role of the Risk Champion will include
• Preparing the Risk Management Plan.
• Facilitating risk workshops and review meetings at which risks will be identified and assessed.
• Creating and maintaining the Risk Register.
• Interviewing Risk Owners to determine risk responses.
• Ensuring the quality of all risk data.
• Analyzing data and producing risk reports.
• Reviewing progress with Risk Owners of risk responses and their associated actions.
• Advising the Project Manager on all matters relating to risk management.
• Coaching and mentoring team members and other stakeholders on aspects of risk management.
The Risk Champion reports to the Project Manager.

Risk Owner—appointed by the Project Manager in liaison with the Risk Champion as the best person to manage an identified risk. The Risk Owner's role is temporary in that once a risk has been closed, their role ceases. A Risk Owner can be a member of the project team, a stakeholder who is not part of the project team or specialist from outside the project. The role of the Risk Owner will include
• Developing responses to risks in the form of risk actions that they will assign to Action Owners.
• Monitoring the progress on their risk responses.
• Reporting progress on responses to the Risk Champion via the Risk Register.

Action Owner—appointed by Risk Owners to perform the actions that make up a response to a risk. Like the role of the Risk Owner, the role of the risk Action Owner is temporary as once the action has been completed, their role will cease. Several Action Owners may contribute to the response to one risk.
• Implementing agreed-upon actions to support response strategies.
• Reporting progress on actions to the Risk Owner and recommending any other actions needed to manage the risk.

Project Team Members—responsible to the Project Manager and must make sure that the risk management plan and risk management process are followed by themselves and others who report to them. They are inevitably a stakeholder in the project and will therefore participate in risk workshops and risk review meetings as required.
• Participating actively in the risk process and proactively identifying and managing risks in their area of responsibility.
• Providing inputs to the Project Manager for risk reports.

Other Stakeholders—some of which might be classified as key stakeholders. All stakeholders are important to the project, and they must be involved in risk management where appropriate. Stakeholders are often in themselves both causes of risks and the possible source of responses to risks. Key stakeholders will be required to participate in risk workshops throughout the project.

Figure 4-7: *(continued)*

Scale	Probability	+/− Impact on project objectives		
		Time	Cost	Quality
VHI	71–99%	>20 days	>$200K	Very significant impact on overall functionality
HI	51–70%	11–20 days	$101K–$200K	Significant impact on overall functionality
MED	31–50%	4–10 days	$51K–$100K	Some impact in key functional areas
LO	11–30%	1–3 days	$10K–$50K	Minor impact on overall functionality
VLO	1–10%	<1 day	<$10K	Minor impact on secondary functions
NIL	<1%	No change	No change	No change in functionality

Figure 4-8: Example Probability-Impact Scales

A project for the release of a new product has a planned timeline of 10 months and a budget of $4M. Delivery of more than 2 months late would miss the market window, and if the costs were anticipated to grow above $5M, it would be canceled. The earliest feasible delivery date to meet market requirements would be 4 weeks ahead of schedule. Costs savings of more than $500K would double the expected margin. Variations in schedule or budget of up to +/− 15% are acceptable.

Impact scales for this project might be:

	Threat impacts						Opportunity impacts					
	Step 1—Define VHI		Step 2—Define VLO		Step 3—Set intermediate values		Step 4—Define VHI		Step 5—Define VLO		Step 6—Set intermediate values	
	Time	Cost	Time	Cost	Time	Cost	Time	Cost	Time	Cost	Time	Cost
VHI	>8 wks	>$1M					>4 wks	>$500K				
HI					4–8 wks	$500K–$1M					3–4 wks	$250K–$500K
MED					2–4 wks	$100K–$500K					2–3 wks	$80K–$250K
LO					1–2 wks	$10K–$100K					1–2 wks	$10K–$80K
VLO			<1 wk	<$10K					<1 wk	<$10K		

Figure 4-9: Examples of How to Set Impact Scales
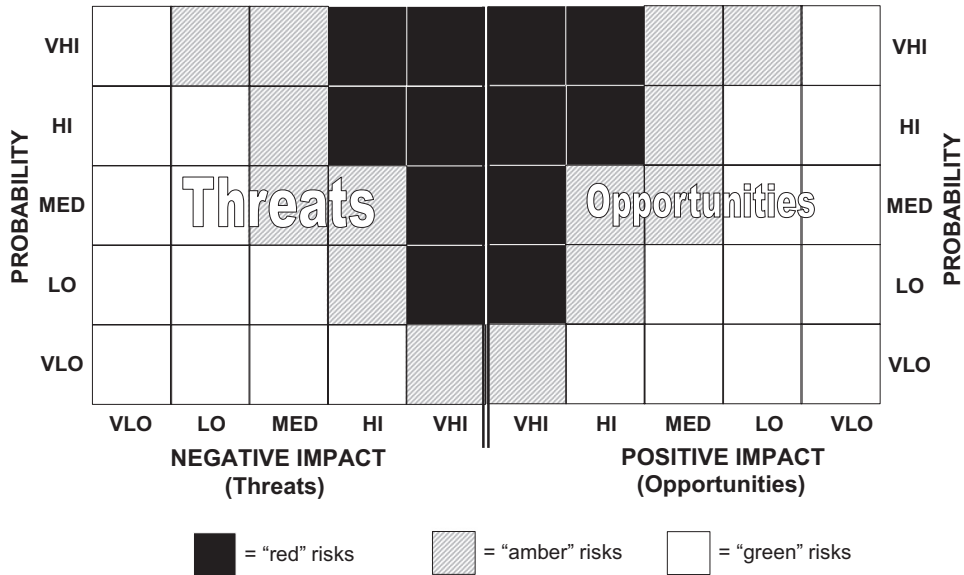
Figure 4-10: Double Probability-Impact Matrix

RBS Level 0	RBS Level 1	RBS Level 2
0. PROJECT RISK	1. TECHNICAL RISK	1.1 Scope definition 1.2 Requirements definition 1.3 Estimates, assumptions & constraints 1.4 Technical processes 1.5 Technology 1.6 Technical interfaces 1.7 Design 1.8 Performance 1.9 Reliability & maintainability 1.10 Safety 1.11 Security 1.12 Test & acceptance
	2. MANAGEMENT RISK	2.1 Project management 2.2 Program/portfolio management 2.3 Operations management 2.4 Organisation 2.5 Resourcing 2.6 Communication 2.7 Information 2.8 HS&E 2.9 Quality 2.10 Reputation
	3. COMMERCIAL RISK	3.1 Contractual terms & conditions 3.2 Internal procurement 3.3 Suppliers & vendors 3.4 Subcontracts 3.5 Client/customer stability 3.6 Partnerships & joint ventures
	4. EXTERNAL RISK	4.1 Legislation 4.2 Exchange rates 4.3 Site/facilities 4.4 Environmental/weather 4.5 Competition 4.6 Regulatory 4.7 Political 4.8 Country 4.9 Social/demographic 4.10 Pressure groups 4.11 Force majeure

Figure 4-11: Sample Risk Breakdown Structure

INTRODUCTION

PROJECT DESCRIPTION AND OBJECTIVES

AIMS, SCOPE, AND OBJECTIVES OF RISK PROCESS

APPLICATION OF THE ATOM PROCESS

RISK TOOLS AND TECHNIQUES

ORGANIZATION, ROLES, AND RESPONSIBILITIES
FOR RISK MANAGEMENT

RISK REVIEWS AND REPORTING

APPENDICES

A PROJECT-SPECIFIC DEFINITIONS OF PROBABILITY AND IMPACTS

B PROJECT-SPECIFIC SOURCES OF RISK (RISK BREAKDOWN
   STRUCTURE)

Figure 4-12: Sample Contents List for a Risk Management Plan
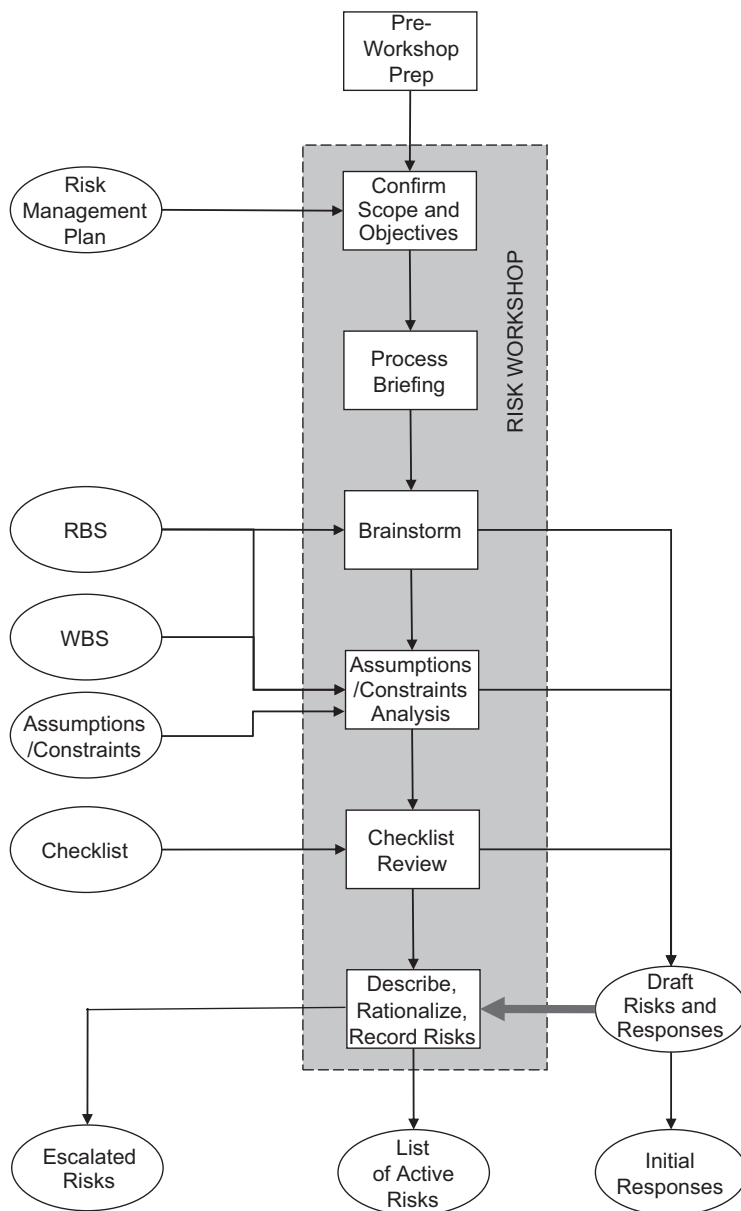
Figure 5-1: Flowchart for the Identification Step

DAY 1
Morning
1. Introductions
2. Confirm project objectives
3. Confirm scope of risk process for this workshop
4. Workshop ground rules
5. Risk management briefing (if required)
6. Expectations and results
7. Identify risks
Brainstorm risks using the Risk Breakdown Structure
Afternoon
Analysis of Assumptions and Constraints to generate further risks
A Standard Risk Checklist to identify any further/final risks
8. Rationalize risks
9. Describe risks using risk metalanguage
10. Record identified risks (during workshop or after meeting)
DAY 2
Morning
11. Explanation of assessment scheme (recap)
12. Assessment of probability and impacts
13. Risk categorization
Afternoon
14. Nomination of Risk Owners
15. *If time, develop initial responses to priority risks*
16. Close the workshop

Figure 5-2: Sample Agenda for a First Risk Assessment/Two-Day Risk Workshop
(Including Identification and Assessment Steps)

Assumption or constraint	Could this assumption/ constraint prove false? (Y/N)	If false, would it affect project? (Y/N)	Convert to a risk?
Instructions: List all project assumptions and constraints in the left-hand column. Identify whether each might prove false (Y/N), and whether a false assumption/ constraint might affect the project (Y/N). Where both answers are Yes, mark the assumption/constraint as a risk.			

Figure 5-3: Assumptions and Constraints Analysis Template

The risk metalanguage provides a three-part structured description of a risk, which separates cause, risk, and effect as follows:		
"As a result of \<cause\>, \<risk\> may occur, which would lead to \<effect on objective(s)\>."		
Example risk descriptions linking these three elements using risk metalanguage might be		
Cause (a definite fact)	**Risk (an uncertain event or set of circumstances)**	**Effect (a direct impact on a project objective)**
As a result of using novel hardware . . .	. . . unexpected system integration errors may occur . . .	. . . which would lead to overspending on the project.
Because our organization has never done a project like this before . . .	. . . we might misunderstand the customer's requirement . . .	. . . which would mean that our solution would not meet the quality acceptance criteria.
We have to outsource production . . .	. . . [so] we may be able to learn new practices from our selected partner . . .	. . . which would lead to increased productivity and profitability.
Because we have no experience using this technology . . .	. . . we might not have the necessary skilled staff to carry out the design work . . .	. . . which would lead to a delay in the project while we train our staff or recruit new skilled staff and increased costs (due to the delay).
The project is planned to take place during the summer . . .	. . . skilled student labor might be available to recruit . . .	. . . which would mean that time can be saved on all activities that take place over that period, leading to an earlier completion date.
Because there are three other projects taking place in the same time frame . . .	. . . we may be able to utilize skilled staff as they become available from another project . . .	. . . which would allow us to deliver early to the customer.

**Figure 5-4:** Examples of Risk Metalanguage
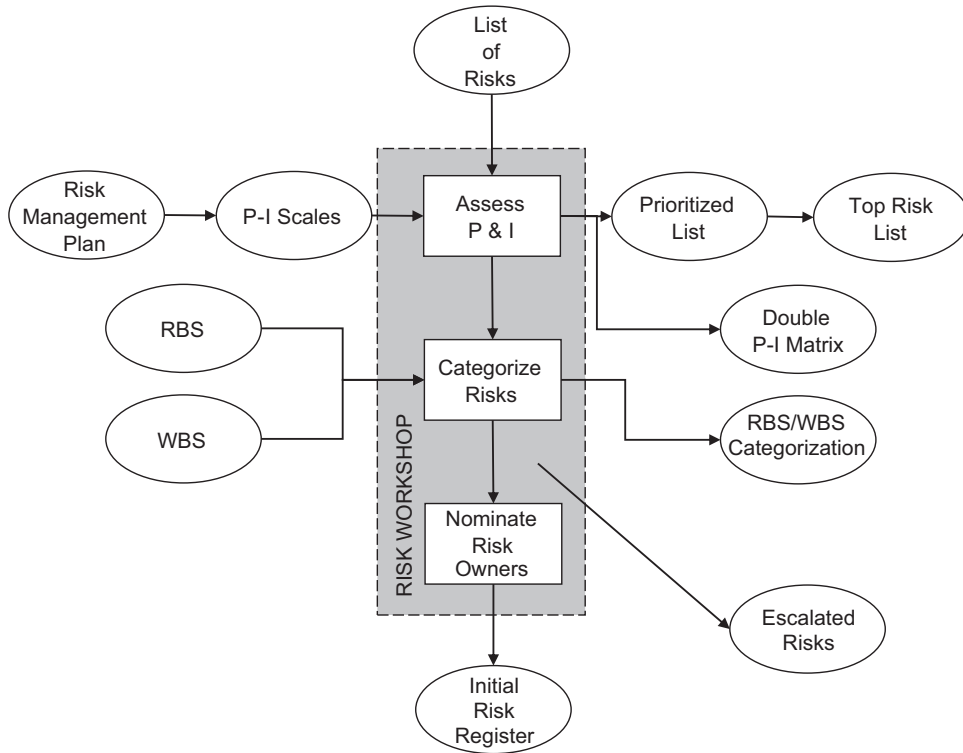
Figure 6-1: Flowchart for the Assessment Step

Scale	Probability	+/− Impact on project objectives		
		Time	**Cost**	**Quality**
VHI	71–99%	>20 days	>$200K	Very significant impact on overall functionality
HI	51–70%	11–20 days	$101K–$200K	Significant impact on overall functionality
MED	31–50%	4–10 days	$51K–$100K	Some impact in key functional areas
LO	11–30%	1–3 days	$10K–$50K	Minor impact on overall functionality
VLO	1–10%	<1 day	<$10K	Minor impact on secondary functions
NIL	<1%	No change	No change	No change in functionality

Figure 6-2: Example of Project-Specific Probability-Impact Scales
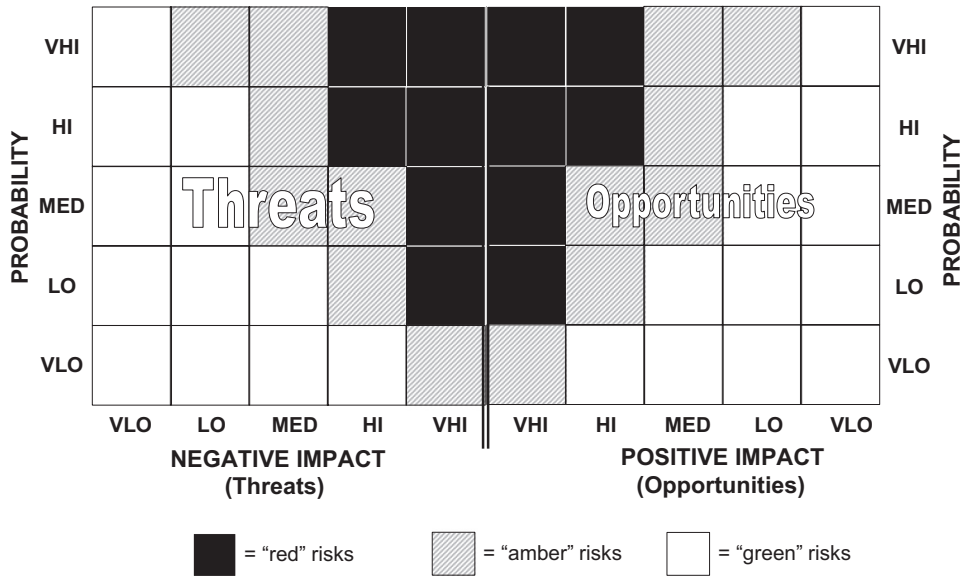
Figure 6-3: Double Probability-Impact Matrix

Rank	Probability	Impact
VHI	0.9	0.8
HI	0.7	0.4
MED	0.5	0.2
LO	0.3	0.1
VLO	0.1	0.05

