

# Chapter 11: Project Risk Management

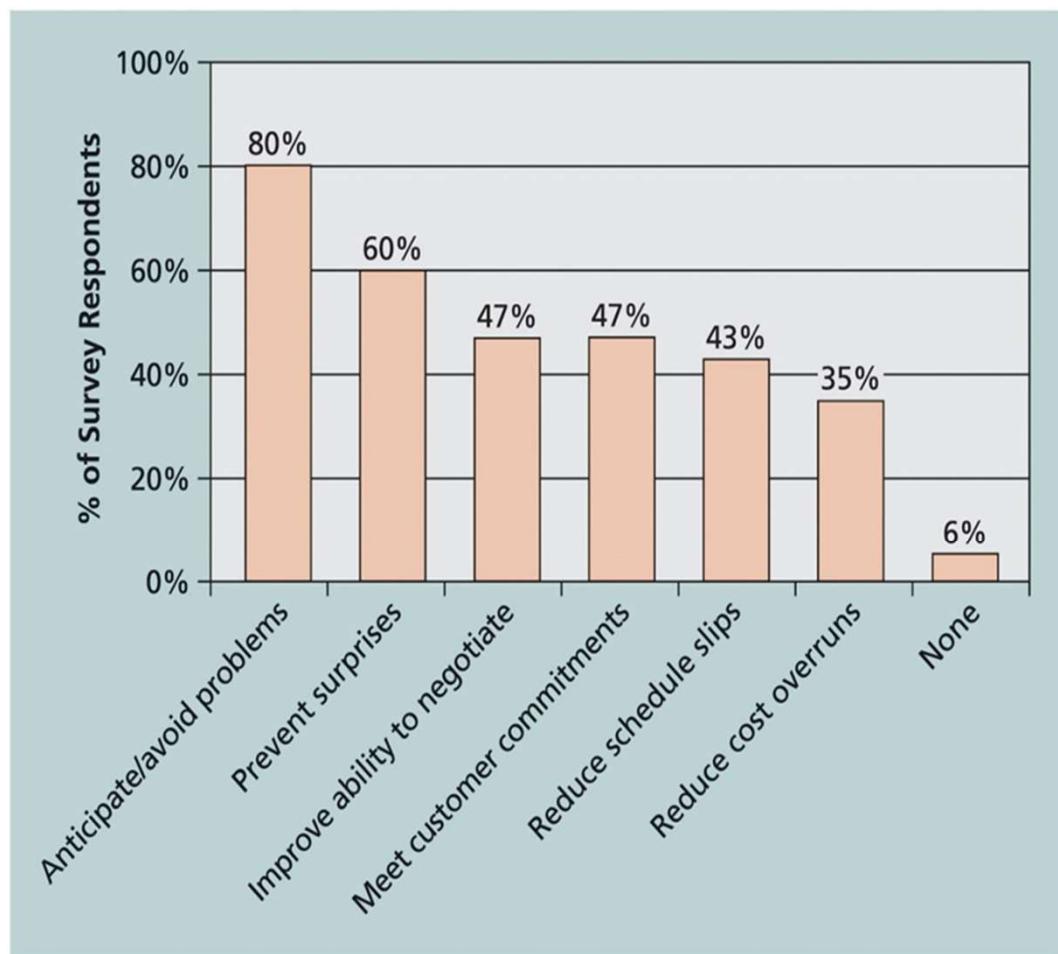


# Learning Objectives

<b>Explain</b>	Explain the concept of risk as it relates to project management, and list the advantages of managing project risks according to best practices
<b>Discuss</b>	Discuss the elements of planning risk management and the contents of a risk management plan
<b>List</b>	List common sources of risks on information technology (IT) projects
<b>Describe</b>	Describe the process of identifying risks and create a risk register and risk report
<b>Discuss</b>	Discuss qualitative risk analysis and explain how to calculate risk factors, create probability/impact matrixes, and apply the Top Ten Risk Item Tracking technique to rank risks
<b>Explain</b>	Explain quantitative risk analysis and how to apply decision trees, simulation, and sensitivity analysis to quantify risks
<b>Provide</b>	Provide examples of using different risk response planning strategies to address both negative and positive risks
<b>Discuss</b>	Discuss how to monitor risks
<b>Describe</b>	Describe how software can assist in project risk management
<b>Discuss</b>	Discuss considerations for agile/adaptive environments

# The Importance of Project Risk Management (1 of 3)

- Project risk management is the art and science of identifying, analyzing, and responding to risk throughout the life of a project and in the best interests of meeting project objectives
  - Risk management is often overlooked in projects, but it can help improve project success by helping select good projects, determining project scope, and developing realistic estimates

