Chapter 2

Project Risk Management

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PMI Publications

The *PMBOK® Guide* and the *Practice Standard for Project Risk Management* are the PMI publications used as the basis for the PMI-RMP exam. While the *PMBOK® Guide* offers information on standardized project management practices across ten knowledge areas, the *Practice Standard* focuses strictly on project risk management, providing a much deeper dive into risk management topics and tools.

From the aspect of reading and learning, neither publication is especially reader-friendly (read: they are boring) and there are both redundancies and slight contradictions between the two publications. I have incorporated information from both publications in this study guide in a format that is arranged more logically and makes the material easier to learn. If you wish to read either publication, you will find it easier to do so after completing this book.

If you are PMP-certified, you are likely to be at least somewhat familiar with the *PMBOK® Guide*. Keep in mind that the current version is the 5th edition. I do not recommend reviewing earlier editions, as there are considerable differences outside of the risk processes.

The *PMBOK® Guide*

A Guide to the Project Management Body of Knowledge (PMBOK® Guide) is the result of a collaborative effort of project managers working globally and across industries. It provides the fundamentals of project management as they apply to a wide range of projects.

As the title implies, it is a "guide" to the body of knowledge and should not be interpreted as a definitive methodology. The intention of the *PMBOK® Guide* is to provide concepts for project managers to apply as appropriate within the constraints of individual organizations' projects and needs.

Project risk management is an inherent part of project management, and vice versa. The two cannot be separated or viewed as individual approaches. PMI-RMP candidates are expected to be familiar with the project management processes, tools and techniques, and vocabulary described in the *PMBOK® Guide*. When appropriate, that information is explicitly addressed in this study guide.

The project management framework within the *PMBOK® Guide* encompasses ten knowledge areas, five process groups (or domains), and 47 project management processes. Each process is associated with a knowledge area and a process group.

Knowledge Areas	Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Integration	•Develop Project Charter	•Develop Project Management Plan	•Direct and Manage Project Work	•Monitor and Control Project Work •Perform Integrated Change Control	•Close Project or Phase
Scope		•Plan Scope Management •Collect Requirements •Define Scope •Create WBS		•Validate Scope •Control Scope	
Time		•Plan Schedule Management •Define Activities •Sequence Activities •Estimate Activity Resources •Estimate Activity Durations •Develop Schedule		•Control Schedule	
Cost		•Plan Cost Management •Estimate Costs •Determine Budget		•Control Costs	
Quality		•Plan Quality Management	•Perform Quality Assurance	•Control Quality	
Human Resource		•Plan Human Resource Management	•Acquire Project Team •Develop Project Team •Manage Project Team		
Communication		•Plan Communications Management	•Manage Communications	•Control Communications	
Risk		•Plan Risk Management •Identify Risks •Perform Qualitative Risk Analysis •Perform Quantitative Risk Analysis •Plan Risk Responses		•Control Risks	
Procurement		•Plan Procurement Management	•Conduct Procurements	•Control Procurements	•Close Procurements
Stakeholder	•Identify Stakeholders	•Plan Stakeholder Management	•Manage Stakeholder Engagement	•Control Stakeholder Engagement	

Figure 2-1: *PMBOK® Guide* Framework

PMBOK® Guide, page 61

Knowledge Areas

The framework contains ten knowledge areas:

1. Integration – The project integration management knowledge area encompasses the processes that identify, define, combine, unify, and coordinate the rest of the processes in the correct project management process groups. As such, they can be considered umbrella processes. You will notice that the integration knowledge area is the only one that lists processes for all five process groups. These processes produce some of the most critical outputs, such as the project charter, the project management plan, the project deliverables, and the work performance reports, etc.

2. Scope – The project scope management knowledge area encompasses the processes required to ensure that the project includes all the work required and only the work required to complete the project successfully. During the scope

processes, requirements are gathered, the scope statement is developed, and from the scope statement, the work breakdown structure (WBS) is developed. The scope baseline, a component of the project management plan, is the "frozen," approved scope of the project. The scope knowledge area also includes obtaining customer acceptance of the completed project deliverables during the process of validating the scope.

3. Time – The project time management knowledge area encompasses the processes required to manage the timely completion of the project through the identification of activities to be completed and the development of the project schedule. The schedule baseline, a component of the project management plan, is the "frozen," approved schedule for the project. Controlling the schedule may also involve conducting various analyses, including but not limited to an earned value analysis to calculate the schedule variance (SV). You will notice that all processes within the time knowledge area have either "activity" or "schedule" in their name.