Figure 6-4: Probability-Impact Scoring Scheme
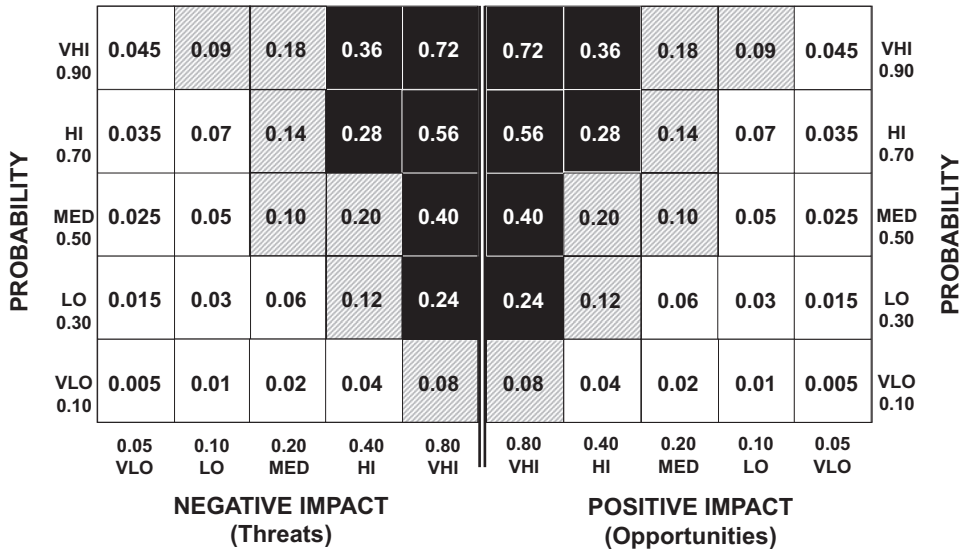
Figure 6-5: Probability-Impact Scoring Scheme on Double
Probability-Impact Matrix

Level 0	Level 1	Level 2	
PROJECT RISK **68 risks**	1. TECHNICAL CONTENT **37 risks**	1.1 SCOPE DEFINITION	**8 risks**
		1.2 TECHNICAL INTERFACES	**4 risks**
		1.3 TEST & ACCEPTANCE	**10 risks**
		1.4 BUSINESS PROCESSES	**2 risks**
		1.5 SDLC	**4 risks**
		1.6 DATA MIGRATION	**5 risks**
		1.7 KNOWLEDGE TRANSFER	**3 risks**
		1.8 ORGANIZATIONAL CHANGE MGT	**0 risks**
		1.9 HARDWARE ACQUISITION	**1 risk**
	2. MANAGEMENT **24 risks**	2.1 SUPPLIER/CUSTOMER RELATIONSHIP	**3 risks**
		2.2 RESOURCING	**8 risks**
		2.3 COMMUNICATION	**2 risks**
		2.4 PROGRAM MGT ORGANIZATION	**8 risks**
		2.5 FACILITIES & INFRASTRUCTURE	**3 risks**
	3. COMMERCIAL **7 risks**	3.1 CONTRACT MANAGEMENT	**5 risks**
		3.2 SUBCONTRACT ISSUES	**2 risks**

Figure 6-6: RBS Categorization

Level 0	Level 1	Level 2	
PROJECT	1. SOFTWARE	1.1 REQUIREMENTS	**18 risks**
		1.2 PROGRAMMING	**10 risks**
		1.3 USER TESTING	**6 risks**
		1.4 TRAINING	**7 risks**
		1.5 WARRANTY SUPPORT	**2 risks**
	2. HARDWARE and COMMS	2.1 SPECIFICATIONS	**10 risks**
		2.2 PROCUREMENT	**8 risks**
		2.3 ASSEMBLY	**1 risk**
		2.4 LOAD TESTING	**2 risks**
		2.5 USER TESTING	**4 risks**
		2.6 WARRANTY SUPPORT	**2 risks**
	3. MANAGEMENT and COMMERCIAL	3.1 PROJECT MANAGEMENT	**4 risks**
		3.2 COMMERCIAL MANAGEMENT	**3 risks**
		3.3 COMMUNICATION	**6 risks**

Figure 6-7: WBS Categorization (Level 2 Only)

Level 0	Level 1	Level 2	
PROJECT RISK **4.28**	1. TECHNICAL CONTENT **2.55**	1.1 SCOPE DEFINITION	**0.55**
		1.2 TECHNICAL INTERFACES	**0.48**
		1.3 TEST & ACCEPTANCE	**0.62**
		1.4 BUSINESS PROCESSES	**0.06**
		1.5 SDLC	**0.48**
		1.6 DATA MIGRATION	**0.20**
		1.7 KNOWLEDGE TRANSFER	**0.15**
		1.8 ORGANIZATIONAL CHANGE MGT	**0.00**
		1.9 HARDWARE ACQUISITION	**0.01**
	2. MANAGEMENT **1.47**	2.1 SUPPLIER/CUSTOMER RELATIONSHIP	**0.25**
		2.2 RESOURCING	**0.41**
		2.3 COMMUNICATION	**0.08**
		2.4 PROGRAM MGT ORGANIZATION	**0.46**
		2.5 FACILITIES & INFRASTRUCTURE	**0.27**
	3. COMMERCIAL **0.26**	3.1 CONTRACT MANAGEMENT	**0.20**
		3.2 SUBCONTRACT ISSUES	**0.06**

Figure 6-8: RBS Categorization by P-I Score

Header information		
Project title, project reference number (where used), phase		
Project Manager		
Client		
Risk Register issue number, date		
Date of most recent risk review		
Risk identification data		
Unique risk identifier		
Date identified		
Threat/opportunity indicator		
Short risk title		
Full risk description (cause/risk/effect)		
Risk source (RBS element)		
Project area affected (WBS element)		
Risk Owner		
Risk status (Draft, Active, Closed, Deleted, Expired, Occurred)		
Risk assessment data		
Probability/frequency of occurrence (current, pre-response) • VLO, LO, MED, HI, VHI		
Impact on each project objective (current, pre-response) • VLO, LO, MED, HI, VHI • Verbal description of impact		
Overall risk ranking • Red/Yellow/Green (or similar) • Risk Score (calculated from probability and impact)		
Risk response data		
Risk response strategy		
Risk actions each with an Action Owner and target completion date		
Risk action status		

Figure 6-9: Data Fields in a Typical Risk Register
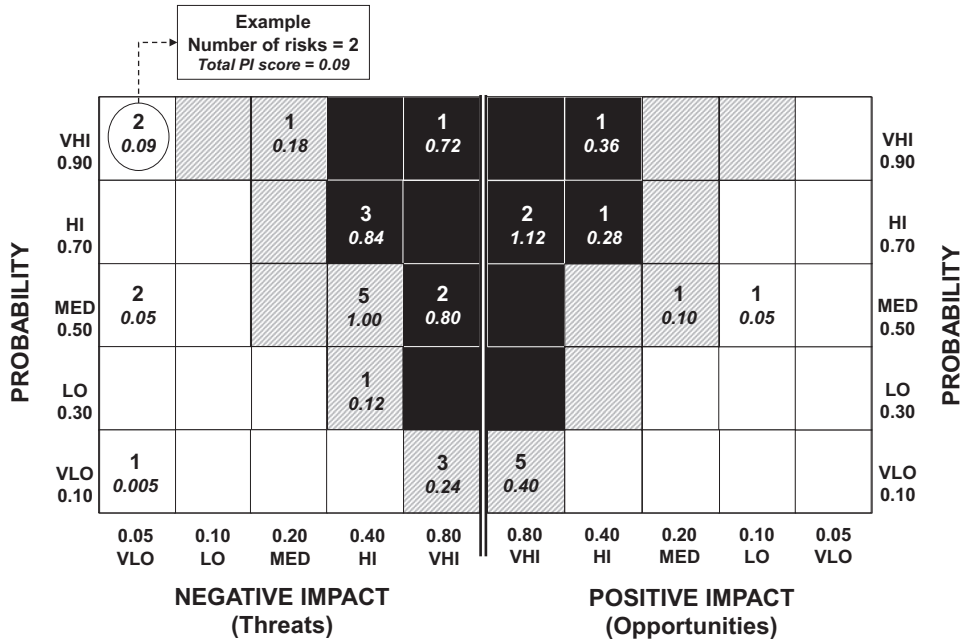
Figure 6-10: Double Probability-Impact Matrix Showing Risk Density
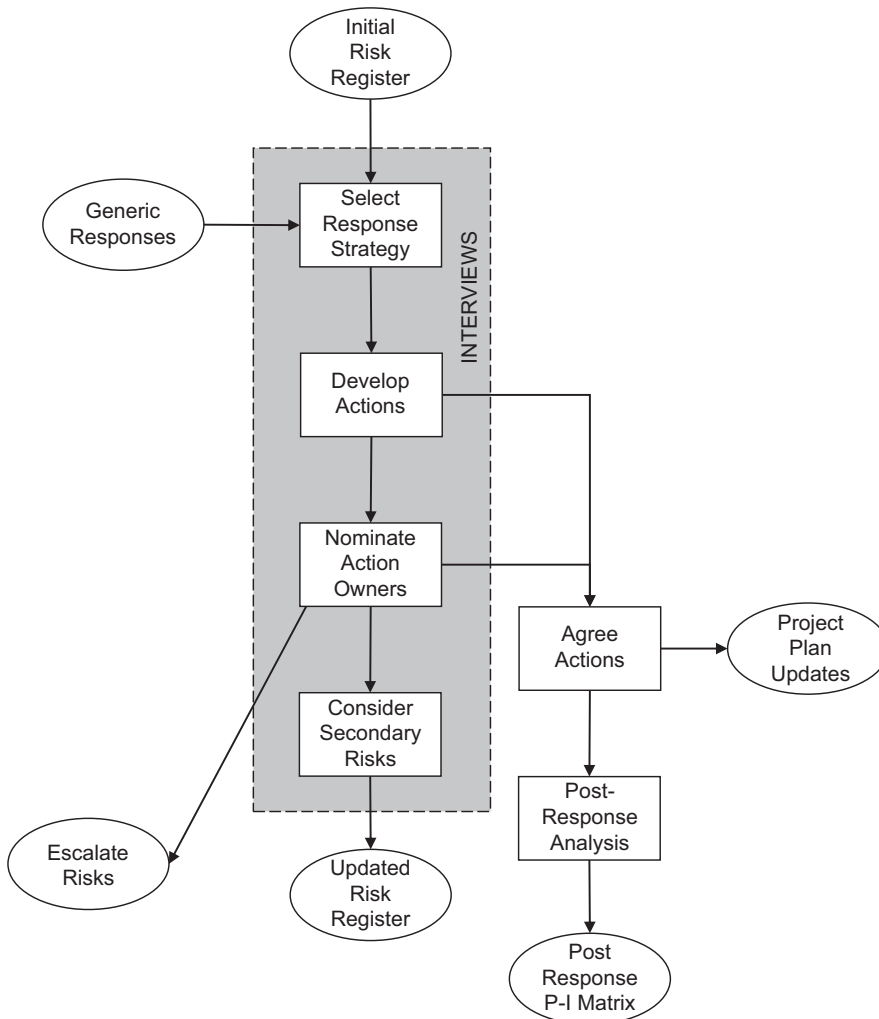
Figure 7-1: Flowchart for the Response Planning Step

Generic responses to threats
Avoid—A response to a threat that eliminates either its probability or impact on the project. This can often be achieved by changing the project management plan for the project or by addressing the cause of the risk.
Transfer—A response to a threat that transfers the risk to a third party who is better able to manage it. The act of transfer does not itself change the risk, but the new owner should be able to take action to avoid or reduce it.
Reduce—A response to a threat that reduces its probability and/or impact on the project, aiming to reduce the risk to an acceptable level. This may be achieved by addressing key risk drivers.
Generic responses to opportunities
Exploit—A response to an opportunity that ensures that the opportunity is taken by guaranteeing that it will definitely occur.
Share—A response to an opportunity that shares the risk with a third party better able to manage it, either by exploiting or enhancing the opportunity.
Enhance—A response to an opportunity that increases its probability and/or impact on the project.
Generic response to threats and opportunities
Accept—A response where either no course of action is taken (perhaps because it is not worth doing anything or it is not possible to), or responses are designed that are contingent upon a change in circumstances. Alternatively, a contingency reserve (time, money, and resources) can be established to deal with the risk should it occur.

Figure 7-2: Generic Response Strategies

Priority	Threat strategy	Opportunity strategy
1	AVOID	EXPLOIT
2	TRANSFER	SHARE
3	REDUCE	ENHANCE
4	ACCEPT	

Figure 7-3: Priorities for Selecting Response Strategies
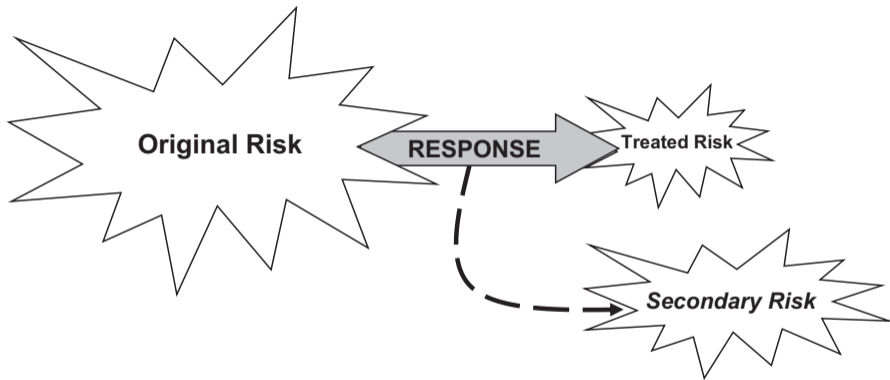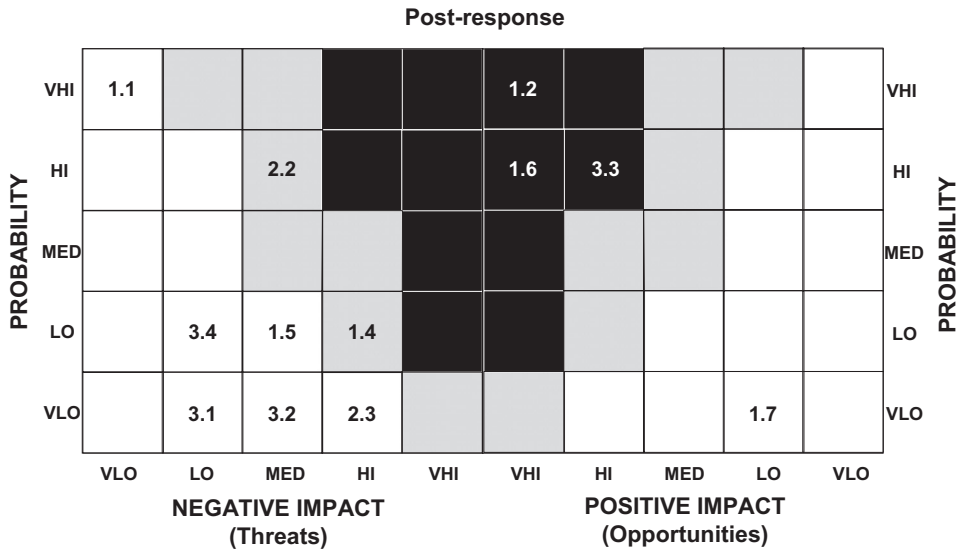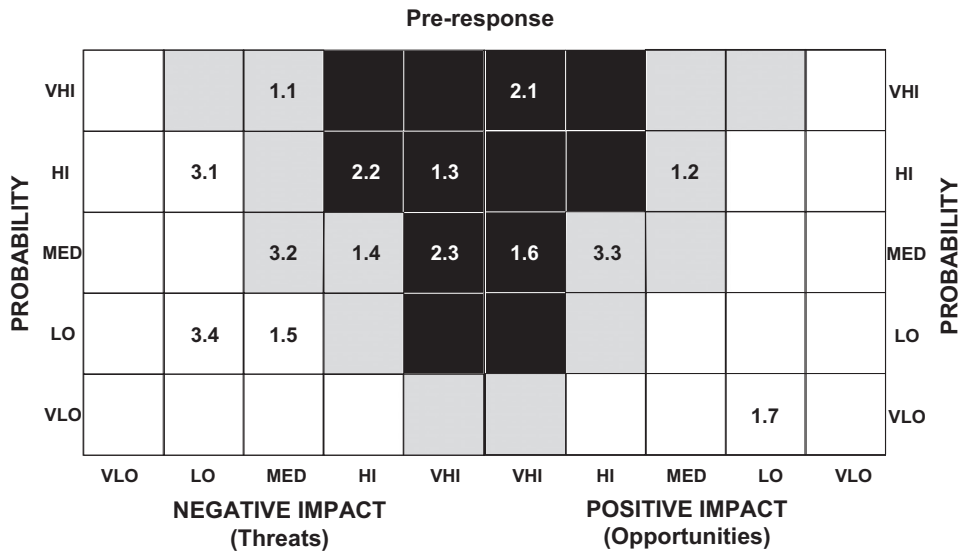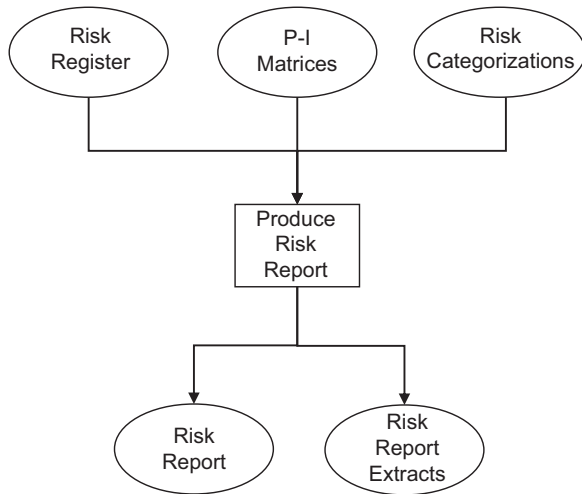
Figure 7-4: Secondary Risks

Figure 7-5: Pre- and Post-Response P-I Matrices

Figure 8-1: Flowchart for the Reporting Step

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EXECUTIVE SUMMARY

SCOPE AND OBJECTIVES OF REPORT

PROJECT STATUS SUMMARY

OVERALL RISK STATUS

TOP RISKS, ACTIONS, AND OWNERS

DETAILED RISK ASSESSMENT
    High/Medium/Low Risks
    Causal Analysis (Mapped to RBS)
    Effects Analysis (Mapped to WBS)