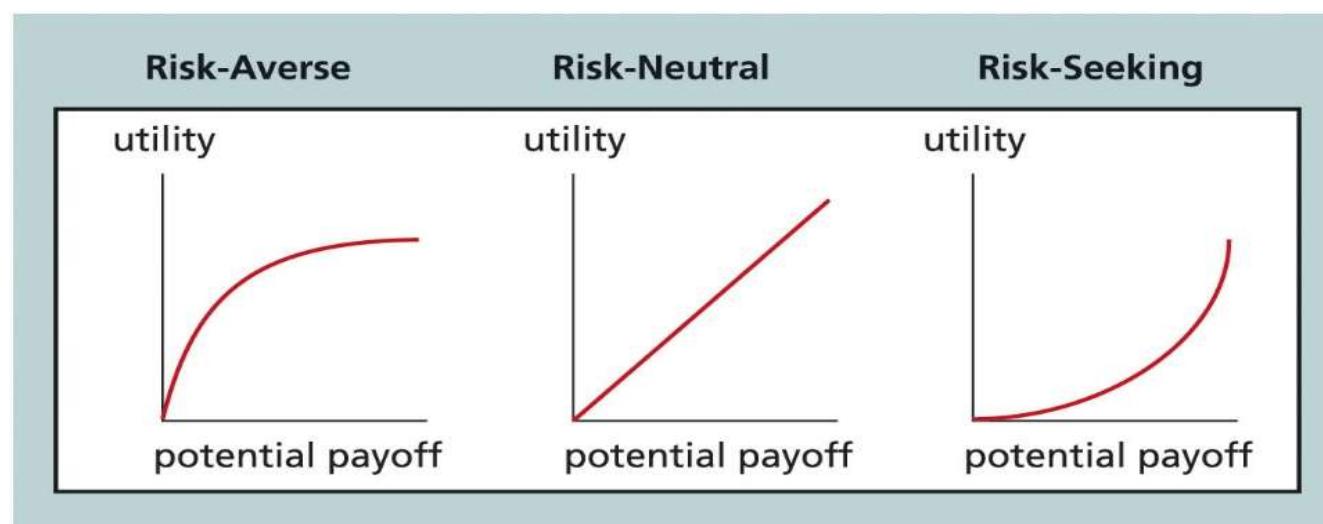


Source: Kulik and Weber, KLCI Research Group

**FIGURE 11-1** Benefits from software risk management practices

# The Importance of Project Risk Management (2 of 3)

- A dictionary definition of risk is “the possibility of loss or injury”
  - General definition of a project risk: an uncertainty that can have a negative or positive effect on meeting project objectives
  - Managing negative risks involves a number of possible actions that project managers can take to avoid, lessen, change, or accept the potential effects of risks on their projects
  - Positive risk management is like investing in opportunities
- Risk utility is the amount of satisfaction or pleasure received from a potential payoff
  - Utility rises at a decreasing rate for people who are risk-averse
  - Those who are risk-seeking have a higher tolerance for risk and their satisfaction increases when more payoff is at stake
  - Risk-neutral approach achieves a balance between risk and payoff



**FIGURE 11-2** Risk utility function and risk preference

# The Importance of Project Risk Management (3 of 3)

- Project risk management processes
  - Planning risk management: deciding how to approach and plan the risk management activities for the project
  - Identifying risks: determining which risks are likely to affect a project and documenting the characteristics of each
  - Performing qualitative risk analysis: prioritizing risks based on their probability and impact of occurrence
  - Performing quantitative risk analysis: numerically estimating the effects of risks on project objectives
  - Planning risk responses: taking steps to enhance opportunities and reduce threats to meeting project objectives
  - Implementing risk responses: implementing the risk response plans
  - Monitoring risk: monitoring identified and residual risks, identifying new risks, carrying out risk response plans, and evaluating the effectiveness of risk strategies throughout the life of the project

# Best Practice

- Some organizations make the mistake of only addressing tactical and negative risks when performing project risk management
  - David Hillson suggests overcoming this problem by widening the scope of risk management to encompass both strategic risks and upside opportunities, which he refers to as integrated risk management
  - Hillson described the importance of good working relationships; especially between the project sponsor and project manager

# Advice for Young Professionals

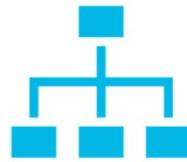
- Young project professionals are sometimes more willing to take risks with unique or untested approaches
  - Take the time to find out what other, more experienced people might feel about the circumstances of a project before making up your mind about potential risks
    - Then, taking other views into account, you can determine how best to plan for the impacts that might occur while balancing the rewards of a potential payoff from a unique or untested approach

# Planning Risk Management (1 of 2)



**Main output of this process is a risk management plan**

Documents the procedures for managing risk throughout a project



**The project team should review project documents as well as corporate risk management policies, risk categories, lessons-learned reports from past projects, and templates for creating a risk management plan**

It is also important to review the risk tolerances of various stakeholders



**Additional plans**

**Contingency plans:** predefined actions that the project team will take if an identified risk event occurs

**Fallback plans:** developed for risks that have a high impact on meeting project objectives, and are put into effect if attempts to reduce the risk are not effective

**Contingency reserves or allowances:** funds included in the cost baseline that can be used to mitigate cost or schedule overruns if known risks occur

