Chapter 11
Project Risk Management (PMBOK Guide)

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Introduction

- The process of conducting risk management planning, identification, analysis, response planning, and monitoring and control on a project
- Objective: increase the probability and impact of positive events, and decrease the probability and impact of negative events
- Plan risk management
- Identify risks
- Perform qualitative risk analysis
- Perform quantitative risk analysis
- Plan risk responses
- Monitor and control risks
Introduction

• Risk
  – Occurs in future
  – An uncertain event or condition
  – May affect: scope, schedule, cost, performance, and quality
  – May have one or more causes, one or more impacts
  – A requirement, assumption, constraint, or condition creates the possibility of negative or positive outcomes
  – Limited personnel, permit issue, limited resources
  – Contingency plans should always be there as not all of risks are known!
Introduction

• Risk tolerance
• Risk attitudes adopted by people are driven by perception, tolerances, and other biases
• Consistent approach to risk should be developed, and communication about risk and its handling should be open and honest
• Risk response should be a balance between risk taking and risk tolerance
• Risk management should be proactive and consistent throughout project
11.1 Plan Risk Management

• The process of how to conduct risk management activities
• Success of the other five risk management processes will be enhanced by careful and explicit planning
• The degree, type and visibility of risk management should be commensurate with both the risks and importance of the project
• Important to provide sufficient resources and time for risk management activities, and risk evaluation
Inputs, Tools & Techniques, Outputs

**Inputs**

1. Project scope statement
2. Cost management plan
3. Schedule management plan
4. Communications management plan
5. Enterprise environmental factors
6. Organizational process assets

**Tools & Techniques**

1. Planning meetings and analysis

**Outputs**

1. Risk management plan
Data Flow
Inputs

• Project scope statement  
  – What the risks are and how significant they are

• Cost management plan  
  – How risk budgets, contingencies, and management reserves will be reported and assessed

• Schedule management plan  
  – How schedule contingencies will be reported assessed

• Communications management plan  
  – Who to share information on various risks and responses at different times

• Enterprise environmental factors  
  – Risk attitudes and tolerances (the degree of risk that an organization withstand)
Input

• Organizational process assets
  – Risk categories
  – Common definitions of concepts
  – Risk statement formats
  – Standard templates
  – Roles and responsibilities
  – Authority levels for decision-making
  – Lessons learned, and
  – Stakeholder registers
Tools and Techniques

• Planning meetings and analysis
  – Attendees
    • Project manager
    • Selected team members and stakeholders
    • Anyone within organization in charge of managing risk planning and executing activities
  – High level plans are defined including risk management cost and schedule
  – Risk contingency reserve application approaches are established and reviewed
  – Responsibilities are assigned
  – Templates for risk categories, definition of terms like level of risk, probability by type of risk, impact by type of objectives, and probability and impact matrix will be tailored to the specific project
Outputs

• Risk management plan
  – Methodology (approaches, tools, and data sources to perform risk management)
  – Roles and responsibilities (lead, support, and risk management team members, and their responsibilities)
  – Budgeting (assign resources, estimates funds, and establishes protocols of contingency reserve)
  – Timing (when and how often should the risk management process should be performed, establishes protocols for application of schedule contingency reserves, and establishes risk management activities to be included in the project schedule)
  – Risk categories (process of systematically identifying risks. Simple list/structures into Risk Breakdown Structure (RBS))
Example of Risk Breakdown Structure (RBS)

The Risk Breakdown Structure (RBS) lists the categories and sub-categories within which risks may arise for a typical project. Different RBSs will be appropriate for different types of projects and different types of organizations. One benefit of this approach is to remind participants in a risk identification exercise of the many sources from which project risk may arise.
Outputs

– Definition of risk probability and impact
  • Negative perspective
  • Positive perspective
Definition of Impact Scales for Four Project Objectives

<table>
<thead>
<tr>
<th>Project Objective</th>
<th>Relative or numerical scales are shown</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very low / .05</td>
</tr>
<tr>
<td>Cost</td>
<td>Insignificant cost increase</td>
</tr>
<tr>
<td>Time</td>
<td>Insignificant time increase</td>
</tr>
<tr>
<td>Scope</td>
<td>Scope decrease barely noticeable</td>
</tr>
<tr>
<td>Quality</td>
<td>Quality degradation barely noticeable</td>
</tr>
</tbody>
</table>