CONCLUSIONS AND RECOMMENDATIONS

APPENDICES
    COMPLETE RISK REGISTER
    PRIORITIZED RISK LIST
    [OTHER RESULTS AS REQUIRED]
```

Figure 8-2: Sample Contents List for a Full Risk Report
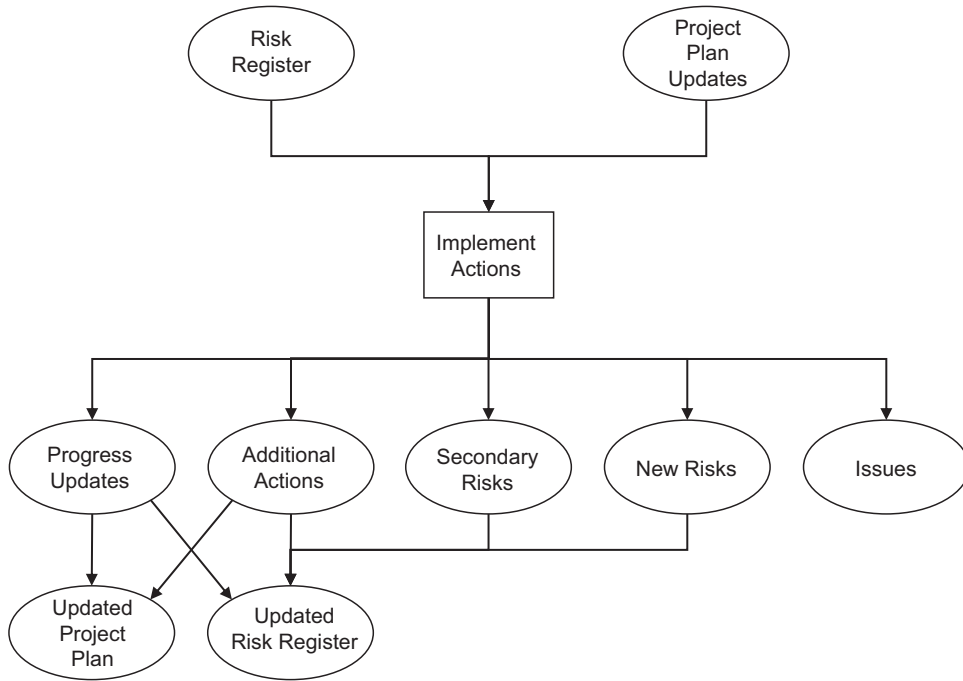
Figure 9-1: Flowchart for the Implementation Step
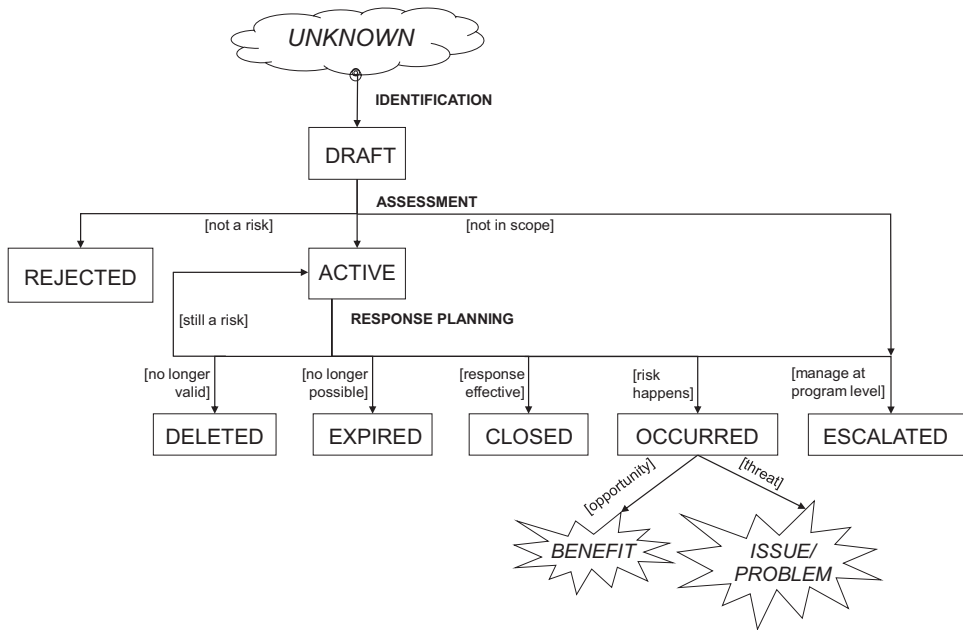
Figure 9-2: Relationship between Risk Status Values (adapted from Hillson 2004)

Activity	Major review		Minor review	
Review existing risks	Risk workshop	All risks plus secondary risks	Risk review meeting	Red risks (amber if time)
Identify new risks		Brainstorming, assumptions/ constraints, checklist		Facilitated team discussion
Assess new risks		Using P-I scales		Using P-I scales
Response planning— strategy and owners		Interview		
Response planning— actions		Post interview discussions		Post meeting discussions
Report		Full report		Summary report
Other activities		Process check		*None*
Duration		½ day		1 day
Attendees		Project Manager, Risk Champion, Key Stakeholders		Project Manager, Risk Champion, Project Team, Risk Owners

**Figure 10-1:** Differences between Major and Minor Reviews
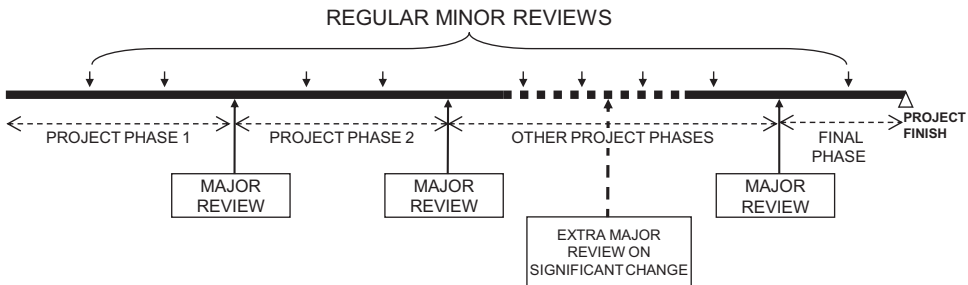
Figure 10-2: Relation between Major and Minor Reviews
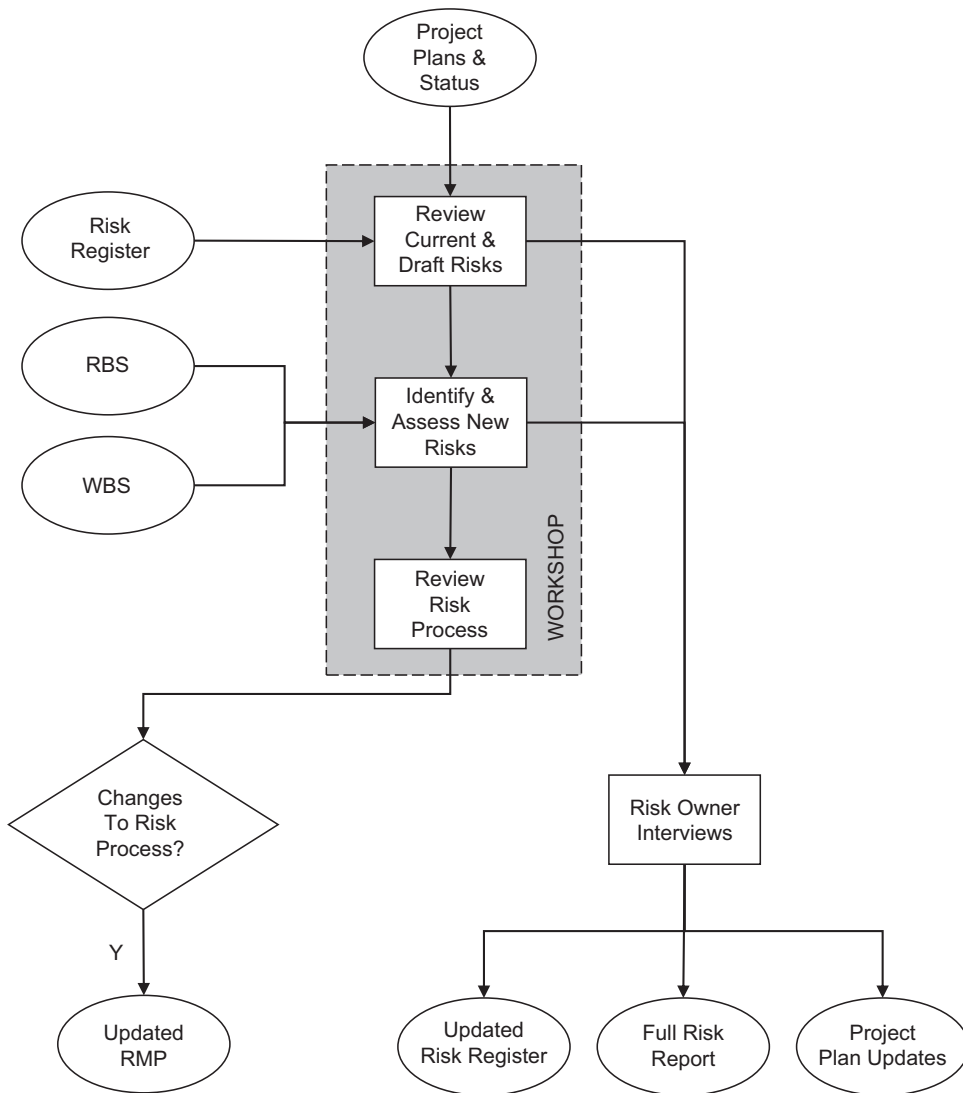
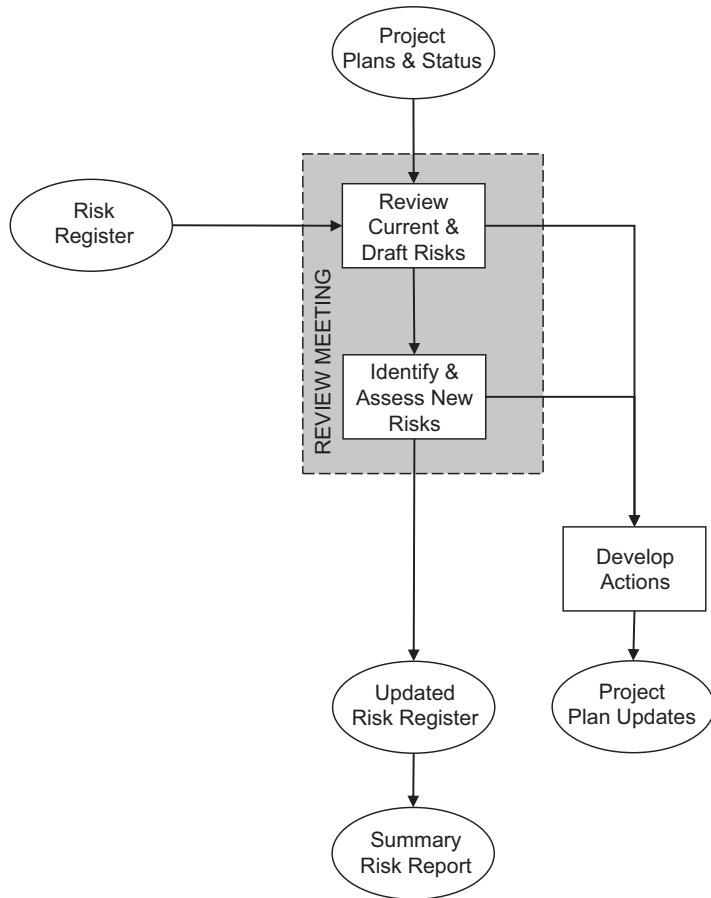**Figure 10-3:** Flowchart for Major Review Step

Time allowance (hours)	Content
½	1. Initial scene setting
3	2. Review current risks
1	3. Review draft risks
1	4. Consider new risks
–	5. Update Risk Register (done during steps 1–4)
½	6. Review risk process effectiveness
¼	7. Close workshop

Figure 10-4: Sample Agenda for a Major Review Workshop
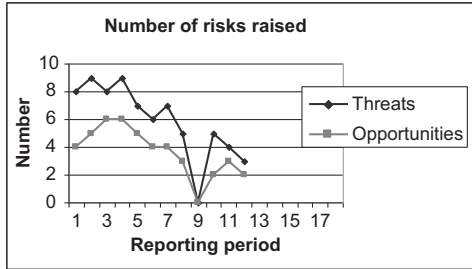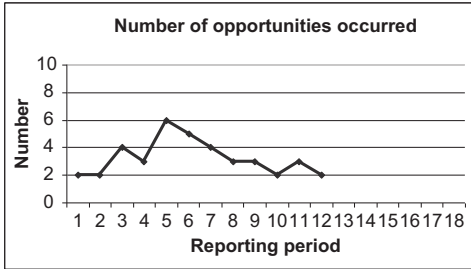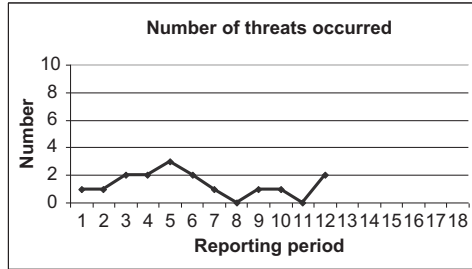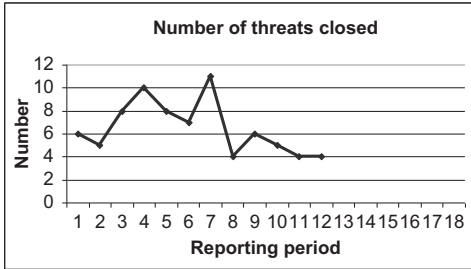
Figure 10-5: Sample Metrics to Measure Risk Exposure

Figure 11-1: Flowchart for Minor Review Step

Time allowance (hours)	Content
¼	1. Introductions
2	2. Review red risks
½	3. Review draft risks
½	4. Consider new risks
	5. Review amber risks if time permits
	6. Update Risk Register (done during earlier steps)
¼	7. Close meeting

Figure 11-2: Sample Agenda for a Half-Day Risk Review Meeting

EXECUTIVE SUMMARY

SCOPE AND OBJECTIVES OF REPORT

OVERALL RISK STATUS

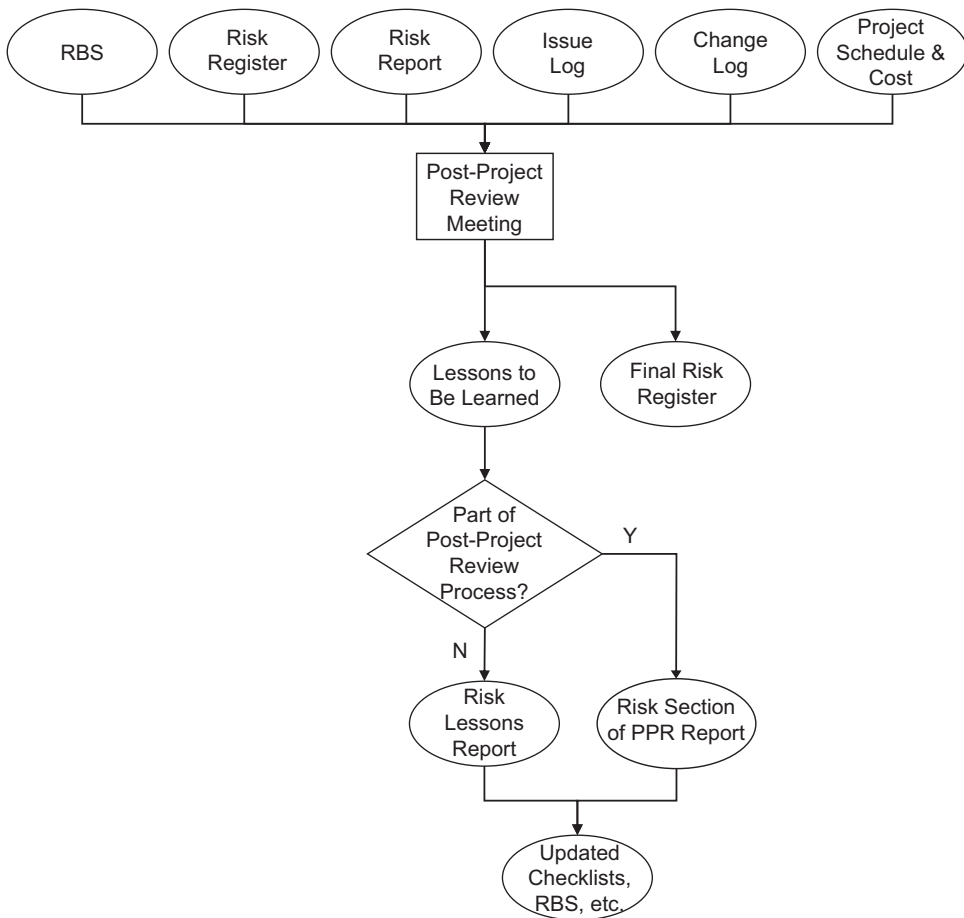TOP RISKS, ACTIONS, AND OWNERS

CHANGES SINCE LAST REVIEW

CONCLUSIONS AND RECOMMENDATIONS

APPENDIX
    COMPLETE RISK REGISTER IN PRIORITY ORDER

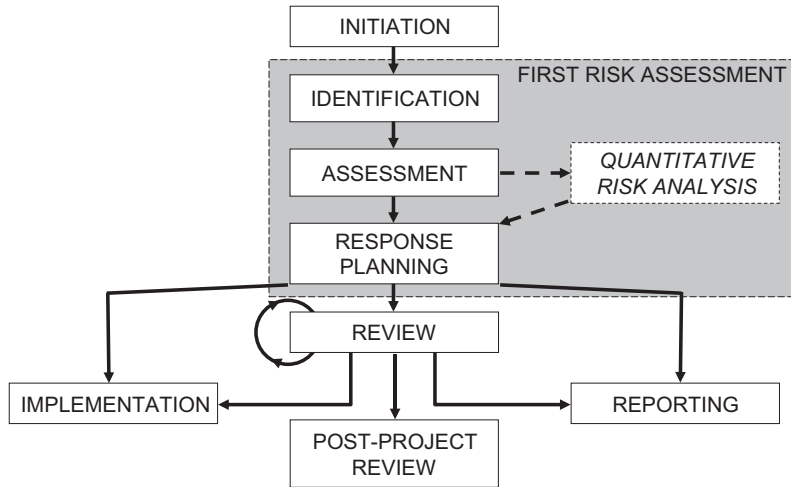**Figure 11-3:** Sample Contents List for a Summary Risk Report

Figure 12-1: Flowchart for the Post-Project Review Step

Time allowance (hours)	Content
¼	1. Introductions
½	2. Review final Risk Register
2	3. Identify risk-related "lessons to be learned"
½	4. Summarize "lessons to be learned"
¼	5. Close the meeting

Figure 12-2: Typical Agenda for a Post-Project Review Meeting
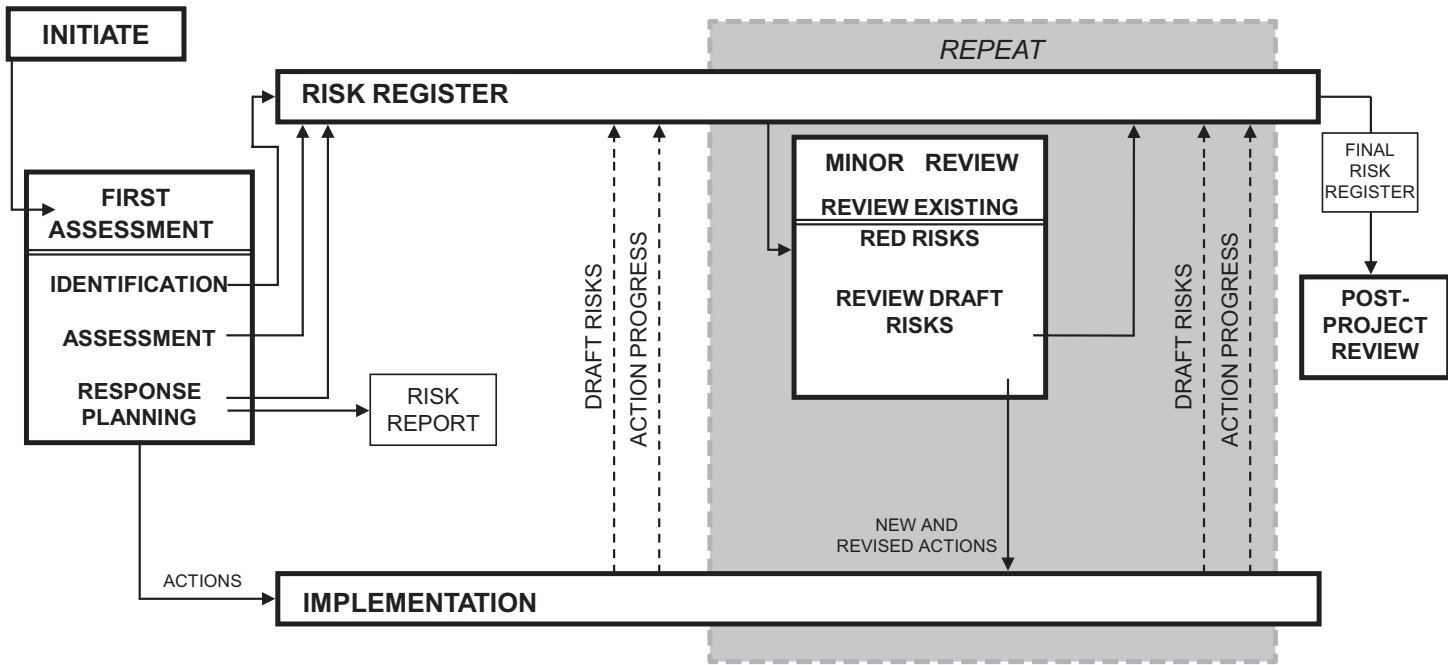
Figure 13-1: Steps in the ATOM Process

Figure 13-2: The ATOM Process for Small Projects

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INTRODUCTION

PROJECT DESCRIPTION AND OBJECTIVES

AIMS, SCOPE, AND OBJECTIVES OF RISK PROCESS

APPLICATION OF THE ATOM PROCESS

RISK TOOLS AND TECHNIQUES

ORGANIZATION, ROLES, AND RESPONSIBILITIES
FOR RISK MANAGEMENT

RISK REVIEWS AND REPORTING

APPENDICES
    PROJECT-SPECIFIC DEFINITIONS OF PROBABILITY
    AND IMPACTS
    PROJECT-SPECIFIC SOURCES OF RISK (RISK
    BREAKDOWN STRUCTURE)
```