**Management reserves:** funds held for unknown risks that are used for management control purposes

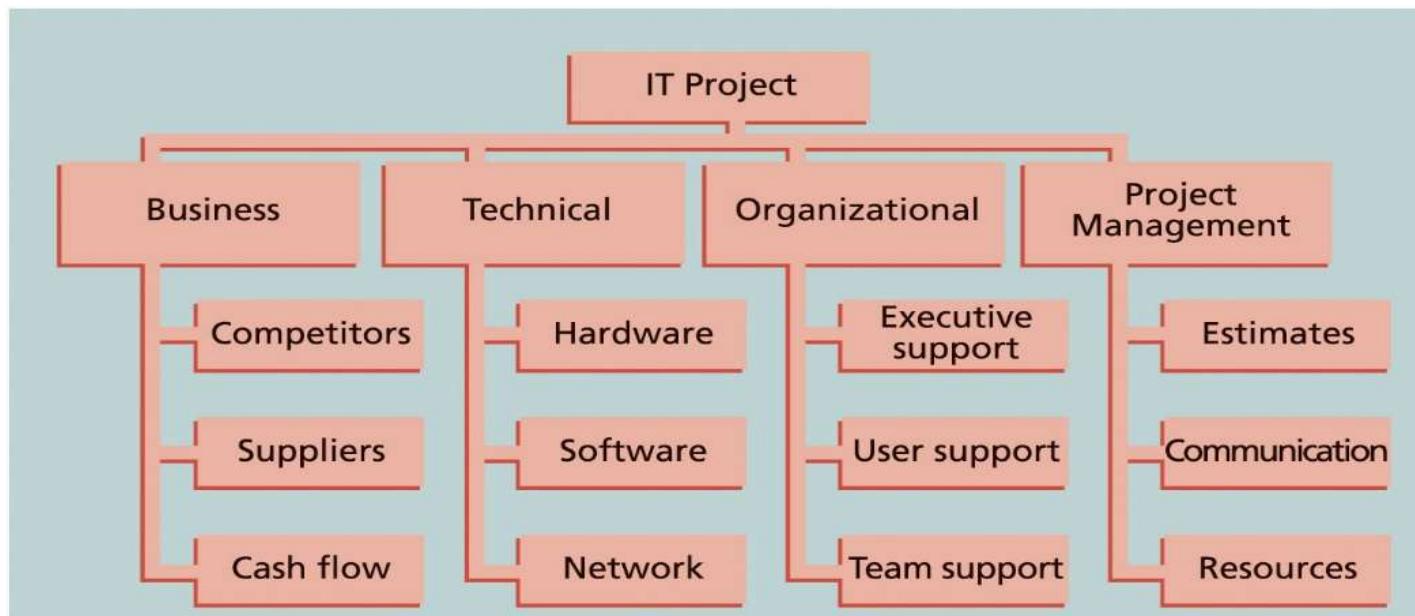
# Planning Risk Management (2 of 2)

Topic	Questions to Answer
Methodology	How will risk management be performed on this project? What tools and data sources are available and applicable?
Roles and responsibilities	Which people are responsible for implementing specific tasks and providing deliverables related to risk management?
Budget and schedule	What are the estimated costs and schedules for performing risk-related activities?
Risk categories	What are the main categories of risks that should be addressed on this project? Is there a risk breakdown structure for the project? (See the information on risk breakdown structures later in this chapter.)
Risk probability and impact	How will the probabilities and impacts of risk items be assessed? What scoring and interpretation methods will be used for the qualitative and quantitative analysis of risks? How will the probability and impact matrix be developed?
Revised stakeholders' tolerances	Have stakeholders' tolerances for risk changed? How will those changes affect the project?
Tracking	How will the team track risk management activities? How will lessons learned be documented and shared? How will risk management processes be audited?
Risk documentation	What reporting formats and processes will be used for risk management activities?

Table 11-2 Topics addressed in a risk management plan

# Common Sources of Risk on IT Projects (1 of 3)

- Several studies show that IT projects share some common sources of risk
  - The Standish Group developed an IT success potential scoring sheet based on potential risks
- Other broad categories of risk help identify potential risks
  - Market risk
  - Financial risk
  - Technology risk
  - People risk
  - Structure/process risk
- A risk breakdown structure is a hierarchy of potential risk categories for a project



## Common Sources of Risk on IT Projects (2 of 2)

Knowledge Area	Risk Conditions
Integration	Inadequate planning; poor resource allocation; poor integration management; lack of post-project review
Scope	Poor definition of scope or work packages; incomplete definition
Time	Errors in estimating time or resource availability; errors in determining the critical path; poor allocation and management of float; early release of competitive products
Cost	Estimating errors; inadequate productivity, cost, change, or contingency
Quality	Poor attitude toward quality; substandard design, materials, and workmanship; inadequate quality assurance program
Human resource	Poor conflict management; poor project organization and definition of responsibilities; absence of leadership
Communications	Carelessness in planning or communicating
Risk	Ignoring risk; unclear analysis of risk; poor insurance management
Procurement	Unenforceable conditions or contract clauses; adversarial relations
Stakeholders	Lack of consultation with key stakeholder; poor sponsor engagement

Table 11-3 Potential negative risk conditions associated with each knowledge area. \*Source: R.M. Wideman