This table presents examples of risk impact definitions for four different project objectives. They should be tailored in the Risk Management Planning process to the individual project and to the organization’s risk thresholds. Impact definitions can be developed for opportunities in a similar way.
Outputs

– Probability and impact matrix (risks are prioritized based on their potential implications)
– Revised stakeholder’s tolerances
– Reporting format (how to document, analyze, and communicate the outcomes of the risk management processes)
– Tracking (documents how risk activities are recorded for the benefit of the current project, as well as for future needs and lessons learned, and how risk management processes will be audited)
11.2 Identify Risks

• The process of determining which risks may affect the project and documenting their characteristics

• Project manager, team members, risk management team, customers, subject matter experts, end users, other project managers, stakeholders, and risk management experts should participate

• Iterative process, frequency depends on situation
Inputs, Tools & Techniques, Outputs

**Inputs**
1. Risk management plan
2. Activity cost estimates
3. Activity duration estimates
4. Scope baseline
5. Stakeholder register
6. Cost management plan
7. Schedule management plan
8. Quality management plan
9. Project documents
10. Enterprise environmental factors
11. Organizational process assets

**Tools & Techniques**
1. Documentation reviews
2. Information gathering techniques
3. Checklist analysis
4. Assumptions analysis
5. Diagramming techniques
6. SWOT analysis
7. Expert judgment

**Outputs**
1. Risk register
Data Flow
Inputs

• Risk management plan (roles and responsibilities, risk management activities in budget and schedule, risk categories)
• Activity cost estimation (provides quantitative assessment of the likely cost to complete scheduled activities)
• Activity duration estimation (provides quantitative assessment of the likely time to complete scheduled activities)
• Scope baseline (assumptions made and their uncertainty, at both micro and macro levels)
• Stakeholder register (for soliciting inputs for identifying risks)
• Cost management plan (may generate or alleviate risk by its nature or structure)
• Schedule management plan (may generate or alleviate risk by its nature or structure)
• Quality management plan (may generate or alleviate risk by its nature or structure)
Inputs

• Project documents
  – Assumptions log
  – Work performance reports
  – Earned value reports
  – Network diagrams
  – Baselines, and
  – Other project information proved to be valuable

• Enterprise environmental factors
  – Published information including commercial databases
  – Academic checklists
  – Benchmarking
  – Industry studies, and
  – Risk attitudes

• Organizational process assets
  – Project files including actual data
  – Organizational and project process controls
  – Risk statement templates and
  – Lessons learned
Tools and Techniques

• Documentation reviews (plans, assumptions, previous project files, contracts, and other information)
• Information gathering techniques
  – Brainstorming (to get comprehensive list of project risks using multidisciplinary experts, and the categorizing the ideas)
  – Delphi techniques (questionnaire, anonymous, unbiased)
  – Interviewing (experienced project participants, stakeholders, and subject matter experts)
  – Root cause analysis (to identify problem, discover the underlying cause, develop prevention action)
• Checklist analysis (based on historical information and knowledge. The lowest level of RBS is a good point to start, should always be reviewed to incorporate new lessons learned)
Tools and Techniques

• Assumptions analysis (to check the validity of the assumptions, their accuracy, instability, inconsistency or incompleteness of them)
• Diagramming techniques
  – Cause and effect diagrams (or Ishikawa/fishbone diagrams)
  – System/process flowcharts (showing how various elements of a system interrelate, and the mechanism of causation)
  – Influence diagrams (graphical representations of situation showing casual influences, time ordering of events, and other relationships among variables and outcomes)
  – SWOT analysis (Strength, Weakness, Opportunities, Threats. Strengths should offset threats, opportunities overcome weakness)
  – Expert judgment
Outputs

• Risk register
  – List of identified risks
    • Should be described in as much detail as is reasonable
    • Structure:
      – EVENT may occur, causing IMPACT or
      – If CAUSE, EVENT may occur, leading to EFFECT
    • The root causes of risks may become evident
  – List of potential responses
11.3 Perform Qualitative Risk Analysis

- The process of prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact.
- Also assessing the time frame for response and the organization’s risk tolerance associated with the project constraints of cost, schedule, scope, and quality.
Inputs, Tools & Techniques, Outputs

**Inputs**
1. Risk register
2. Risk management plan
3. Project scope statement
4. Organizational process assets

**Tools & Techniques**
1. Risk probability and impact assessment
2. Probability and impact matrix
3. Risk data quality assessment
4. Risk categorization
5. Risk urgency assessment
6. Expert judgment