Figure 13-3: Sample Contents List for a Risk Management Plan for a Small Project

Scale	Probability	+/− Impact on project objectives		
		Time	Cost	Quality
HI	67–99%	>20 days	>$20K	Major impact on overall functionality
MED	34–66%	10–20 days	$10K–$20K	Significant impact in key functional areas
LO	1–33%	<10 days	<$10K	Minor impact on overall functionality
NIL	<1%	No change	No change	No change in functionality

Figure 13-4: Three-Point Project-Specific Probability-Impact Scales

Scale	Probability	+/− Impact on project objectives		
		Time	Cost	Quality
HI	71–99%	>20 days	>$20K	Major impact on overall functionality
MED	41–70%	10–20 days	$11K–$20K	Significant impact in key functional areas
LO	11–40%	3–10 days	$3K–$10K	Minor impact on overall functionality
VLO	1–10%	<3 days	<$3K	Minor impact on secondary functions
NIL	<1%	No change	No change	No change in functionality

Figure 13-5: Four-Point Project-Specific Probability-Impact Scales

1. Confirm scope and objectives of risk process

2. Identify risks using
        Assumptions and Constraints Analysis
        Standard Risk Checklist
        Open discussion/brainstorm [possibly]

3. Rationalize risks
4. Assess probabilities and impacts, plot P-I Matrix
5. Assign Risk Owners
6. Prioritize risks
7. Determine response strategy & initial actions
8. Record risk data (after meeting)

Figure 13-6: Risk Steps during Project Team Meeting for Small Projects

Figure 13-7: Double Three-by-Three Probability-Impact Matrix

Figure 13-8: Double Four-by-Four Probability-Impact Matrix

Project name: Project manager: Status date:														
Risk ID	**Date raised**	**Risk description**			**Pre-response assessment**			**Risk owner**	**Risk response strategy**	**Risk response actions (with owners)**	**Action status**	**Post-response assessment**		
		Cause	**Risk**	**Effect**	**Probability**	**Impact**	**Priority (R/Y/G)**					**Probability**	**Impact**	**Priority (R/Y/G)**
1														
2														
3														
4														
5														

Figure 13-9: Sample Simplified Risk Register Format

```
EXECUTIVE SUMMARY

SCOPE AND OBJECTIVES OF REPORT

OVERALL RISK STATUS

TOP RISKS, ACTIONS, AND OWNERS

CONCLUSIONS AND RECOMMENDATIONS

APPENDIX
  COMPLETE RISK REGISTER IN PRIORITY ORDER
```

Figure 13-10: Sample Contents List for a Small-Project Risk Report

Initiation:
- Confirm project objectives and risk assessment framework
- Draft and issue Risk Management Plan

Identification:
- Clarify project assumptions and constraints
- Identify risks in project team meeting

Assessment:
- Assess probability and impacts of identified risks during project team meeting
- Nominate a Risk Owner for each risk
- Produce a prioritized list of threats and opportunities

Response Development:
- Develop appropriate responses and actions during project team meeting
- Record all risk data into risk tool after project team meeting
- Include agreed-upon actions in the project plan

Reporting:
- Produce and issue the Risk Register
- Draft and issue Risk Report (or risk section in regular project progress report)

Implementation:
- Perform agreed-upon actions and report to Risk Owners
- Update the project plan with action status
- Raise new risks as they become visible and enter into risk tool

Review:
- Review existing red risks and all draft risks in project team meeting
- Enter updated risk data into risk tool
- Re-issue Risk Register

Post-Project Review:
- Prepare risk data for the meeting
- Consider risks during post-project review meeting (or hold a separate risk meeting)
- Capture "lessons to be learned," including generic risks, effective responses, and process improvements

Figure 13-11: ATOM Activities for a Small Project
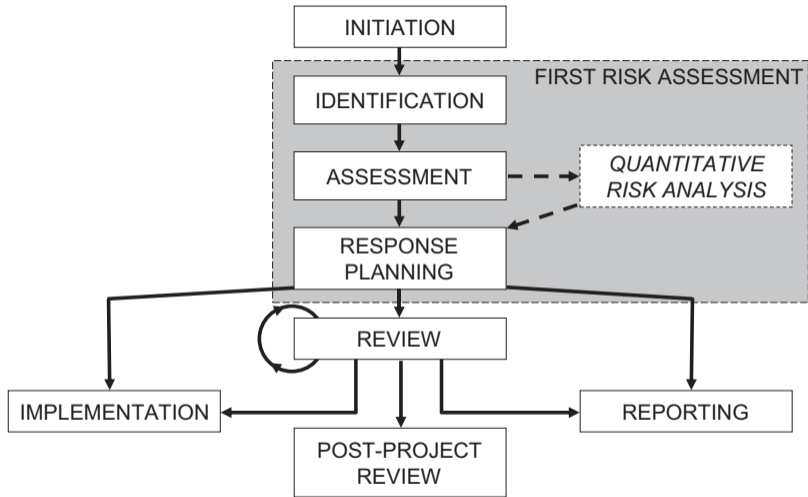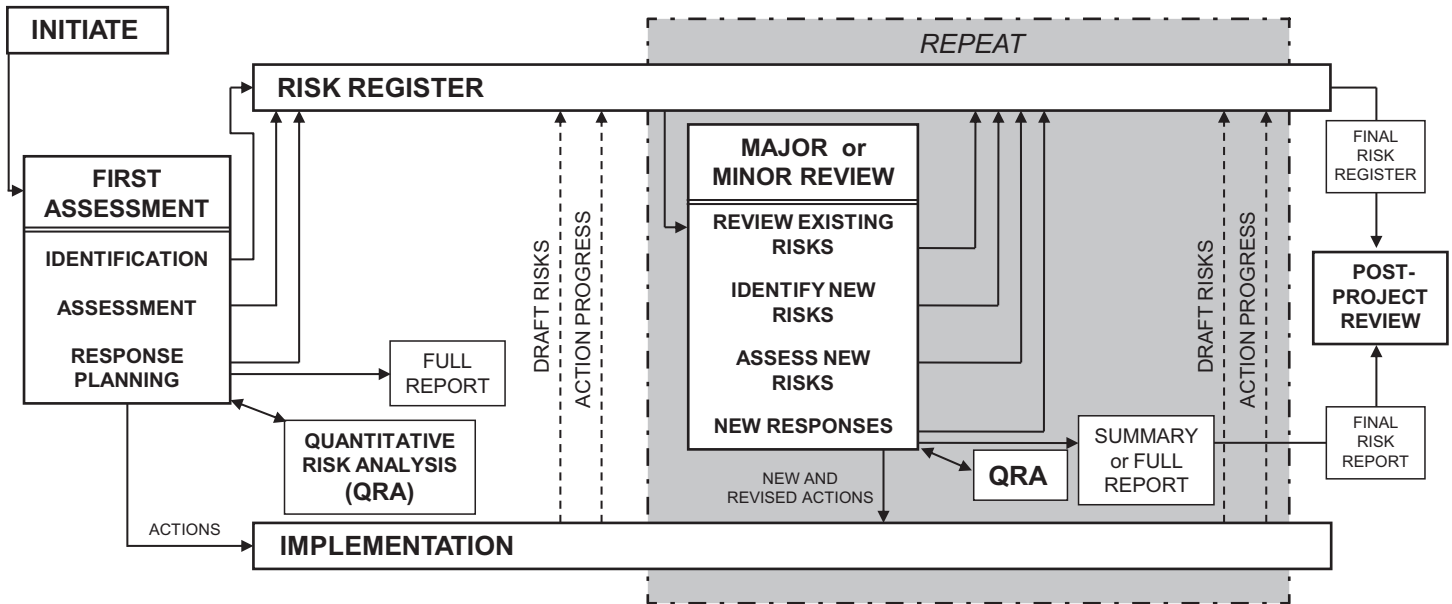
Figure 14-1: Steps in the ATOM Process