4. Cost – The project cost management knowledge area encompasses the processes involved in planning, estimating, budgeting, and controlling costs so that the project can be completed within the approved budget. The cost baseline, a component of the project management plan, is the "frozen" approved budget for the project. Controlling costs on the project may also involve using a number of variance analysis and forecasting techniques, including but not limited to computing an earned value analysis to determine the cost variance (CV), forecasting the estimate to complete (ETC) and the estimate at completion (EAC), and determining the to-complete performance index (TCPI).

5. Quality – There are three processes in the project quality management knowledge area that determine, measure, and improve the quality of both the product and the project. Many of the tools and techniques that are used in the quality knowledge area also apply to project risk management.

6. Human Resource – The project human resource management knowledge area encompasses the processes of organizing, managing, and leading the project team. These include documenting roles and responsibilities, acquiring the team members from internal and/or external sources, enhancing the team's competencies and working relationships, and resolving conflicts and managing issues within the team.

7. Communications – The project communications management knowledge area encompasses the processes that are required to ensure timely and appropriate planning, collection, creation, distribution, management, and control, as well as the ultimate disposition of information. This area includes both written and verbal communication techniques, record management, and status reporting. Project communication management is integral to managing stakeholder engagement.

8. Risk – The project risk management knowledge area encompasses the processes of conducting risk management planning, identification, analysis, response planning, and risk control for the project. These six risk processes will be discussed in extensive detail in the last six chapters of this book.

9. Procurement – The project procurement management knowledge area encompasses the processes necessary for purchasing or acquiring products, services, or results needed from outside the project team. Upon conducting a make-or-buy analysis, it may be determined that certain project materials or services should or must be procured externally. Alignment with the organization's procurement policies, including vendor selection and contract utilization, is required. Risk responses may also require procurement activities for the appropriate transfer of information about risks.

10. Stakeholder – The project stakeholder management knowledge area encompasses the processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution. The stakeholder knowledge area was a new addition to the 5th Edition of the *PMBOK® Guide*. Previously, the stakeholder processes were considered part of the project communication management knowledge area, and because of this, there is some overlap and redundancy between the two knowledge areas.

Process Groups

The project management framework consists of five process groups: initiating, planning, executing, monitoring and controlling, and closing. Because a project is a temporary initiative, it generally starts with the initiating processes and ends with the closing processes. However, planning, executing, and monitoring and controlling processes occur concurrently and iteratively throughout the project.
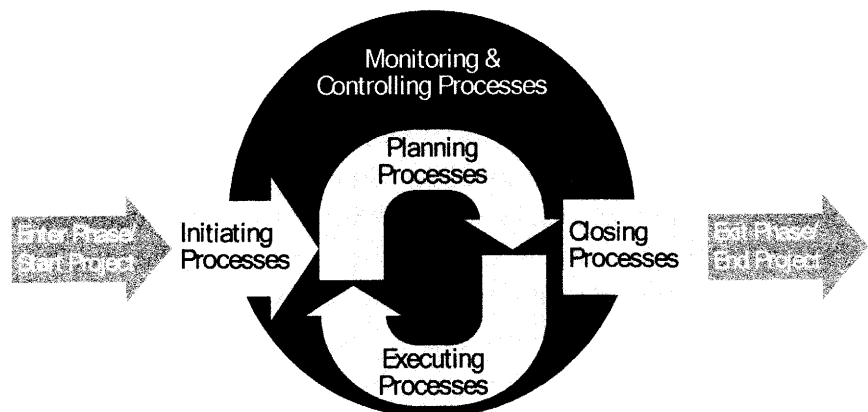

Figure 2-2: Project Management Process Groups

PMBOK® Guide, page 50

The process groups (or domains) represent groups of related processes and not project phases. These process groups may be repeated throughout multiple project phases. This can be one of the more confusing aspects the project management framework, because at first glance, the process groups misleadingly appear to reflect project phases. Figure 2-2 above is a good visual to keep in mind to understand the relationships between these domains.

1. Initiating – The initiating process group encompasses the two processes that begin to define the project and objectives. These processes may occur at the beginning of a project or the beginning of a new phase of the project. The initiating processes secure authorization for the project or phase to begin. In addition, it is during this process group that the stakeholders for the project are identified.

