PROJECT RISK MANAGEMENT

WHAT DOES THE RISK KNOWLEDGE AREA DO?

- Risk management planning, identification, analysis, responses, and monitoring & control on a project

- The objectives of Project Risk management are to increase the probability & impact of positive events (opportunities), and decrease the probability & impact of events adverse to the project (threats)
PROJECT RISK MANAGEMENT

What is project risk?
• Uncertain event or condition that, if it occurs, has a positive or a negative effect on at least one project objective (i.e. time, cost, scope, or quality)

  Positive effect is an opportunity
  Negative effect is a threat

Known risks
• Those that are identified and can be proactively managed & analyzed

Unknown risks (unknown knowns & unknown unknowns)
• Cannot be proactively managed
PROJECT RISK MANAGEMENT

• Look for risks caused by things like poor project management, dependency on uncontrollable external resources, concurrent multiple projects, etc.

• Accept risks if they're in balance with a possible reward

• Communicate about risk information openly & honestly

• Provide risk responses in line with the organization's perceived balance between risk-taking & risk-avoidance

• To be successful, an organization should be committed to addressing the management of risk proactively & consistently throughout the project
RISK PROCESSES

RISK PROCESS DEFINITIONS

11.1 Plan Risk Management
• Process of deciding how to approach and conduct (plan & execute) the risk management activities for a project.

11.2 Identify Risks
• Determine which threats/opportunities might affect the project & document their details

11.3 Perform Qualitative Risk Analysis
• Assess each risk's chance of occurring & probable impact to get a prioritized list of risks requiring more analysis or action
11.4 Perform Quantitative Risk Analysis
• Numerically analyze identified risks' effect on overall project objectives

11.5 Plan Risk Responses
• Analyze risks and make a plan of actions & options to enhance opportunities & reduce threats to project objectives

11.6 Monitor & Control Risks
Track identified & residual risks, identify new risks, execute risk response plans & evaluate their effectiveness

See Figure 11-20, p.309 for Risks data flow diagram
# Risk Processes

## Processes by process group

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<thead>
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PLAN RISK MANAGEMENT

HOW DO YOU PLAN FOR RISK?

• Establish an agreed-upon approach for conducting risk management activities & evaluating risk

• Ensure that the level, type, and visibility of risk management are commensurate with both risk and importance of the project to the organization

• Provide sufficient resources and time for risk management activities

• Planning Risk management should be completed early during project planning, since it is crucial to successfully performing the other processes
PLAN RISK MANAGEMENT

INPUTS
- Project scope statement
- Cost mgmt. plan
- Schedule mgmt. plan
- Communications mgmt. plan
- Enterprise environmental factors
- Organizational process assets

TOOLS & TECHNIQUES
- Planning meeting & analysis

OUTPUTS
- Risk management plan
PLAN RISK MANAGEMENT-INPUTS

INPUTS

Project Scope Statement (sec 5.2.3.1)
Cost Management Plan (sec 7.0)
Schedule Management Plan (sec 6.0)
Communications Management Plan (sec 10.2.3.1)
PLAN RISK MANAGEMENT-INPUTS

Enterprise Environmental Factors
- Attitudes towards risk and the risk tolerance of organizations and people involved in the project will influence the project management plan.

Organizational Process Assets
- Organizations may have predefined approaches to risk management such as categories, common definitions of concepts & terms, standard templates, roles & responsibilities, and authority levels for decision-making.
PLAN RISK MANAGEMENT - T & T

TOOLS & TECHNIQUES

Planning Meetings and Analysis

- Project teams hold planning meetings to develop the risk management plan (attendees may include the project manager, selected project team members and stakeholders)
- Develop risk cost elements (e.g. contingency reserves) and schedule activities (e.g. risk status meetings or buffer time) for inclusion in the project budget and schedule
- Assign risk responsibilities
- Develop general organizational templates for risk categories and definitions (e.g. risk levels, types)
PLAN RISK MANAGEMENT - OUTPUTS