Figure 14-2: The ATOM Process for Large Projects

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INTRODUCTION

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ORGANIZATION, ROLES, AND RESPONSIBILITIES FOR
RISK MANAGEMENT

RISK REVIEWS AND REPORTING

APPENDICES
    PROJECT-SPECIFIC DEFINITIONS OF PROBABILITY AND IMPACTS
    PROJECT-SPECIFIC SOURCES OF RISK (RISK BREAKDOWN
    STRUCTURE)
```

Figure 14-3: Sample Contents List of a Risk Management Plan for a Large Project

DAY 1
Morning
1. Introductions
2. Confirm project objectives
3. Confirm scope of risk process for this workshop
4. Workshop ground rules
5. Risk management briefing (if required)
6. Expectations and results
7. Identify risks
Brainstorm risks using the Risk Breakdown Structure
Afternoon
Analysis of Assumptions and Constraints to generate further risks
A Standard Risk Checklist to identify any further/final risks
8. Rationalize risks
9. Describe risks using risk metalanguage
10. Record identified risks (during workshop or after meeting)
DAY 2
Morning
11. Explanation of assessment scheme (recap)
12. Assessment of probability and impacts
13. Risk categorization
Afternoon
14. Nomination of Risk Owners
15. *If time, develop initial responses to priority risks*
16. Close the workshop

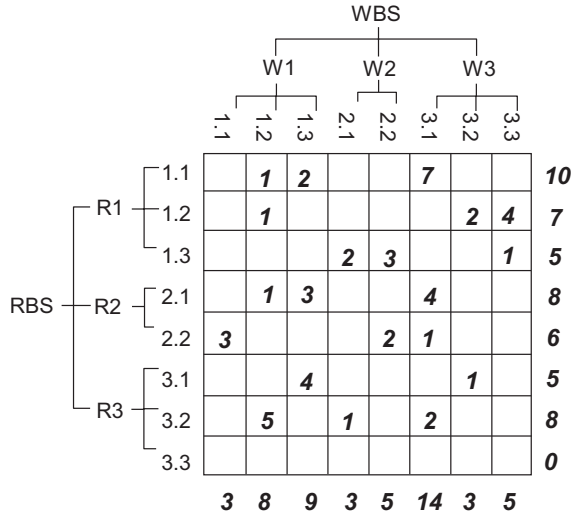**Figure 14-4:** Sample Agenda for a First Risk Assessment/Two-Day Risk Workshop for Large Projects

Figure 14-5: Identifying Opportunities and Threats Using SWOT Analysis

Figure 14-6: Correlating RBS with WBS

RBS \ WBS	1.1	1.2	1.3	2.1	2.2	3.1	3.2	3.3	
1.1		1	2			7			10
1.2		1					2	4	7
1.3				2	3			1	5
2.1		1	3			4			8
2.2	3				2	1			6
3.1			4				1		5
3.2		5		1		2			8
3.3									0
	3	8	9	3	5	14	3	5	

Scale	+/− Impact on non-project objectives (*)
VHI	Critical
HI	Major
MED	Significant
LO	Minor
VLO	Insignificant
NIL	None
(*) For example, strategic goals, program benefits, or company reputation.	

Figure 14-7: Example Scale for Non-Project Impacts

| Scale	Manageability
VLO	Unmanageable
LO	Requires innovation or research
MED	Requires significant effort to address
HI	Suitable responses are available if needed
VHI	Can be controlled by normal activities

**Figure 14-8:** Example Scale for Manageability

The overlay chart below illustrates a different picture for each of the six risks shown. The action window for Risk 1 starts now, and the action must be in place within three weeks or it is too late to take action. Risk 2 has a longer action window, and action cannot start for two weeks. Risk 3 action must take place in three weeks' time, and there is no room for maneuver. The action window for Risk 4 overlaps the impact window, so although the action could take longer to implement, this might be a foolish thing to do. The planned action for Risk 5 can only take place three weeks after the impact window for the risk opens. In this case, new action strategies should be sought or contingency plans developed. Risk 6 has a long action window, and therefore, there should be no reason why the action cannot be successfully implemented.
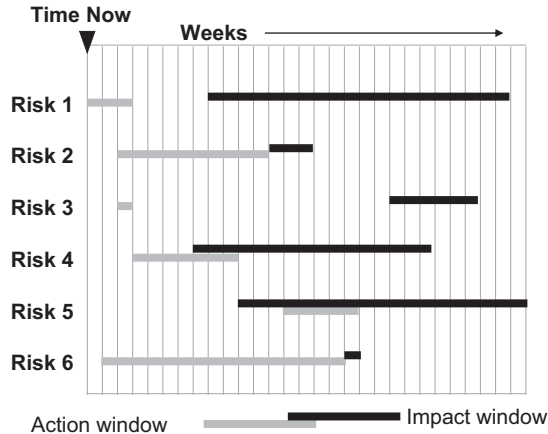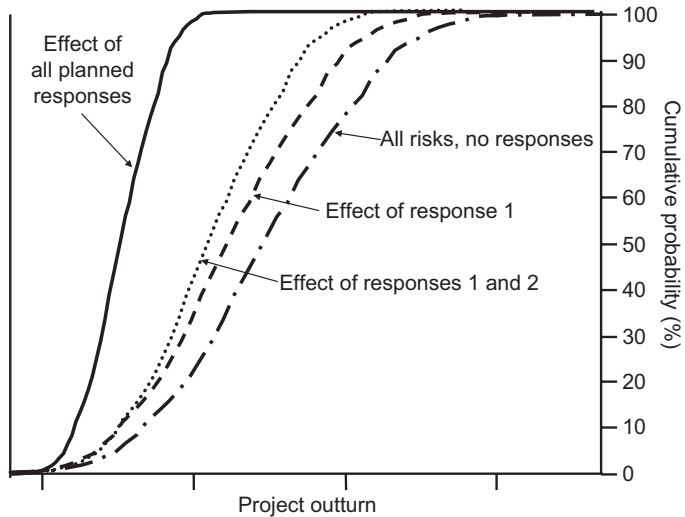

Figure 14-9: Impact and Action Windows Overlay Chart
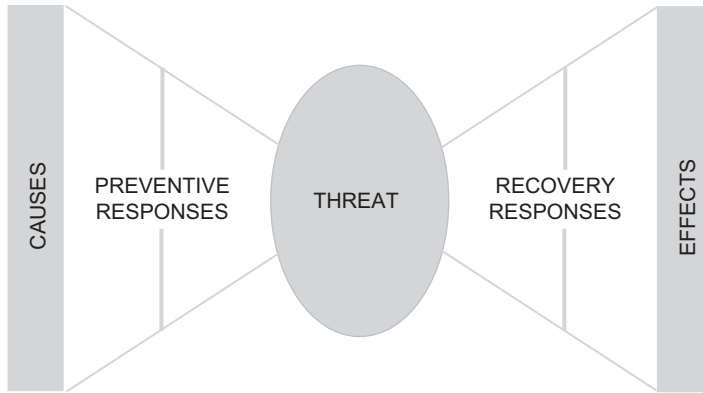
Figure 14-10: The Bowtie Diagram for Threats
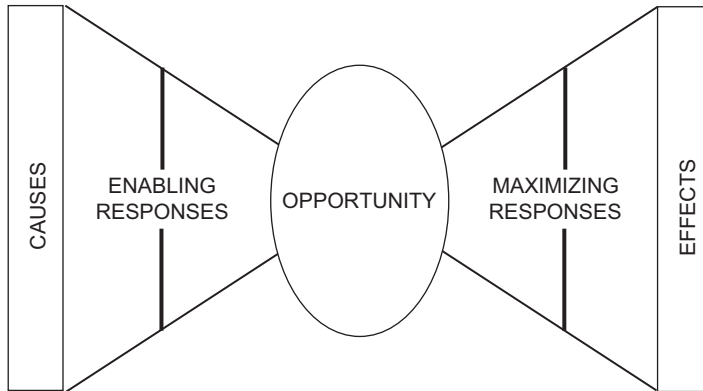
Figure 14-11: The Bowtie Diagram for Opportunities

Figure 14-12: Overlapping S-Curves (Onion Ring)

EXECUTIVE SUMMARY

SCOPE AND OBJECTIVES OF REPORT

PROJECT STATUS SUMMARY

OVERALL RISK STATUS

TOP RISKS, ACTIONS, AND OWNERS

DETAILED QUALITATIVE RISK ASSESSMENT
    High/Medium/Low Risks
    Causal Analysis (Mapped to RBS)
    Effects Analysis (Mapped to WBS)

QUANTITATIVE RISK ANALYSIS RESULTS
    Overall project risk
    Expected values
    Main risk drivers & key risks

CONCLUSIONS AND RECOMMENDATIONS

APPENDICES
    COMPLETE RISK REGISTER
    PRIORITIZED RISK LIST
    INPUT DATA FOR RISK MODEL
    DETAILED QUANTITATIVE ANALYSIS

OUTPUTS
    [OTHER RESULTS AS REQUIRED]

Figure 14-13: Sample Contents List for a Full Risk Report
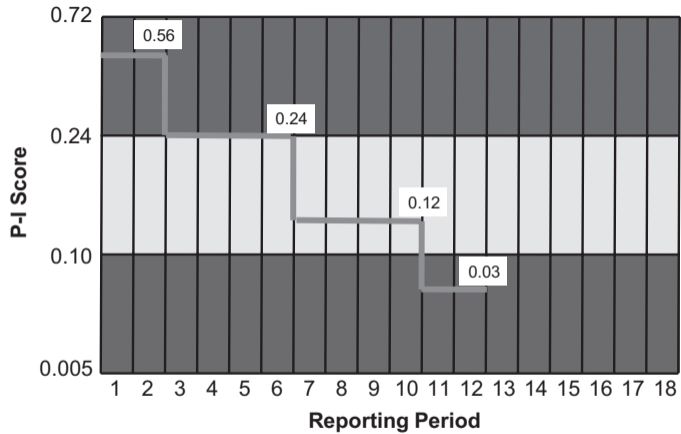
Figure 14-14: Example Risk Waterfall Chart

Time allowance (hours)	Content
¼	1. Introductions
¼	2. Confirm original project objectives
¼	3. Confirm meeting objectives
1	4. Review final Risk Register and Risk Reports
2	5. Identify risk-related "lessons to be learned"
½	6. Summarize "lessons to be learned"
¼	7. Close the meeting

Figure 14-15: Typical Agenda for a Risk Lessons-Learned Meeting

Initiation:
- Determine key stakeholders and hold initiation meeting
- Draft and issue Risk Management Plan

Identification:
- Identify risks through facilitated risk workshop, risk identification interviews, and post-project review analysis
- Record all identified risks in risk tool

Assessment:
- Assess identified risks during facilitated risk workshop (probability, impacts, other key characteristics)
- Categorize risks using the Risk Breakdown Structure and Work Breakdown Structure
- Nominate a Risk Owner for each risk
- Generate baseline risk metrics
- Develop a Monte Carlo risk model and perform initial analysis
- Record all additional risk data in the risk tool
- Produce assessment and analysis outputs

Response Development:
- Determine response strategies and Action Owners during interviews with Risk Owners using bowtie diagrams for key risks
- Confirm and refine proposed actions with Action Owners and include in project plan
- Update the Risk Register with response strategies and agreed-upon actions
- Update quantitative risk analysis to reflect post-response expectations

Reporting:
- Analyze current risk exposure and draft and issue Full Risk Report (including the complete Risk Register), plus extracts as required

Implementation:
- Perform agreed-upon actions and report progress and identify need for new actions
- Identify secondary risks, issues or problems, and new risks
- Modify the project schedule and budget to include new or re planned actions
- Update the Risk Register with the current status of each risk and progress on agreed-upon actions

Review:
- Minor Review
  - Hold facilitated risk meeting to review all red risks, draft risks, plus amber risks if time allows
  - Identify and assess new risks, appoint Risk Owners, and develop responses
  - Update the Risk Register and project plan to take into account risk actions
  - Revise and define risk actions and appoint Risk Action Owners
  - Draft and issue Summary Risk Report

Figure 14-16: ATOM Activities for a Large Project *(continues)*

- Major Review
  - Review all current risks and draft risks through facilitated risk workshop
  - Identify and assess new risks, appoint Risk Owners, and develop responses
  - Revise and define risk actions and appoint Risk Action Owners
  - Update the Risk Register and project plan to take into account risk actions
  - Update the quantitative risk analysis model to determine predicted project outcomes both pre-response and post-response
  - Update risk metrics to allow trend analysis
  - Draft and issue Full Risk Report
  - Review risk process efficiency and effectiveness

Post-Project Review:
- Prepare risk data for the meeting
- Consider risks during Risk Lessons Learned Meeting
- Capture conclusions in Risk Lessons Learned Report as input to the main post-project review

Figure 14-16: *(continued)*
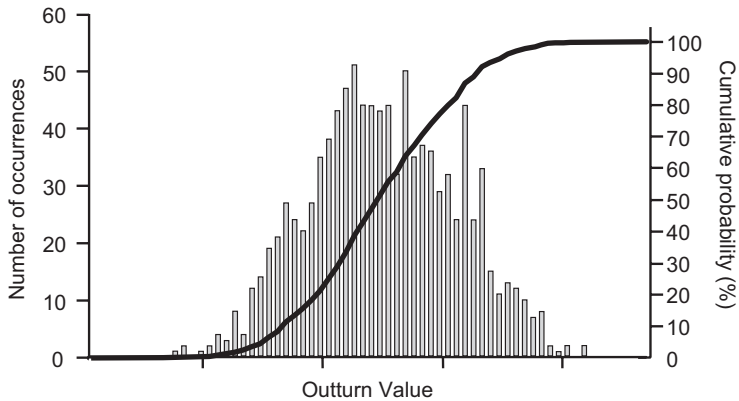
Figure 15-1: Example Monte Carlo Histogram and S-Curve
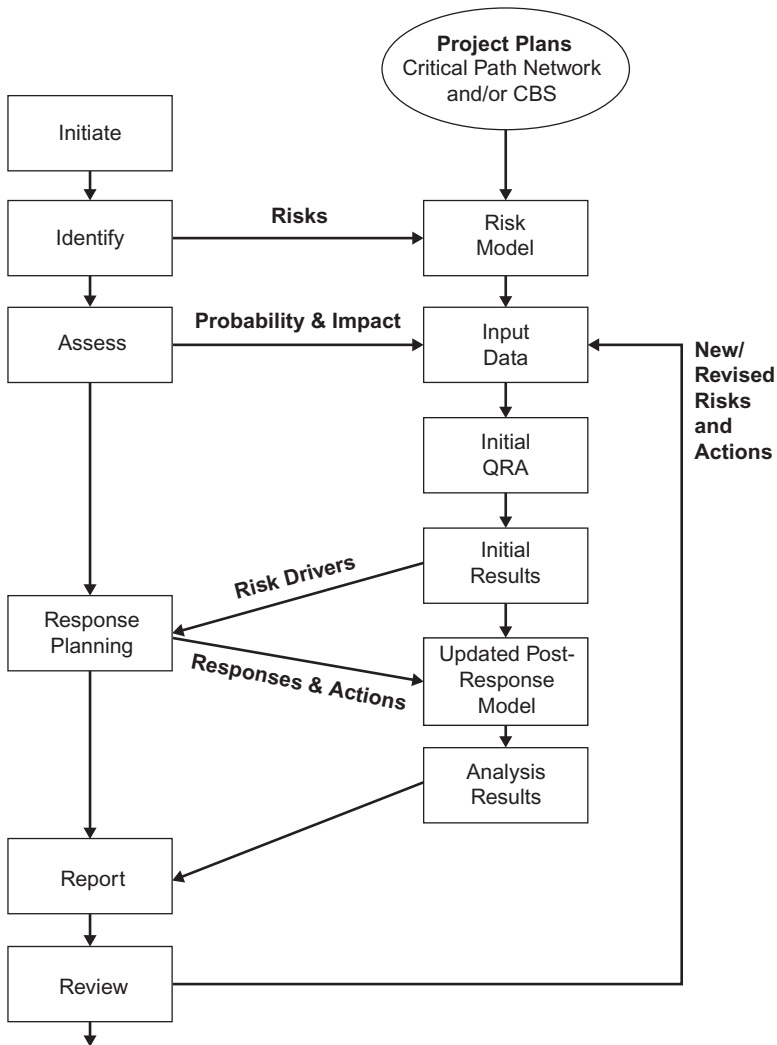
Figure 15-2: Relationship between Quantitative Risk Analysis and the ATOM Process
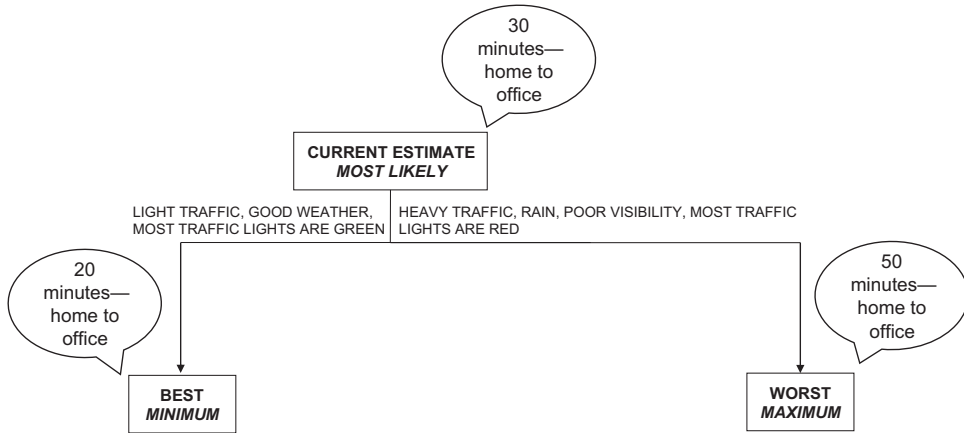
Figure 15-3: Three-Point Estimate for General Variability