# Identifying Risks (1 of 2)

Understanding what potential events might hurt or enhance a particular project

- You cannot manage risks if you do not identify them first

Another consideration is the likelihood of advanced discovery

- Often viewed at a program level rather than a project level

Suggestions for identifying risks: tools and techniques

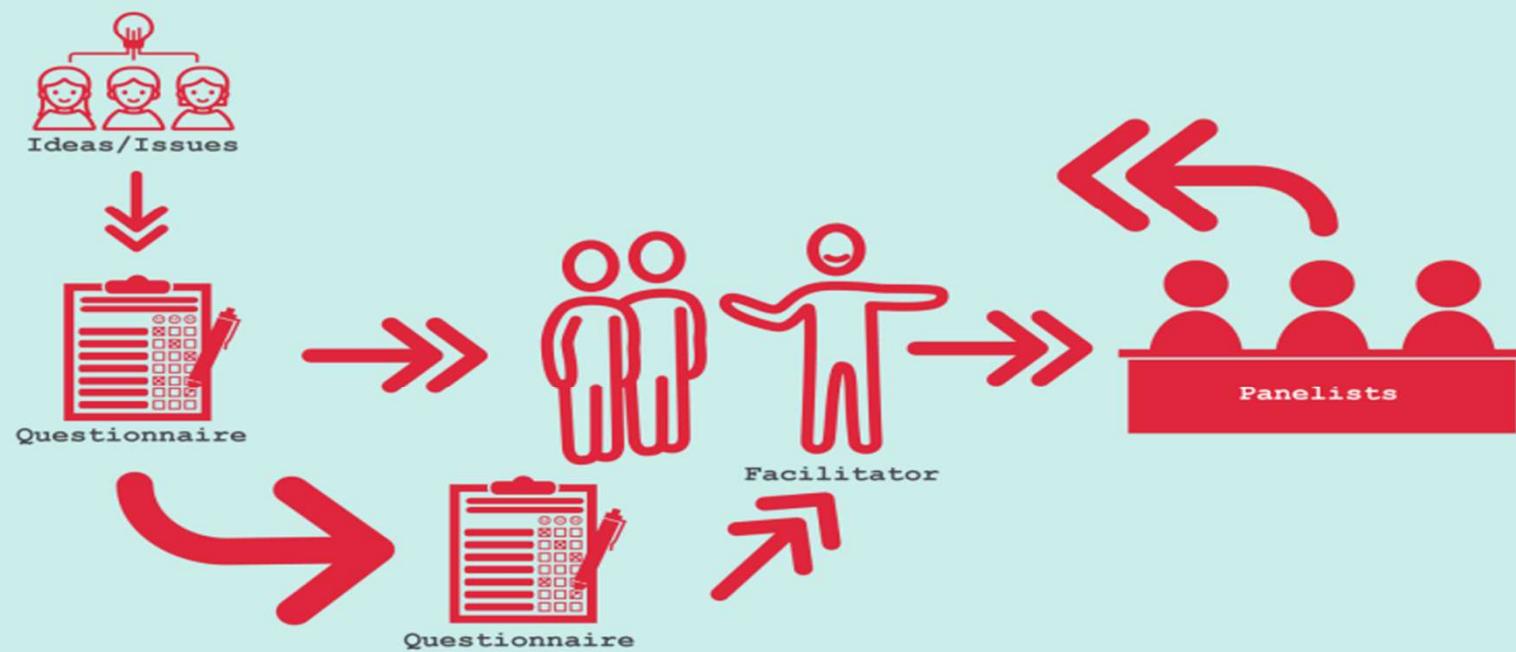
- Brainstorming
- The Delphi Technique
- Interviewing
- SWOT analysis

Brainstorming

- Group attempts to generate ideas or find a solution for a specific problem by amassing ideas spontaneously and without judgment
- An experienced facilitator should run the brainstorming session
- Be careful not to overuse or misuse brainstorming
- Psychology literature shows that individuals produce a greater number of ideas working alone than they do through brainstorming in small, face-to-face groups
- Group effects often inhibit idea generation

## The Delphi Method In A Nutshell

The Delphi method is a survey-based framework for estimating the likelihood and outcome of future events. The Delphi method is a survey-based framework for estimating the likelihood and outcome of future events. It was developed in response to military strategy formation during the Cold War. The Delphi method has been adapted considerably since the 1960s.