Risk Management Plan

- Describes how risk management will be structured & performed on the project

- It includes:

  - Methodology – defines the approaches, tools, & data sources that may be used to perform risk management on the project

  - Roles & responsibilities - defines the lead, support, & risk management team membership for each type of activity in the risk management plan, assigns people to these roles, and clarifies their responsibilities

  - Budgeting – assigns resources & estimates costs needed for risk management for inclusion in the project cost baseline
PLAN RISK MANAGEMENT - OUTPUTS

- **Timing**
  Defines when & how often the risk management process will be performed throughout the project life cycle, and establishes risk management activities to be included in the project schedule.

- **Risk categories**
  - Provides a structure that ensures a comprehensive process of systematically identifying risk to a consistent level of detail & contributes to the effectiveness and quality of Risk Identification
  - An organization can use a previously prepared categorization of typical risks.
  - A Risk Breakdown Structure (RBS) (not a Resource Breakdown Structure, which is also RBS) is one approach to providing such a structure (see fig.11-4, page 244)

- **Revised stakeholders' tolerances** - Stakeholders tolerances may be revised in risk management planning process
Definitions of risk probability & impact

- The impact scale reflects significance of impact, either negative for threats or positive for opportunities, on each project objective if a risk occurs.
- Impact scales are specific to the objective potentially impacted, type & size of the project, organization’s strategies and financial state, and the organization’s sensitivity to particular impacts.
- See fig. 11-5 in page 281
PLAN RISK MANAGEMENT - OUTPUTS

- Relative scales (also called ordinal scale) for impact are rank ordered descriptors such as low, medium, high, very high reflecting impact in increasing order.
- Alternatively, numeric scales (also called cardinal scales) assign values to these impacts. The values may be
  - Linear (e.g. 1, 3, 5, 7, 9) or,
  - Non-linear (e.g. 1, 2, 4, 8) – non-linear scales may represent organization’s desire to avoid high-impact threats or exploit high impact opportunities, even if they have relatively low probability

### Linear – Risk Value total is 40

<table>
<thead>
<tr>
<th>Risk impact-→ Proj. Objective</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>Time</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Cost</td>
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<td>Scope</td>
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<td>Quality</td>
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<tr>
<td><strong>Total</strong></td>
<td>38</td>
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### Non-Linear – Risk value is 63

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Note: The figures in the box are probability of a risk impacting an objective
PLAN RISK MANAGEMENT - OUTPUTS

• **Probability & impact matrix**
  - Risks are prioritized by their potential impact on project multiplied by their possibility of occurring, e.g. 10% x $800 = $80 risk value
  - See Figure 11-5, p.245 for a sample impact scale (relative & numerical)
  - See Figure 11-8, p.252 for a Probability & Impact Matrix look-up table where you can look up your impact (bottom row) multiplied by your determined probability (left column) and get a rating which can be measured against other projects in your company

• **Reporting formats**
  Describes the content & format of risk register (list of risks with details)

• **Tracking**
  Documents how all facets of risk activities will be recorded for the benefit of current project, future needs, and lessons learned.
# RISK PROCESSES

Processes by process group

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IDENTIFY RISKS

WHAT HAPPENS IN IDENTIFY RISKS?

• Identify Risks determines which risks might affect the project & documents their characteristics

• Participants in identify risk activities can include the following, where appropriate: project manager, project team members, risk management team (if assigned), risk experts from outside, customers, end-users, stakeholders, etc.

• All project personnel should be encouraged to identify risks.