Activity or budget item	Distribution type for general variability including modeling parameters	Correlation group (where relevant)

Figure 15-4: Example General Variability Entry Form
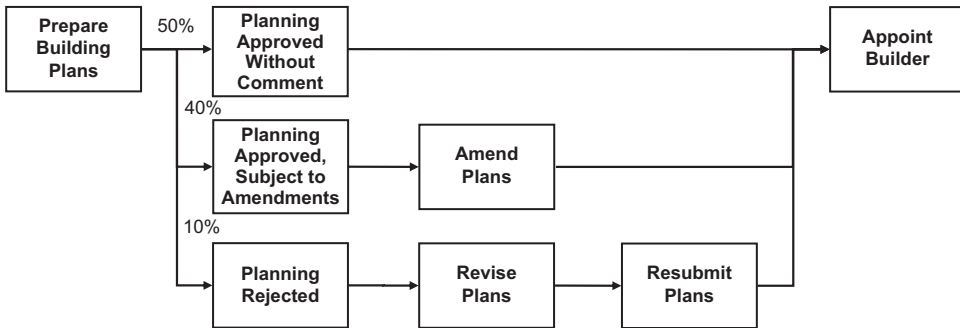
Figure 15-5: Probabilistic Branching

Planning permission is required for the project to proceed. However, planning permission is only approved without comment on 50% of occasions. 40% of the time planning will be approved subject to amendments. 10% of the time planning will be rejected and plans will need to be revised and resubmitted.
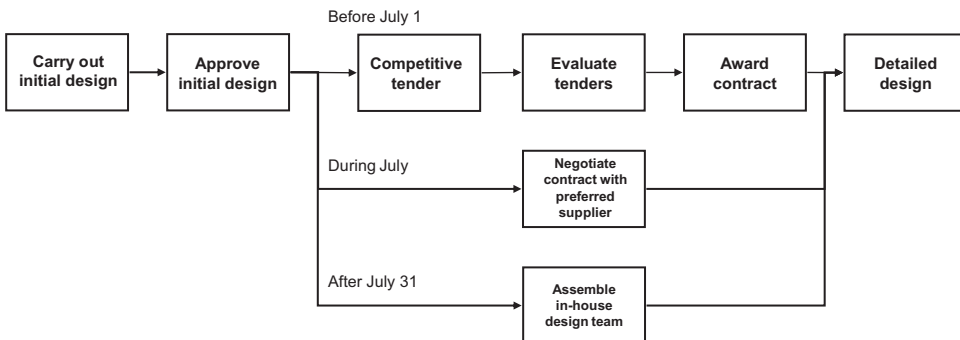
Figure 15-6: Conditional Branching

The procurement strategy for the project is based on the use of competitive tendering and the use of contractors. However, it is recognized that this approach must not delay the project; therefore, two alternative strategies have been determined. If the initial design is not approved until after July 1 but before July 31, a contract will be negotiated with a preferred supplier. If the initial design is not approved until after July 31, then an in-house design team will be assembled.

Risks (opportunity or threat)	Mapped to activities or budget items	PROB.	MIN	ML	MAX	Distribution type for impact	Correlation group (where relevant)

Figure 15-7: Example Risk Mapping Form
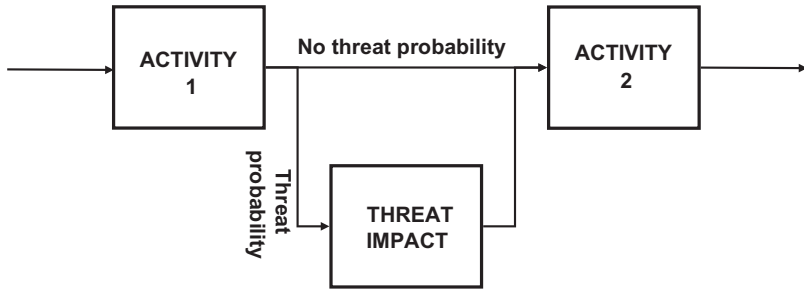
Figure 15-8: Modeling Threats with Probabilistic Branching
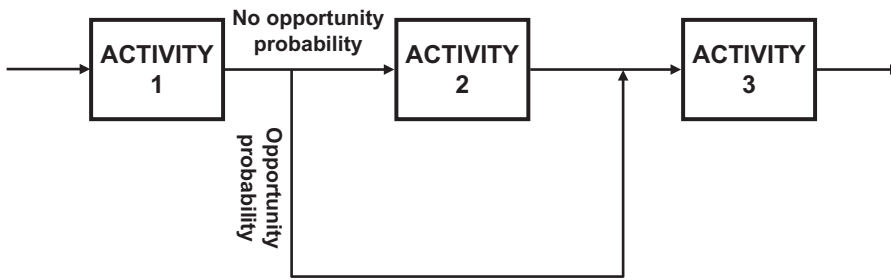
Option A – Null branch = opportunity to remove planned work
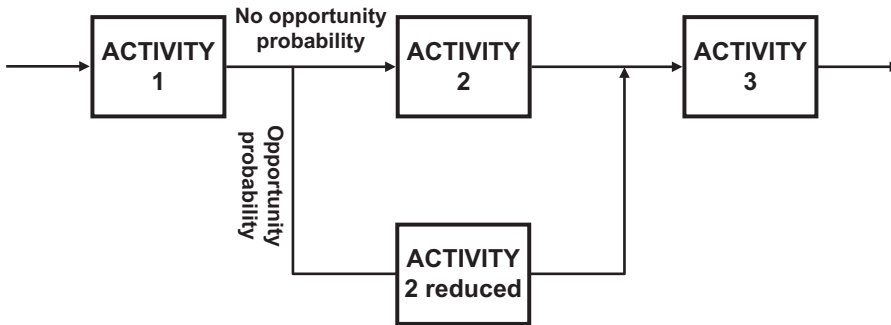
Option B – Risk impact = shorter/cheaper than plan
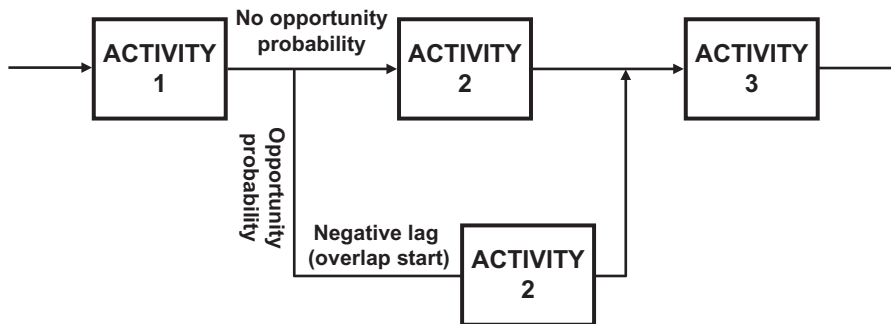
Option C – Negative lag to allow early/overlapped start

Figure 15-9: Modeling Opportunities with Probabilistic Branching

Strength of correlation	Correlation coefficient
Weak	0.70
Medium	0.80
Strong	0.90
Very strong	0.95
Total dependence	1.00

Figure 15-10: Strength of Correlation versus Correlation Coefficient
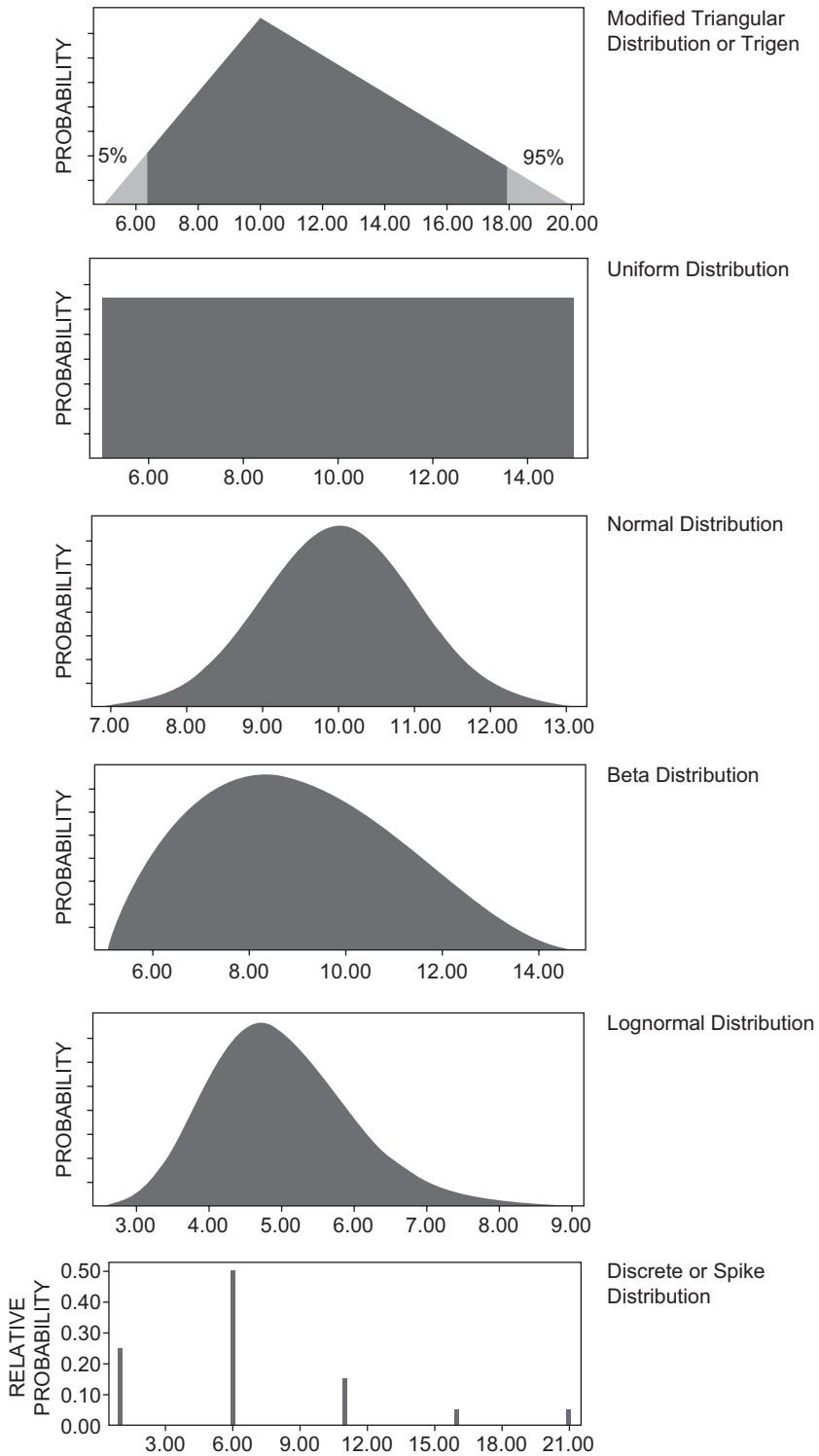
Figure 15-11: Typical Distributions Used in Monte Carlo Simulation
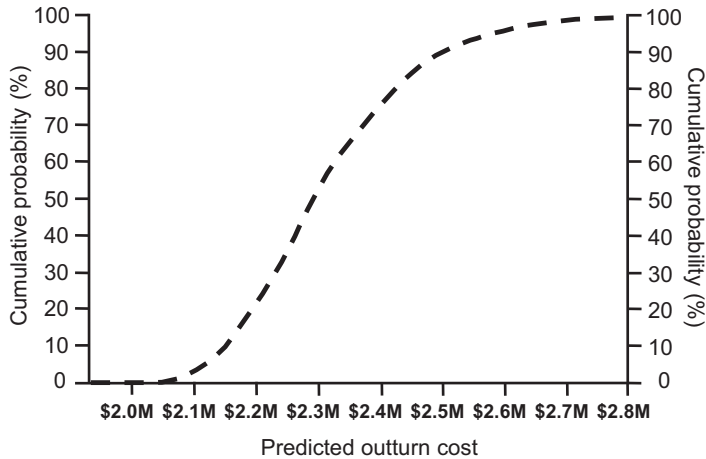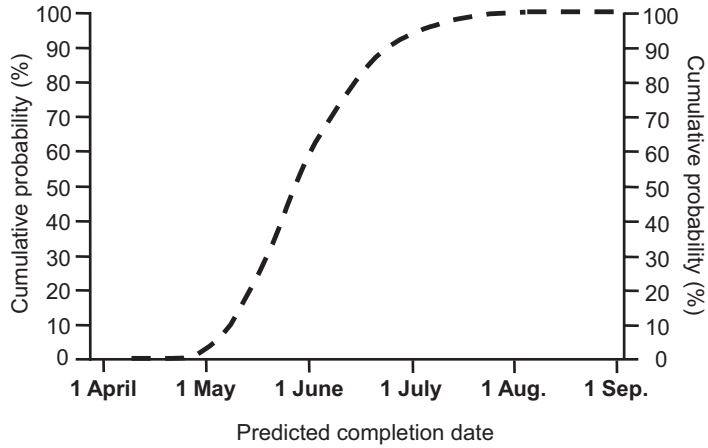
Figure 15-12: Example S-Curves for Time and Cost
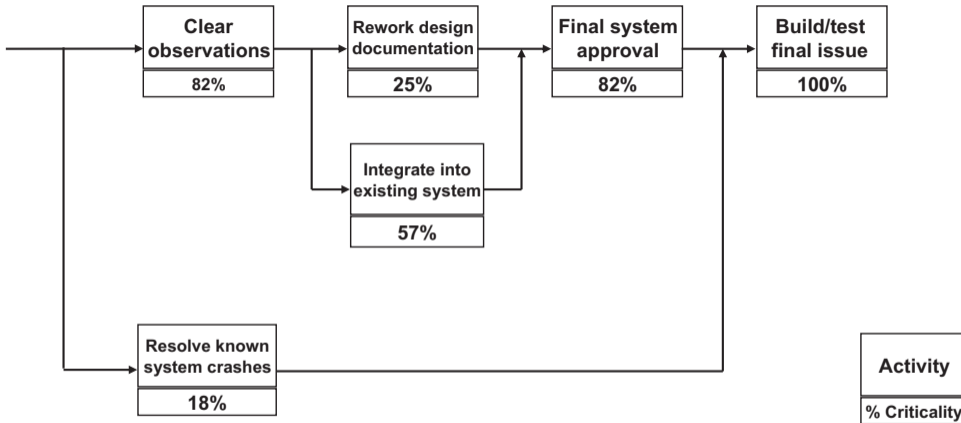
Figure 15-13: Example Criticality Analysis Diagram
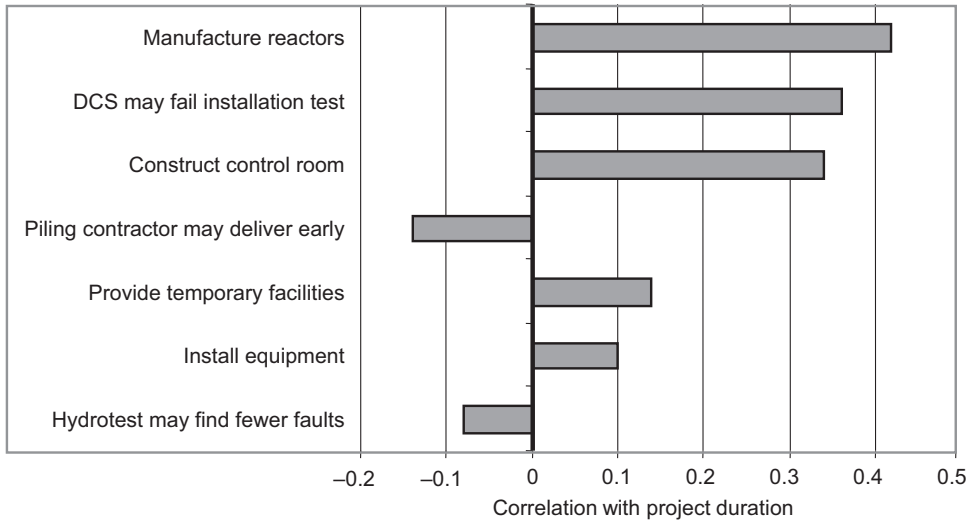
Figure 15-14: Example Tornado Chart
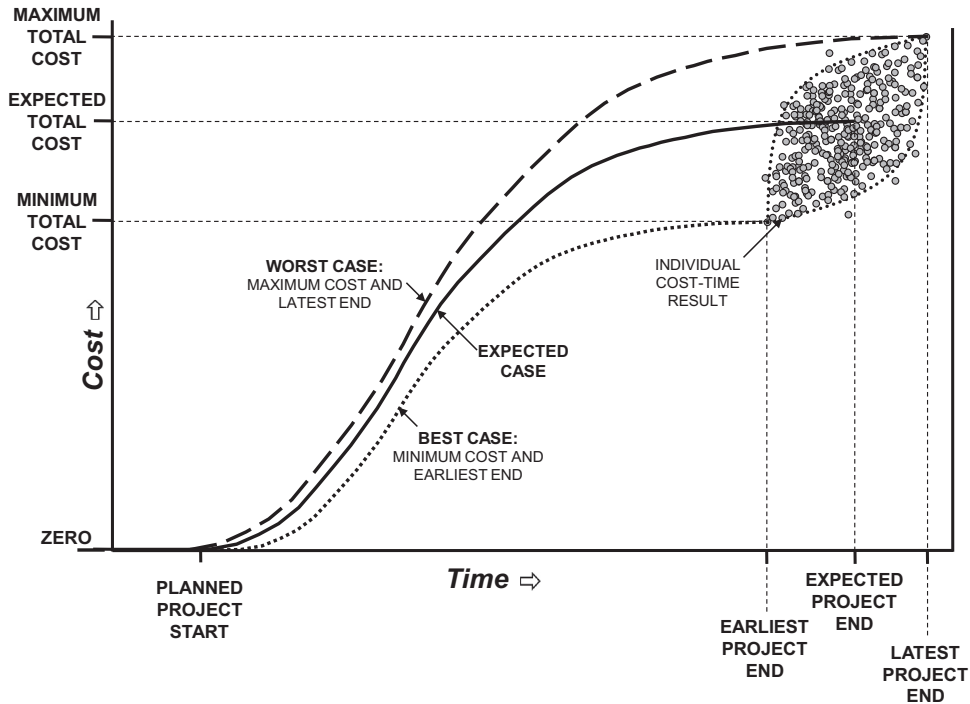
Figure 15-15: Example Eyeball (Football) Plot
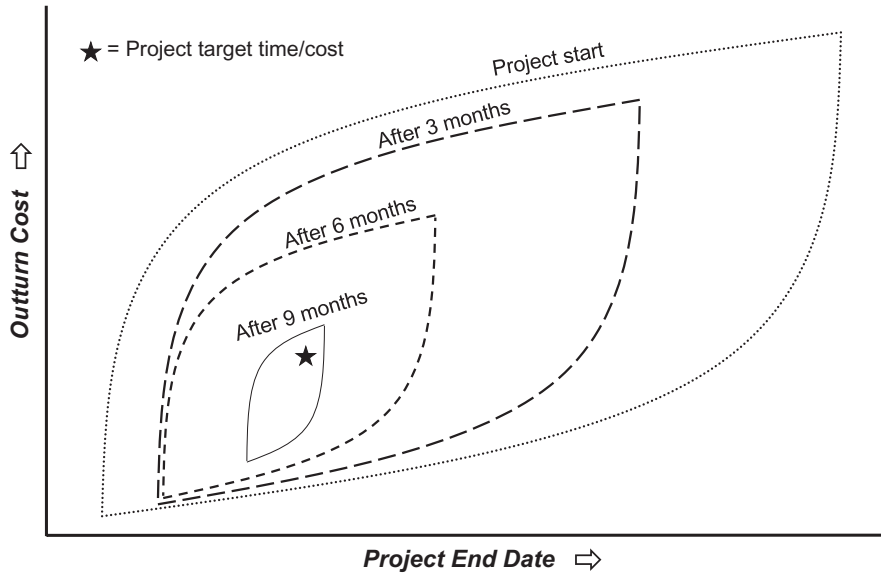
Figure 15-16: Overlaid Eyeball Plots
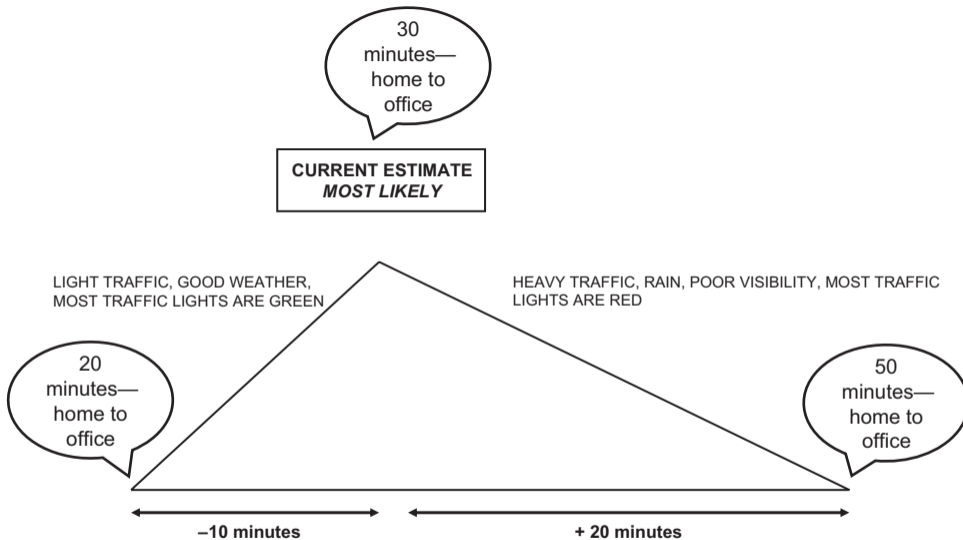
Figure 15-17: Skewed Distribution Three-Point Estimate for General Variability
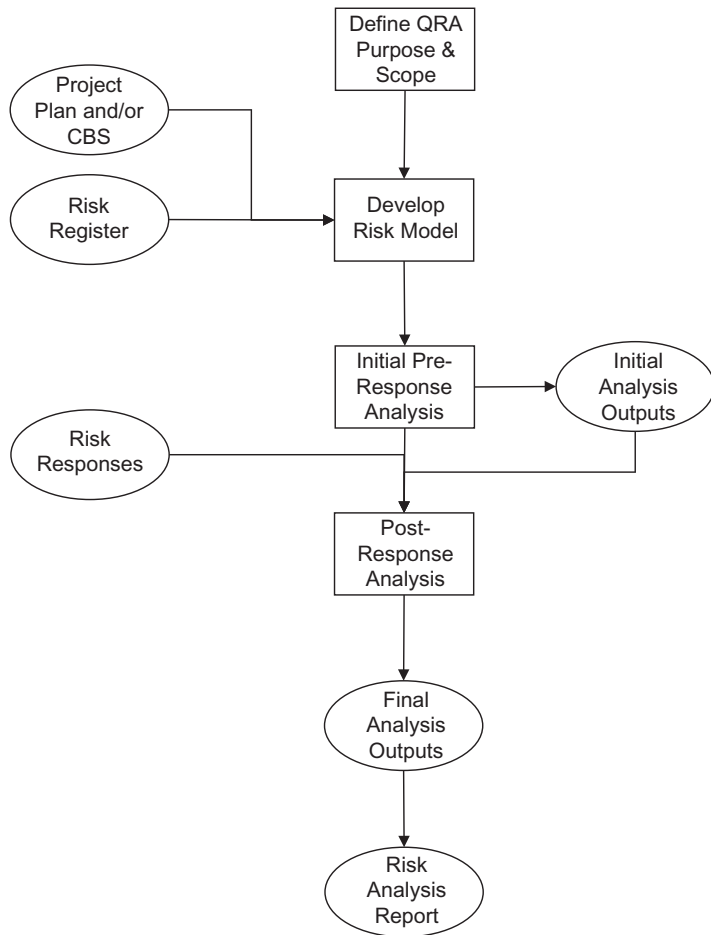
Figure 15-18: Summary of Steps Required for a Full Quantitative Risk Analysis

ATOM process step	Small project	Medium project	Large project
Initiation	—	Meeting	Dedicated initiation meeting
Identification	Meeting	Workshop	workshop + interviews
Assessment	Meeting	Workshop	Workshop
Quantitative Analysis	Not applicable	Not applicable	Workshop + interviews
Response Planning	Meeting	Workshop + interviews	Interviews
Reporting	Not applicable		
Implementation	Not applicable		
Major Reviews	Not applicable	Workshop	Workshop
Minor Reviews	Meeting	Meeting	Meeting
Post-Project Review	Meeting	Meeting	Meeting

Figure 16-1: Scope of the ATOM Risk Workshop or Risk Meeting

Element	Comments
Confirm project objectives, and identify and rationalize risks. Optional: nominate Risk Owners	There is no reason why project objectives cannot be discussed and hopefully fully confirmed prior to this workshop.
Describe risks using risk metalanguage.*	If Risk Owners have already been nominated, then this workshop could be limited to the Project Manager (if not a Risk Owner), Risk Owners, and the Risk Champion and Risk Facilitator (if not the Risk Champion).
Assess probability and impacts (of each risk).*	Again, this should be done with the Project Manager and Risk Owners.
Develop risk responses.*	Again, this should be done with the Project Manager and Risk Owners.
Consider Monte Carlo simulation.	This would be a wider group, including the Project Manager, planners/schedulers, cost estimators, Risk Owners, and Risk Analyst.

Figure 16-2: Elements of Smaller, Focused Workshops

* Note: These elements could also be achieved by directly interviewing Risk Owners and, where appropriate, Action Owners as well.

Identifier (to be kept anonymous to others)	Cause	Risk Event	Effect	Comments

Figure 16-3: Pro Forma for Risk Identification Using the Delphi Technique

Conscious factors (situational and rational)	Subconscious factors		Affective factors (emotions and feelings)
	Heuristics	**Cognitive biases**	
Familiarity	Intuition	Prospect theory	Fear (dread, worry, concern, etc.)
Manageability	Representativeness	Repetition bias	
Proximity	Availability	Illusion of control	Desire (excitement, wonder, etc.)
Propinquity	Reality traps	Illusion of knowledge	
Severity of impact	Confirmation trap	Intelligence trap	Love (lust, adoration, attraction, etc.)
Group dynamics	Lure of choice	Optimism bias	
Organizational culture	Affect heuristic	Fatalism bias	Hate (dislike, disgust, etc.)
	Anchoring	Precautionary principle	Joy (happiness, etc.)
	Group effects (e.g., groupthink)	Hindsight bias	Sadness (depression, etc.)

Figure 16-4: Common Influences on Risk Perception
(adapted from Murray-Webster and Hillson 2008)
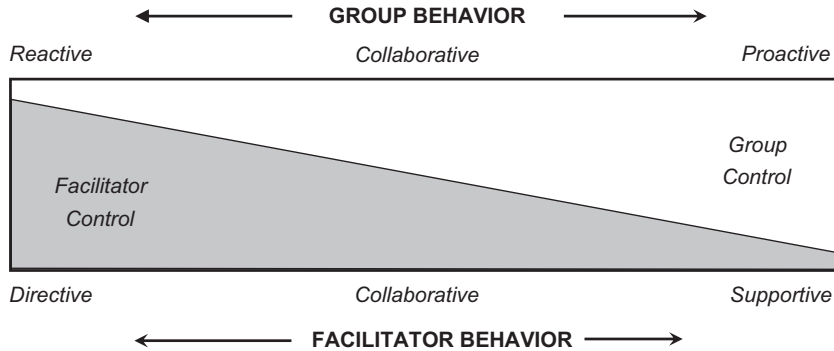
Figure 17-1: The Facilitation Spectrum

Description	Zone 1 Directive	Zone 2 Collaborative	Zone 3 Supportive
Title	Leader	Partner	Friend
Position	In front	Alongside	Behind
Verbalization	"Do this!"	"Shall we . . . ?"	"How can I help?"

Figure 17-2: Facilitator Role in Zones 1, 2, and 3 of the Facilitation Spectrum

Tuckman stage (Tuckman 1965)	Workshop tasks	Facilitation style
Forming and storming	Objective-setting Agenda and ground rules	Directive
Norming	Workshop initiation Corrective input	Directive/Collaborative
Performing	Identify and assess risks Develop responses	Collaborative/Supportive
Adjourning	Workshop wrap-up Summary and next steps	Directive

Figure 17-3: Mapping Facilitation Styles to Risk Workshop Tasks
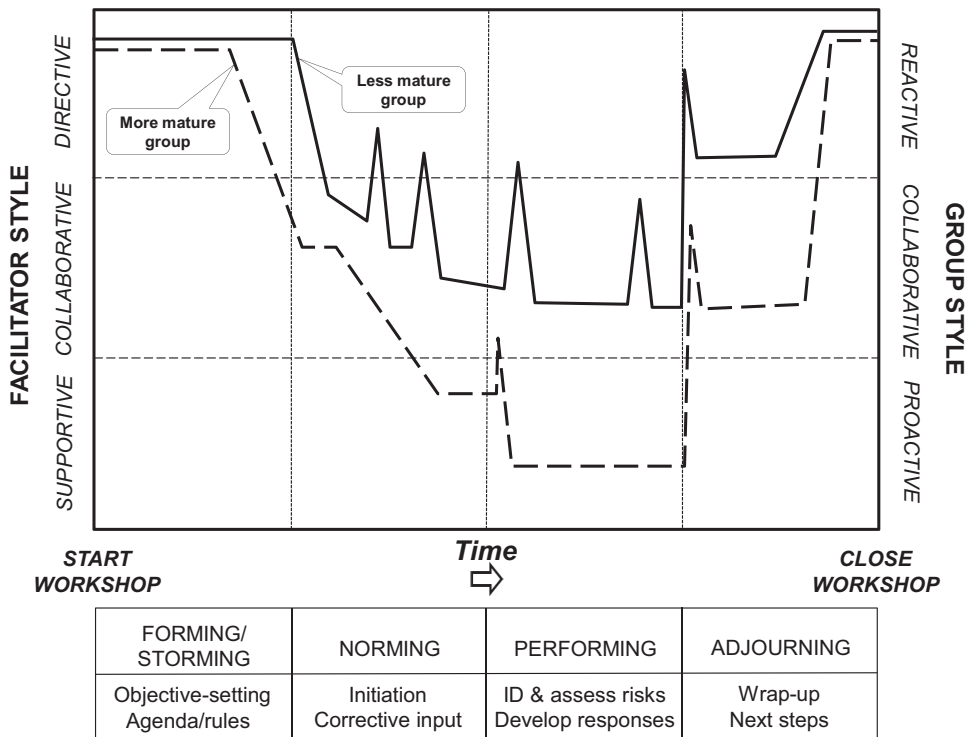
Figure 17-4: Using Facilitation Styles during a Risk Workshop

Type	Characteristics	Management strategy
Aggressive	These people do not want to be in the workshop, think it is a waste of time, and actively oppose what the facilitator is trying to achieve. They are often loud, argumentative, and critical, and their behavior distracts others from contributing.	*Defuse*. Give them time to make their point and do not argue with them; listen patiently and use conciliatory language. If necessary, speak to them outside the meeting during a break, asking for more tolerance and seeking their active support.
Complainer	Everything is wrong for a complainer, from the room size or temperature to the meeting time and duration, the list of participants, the type of refreshments, the agenda and scope of the workshop, and so on.	*Defer*. Listen to their complaints and acknowledge anything that is valid. Then agree to address concerns outside the meeting. Deal with immediate matters during a break and take up other issues later.
Know-it-all	Some people delight in expressing their opinion and demonstrating their expert knowledge of a topic, even when they are not real experts. They have strong opinions and voice them confidently. They are the first to answer every question, often dismissing the views of others as uninformed or naïve.	*Demur*. Recognize valid expertise and play back their opinion so they know they have been heard and appreciated, then expand on their input if possible, building on it to regain the initiative.
