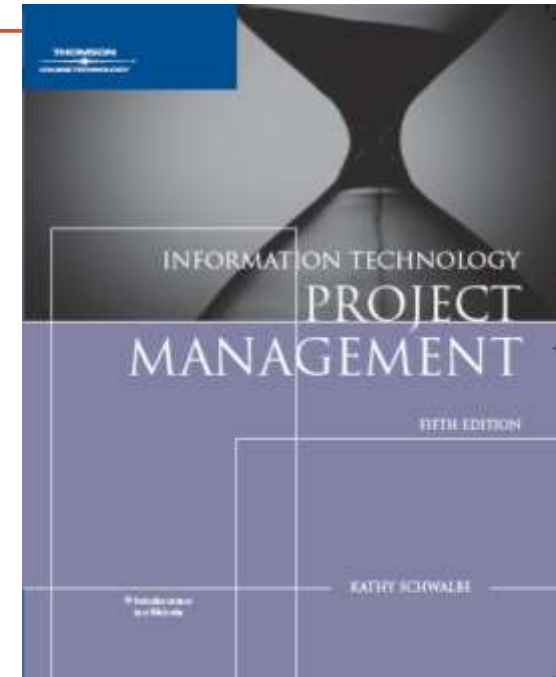


PROJECT RISK MANAGEMENT

Information Technology Project Management, Fifth Edition



Learning Objectives

- Understand what risk is and the importance of good project risk management
- Discuss the elements involved in risk management planning and the contents of a risk management plan
- List common sources of risks in information technology projects

Learning Objectives (continued)

- Describe the risk identification process, tools and techniques to help identify project risks, and the main output of risk identification: a risk register
- Discuss the qualitative risk analysis process and explain how to calculate risk factors, create probability/impact matrixes, and apply the Top Ten Risk Item Tracking technique to rank risks

Learning Objectives (continued)

- Explain the quantitative risk analysis process and how to apply decision trees, simulation, and sensitivity analysis to quantify risks
- Provide examples of using different risk response planning strategies to address both negative and positive risks
- Discuss what is involved in risk monitoring and control
- Describe how software can assist in project risk management

The Importance of Project Risk Management

- 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

Research Shows Need to Improve Project Risk Management

- Study by Ibbs and Kwak shows risk has the lowest maturity rating of all knowledge areas
- A similar survey was completed with software development companies in Mauritius, South Africa in 2003, and risk management also had the lowest maturity
- KLCI study shows the benefits of following good software risk management practices