# Identifying Risks (2 of 2)

## Delphi Technique

- Used to derive a consensus among a panel of experts who make predictions about future developments
- Provides independent and anonymous input regarding future events
- Uses repeated rounds of questioning and written responses and avoids the biasing effects possible in oral methods

## Interviewing

- Fact-finding technique for collecting information in face-to-face, phone, e-mail, or virtual discussions
- Interviewing people with similar project experience is an important tool for identifying potential risks

## SWOT analysis

- Strengths, weaknesses, opportunities, and threats
- Helps identify the broad negative and positive risks that apply to a project

# The Risk Register (1 of 2)

- *Important output of the risk identification process*

- List of identified risks and other information needed to begin creating a risk register
  - Contains the results of various risk management processes and that is often displayed in a table or spreadsheet format
  - Tool for documenting potential risk events and related information
- Risk events refer to specific, uncertain events that may occur to the detriment or enhancement of the project

- *Risk register contents*

- Identification number for each risk event
- Rank for each risk event
- Name of each risk event
- Description of each risk event
- Category under which each risk event falls
- Root cause of each risk
- Triggers for each risk; indicators or symptoms of actual risk events
- Potential responses to each risk
- Risk owner or person who will own or take responsibility for each risk
- Probability and impact of each risk occurring
- Status of each risk

- *Risk report contents*

- Sources of overall project risk
- Important drivers of overall project risk exposure
- Summary information on risk events

# The Risk Register ( 2 of 2)

No.	Rank	Risk	Description	Category	Root Cause	Triggers	Potential Responses	Risk Owner	Probability	Impact	Status
R44	1										
R21	2										
R7	3										

Table 11-4 Sample risk register

# Performing Qualitative Risk Analysis

Assess the likelihood and impact of identified risks to determine their magnitude and priority

Risk quantification tools and techniques

- Probability/impact matrixes
- The Top Ten Risk Item Tracking
- Expert judgment

# Using Probability/Impact Matrixes to Calculate Risk Factors

- Lists relative probability of a risk occurring on one side of a matrix or axis on a chart and the relative impact of the risk occurring
  - List the risks and then label each one as high, medium, or low in terms of its probability of occurrence and its impact if it did occur
- Calculates risk factors
  - Numbers that represent the overall risk of specific events based on their probability of occurring and the consequences to the project if they do occur