**Outputs**
1. Risk register updates
Data Flow

Project Risk Management

5.2 Define Scope
- Project scope statement

Enterprise/Organization
- Organizational process assets

11.1 Plan Risk Management
- Risk management plan

11.2 Identify Risks
- Risk register

11.3 Perform Qualitative Risk Analysis
- Risk register updates
Inputs

• Risk register
• Risk management plan
  – Roles and responsibilities for conducting risk management
  – Budgets
  – Schedule activities for risk management
  – Risk categories
  – Definitions of probability and impact, the probability and impact matrix, and
  – Revised stakeholders’ risk tolerance
• Project scope statement
  – Risk associated with common type projects versus projects using first-of-its-kind technology, complex, state-of-the-art tools
• Organizational process assets
  – Information on prior, similar completed projects
  – Studies of similar projects by risk specialities, and
  – Risk databases that may be available from industry or proprietary sources
Tools and Techniques

• Risk probability and impact assessment
  – Impact on project’s schedule, cost, quality, or performance, including both negative effects for threats and positive effects for opportunities

• Probability and impact matrix
  – Low, moderate, or high priority
  – Can rate a risk separately for each objective (cost, time, and scope)
  – High-risks with negative impact have priorities and need aggressive actions
  – Low-risks with negative impact should be added to watchlist
  – High-risks with positive impact should be targeted first
  – Low-risks with positive impact should be added to watchlist
# Probability and Impact Matrix

<table>
<thead>
<tr>
<th>Probability</th>
<th>Threats</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.90</td>
<td>0.05</td>
<td>0.72</td>
</tr>
<tr>
<td>0.70</td>
<td>0.04</td>
<td>0.56</td>
</tr>
<tr>
<td>0.50</td>
<td>0.03</td>
<td>0.40</td>
</tr>
<tr>
<td>0.30</td>
<td>0.02</td>
<td>0.24</td>
</tr>
<tr>
<td>0.10</td>
<td>0.01</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>0.05</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Impact (numerical scale) on an objective (e.g., cost, time, scope or quality)

Each risk is rated on its probability of occurring and impact on an objective if it does occur. The organization’s thresholds for low, moderate or high risks are shown in the matrix and determine whether the risk is scored as high, moderate or low for that objective.

- Dark gray: high risk
- Medium gray: low risk
- Light gray: moderate risk
Tools and Techniques

• Risk data quality assessment
  – Accurate and unbiased data is required. Accuracy, quality, reliability, and integrity of data regarding risk should be checked

• Risk categorization
  – Using RBS, the are of project is affected, project phases

• Risk urgency assessment
  – Risks requiring near term responses
  – Time to affect a risk assessment
  – Symptoms and warning signs
  – Risk rating

• Expert judgment
Outputs

• Risk register update
  – Risk ranking or priority list of project risks
    • High, moderate, and low
    • For schedule, cost, and performance
  – Risks grouped by categories
    • May reveal common root causes
  – Causes of risk or project area requiring particular attention
    • May improve the effectiveness of risk responses
  – List of risks for additional response in the near-term
  – List of risks for additional analysis and response
  – Watchlists of low-priority risks
  – Trends in qualitative risk analysis results
    • Apparent trend can make risk response more/less urgent/important
11.4 Perform Qualitative Risk Analysis

• The process of numerically analyzing the effect of identified risks on overall project objectives

• Is performed on risks that have been prioritized by the Perform Qualitative Risk Analysis process

• Presents qualitative approach to making decisions in the presence of uncertainty

• Should be repeated after Plan Risk Responses as well as part of Monitor and Control to determine if the overall project risk has been satisfactorily decreased
Inputs, Tools & Techniques, Outputs

**Inputs**
1. Risk register
2. Risk management plan
3. Cost management plan
4. Schedule management plan
5. Organizational process assets

**Tools & Techniques**
1. Data gathering and representation techniques
2. Quantitative risk analysis and modeling techniques
3. Expert judgment

**Outputs**
1. Risk register updates
Data Flow

6.0 Project Time Management
- Schedule management plan

7.0 Project Cost Management
- Cost management plan

Enterprise/Organization
- Organizational process assets

11.1 Plan Risk Management
- Risk management plan

11.2 Identify Risks
- Risk register

11.4 Perform Quantitative Risk Analysis
- Risk register updates
Inputs

• Risk register
• Risk management plan
• Cost management plan
  – Sets the format and establishes criteria for planning, structuring, estimating, budgeting, and controlling project costs
  – It helps determine the structure and/or application approach for quantitative analysis of the budget or cost plan
• Schedule management plan
  – Sets the format and establishes criteria for developing, and controlling project schedule
  – It helps determine the structure and/or application approach for quantitative analysis of the schedule
• Organizational process assets
  – Information on prior, similar completed projects
  – Studies of similar projects by risk specialists, and
  – Risk databases that may be available from industry or proprietary sources
Tools and Techniques