2. Planning – The planning process group encompasses those processes that define and refine the project objectives. The planning processes identify the project approach to achieving the objectives and scope of the project and span all ten knowledge areas. While there are 24 processes in planning (over half of the total processes), this does not represent the proportional time spent on these processes in reality. Rather, it reflects the need to ensure that all aspects of the project have undergone appropriate planning. The ultimate output of these planning processes is the project management plan. The project management plan includes the project baselines and all of the subsidiary plans. Planning processes are performed iteratively throughout the project.

3. Executing – The executing process group encompasses those processes that integrate the project resources to carry out the project management plan. There are only eight executing processes, but these processes represent the majority of the work, effort, and budget of the project. This is where the work of the project actually occurs, and as such, it should not be considered a phase. Rather, the executing processes occur throughout the project life cycle.

4. Monitoring and Controlling – The monitoring and controlling process group encompasses those processes that measure and monitor progress against the project management plan and specifically against the project baselines. These processes identify variances from those baselines and determine the actions that need to be taken to address those variances. The monitoring and controlling of the project occurs from initiation to completion.

5. Closing – The closing process group encompasses the two processes that formalize acceptance of the product, service, or result. The closing processes close out any procurements, bring the project or phase to a close, and complete the administrative closure of the project. Closing processes may be occurring throughout the project.

Though they may resemble phases, the process groups are really iterative groups of related processes.

The interactions of the process groups are based on the Plan-Do-Check-Act (PDCA) cycle as defined by Walter Shewhart. The PDCA cycle was later modified by W. Edwards Deming.

- "Plan" represents the planning process group
- "Do" represents the executing process group
- "Check" and "Act" represent the monitoring and controlling process group

Planning

PLAN

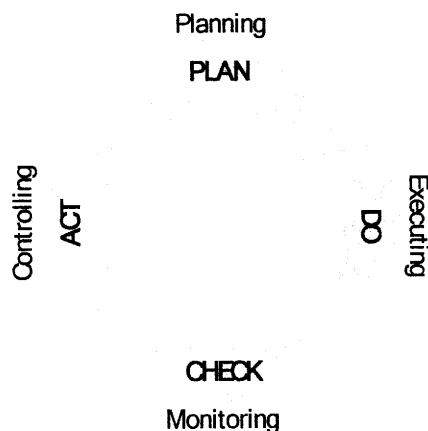Controlling **ACT**   **DO** Executing

CHECK

Monitoring

Figure 2-3: Plan-Do-Check-Act-Cycle

Note the iterative nature of the relationship, indicating that as work progresses, the results will be continuously monitored, controlled, and potentially re-planned.

The *Practice Standard for Project Risk Management*

The *Practice Standard for Project Risk Management*, published in 2009, defines the aspects of project risk management that are recognized as good practice for most projects.

While the *Practice Standard* aligns with and is a bit redundant with the risk section within the *PMBOK® Guide*, it provides more information on a number of risk tools and techniques.

There are some slight differences between the components of the risk management processes, related to the inputs, tools and techniques, and outputs. Those differences are highlighted in this book.

PMI Risk Processes

Both the *PMBOK® Guide* and the *Practice Standard for Project Risk Management* present six project risk management processes. The first five processes are in the planning process group, and the final process is in the monitoring and controlling process group:

1. Plan Risk Management
2. Identify Risks
3. Perform Qualitative Risk Analysis
4. Perform Quantitative Risk Analysis
5. Plan Risk Responses
6. Control Risks (note that in the *Practice Standard*, this process reflects the *PMBOK® Guide*, 4th Edition name "Monitor and Control Risks")
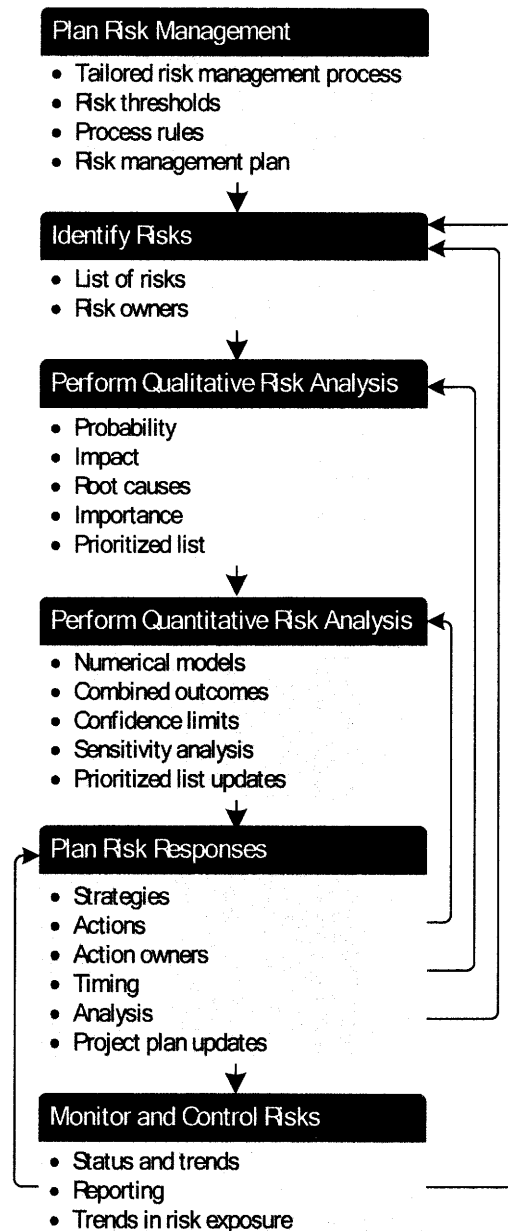
Plan Risk Management
- Tailored risk management process
- Risk thresholds
- Process rules
- Risk management plan

Identify Risks
- List of risks
- Risk owners

Perform Qualitative Risk Analysis
- Probability
- Impact
- Root causes
- Importance
- Prioritized list

Perform Quantitative Risk Analysis
- Numerical models
- Combined outcomes
- Confidence limits
- Sensitivity analysis
- Prioritized list updates

Plan Risk Responses
- Strategies
- Actions
- Action owners
- Timing
- Analysis
- Project plan updates

Monitor and Control Risks
- Status and trends
- Reporting
- Trends in risk exposure

Figure 2-4: Project Risk Management Process Flow Diagram
Practice Standard for Project Risk Management, page 17

To remember the processes, use the acronym PIER-C: Plan, Identify, Evaluate (qualitatively and quantitatively), Respond, and Control.

ISO 31000 Risk Principles and Guidelines

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies. ISO 31000 is the ISO standard for risk management. PMI's *PMBOK® Guide* and the *Practice Standard for Project Risk Management* align with ISO 31000, although some of the terminology may be somewhat different. As reference, these differences are presented throughout this text.

For example, the naming of the processes differs from the *PMBOK® Guide* and the *Practice Standard* in the ISO 31000 standard:

- Plan Risk Management is known as "establishing the context"
- Identify Risks is known as "risk identification"
- Perform Qualitative Risk Analysis is known as "risk analysis"
- Perform Quantitative Risk Analysis is known as "risk analysis" and "risk evaluation"
- Plan Risk Responses is known as "risk treatment"
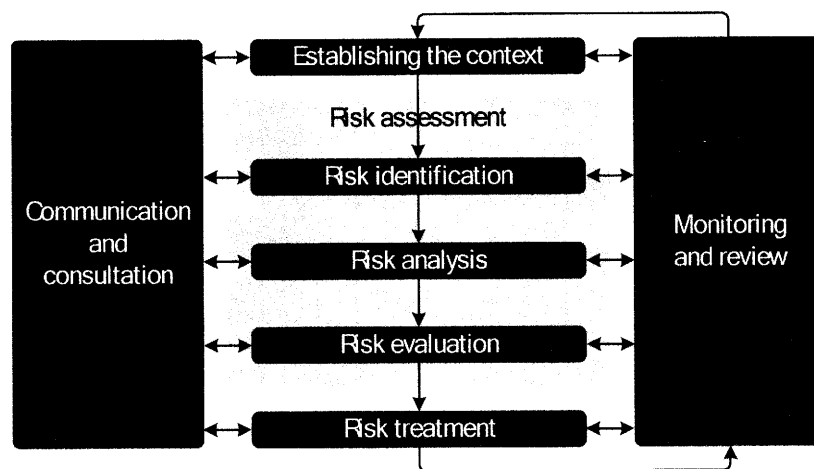- Control Risks is known as "monitoring and review"

Figure 2-5: The ISO 31000 Risk Management Process

ISO 31000 - Risk Management Principles and Guidelines, page 14

Plan Risk Management

The Plan Risk Management process defines the scope and objectives of the project risk management approach, ensuring that the project risk management is fully integrated with the overall project management.