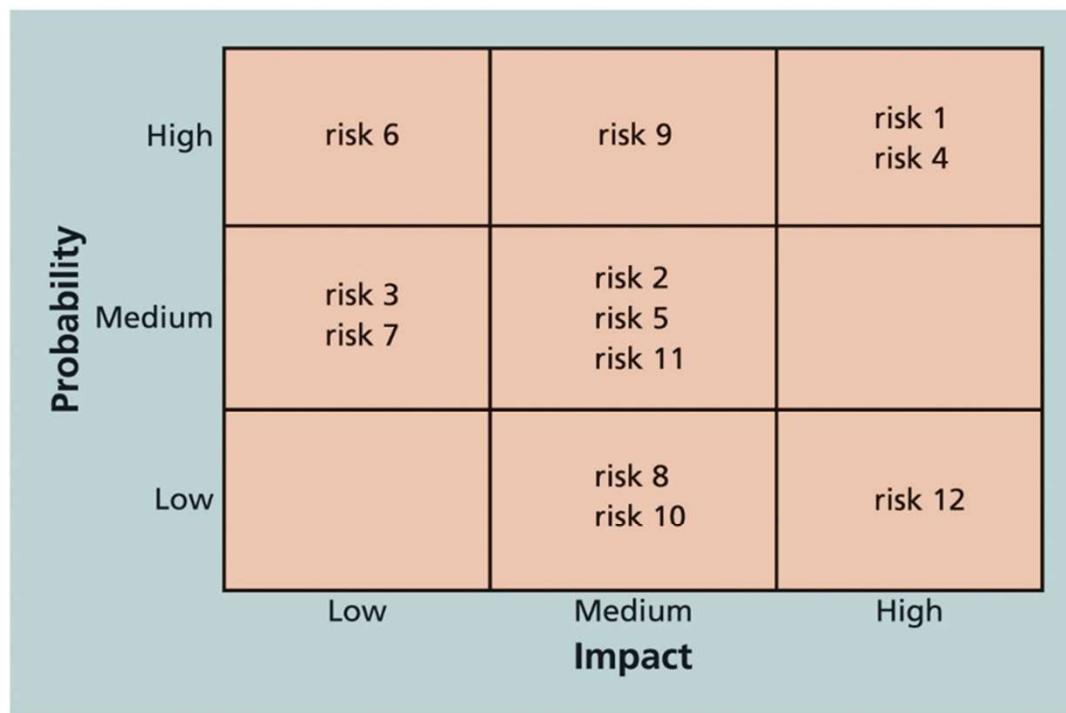


FIGURE 11-5 Sample probability/impact matrix

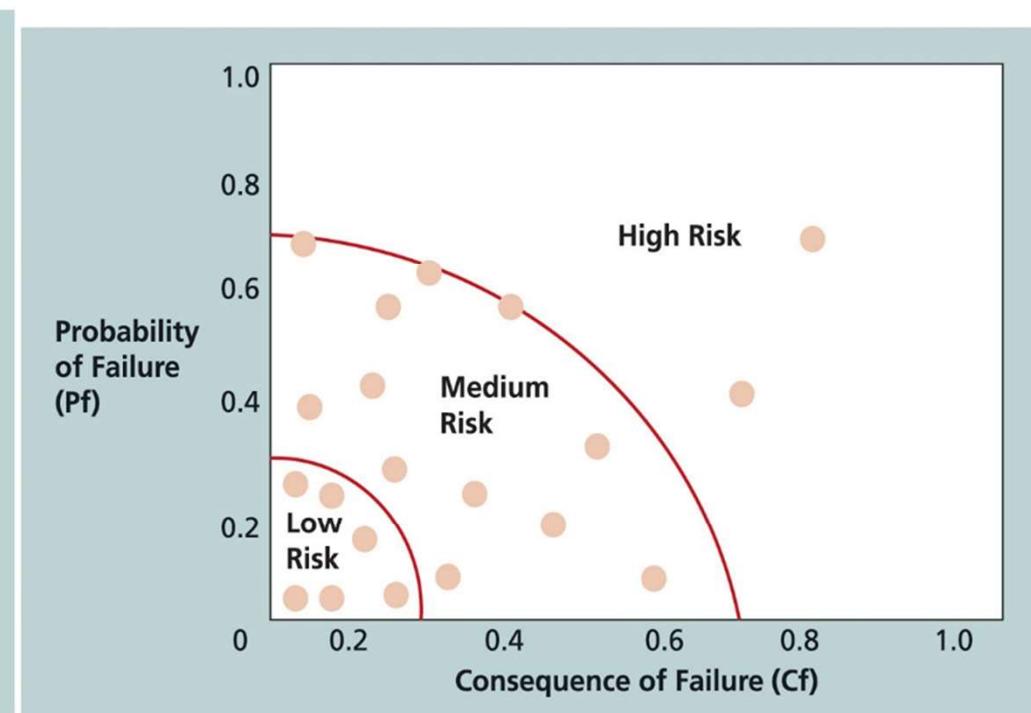


FIGURE 11-6 Chart showing high-, medium-, and low-risk technologies

# Top Ten Risk Item Tracking

- Qualitative risk analysis tool that helps to identify risks and maintain an awareness of risks throughout the life of a project
  - Involves establishing a periodic review of the top ten project risk items
  - Includes the current ranking, previous ranking, number of times the risk appears on the list over a period of time, and a summary of progress made in resolving the risk item
- A watch list is a list of risks that are low priority, but are still identified as potential risks
  - Qualitative analysis can also identify risks that should be evaluated quantitatively

Table 11-5 Example of top ten risk item tracking

	Monthly Ranking	Monthly Ranking	Monthly Ranking	
Risk Event	Rank This Month	Rank Last Month	Number of Months in Top Ten	Risk Resolution Progress
Inadequate planning	1	2	4	Working on revising the entire project management plan
Poor definition	2	3	3	Holding meetings with project customer and sponsor to clarify scope
Absence of leadership	3	1	2	Assigned a new project manager to lead the project after the previous one quit
Poor cost estimates	4	4	3	Revising cost estimates
Poor time estimates	5	5	3	Revising schedule estimates

# Performing Quantitative Risk Analysis



Often follows qualitative risk analysis, but both can be done together

Large, complex projects involving leading edge technologies often require extensive quantitative risk analysis



Main techniques

Decision tree analysis  
Simulation  
Sensitivity analysis

# Decision Trees and Expected Monetary Value (EMV) (

- A decision tree is a diagramming analysis technique used to help select the best course of action in situations in which future outcomes are uncertain
  - Estimated monetary value (EMV) is the product of a risk event probability and the risk event's monetary value
    - You can draw a decision tree to help find the EMV