• Data gathering and representation techniques
  – Interviewing
  – Probability distributions

• Quantitative risk analysis and modeling techniques
  – Sensitivity analysis
  – Expected Monetary Value (EMV) analysis
    • Analysis under uncertainty
    • Statistical concept that calculates the average outcome when the future includes scenarios that may or may not happen
    • Opportunities -> positive values, threats -> negative values
    • EMV: multiplying the value of each possible outcome by its possibility of occurrence and adding products together
    • Common use: decision tree analysis
  – Modeling and simulation

• Expert Judgment
  – To identify potential cost and schedule impacts, to evaluate probability, and to define inputs into the tools
  – Interpretation of the data
  – Identify the weakness of the tools, their relative strengths
  – When and which tool is more appropriate given the organization’s capabilities and culture
Range of Project Cost Estimates Collected During the Risk Interview

<table>
<thead>
<tr>
<th>WBS Element</th>
<th>Low</th>
<th>Most Likely</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>$4M</td>
<td>$6M</td>
<td>$10M</td>
</tr>
<tr>
<td>Build</td>
<td>$16M</td>
<td>$20M</td>
<td>$35M</td>
</tr>
<tr>
<td>Test</td>
<td>$11M</td>
<td>$15M</td>
<td>$23M</td>
</tr>
<tr>
<td>Total Project</td>
<td>$31M</td>
<td>$41M</td>
<td>$68M</td>
</tr>
</tbody>
</table>

Interviewing relevant stakeholders helps determine the three-point estimates for each WBS element for triangular, beta or other distributions. In this example, the likelihood of completing the project at or below the most likely estimate of $41 million is relatively small as shown in the simulation results in Figure 11.16 (Cost Risk Simulation Results).
Examples of Commonly Used Probability Distributions

Beta and triangular distributions are frequently used in quantitative risk analysis. The data shown in the figure on the left (Beta Distribution) is one example of a family of such distributions determined by two "shape parameters". Other commonly used distributions include the uniform, normal and lognormal. In these charts the horizontal (X) axes represent possible values of time or cost and the vertical (Y) axes represent relative likelihood.
Decision Tree Diagram

Note 1: The decision tree shows how to make a decision between alternative capital strategies (represented as "decision nodes") when the environment contains uncertain elements (represented as "chance nodes").

Note 2: Here, a decision is being made whether to invest $120M US to build a new plant or to instead invest only $50M US to upgrade the existing plant. For each decision, the demand (which is uncertain, and therefore represents a "chance node") must be accounted for. For example, strong demand leads to $200M revenue with the new plant but only $120M US for the upgraded plant, perhaps due to capacity limitations of the upgraded plant. The end of each branch shows the net effect of the payoffs minus costs. For each decision branch, all effects are added (see shaded areas) to determine the overall Expected Monetary Value (EMV) of the decision. Remember to account for the investment costs. From the calculations in the shaded areas, the upgraded plant has a higher EMV of $46M—also the EMV of the overall decision. (This choice also represents the lowest risk, avoiding the worst case possible outcome of a loss of $50M).
Cost Risk Simulation Results

This cumulative distribution, assuming the data ranges in Figure 11-13 and triangular distributions, shows that the project is only 12 percent likely to meet the $41 million estimate. If a conservative organization wants a 75% likelihood of success, a budget of $50 million (a contingency of nearly 22% (($50M - $41M)/$41M)) is required.
Outputs

- Risk register updates
- Probabilistic analysis of the project
- Probability of achieving cost and time objectives
- Prioritized list of quantified risks
- Trends in quantitative risk analysis results
11.5 Plan Risk Responses

• The processes of developing options and actions to enhance opportunities and to reduce threats to project objectives

• Follows Qualitative Risk Analysis and Perform Qualitative Risk Analysis processes, identifies and assigns people to take responsibility for risk responses.