• Identify risks - is an iterative process because:
  • Risk events may happen, which may cause new risks
  • Status of identified risks may change
  • New risks may occur
IDENTIFY RISKS

INPUTS
- Risk management plan
- Activity cost estimates
  - Activity duration estimates
  - Scope baseline
- Stakeholder register
- Cost mgmt. plan
- Schedule mgmt. plan
- Quality mgmt. plan
- Project documents
  - Enterprise environmental factors
  - Organizational process assets

TOOLS & TECHNIQUES
- Documentation reviews
- Information gathering techniques
  - Checklist analysis
  - Assumptions analysis
  - Diagramming techniques
    - SWOT analysis
    - Expert judgement

OUTPUTS
- Risk register
IDENTIFY RISKS - INPUTS

INPUTS

• Risk Management Plan
• Activity cost estimates
• Activity time estimates
• Activity duration estimates
• Scope baseline
• Stakeholder register
IDENTIFY RISKS - INPUTS

• Cost mgmt. plan
• Schedule mgmt. plan
• Quality mgmt. plan
• Project documents
• Enterprise Environmental Factors
• Organizational Process Assets
IDENTIFY RISKS – T&T

TOOLS & TECHNIQUES

Documentation Reviews
Structured review of project documentation including plans, assumptions, prior project files, and other information to ensure

• Quality of the plans
• Consistency between those plans and with the project requirements and assumptions
IDENTIFY RISKS – T&T

Information Gathering Techniques

**Brainstorming** -a group creativity technique to share impulsive ideas & get new ideas from each other to build on

**Delphi technique** -experts take part in an anonymous questionnaire so as not to influence each other, then their ideas are shared for more input

**Interviewing** -meeting a person to draw out facts & statements

**Root cause identification** -examine underlying causes for a risk
IDENTIFY RISKS – T&T

Checklist Analysis
- Checklist are developed based on historical information & knowledge
- Impossible to build an exhaustive one
- Get sample checklists or Questionnaires commercially or from the internet

Assumptions Analysis
- Are assumptions still valid? It identifies risks to the project from inaccuracy, inconsistency, or incompleteness of assumptions.

Diagramming Techniques
- Cause-and-effect diagrams (also called Ishikawa or fishbone diagrams)
- System or process flow charts
- Influence diagrams (What affects What) – It is a graphical representation of situation showing causal influences, time ordering of events, and other relationships among variables and outcomes.
SWOT Analysis

• The technique examines the project from each of the SWOT (strengths, weaknesses, opportunities, and threats) perspectives to increase the breadth of identified risks by including internally generated risks

• SWOT analysis also examines the degree to which organizational strengths offset threats and opportunities that may serve to overcome weaknesses.

Expert Judgement
IDENTIFY RISKS – OUTPUTS

Risk Register

The primary outputs of Identify Risks are the initial entries into the risk register. The risk register ultimately contains the outcomes of the other risks mgmt. processes as they are conducted, resulting in an increase in the level and type of information contained in the risk register over time. The preparation of risk register begins with

• List of identified risks
• List of potential responses
# RISK PROCESSES

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QUALITATIVE RISK ANALYSIS

HOW DO YOU PERFORM QUALITATIVE RISK ANALYSIS?

• Prioritize identified risks for further action, such as Quantitative Risk Analysis or Risk Response Planning

• Organizations can improve the project’s performance effectively by focusing on high-priority risks

• Assess the priority of identified risks using their probability of occurring, the corresponding impact on project objectives if the risks do occur

• Also use factors such as time frame & risk tolerance of the project constraints of cost, schedule, scope & quality
PERFORM QUALITATIVE RISK ANALYSIS

**INPUTS**
- Risk register
- Risk management plan
- Project scope statement
- Organizational process assets

**TOOLS & TECHNIQUES**
- Risk probability and impact assessment
- Probability and impact matrix
- Risk data quality assessment
  - Risk categorization
  - Risk urgency assessment
  - Expert judgement

**OUTPUTS**
- Risk register (updates)
PERFORM QUALITATIVE RISK ANALYSIS - INPUTS

INPUTS

Risk Register
Risk Management Plan
Project Scope Statement
Organizational Process Assets
PERFORM QUALITATIVE RISK ANALYSIS - T&T