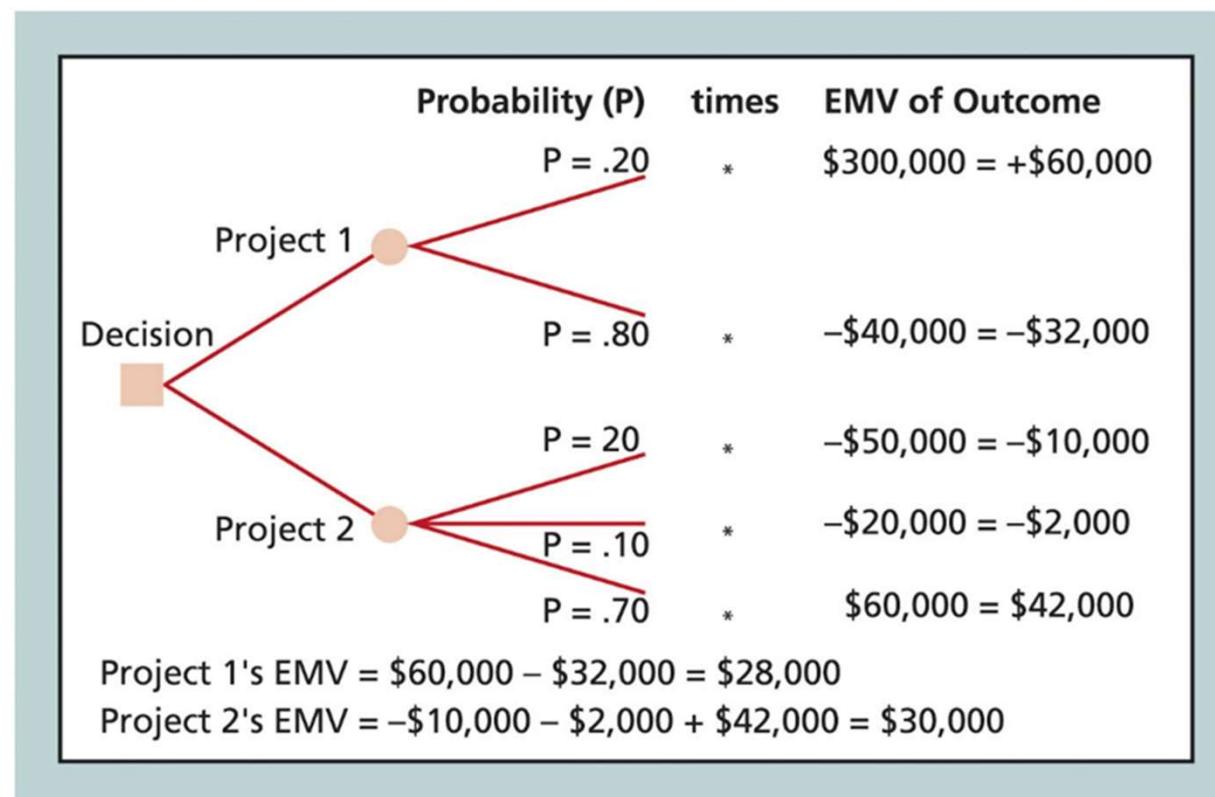


FIGURE 11-7 Expected monetary value (EMV) example

# Simulation (1 of 2)

Uses a representation or model of a system to analyze the expected behavior or performance of the system

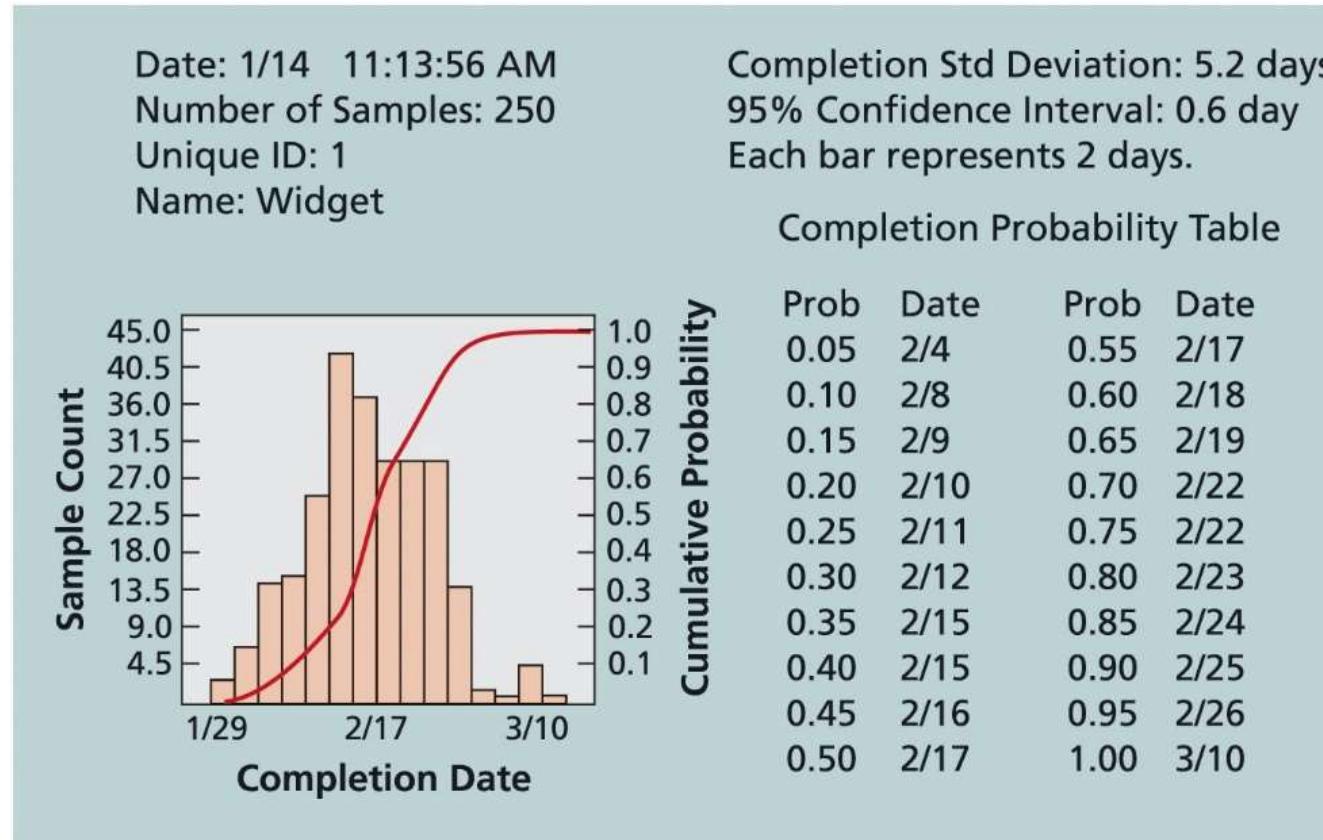
- Monte Carlo analysis simulates a model's outcome many times to provide a statistical distribution of the calculated results
  - Predict the probability of finishing by a certain date or the probability that the cost will be equal to or less than a certain value
  - You can use several different types of distribution functions when performing a Monte Carlo analysis