• Addresses risks based on priorities, inserting resources and activities into budget, schedule, and project management plan

• Should be appropriate to the significance of the risk, cost effective, realistic, agreed by all parties, timely, and owned by a responsible person
Inputs, Tools & Techniques, Outputs

**Inputs**
1. Risk register
2. Risk management plan

**Tools & Techniques**
1. Strategies for negative risks or threats
2. Strategies for positive risks or opportunities
3. Contingent response strategies
4. Expert judgment

**Outputs**
1. Risk register updates
2. Risk-related contract decisions
3. Project management plan updates
4. Project document updates
Data Flow

Project Risk Management

11.1 Plan Risk Management
- Risk management plan

11.2 Identify Risks
- Risk register
- Risk register updates

11.5 Plan Risk Responses

Project Documents
- Project document updates

4.2 Develop Project Management Plan
- Project management plan updates

12.1 Plan Procurements
- Risk-related contract decisions
Inputs

• Risk register
  – Identified risks, Root causes of risks, Lists of potential responses, Risk owners, Symptoms, Warning signs, Relative rating/priority list, List of risks with near-term response, Trends in qualitative analysis results, Watchlist of low-priority risks

• Risk management plan
  – Roles and responsibilities, risk analysis definitions, timing for reviews, risk thresholds for low, moderate, and high risks
Tools and Techniques

• Risk analysis tools such as tree analysis can be used to choose the most appropriate responses
• Mixed responses are most likely to be effective
• Strategies for negative risks or threats
  – Avoid (extending schedule, reducing scope, shutting down the project)
  – Transfer (financial risk exposure, insurance, warranties, guarantees)
  – Mitigate (taking early actions, adopting less complex processes, conduction more tests, choosing more stable suppliers, prototyping, redundancy)
  – Accept (Passive acceptance: no action except to document the strategy and leave it to the project team to deal with it. Active acceptance: establishing contingency reserve for money, time, and resources)
• Strategies for positive risks or opportunities
  – Exploit (seeking to eliminate the uncertainty associated with a particular upside risk by ensuring the opportunity definitely happens. Such as rewards to shorter time to complete, lower the cost)
  – Share (allocating some or all of the ownership of the opportunity to a third party who is able to capture the opportunity for the benefit of the project. Such as joint ventures, special purpose companies)
  – Enhance (such as adding more resources to finish early)
  – Accept (not actively pursuing it)
Tools & Techniques

• Contingent Response Strategies (to be executed under certain predefined conditions such as missing intermediate milestones, gaining high priority with a supplier)

• Expert Judgment (for specific and defined risk)
Outputs

- Risk register updates
  - Appropriate responses are chosen, agreed upon, and included in the risk register
  - Level of detail corresponds with the priority ranking and the planned responses (high and moderate risks usually in detail)
  - Identified risks, their descriptions, areas of the project (WBS) affected, their causes (RBS), and how they may affect project objectives
  - Risk owners and assigned responsibilities
  - Outputs from the Perform qualitative Analysis process, including prioritized lists of project risks
  - Agreed-upon response strategies
  - Specific actions to implement the chosen response strategy
  - Triggers, symptoms, and warning signs of risks’ occurrence
  - Budget and schedule activities required to implement the chosen responses
  - Budget and schedule activities required to implement the chosen responses
  - Contingency plans and triggers that call their execution
  - Fallback plans for use as a reaction to a risk that has occurred and the primary response to be inadequate
  - Residual risks that are expected to remain after planned responses have been taken as well as those that have been deliberately accepted
  - Secondary risks arise as a direct outcome of implementing a risk response, and
  - Contingency reserves that are calculated based on the quantitative risk analysis of the project and the organization’s risk thresholds
Outputs

• Risk related contract decisions
  – Insurance, services for mitigating or transferring part or all of the threat or enhancing or sharing part or all of the opportunity
  – Usually are inputs to the Plan Procurements

• Project management plan updates
  – Schedule management plan
    • Changes to tolerance or behaviour related to resources loading and levelling, and schedule
  – Cost management plan
    • Changes in tolerance or behaviour related to cost accounting, tracking, and reports, as well as updates to the budget and the consumption of contingency reserves
  – Quality management plan
    • Changes in tolerance or behaviour related to requirements, quality assurance, quality control, as well as updates to the requirements documentation
  – Procurement management plan
    • Changes in tolerance or behaviour related to strategy of make-buy decisions or contract types
  – Human resource management plan
    • Changes in tolerance or behaviour related to organizational structure, resource applications, tolerance or behaviour related to staff allocation, as well as updates to the resource loading

  – Work breakdown structure
  – Schedule baseline
  – Cost performance baseline
Outputs