TOOLS & TECHNIQUES

Risk Probability & Impact Assessment

- It investigates the likelihood that each specific risk will occur
- Risk impact assessment investigates the potential effect on a project objective such as time, cost, scope, or quality, including both negative effect for threats and positive effects for opportunities.
- The level of probability for each risk and its impact on each objective is evaluated during the interview or meeting with experts or key stakeholders

Probability & Impact Matrix

Risk Data Quality Assessment

- Risk analysis requires accurate & unbiased data
- Examine the degree to which the data about the risk is useful
- Examine the degree to which the risk is understood
- Examine the risk data for accuracy, quality, reliability, & integrity
PERFORM QUALITATIVE RISK ANALYSIS – T&T

TOOLS & TECHNIQUES

Risk Categorization

• Risks to the project can be categorized by sources of risk (e.g. using the RBS)

Risk Urgency Assessment

• Risks requiring near-term responses may be considered more urgent to address.

Expert Judgement

• Expert judgement is required to assess the probability and impact of each risk to determine its location in the matrix shown in Fig. 11-10 (page 293)
# RISK PROCESSES

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PERFORM QUANTITATIVE RISK ANALYSIS

HOW DO YOU PERFORM QUANTITATIVE RISK ANALYSIS?

• Analyze priority risks (identified in Qualitative Risk Analysis)
• Analyzes the effect of those risk events and assigns a numerical (quantitative) rating to those risks
• It also presents a quantitative approach to making decisions in the presence of uncertainty
• The process uses techniques such as Monte Carlo simulation & decision tree analysis to:
  • Quantify possible outcomes for the project and their probabilities
  • Assess probability of achieving specific project objectives
  • Identify risks requiring the most attention
  • Identify cost, schedule & scope targets in the light of risk
  • Make best decisions when conditions or outcomes are uncertain
• Experienced risk managers sometime perform it directly after Identify Risk
PERFORM QUANTITATIVE RISK ANALYSIS

**TOOLS & TECHNIQUES**
- Data gathering & representation techniques
- Quantitative risk analysis & modeling techniques
- Expert judgment

**INPUTS**
- Risk register
- Risk mgmt. plan
- Cost mgmt. plan
- Schedule mgmt. plan
- Organizational process assets

**OUTPUTS**
- Risk register (updates)
PERFORM QUANTITATIVE RISK ANALYSIS-INPUTS

INPUTS

Risk Register
Risk Management Plan
Cost Management Plan
Schedule Management Plan
Organizational Process Assets
Data Gathering & Representation Techniques

- **Interviewing:**
  - The information needed depends upon type of probability distributions that will be used, e.g. three-point estimates for some commonly used distributions, and the mean & standard deviation for others.
  - Documenting the rationale of the risk ranges is an important component of risk interview.
- **Probability distributions** (beta and triangular) see Figure 11-14, p.298
Quantitative Risk Analysis & Modeling Techniques

Commonly used techniques include:

- **Sensitivity Analysis**
  Which risks have the most potential impact on the project (tornado diagram is used-will definitely get question in exam)

- **Expected Monetary Value (EMV) Analysis**
  - Calculates average outcome from a group of conditional values when their future has events that may or may not occur (Will definitely get question in exam)
  - Multiply each possible impact by its probability (risk value), uses decision tree
  - Decision Tree diagram (see Fig. 11-15, page 299)

- **Modeling & Simulation**
  - Models that translate uncertainties at a detailed level into their potential impact
  - Typically uses Monte Carlo technique
  - Better for cost or schedule risk than EMV because EMV is subject to misuse
Expert Judgement

- It is required to identify potential cost and schedule impacts, to evaluate probability, and to define inputs (such as probability distributions) into the tools.

- It also comes into play in the interpretation of the data. Experts should be able to identify the weaknesses of the tools as well as their relative strengths.