Agreeable	While agreeable individuals may appear to be the facilitator's friend, they often fail to share their true opinion for fear of upsetting someone or being criticized. They smile and nod encouragingly, but shy away from disagreeing with others and are often reluctant to speak first in any debate.	*Direct*. Beware of allowing them to get away with "being nice" and challenge them to express their true opinions. Ask them to contribute first from time to time.
Negative	These people will disagree with others on principle, seeing it as their role to give the opposing viewpoint (even if they don't believe it). They undermine the	*Detach*. Maintain a degree of neutrality, not allowing them to get you on their side in criticizing others. Accept valid alternative viewpoints, but aim for

Figure 17-5: Handling Difficult Behavior *(continues)*

Type	Characteristics	Management strategy
	facilitator and other participants by casting doubt on the truth or reliability of their inputs and prevent consensus through constant naysaying.	realistic compromise. Deperson-alize their opposition; make it about the process or the principle, but not about the person.
Staller	For the staller, there is never enough information to make a firm judgment or to give a clear opinion. They wish to defer everything until later, when more data is available or more progress has been made.	*Delegate*. Explore reasons why they are reluctant to offer an opinion on the available data, find out exactly what additional information they require, and give them an action to bring it to the next meeting. Encourage them to give an interim assess-ment based on the current data.
Silent	Some people just refuse to contribute. They sit quietly but will not speak up to give their opinion, even when challenged or specifically invited to do so.	*Decline*. Refuse to accept nonparticipation or withdrawal. Ask them direct, open questions and then wait for an answer, using silence as a motivator. Speak to them during a break to encourage participation.

Figure 17-5: *(continued)*
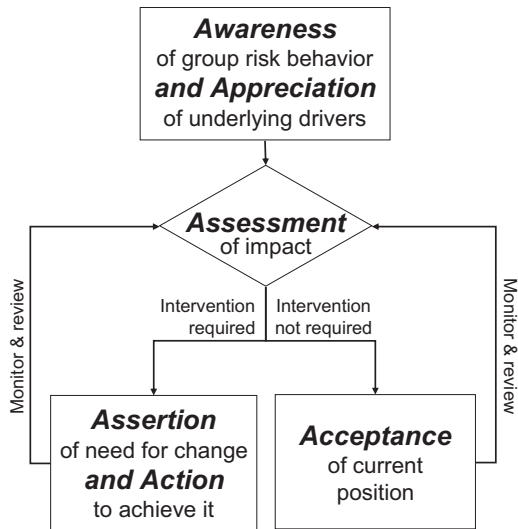
Figure 17-6: The Six As Model of Applied Emotional Literacy
(Murray-Webster and Hillson 2008; used with permission)
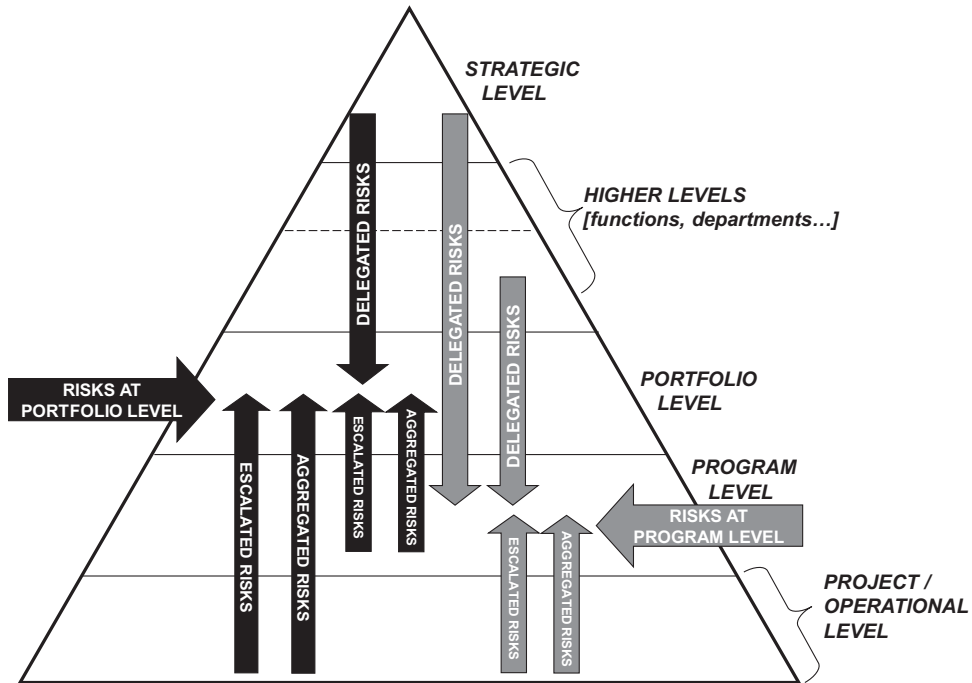
Figure 18-1: Sources of Risks across the Organization
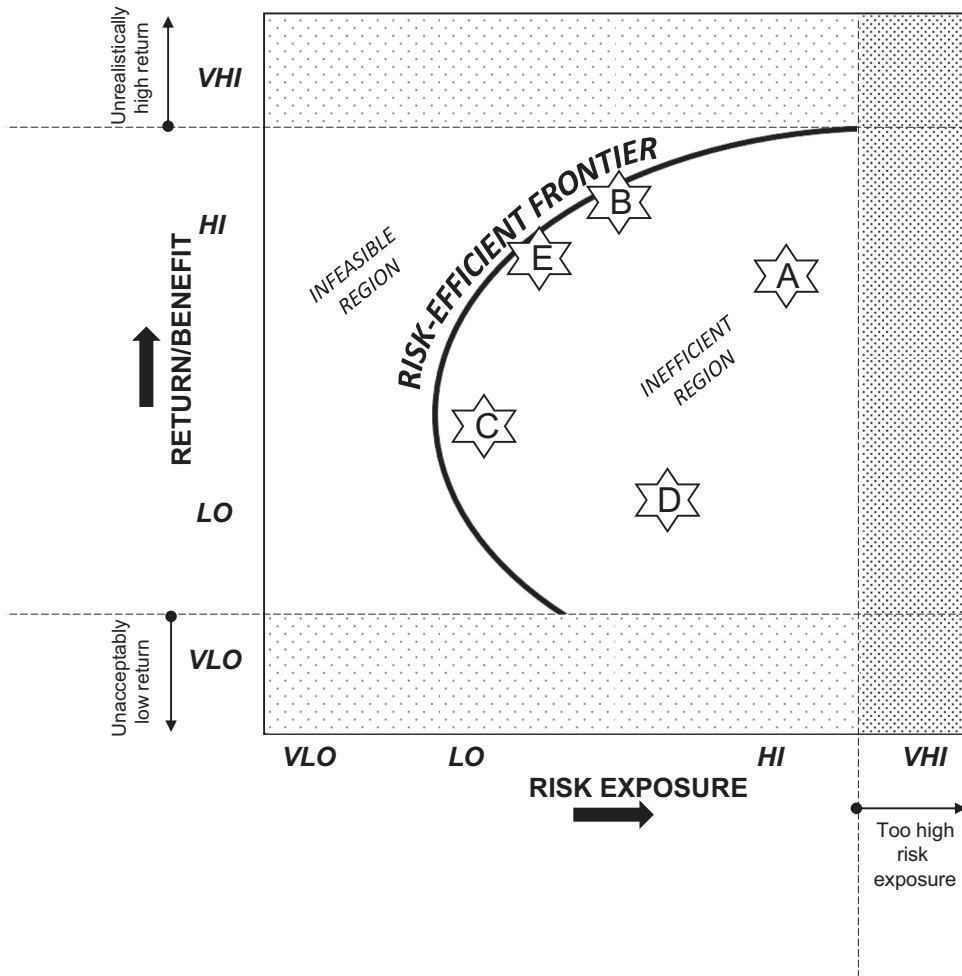
Figure 18-2: Example Risk Efficiency Graph
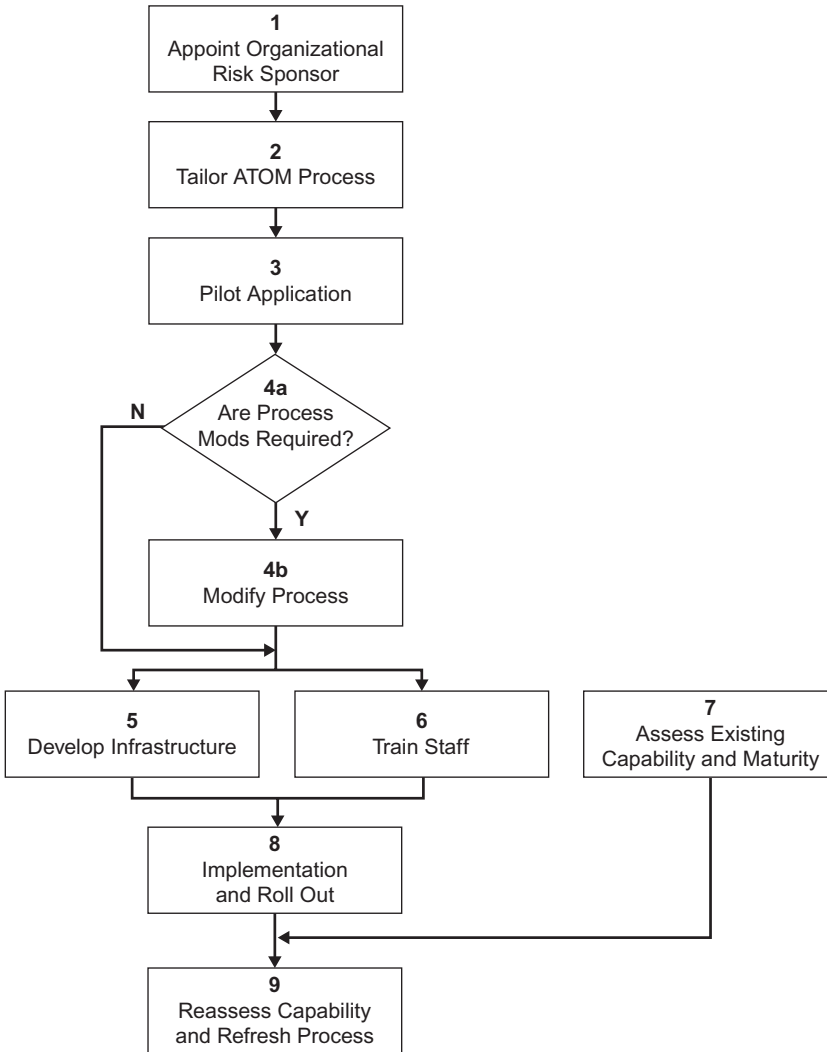
Figure E-1: Recommended Next Steps

Appendix: Templates and Examples

ATOM presents a practical "how-to" method that is applicable to any project of any size. To aid practitioners in putting ATOM into practice, this appendix provides a range of templates and examples to support each step of the ATOM risk process. Some of these templates and examples can be used without modification, while others require tailoring to the specific requirements of the project and organization. Further details on how to use each template and example are given in the relevant chapter.

The templates and examples in this appendix are listed below.

Agenda Templates

A-1: Typical agenda for an Initiation meeting

A-2: Sample agenda for a First Risk Assessment/two-day risk workshop

A-3: Sample agenda for a Major Review workshop

A-4: Sample agenda for a half-day risk review meeting

A-5: Typical agenda for a Post-Project Review meeting

Report Format Templates

A-6: Sample Risk Register format

A-7: Sample simplified Risk Register format

A-8: Sample contents list for a full risk report

A-9: Sample contents list for a summary risk report

Techniques Templates

A-10: Example project sizing tool

A-11: Stakeholder analysis template

A-12: Example RACI chart

A-13: Example Risk Checklist (based on Risk Breakdown Structure)

A-14: Example of Project-Specific Probability-Impact Scales

A-15: Double Probability-Impact Matrix

A-16: Sample Risk Breakdown Structure

A-17: Assumptions and constraints analysis template

A-18: Example risk mapping form

Agenda Templates

Time allowance (hours)	Content
½	1. Introductions
¼	2. Background to the project
½ – 1	3. Clarification of project objectives: Scope, time, cost, quality, other objectives?
¼	4. Scope and objectives of the risk management process
¼	5. Application of the ATOM risk management process
¼	6. Tools and techniques to be used
½	7. Roles and responsibilities for risk management
¼	8. Reporting and review requirements
¼	9. Definitions of scales for probability and impacts (P-I Scales)
¼	10. Risk thresholds
¼	11. Potential sources of risk to this project
¼	12. Next steps

Figure A-1: Typical Agenda for an Initiation Meeting

DAY 1	
Morning	
1. Introductions	
2. Confirm project objectives	
3. Confirm scope of risk process for this workshop	
4. Workshop ground rules	
5. Risk management briefing (if required)	
6. Expectations and results	
7. Identify risks	
Brainstorm risks using the Risk Breakdown Structure	
Afternoon	
Analysis of Assumptions and Constraints to generate further risks	
A Standard Risk Checklist to identify any further/final risks	
8. Rationalize risks	
9. Describe risks using risk metalanguage	
10. Record identified risks (during workshop or after meeting)	
DAY 2	
Morning	
11. Explanation of assessment scheme (recap)	
12. Assessment of probability and impacts	
13. Risk categorization	
Afternoon	
14. Nomination of Risk Owners	
15. _If time, develop initial responses to priority risks_	
16. Close the workshop	

Figure A-2: Sample Agenda for a First Risk Assessment/Two-Day Risk Workshop

Time allowance (hours)	Content
½	1. Initial scene setting
3	2. Review current risks
1	3. Review draft risks
1	4. Consider new risks
–	5. Update Risk Register (done during steps 1–4)
½	6. Review risk process effectiveness
¼	7. Close workshop

Figure A-3: Sample Agenda for a Major Review Workshop

Time allowance (hours)	Content
¼	1. Introductions
2	2. Review red risks
½	3. Review draft risks
½	4. Consider new risks
	5. Review amber risks if time permits
	6. Update Risk Register (done during earlier steps)
¼	7. Close meeting

Figure A-4: Sample Agenda for a Half-Day Risk Review Meeting

Time allowance (hours)	Content
¼	1. Introductions
½	2. Review final Risk Register
2	3. Identify risk-related "lessons to be learned"
½	4. Summarize "lessons to be learned"
¼	5. Close the meeting

Figure A-5: Typical Agenda for a Post-Project Review Meeting

Report Format Templates

Header information
Project title, project reference number (where used), phase Project Manager Client Risk Register issue number, date Date of most recent risk review
Risk identification data
Unique risk identifier Date identified Threat/opportunity indicator Short risk title Full risk description (cause/risk/effect) Risk source (RBS element) Project area affected (WBS element) Risk Owner Risk status (Draft, Active, Closed, Deleted, Expired, Occurred)
Risk assessment data
Probability/frequency of occurrence (current, pre-response) • VLO, LO, MED, HI, VHI Impact on each project objective (current, pre-response) • VLO, LO, MED, HI, VHI • Verbal description of impact Overall risk ranking • Red/Yellow/Green (or similar) • Risk Score (calculated from probability and impact)
Risk response data
Risk response strategy Risk actions each with an Action Owner and target completion date Risk action status

Figure A-6: Sample Risk Register Format

Project name: Project manager: Status date:															
Risk ID	Date raised	Risk description			Pre-response assessment			Risk owner	Risk response strategy	Risk Response Actions (with owners)	Action status	Post-response assessment		
		Cause	Risk	Effect	Probability	Impact	Priority (R/Y/G)					Probability	Impact	Priority (R/Y/G)
1														
2														
3														
4														
5														

Figure A-7: Sample Simplified Risk Register Format