• Project document updates
  – Assumption log updates
    • May be incorporated in the scope statement or in a separate assumptions log
  – Technical documentation updates
    • Technical approaches and/or physical deliverables may change
11.6 Monitor and Control Risks

- The process of implementing risk response plans, tracking identified risks, monitoring residual risks, identifying new risks, and evaluating risk process effectiveness throughout the project.
- Project work should be continuously monitored for new, changing, and outdated risks.
- Techniques such as variance and trend analysis.
- Purposes:
  - Project assumptions still valid.
  - If assessed risk has changed or can be retired.
  - Risk management policies/procedures are followed.
  - Contingency reserves of cost/schedule should be modified in alignment with the current risk assessment.
- Can involve choosing alternative strategies, executing a contingency or fallback plan, taking corrective action, and modifying the project management plan.
- Risk response owner reports periodically to PM on the effectiveness of the plan, any unanticipated effects, any correction needed to handle the risk appropriately.
- Include updating the organizational process assets, lessons learned databases, risk management templates.
Inputs, Tools & Techniques, Outputs

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Tools &amp; Techniques</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>.1 Risk register</td>
<td>.1 Risk reassessment</td>
<td>.1 Risk register updates</td>
</tr>
<tr>
<td>.2 Project management plan</td>
<td>.2 Risk audits</td>
<td>.2 Organizational process assets updates</td>
</tr>
<tr>
<td>.3 Work performance information</td>
<td>.3 Variance and trend analysis</td>
<td>.3 Change requests</td>
</tr>
<tr>
<td>.4 Performance reports</td>
<td>.4 Technical performance measurement</td>
<td>.4 Project management plan updates</td>
</tr>
</tbody>
</table>

| Outputs                        |                         |
| .5 Reserve analysis            | .5 Project document updates |
Data Flow

Project Risk Management

11.6 Monitor and Control Risks

4.2 Develop Project Management Plan

10.5 Report Performance

4.3 Direct and Manage Project Execution

11.2 Identify Risks

- Risk management plan
- Project management plan updates
- Risk register
- Risk register updates
- Project document updates
- Change requests
- Organizational process assets updates

Enterprise/ Organization

4.5 Perform Integrated Change Control

Project Documents
Inputs

- **Risk Register**
  - Identified risks and risk owners, agreed-upon risk responses, specific implementation actions, symptoms and warning signs of risk, residual and secondary risks, watchlist of low-priority risks, and time and cost contingency reserves

- **Project management plan**
  - Risk tolerances, protocols, risk owners, time, and other resources to project risk management

- **Work performance information**
  - Deliverable status
  - Schedule progress, and
  - Costs incurred

- **Performance report**
  - Variance analysis
  - Earned value data, and
  - Forecasting data
Tools and Techniques

• Risk Assessment
  • Should be done regularly
    – Identification of new risks
    – Reassessment of current risks
    – Closing outdated risks

• Risk audits
  – Examining and documenting the effectiveness of risk responses in dealing with identified risks. Their root causes, and the risk management process
  – PM should make sure it is done regularly
  – Should have clear format and objectives
Tools & Techniques

• Variance and trend analysis
  – Checking planned results to the actual results
  – Earned value analysis and other methods of project variance and trend analysis can be used
  – Outcome: forecast potential deviation of the project at completion from cost/schedule targets

• Technical performance measurement
  – Checking planned results to the actual results
  – Metrics should be defined. Such as weight, transaction times, numbers of delivered defects, storage capacity

• Reserve analysis
  – Compares the amount of remained contingency reserves to the amount of remaining risks

• Status meetings
  – Agenda in periodic meetings
  – Depending on the amount of identified risks, their priority, and difficulty of response the required time for meeting varies
  – Risk management becomes easier the more often it is practiced
  – The more we talk about it, the more likely people identify risks and opportunities
Outputs

• Risk register updates
  – Outcome of risk assessments, risk audits, and periodic risk reviews which can be:
    • New identified risks, updates to probability, impact, priority, response plans, ownership, and other elements of the risk register
    • Closed risks and released associated reserves
  – Actual outcomes of the project’s risks and risk responses

• Organizational process assets updates
  – Template for the risk management plan including the probability and impact matrix, and risk register
  – RBS
  – Lessons learned from the project management activities

• Change requests
  – Recommended corrective actions
    • Contingency plans and workarounds (not planned responses to unidentified or accepted passive risks)
  – Recommended prevention actions

• Project management plan updates
• Project document updates