- Experts may determine when a specific tool may or may not be more appropriate given the organization’s capabilities and culture.
QUANTITATIVE RISK ANALYSIS - OUTPUT

OUTPUT

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
### RISK PROCESSES

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PLAN RISK RESPONSES

HOW DO YOU PLAN RISK RESPONSES?

• Develop **options** & determine **actions** to enhance opportunities and reduce threats
• Risk responses must be:
  • Appropriate to the significance of the risk
  • Cost effective
  • Timely
  • Realistic
  • Within the project context
  • Agreed upon by all parties involved
  • Owned by a responsible person
PLAN RISK RESPONSES

INPUTS
• Risk register
• Risk management plan

TOOLS & TECHNIQUES
• Strategies for negative risks or threats
• Strategies for positive risks or opportunities
• Contingent response strategies
  • Expert judgement

OUTPUTS
• Risk register (updates)
• Risk-related contract decisions
• Project management plan (updates)
• Project document updates
PLAN RISK RESPONSES - INPUTS

INPUTS

Risk Register

Risk Management Plan
PLAN RISK RESPONSES – T&T

TOOLS & TECHNIQUES

Strategies for Negative Risks or Threats
Avoid – Changing the Project Management Plan to eliminate a potential risk

For example:
- Avoid a scope risk by changing to a less "bleeding edge" technology, e.g. TD bank lost three months on a project because of unproven software
- Avoid a cost risk by properly doing Activity Resource Estimating
- Avoid a resource risk by removing its requirement
PLAN RISK RESPONSES – T&T

- **Transfer** - To third party
  - Generally involves payment to the party taking on the risk e.g. procurement of a critical item. For example:

- Transfer a scope risk by employing a contractor

- Transfer schedule risk by purchasing flood insurance for a New Orleans project

- Transfer a resource risk by purchasing on-site warranty
PLAN RISK RESPONSES—T&T

- **Mitigate** - Reduce impact of an adverse risk/or reduction in the probability
  For example:
  - Mitigate a scope risk by building a prototype
  - Mitigate a resource risk by cross-training a team member
  - Mitigate a schedule risk by using a pool of temporary workers, e.g.
  - Departmental Stores/Malls use lots of part-time workers

- **Accept**
  - Used because it's seldom possible to eliminate all threats from a project
  - Actively decide not to change project plan to deal with a risk
  - Passive acceptance requires no action, leaving the project team to deal with the threats or opportunities as they occur
  - Active acceptance establishes a contingency reserve or strategy
PLAN RISK RESPONSES – T&T

Strategies for Positive Risks or Opportunities

- **Exploit** - Eliminates the uncertainty associated with a particular upside risk by making the opportunity will definitely happen e.g. hiring more talented resources to the project to reduce the completion time

"To take advantage of" or "To make best use of“
PLAN RISK RESPONSES – T&T

• **Share** - Share responsibility and accountability to get best chance of seizing an opportunity e.g. risk sharing partnerships or joint ventures

• **Enhance** - Modify the "size" of an opportunity by increasing probability and/or positive impacts by identifying & maximizing key drivers. e.g. a sales opportunity may make a higher profit if a volume discount is offered

• **Accept**

Accepting an opportunity is being willing to take advantage of it if it comes along, but not actively pursuing it.
PLAN RISK RESPONSES – T&T

Contingent Response Strategy

• Respond only if certain event occurs and there's sufficient warning to implement the plan. Examples of events that trigger contingency response

  • missing intermediate milestones
  • cost of resource has gone down
  • gaining high priority with a supplier

should be defined and tracked
Expert Judgement

Input from knowledgeable parties pertaining to the actions to be taken on a specific and defined risk.
PLAN RISK RESPONSES - OUTPUTS