Steps of a Monte Carlo analysis

a statistical sampling method which employs a random selection of parameter values in such a way that they reflect the random physical processes of the original problem

- Collect the most likely, optimistic, and pessimistic estimates for the variables in the model
- Determine the probability distribution of each variable
- Select a random value based on the probability distribution for each variable
- Run a deterministic analysis or one pass through the model
- Repeat steps three and four many times to obtain the probability distribution of the model's results

## Simulation (2 of 2)



**FIGURE 11-8** Sample Monte Carlo-based simulation results for project schedule

# Sensitivity Analysis

- Used to show the effects of changing one or more variables on an outcome
  - For example, many people use it to determine what the monthly payments for a loan will be given different interest rates or periods of the loan
- Spreadsheet software, such as Microsoft Excel, is a common tool for performing sensitivity analysis



FIGURE 11-9 Sample sensitivity analysis for determining break-even point

# Planning Risk Responses (1 of 2)

After identifying and quantifying risks, the organization must decide how to respond to them

- Basic response strategies for negative risks
  - Risk avoidance Risk transference Risk acceptance
  - Risk mitigation Risk escalation
- Basic response strategies for positive risks
  - Risk exploitation Risk enhancement Risk sharing
  - Risk acceptance Risk escalation

It's also important to identify residual and secondary risks

- Residual risks: risks that remain after all of the response strategies have been implemented
- Secondary risks: direct result of implementing a risk response

# Planning Risk Responses (2 of 3)

Technical Risks	Cost Risks	Schedule Risks
Emphasize team support and avoid stand-alone project structure	Increase the frequency of project monitoring	Increase the frequency of project monitoring
Increase project manager authority	Use WBS and CPM	Use WBS and CPM
Improve problem handling and communication	Improve communication, understanding of project goals, and team support	Select the most experienced project manager
Increase the frequency of project monitoring	Increase project manager authority	
Use WBS and CPM		

Table 11-6 General risk mitigation strategies for technical, cost, and schedule risks. \*Source: J. Couillard

# Implementing Risk Responses

- Main executing process performed as part of project risk management is implementing risk responses
  - Key outputs
    - Change requests
    - Project documents updates

# Monitoring Risks

Involves ensuring the appropriate risk responses are performed, tracking identified risks, identifying and analyzing new risk, and evaluating effectiveness of risk management throughout the entire project

Carrying out individual risk management plans involves monitoring risks based on defined milestones and making decisions regarding risks and their response strategies

- Project risk management does not stop with the initial risk analysis
- Project teams sometimes use workarounds—unplanned responses to risk events—when they do not have contingency plans in place

# Using Software to Assist in Project Risk Management

- Risk registers can be created in a simple Microsoft Word or Excel file or as part of a sophisticated database
  - More sophisticated risk management software, such as Monte Carlo simulation tools, help develop models and use simulations to analyze and respond to various risks

Likelihood	Consequences				
	Insignificant <i>Risk is easily mitigated by normal day to day process</i>	Minor <i>Delays up to 10% of Schedule Additional cost up to 10% of Budget</i>	Moderate <i>Delays up to 30% of Schedule Additional cost up to 30% of Budget</i>	Major <i>Delays up to 50% of Schedule Additional cost up to 50% of Budget</i>	Catastrophic <i>Project abandoned</i>
<b>Certain</b> <i>&gt;90% chance</i>	High	High	Extreme	Extreme	Extreme
<b>Likely</b> <i>50% - 90% chance</i>	Moderate	High	High	Extreme	Extreme
<b>Moderate</b> <i>10% - 50% chance</i>	Low	Moderate	High	Extreme	Extreme
<b>Unlikely</b> <i>3% - 10% chance</i>	Low	Low	Moderate	High	Extreme
<b>Rare</b> <i>&lt;3% chance</i>	Low	Low	Moderate	High	High

## Considerations for Agile/Adaptive Environments

- All types of projects should share knowledge related to risks as quickly as possible and keep documents up to date
  - Risk is considered during each iteration for agile/adaptive projects, which does elevate its importance
  - Changing priorities can be addressed more easily by changing the product backlog for each iteration

# Chapter Summary

Risk is an uncertainty that can have a negative or positive effect on meeting project objectives

- Many organizations do a poor job of project risk management, if they do any at all
- Successful organizations realize the value of good project risk management

Risk management is an investment

- Costs are associated with identifying risks, analyzing those risks, and establishing plans to address them

Implementing risk responses involves putting the appropriate risk response plans into action

- Monitoring risks involves monitoring implementation of risk response plans, tracking identified risks, identifying and analyzing new risks, and evaluating effectiveness of risk management throughout the entire project