```
EXECUTIVE SUMMARY

SCOPE AND OBJECTIVES OF REPORT

PROJECT STATUS SUMMARY

OVERALL RISK STATUS

TOP RISKS, ACTIONS, AND OWNERS

DETAILED RISK ASSESSMENT
     High/Medium/Low Risks
     Causal Analysis (Mapped to RBS)
     Effects Analysis (Mapped to WBS)

CONCLUSIONS AND RECOMMENDATIONS

APPENDICES
     COMPLETE RISK REGISTER
     PRIORITIZED RISK LIST
     [OTHER RESULTS AS REQUIRED]
```

Figure A-8: Sample Contents List for a Full Risk Report

```
EXECUTIVE SUMMARY

SCOPE AND OBJECTIVES OF REPORT

OVERALL RISK STATUS

TOP RISKS, ACTIONS, AND OWNERS

CHANGES SINCE LAST REVIEW

CONCLUSIONS AND RECOMMENDATIONS

APPENDIX
     COMPLETE RISK REGISTER IN PRIORITY ORDER
```

Figure A-9: Sample Contents List for a Summary Risk Report

Techniques Templates

This Project Sizing Tool divides projects into three categories (Small, Medium, and Large), to indicate the appropriate level of risk management process. Two shortcuts are used: projects with value <$50K are automatically defined as Small, and projects valued at >$5M are defined as Large. Projects valued between $50K–$5M are assessed against the ten criteria below. For each criterion the closest description is selected, and the corresponding criterion score is recorded at the right of the row (one of 2, 4, 8, or 16). Criterion scores are totaled to give an overall project score, indicating project size as follows:

≥75	*Large project*	An extended ATOM risk management process is required.
35–74	*Medium project*	A standard ATOM risk management process is required.
<35	*Small project*	A reduced ATOM risk management process is required.

Criterion	Criterion value = 2	Criterion value = 4	Criterion value = 8	Criterion value = 16	Criterion score
Strategic importance	Minor contribution to business objectives	Significant contribution to business objectives	Major contribution to business objectives	Critical to business success	
Commercial/ contractual complexity	No unusual commercial arrangements or conditions	Minor deviation from existing commercial practices	Novel commercial practices, new to at least one party	Groundbreaking commercial practices	
External constraints and dependencies	None	Some external influence on elements of the project	Key project objectives depend on external factors	Overall project success depends on external factors	
Requirement stability	Clear, fully defined, agreed-upon objectives	Some requirement uncertainty, minor changes during project	Major requirement uncertainty, major changes during project	Requirements not finalized and subject to negotiation	
Technical complexity	Routine repeat business, no new technology	Enhancement of existing product/ service	Novel product/ project with some innovation	Groundbreaking project with high innovation	
Market sector regulatory characteristics	No regulatory requirements	Standard regulatory framework	Challenging regulatory requirements	Highly regulated or novel sector	
Project value	Small project value (<$250K)	Significant project value ($250K–$1M)	Major project value ($1–$3M)	Large project value (>$3M)	
Project duration	Duration <3 months	Duration 3–12 months	Duration 1–3 years	Duration >3 years	
Project resources	Small in-house project team	Medium in-house project team	Large project team including external contractors	International project team or joint venture	
Post-project liabilities	None	Acceptable exposure	Significant exposure	Punitive exposure	
				OVERALL PROJECT SCORE	

Figure A-10: Example Project Sizing Tool

Stakeholder	Area of interest	Attitude (+/−)	Power (+/−)	Interest (+/−)	Stakeholder type

Instructions:

- List all key stakeholders and their interest (or stake) in the project in the left-hand two columns.
- For each stakeholder, identify whether their attitude toward the project is supportive or resistant (+ or −), whether their power to influence the project is high or low (+ or −), and whether their level of interest in the project is high or low (+ or −).

Figure A-11: Stakeholder Analysis Template

	Project Sponsor	Project Manager	Risk Champion	Risk Owner	Action Owner	Project Team Members	Other Stakeholders
Produce and maintain Risk Management Plan	C	A	R	I	I	I	I
Facilitate risk process (workshops, interviews, risk review meetings, etc.)		A	R				
Identify risks	R	R	A	I		R	R
Assess risks		R	A	I		R	R
Develop responses		A	C	R	C	C	I
Implement responses		I	I	A	R	C	I
Report progress on actions (individual risks)		I	A	R	R		
Produce and maintain Risk Register	I	A	R	C	I	I	I
Produce and maintain Risk Reports	I	A	R	C	I	I	I
Key:							
R = Responsible **A** = Accountable/Approve **C** = Consult **I** = Inform							

Figure A-12: Example RACI Chart

RBS Level 0	RBS Level 1	RBS Level 2	Example risks	Could this risk affect our project? Yes No Don't know Not applicable
0. PROJECT RISK	1. TECHNICAL RISK	1.1 Scope definition	Scope changes may arise during project. Redundant scope may be discovered.	
		1.2 Requirements definition	Client may introduce significant change during project (positive or negative). Internal inconsistencies may exist within requirements. Key requirements may be missing from formal requirement specification.	
		1.3 Estimates, assumptions, and constraints	Basis of estimating may be wrong. Planning assumptions may be invalidated during project. Imposed constraints may be relieved or removed.	
		1.4 Technical processes	Standard processes may not meet requirements of specific solution. New processes may be required. Processes may be improved and made more effective.	
		1.5 Technology	New technology may be developed during project lifetime. Technology changes may invalidate design.	

Figure A-13: Example Risk Checklist (based on Risk Breakdown Structure) *(continues)*

RBS Level 0	RBS Level 1	RBS Level 2	Example risks	Could this risk affect our project? Yes No Don't know Not applicable
0. PROJECT RISK	1. TECHNICAL RISK	1.6 Technical interfaces	Unexpected interactions may occur at key interfaces. Data inconsistencies across interfaces may require rework. Key interfaces may be reduced.	
		1.7 Design	It may prove impossible to meet some requirements within design limitations. Reuse of existing design elements may be possible.	
		1.8 Performance	Final solution may not meet performance requirements. Some performance requirements may be mutually exclusive.	
		1.9 Reliability & maintainability	Target reliability criteria may be unattainable with chosen solution. The use of innovative technology may improve reliability. Maintainability requirements may impose unacceptable design constraints.	
		1.10 Safety	ALARP solution may impose additional cost. Changes in safety regula-tions may require significant redesign.	

Figure A-13: *(continues)*

RBS Level 0	RBS Level 1	RBS Level 2	Example risks	Could this risk affect our project? Yes No Don't know Not applicable
0. PROJECT RISK	1. TECHNICAL RISK	1.11 Security	Security implications may be overlooked during design. Government regulations may change during project.	
		1.12 Test & acceptance	Test protocols may reveal significant design error, requiring rework. Client may withhold final acceptance for reasons outside contract.	
	2. MANAGEMENT RISK	2.1 Project management	Project management systems may not be adequate to support project requirements. Poor decision making may result in inappropriate task allocation. Adoption of best practice risk process may improve project performance.	
		2.2 Program/ portfolio management	Project may be given inappropriate priority within the program. Other projects may divert key resources. Other projects may be canceled and release resources.	
		2.3 Operations management	Design may expose weaknesses in existing products or processes. Business-as-usual demands may reduce project funding or contingency.	

Figure A-13: *(continues)*

RBS Level 0	RBS Level 1	RBS Level 2	Example risks	Could this risk affect our project? Yes No Don't know Not applicable
0. PROJECT RISK	2. MANAGEMENT RISK	2.4 Organization	Reorganization may impact project organization (negatively or positively). Changes in corporate structure may affect project (negatively or positively).	
		2.5 Resourcing	Key resources may be unavailable when required. Specific skills may not be available when required. It may be possible to recruit existing subcontract staff permanently.	
		2.6 Communication	The client's requirement may be misunderstood. Project reporting needs may change during project. Key stakeholder interests may change (positively or negatively).	
		2.7 Information	Client may fail to provide required information on time. Client-supplied information may be inadequate to support project.	
		2.8 HS&E	Health & safety legislation may change during the project. An accident or incident may occur, delaying the project.	

Figure A-13: *(continues)*

RBS Level 0	RBS Level 1	RBS Level 2	Example risks	Could this risk affect our project? Yes No Don't know Not applicable
0. PROJECT RISK	2. MANAGEMENT RISK	2.9 Quality	The number of defects found during integration may not match expectations (higher or lower). Quality circles may result in significant effort reduction. Effective quality management may reduce rework.	
		2.10 Reputation	Corporate reputation incident may damage support for the project. Senior management may lose confidence in project team. Improved reputation may increase availability of funds and resources.	
		3.1 Contractual terms & conditions	Client standard terms may prove unacceptably onerous. Contractual terms may contain internal inconsistencies. Harmonized client/ subcontractor terms may reduce risk exposure.	
	3. COMMERCIAL RISK	3.2 Internal procurement	Other departments may not deliver as expected. Required skills may not be available from other departments. Internal support may increase as the project progresses.	

Figure A-13: *(continues)*

RBS Level 0	RBS Level 1	RBS Level 2	Example risks	Could this risk affect our project? Yes No Don't know Not applicable
0. PROJECT RISK	3. COMMERCIAL RISK	3.3 Suppliers & vendors	A key supplier may go out of business. Mergers between suppliers may erode competitiveness. Vendors may be able to deliver ahead of schedule.	
		3.4 Subcontracts	Key subcontractors may refuse to work together. Subcontract staff may take industrial action (strike). Partnering with selected subcontractors may improve working relationships.	
		3.5 Client/ customer stability	Client may change business focus and withdraw support for project. Changes in client personnel may require additional project management effort. Client may be bought out or merge with a more supportive company.	
		3.6 Partnerships & joint ventures	Our partner may have competing commercial interests. The joint venture may break up.	
	4. EXTERNAL RISK	4.1 Legislation	Changes in legislation may impose changes in the solution (positive or negative).	

Figure A-13: *(continues)*

RBS Level 0	RBS Level 1	RBS Level 2	Example risks	Could this risk affect our project? Yes No Don't know Not applicable
0. PROJECT RISK	4. EXTERNAL RISK		Legal requirements may add unforeseen design requirements.	
		4.2 Exchange rates	Exchange rates may change during the project (favorably or unfavorably). Key suppliers may invoice in foreign currency.	
		4.3 Site/facilities	Site access may prove more difficult than expected. Required facilities may not be available on site. New transport arrangements may ease project logistics.	
		4.4 Environmental/ weather	Weather may be unseasonable (better or worse than expected). Unexpected environmental conditions may affect progress (positively or negatively).	
		4.5 Competition	A key competitor may launch a competing product and invalidate the project. Key staff may be poached by competitors. Key competitor may withdraw from the market.	
		4.6 Regulatory	Regulatory requirements may impose unexpected design constraints. Significant changes in regulation may occur during the project (positive or negative).	

Figure A-13: *(continues)*

RBS Level 0	RBS Level 1	RBS Level 2	Example risks	Could this risk affect our project? Yes No Don't know Not applicable
0. PROJECT RISK	4. EXTERNAL RISK	4.7 Political	Political factors may influence senior management support for the project. A change in government may result in changed priorities or legislation (positively or negatively).	
		4.8 Country	Local resources may lack the required skills. Currency instability may undermine the business case for the project. Local government interest in the project may change (positively or negatively).	
		4.9 Social/ demographic	Changing social imperatives may impose additional requirements. Public perception of the project may change (positively or negatively).	
		4.10 Pressure groups	Extremists may disrupt project progress. Lobby groups may promote the cause of the project.	
		4.11 Force majeure	Force majeure event may occur, disrupting the project. Occurrence of force majeure may create an opportunity to address underlying issues.	

Figure A-13: *(continued)*

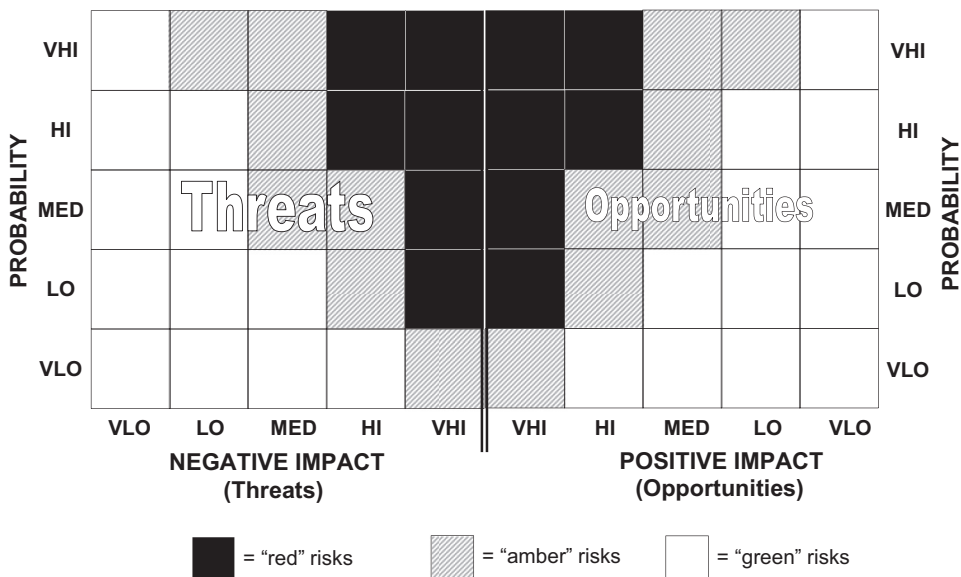| Scale	Probability	+/− Impact on project objectives		
		Time	Cost	Quality
VHI	71–99%	>20 days	>$200K	Very significant impact on overall functionality
HI	51–70%	11–20 days	$101K–$200K	Significant impact on overall functionality
MED	31–50%	4–10 days	$51K–$100K	Some impact in key functional areas
LO	11–30%	1–3 days	$10K–$50K	Minor impact on overall functionality
VLO	1–10%	<1 day	<$10K	Minor impact on secondary functions
NIL	<1%	No change	No change	No change in functionality

Figure A-14: Example of Project-Specific Probability-Impact Scales

Figure A-15: Double Probability-Impact Matrix

RBS Level 0	RBS Level 1	RBS Level 2
0. PROJECT RISK	1. TECHNICAL RISK	1.1 Scope definition 1.2 Requirements definition 1.3 Estimates, assumptions, constraints 1.4 Technical processes 1.5 Technology 1.6 Technical interfaces 1.7 Design 1.8 Performance 1.9 Reliability & maintainability 1.10 Safety 1.11 Security 1.12 Test & acceptance
	2. MANAGEMENT RISK	2.1 Project management 2.2 Program/portfolio management 2.3 Operations management 2.4 Organization 2.5 Resourcing 2.6 Communication 2.7 Information 2.8 HS&E 2.9 Quality 2.10 Reputation
	3. COMMERCIAL RISK	3.1 Contractual terms & conditions 3.2 Internal procurement 3.3 Suppliers & vendors 3.4 Subcontracts 3.5 Client/customer stability 3.6 Partnerships & joint ventures
	4. EXTERNAL RISK	4.1 Legislation 4.2 Exchange rates 4.3 Site/facilities 4.4 Environmental/weather 4.5 Competition 4.6 Regulatory 4.7 Political 4.8 Country 4.9 Social/demographic 4.10 Pressure groups 4.11 Force majeure

Figure A-16: Sample Risk Breakdown Structure

Assumption or constraint	Could this assumption/ constraint prove false? (Y/N)	If false, would it affect project? (Y/N)	Convert to a risk?
Instructions: List all project assumptions and constraints in the left-hand column. Identify whether each might prove false (Y/N), and whether a false assumption/ constraint might affect the project (Y/N). Where both answers are Yes, mark the assumption/constraint as a risk.			

Figure A-17: Assumptions and Constraints Analysis Template

Risks (opportunity or threat)	Mapped to activities or budget items	PROB	MIN	ML	MAX	Distribution type for impact	Correlation group (where relevant)

Figure A-18: Example Risk Mapping Form