The risk management plan, a subsidiary plan to the project management plan, provides detailed information on the risk management approach, taxonomy, tools, communication, and risk analysis structure. The risk management plan is one of the more comprehensive and necessary subsidiary plans, as it provides the foundation and framework for project risk management. The risk management plan may be developed generally for an organization, but it must be modified appropriately for individual projects, as each project will require unique aspects of risk management.

Plan Risk Management: Inputs, Tools and Techniques, and Outputs

Inputs	Tools and Techniques	Outputs
1. Project management plan	1. Analytical techniques	1. Risk management plan
2. Project charter	2. Expert judgment	
3. Stakeholder register	3. Meetings	
4. Enterprise environmental factors		
5. Organizational process assets		

Figure 2-6: Plan Risk Management ITTOs

PMBOK® Guide, page 313

In ISO 31000, planning risk management is known as "establishing the context" of the project risk management approach. When the context is established, the objectives of project risk management are articulated, the internal and external parameters are defined, and the scope and risk criteria for the remaining processes are structured.

Identify Risks

The Identify Risks process, which is conducted iteratively throughout the project, seeks to identify all knowable risks of the project.

Risk identification must occur early in the project, theoretically even before the project is chartered, and must be considered an ongoing process from project conception to completion.

Identify Risks: Inputs, Tools and Techniques, and Outputs

Inputs	Tools and Techniques	Outputs
1. Risk management plan	1. Documentation reviews	1. Risk register
2. Cost management plan	2. Information gathering techniques	
3. Schedule management plan	3. Checklist analysis	
4. Quality management plan	4. Assumptions analysis	
5. HR management plan	5. Diagramming techniques	
6. Scope baseline	6. SWOT analysis	
7. Activity cost estimates	7. Expert judgment	
8. Activity duration estimates		
9. Stakeholder register		
10. Project documents		
11. Procurement documents		
12. Enterprise environmental factors		
13. Organizational process assets		

Figure 2-7: Identify Risks ITTOs

PMBOK® Guide, page 313

According to ISO 31000, "risk identification" includes identifying sources of risk, areas of impacts, and the causes and potential consequences of events. The aim of this step is to generate a comprehensive list of risks based on those events that might create, enhance, prevent, degrade, accelerate, or delay the achievement of the project objectives.

Perform Qualitative Risk Analysis

The Perform Qualitative Risk Analysis process assesses and evaluates the probability of an individual risk occurring and assesses the impact of the risk if it were to occur. This evaluation is based on a pre-defined and communicated risk assessment scale, such as 0-1 or 1-5. These risk assessment scales are documented within the project management plan.

Using the probability and impact scores, the risks are then prioritized for additional analysis or response planning as appropriate. All risks are evaluated using a qualitative risk analysis.

Perform Qualitative Risk Analysis: Inputs, Tools and Techniques, and Outputs

Inputs	Tools and Techniques	Outputs
1. Risk management plan	1. Risk probability and impact assessment	1. Project documents updates
2. Scope baseline	2. Probability and impact matrix	
3. Risk register	3. Risk data quality assessment	
4. Enterprise environmental factors	4. Risk categorization	
5. Organizational process assets	5. Risk urgency assessment	
	6. Expert judgment	

Figure 2-8: Perform Qualitative Risk Analysis ITTOs

PMBOK® Guide, page 328

According to ISO 31000, "risk analysis" involves consideration of the causes and sources of risk, their positive and negative consequences, and the likelihood that those consequences will occur. Factors that affect consequences and their likelihoods should be identified.

Perform Quantitative Risk Analysis

The Perform Quantitative Risk Analysis process further evaluates the higher-priority risks in terms of impact on costs and/or schedule.

In a qualitative analysis, a risk may have an impact score of 3, but in quantitative analysis, that same risk may have a $3,000 or 10-day schedule delay impact.

Quantitative analysis is used to evaluate the aggregate effect of risks on the overall project objectives. Because quantitative risk analysis is more time-consuming and may require specialized tools and knowledge, not all risks are analyzed quantitatively.