• Risk Register (Updates)
  • The risk register is developed in Identify Risk, and is updated during Perform Qualitative Risk Analysis & Perform Quantitative Risk Analysis
  • In Plan risk responses, appropriate responses are chosen, agreed upon, and included in the risk register
  • Components of risk register (read page 305 & 306)
    a) Residual risks - risk that are expected to remain after planned responses have been taken as well as those that have been deliberately accepted
    b) Secondary risks - new risk that arise as a direct outcome of implementing a risk response.
Risk-Related Contractual Agreements

Such as agreements for insurance, services, and other items as appropriate, can be prepared to specify each party’s responsibility for specific risks, should they occur.
PLAN RISK RESPONSES - OUTPUTS

Project Mgmt. Plan (updates)
- Schedule mgmt. plan
- Cost mgmt. plan
- Quality mgmt. plan
- Procurement mgmt. plan
- Human resource mgmt. plan
- Work breakdown structure
- Schedule baseline
- Cost performance baseline

Project Document (updates) – Read page 307
- Assumption log updates
- Technical documentation updates
# RISK PROCESSES

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MONITOR AND CONTROL RISK

WHAT HAPPENS IN MONITOR AND CONTROL RISK?

• Identify, analyze & plan for new or changed risks
• Keep track of the identified risks and those on the watch list
• Reanalyze existing risks
• Monitor trigger conditions for contingency plan
• Monitor residual & secondary risks
• Review the execution of risk responses while evaluating their effectiveness.
• Monitor & Control Risk process applies techniques, such as variance and trend analysis, which require the use of performance data generated during project execution
MONITOR AND CONTROL RISK

Other purposes of Monitor & Control Risk are to determine if:

• Mid-course correction needed to handle the risk appropriately Project assumptions are still valid

• Risk, as assessed, has changed from its prior state, with analysis of trends

• Proper risk management policies & procedures are being followed

• Contingency reserves of cost or schedule should be modified in line with the risk of the project

• Monitor & Control Risk can involve choosing alternative strategies, executing a contingency or fallback plan, taking corrective action & modifying the project management plan

• Receive periodic reports from risk response owner on the effectiveness of the plan, and any unanticipated effects.
MONITOR AND CONTROL RISK

**TOOLS & TECHNIQUES**
- Risk reassessment
- Risk audits
- Variance and trend analysis
- Technical performance measurement
  - Reserve analysis
  - Status meetings

**INPUTS**
- Risk register
- Risk management plan
- Work performance information
- Performance reports

**OUTPUTS**
- Risk register (updates)
- Org. process assets (updates)
  - Change Requests
- Project management plan (updates)
  - Project document updates
MONITOR AND CONTROL RISK - INPUTS

INPUTS

Risk Register

Project Management Plan

Work Performance Information

Performance Reports
MONITOR AND CONTROL RISK – T&T

TOOLS & TECHNIQUES

Risk Reassessment
• Risk Monitoring & Control often requires identification of new risks & re-assessment of risks
• Risk reassessment should be regularly scheduled & should be an agenda item at project team status meetings

Risk Audits
• Examine & document the effectiveness of risk responses in dealing with identified risks and their root causes, as well as the effectiveness of the risk management process

Variance and Trend Analysis
• Earned value analysis & trend analysis may be used to monitor overall project performance. Outcomes from these analyses may forecast potential deviation of the project at completion from cost and schedule targets
• Deviation from baseline plan may indicate the potential impact of threats or opportunities
MONITOR AND CONTROL RISK – T&T

Technical Performance Measurement
• Compares technical accomplishment during project execution to the plan’s schedule of technical achievement

Reserve Analysis
• Compares the amount of contingency reserves remaining to the amount of risk remaining at any time in the project, to determine if the remaining reserve is adequate

Status Meetings
• Risk management can be an agenda item in periodic status meetings to proactively manage risk
MONITOR AND CONTROL RISK - OUTPUTS

Risk Register (Updates)

Organizational Process Assets (Updates)

Change Requests

Project Management Plan (Updates)

Project Document (Updates)

(Read page 311 & 312)