Perform Quantitative Risk Analysis: Inputs, Tools and Techniques, and Outputs

Inputs	Tools and Techniques	Outputs
1. Risk management plan	1. Data gathering and representation techniques	1. Project documents updates
2. Cost management plan		
3. Schedule management plan	2. Quantitative risk analysis and modeling techniques	
4. Risk register	3. Expert judgment	
5. Enterprise environmental factors		
6. Organizational process assets		

Figure 2-9: Perform Quantitative Risk Analysis ITTOs

PMBOK® Guide, page 334

In ISO 31000, quantitative risk analysis is part of both "risk analysis" and "risk evaluation." Risk analysis can be qualitative, semi-quantitative, quantitative, or a combination of these, depending on the circumstances and the resources available to the team. Risk evaluation is used to assist in making decisions, based on the outcomes of risk analysis, about which risks need treatment and the prioritization of treatment implementation.

Plan Risk Responses

During the Plan Risk Responses process, the prioritized risks are evaluated for the most appropriate responses. Responses may be proactive strategies, which are implemented prior to the risk event occurring, or contingent response strategies, which are planned in advance but only implemented if the risk event or risk trigger occurs.

In addition to determining responses, a risk owner is also identified for each of the prioritized risks. This process identifies residual and secondary risks. Residual risks are those risks that remain after a response is taken. Secondary risks are those that arise as a result of implementing a risk response.

Plan Risk Responses: Inputs, Tools and Techniques, and Outputs

Inputs	Tools and Techniques	Outputs
1. Risk management plan	1. Strategies for negative risks or threats	1. Project management plan updates
2. Risk register	2. Strategies for positive risks or opportunities	2. Project documents updates
	3. Contingent response strategies	
	4. Expert judgment	

Figure 2-10: Plan Risk Responses ITTOs

PMBOK® Guide, page 342

In ISO 31000, risk response planning is considered "risk treatment." Risk treatment involves selecting one or more options for modifying risks and implementing those options.

Control Risks

During the Control Risks process, the identified risks are monitored and potentially reassessed as the environment or circumstances change. In addition, the risk responses and risk management approach are audited to ensure that risk is being adequately managed for the project.

Control Risks: Inputs, Tools and Techniques, and Outputs

Inputs	Tools and Techniques	Outputs
1. Project management plan	1. Risk reassessment	1. Work performance information
2. Risk register	2. Risk audits	2. Change requests
3. Work performance data	3. Variance and trend analysis	3. Project management plan updates
4. Work performance reports	4. Technical performance measurement	4. Project documents updates
	5. Reserve analysis	5. Organizational process assets updates
	6. Meetings	

Figure 2-11: Control Risks ITTOs

PMBOK® Guide, page 349

In ISO 31000, controlling risks is considered "monitoring and review." Both monitoring and review should be a planned part of the risk management process and involve regular checking or surveillance. It can be periodic or ad hoc.

Additional Tools and Techniques

There are a number of additional risk management tools and techniques that are presented in the *Practice Standard for Project Risk Management*. The table below summarizes these tools and techniques and the processes that may use them. These tools and techniques are defined in more detail later in the book.

From an exam perspective, it is not critical that you memorize this table. You will find that many of the tools and techniques can be used in a number of different ways and can apply to multiple processes.

	Identify Risks	Perform Qualitative Risk Analysis	Perform Quantitative Risk Analysis	Plan Risk Responses	Control Risks
Analytic hierarchy process (AHP)		X			
Brainstorming	X			X	
Cause and effect diagrams	X				
Checklists	X			X	
Contingency planning				X	
Contingency reserve estimation				X	
Critical chain project management (CCPM)				X	X
Decision tree analysis				X	
Delphi technique	X			X	
Estimating techniques		X			
Expected monetary value (EMV)			X	X	
FMEA / fault tree analysis	X				
Force field analysis	X			X	
Industry knowledge base	X			X	
Influence diagrams	X				
Interviews	X		X	X	
Post project reviews / lessons learned / historical information	X	X			
Prompt lists	X				
Questionnaire	X				
Risk breakdown structure (RBS)	X				
Root cause analysis	X	X			
System dynamics	X				
Work breakdown structure (WBS) review	X				

Figure 2-12: Practice Standard for Project Risk Management Tools

Practice Standard for Project Risk Management