Table 11-1: Project Management Maturity by Industry Group and Knowledge Area*

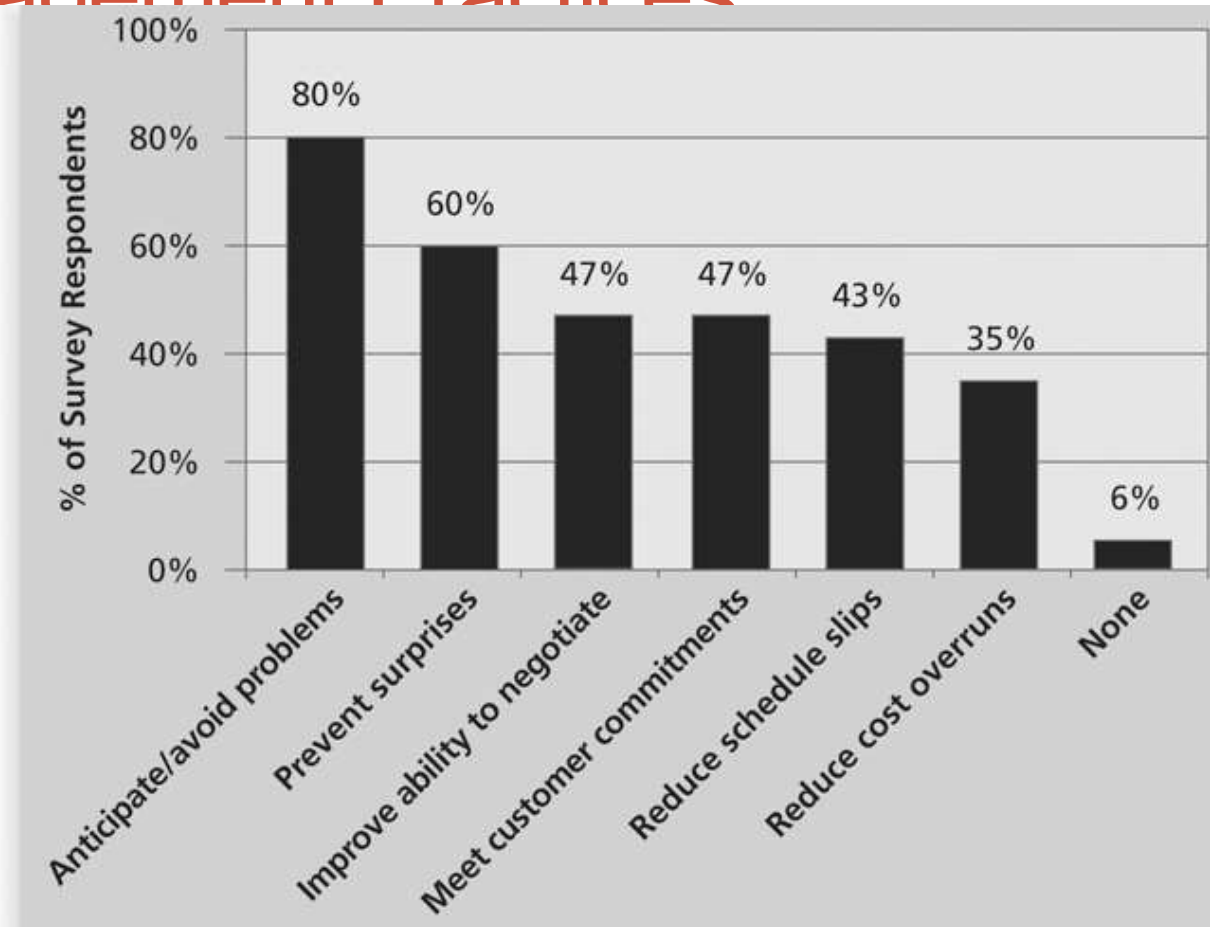
KEY: 1 = LOWEST MATURITY RATING

5 = HIGHEST MATURITY RATING

<i>Knowledge Area</i>	Engineering/ Construction	Telecommunications	Information Systems	Hi-Tech Manufacturing
<i>Scope</i>	3.52	3.45	3.25	3.37
<i>Time</i>	3.55	3.41	3.03	3.50
<i>Cost</i>	3.74	3.22	3.20	3.97
<i>Quality</i>	2.91	3.22	2.88	3.26
<i>Human Resources</i>	3.18	3.20	2.93	3.18
<i>Communications</i>	3.53	3.53	3.21	3.48
<i>Risk</i>	2.93	2.87	2.75	2.76
<i>Procurement</i>	3.33	3.01	2.91	3.33

*Ibbs, C. William and Young Hoon Kwak. "Assessing Project Management Maturity," *Project Management Journal* (March 2000).

Figure 11-1: Benefits from Software Risk Management Practices*



*Kulik, Peter and Catherine Weber, "Software Risk Management Practices – 2001," KLCI Research Group (August 2001).

Negative Risk

- A dictionary definition of risk is “the possibility of loss or injury”
- Negative risk involves understanding potential problems that might occur in the project and how they might impede project success
- Negative risk management is like a form of insurance; it is an investment

Risk Can Be Positive

- Positive risks are risks that result in good things happening; sometimes called opportunities
- A general definition of project **risk** is an uncertainty that can have a negative or positive effect on meeting project objectives
- The goal of project risk management is to minimize potential negative risks while maximizing potential positive risks

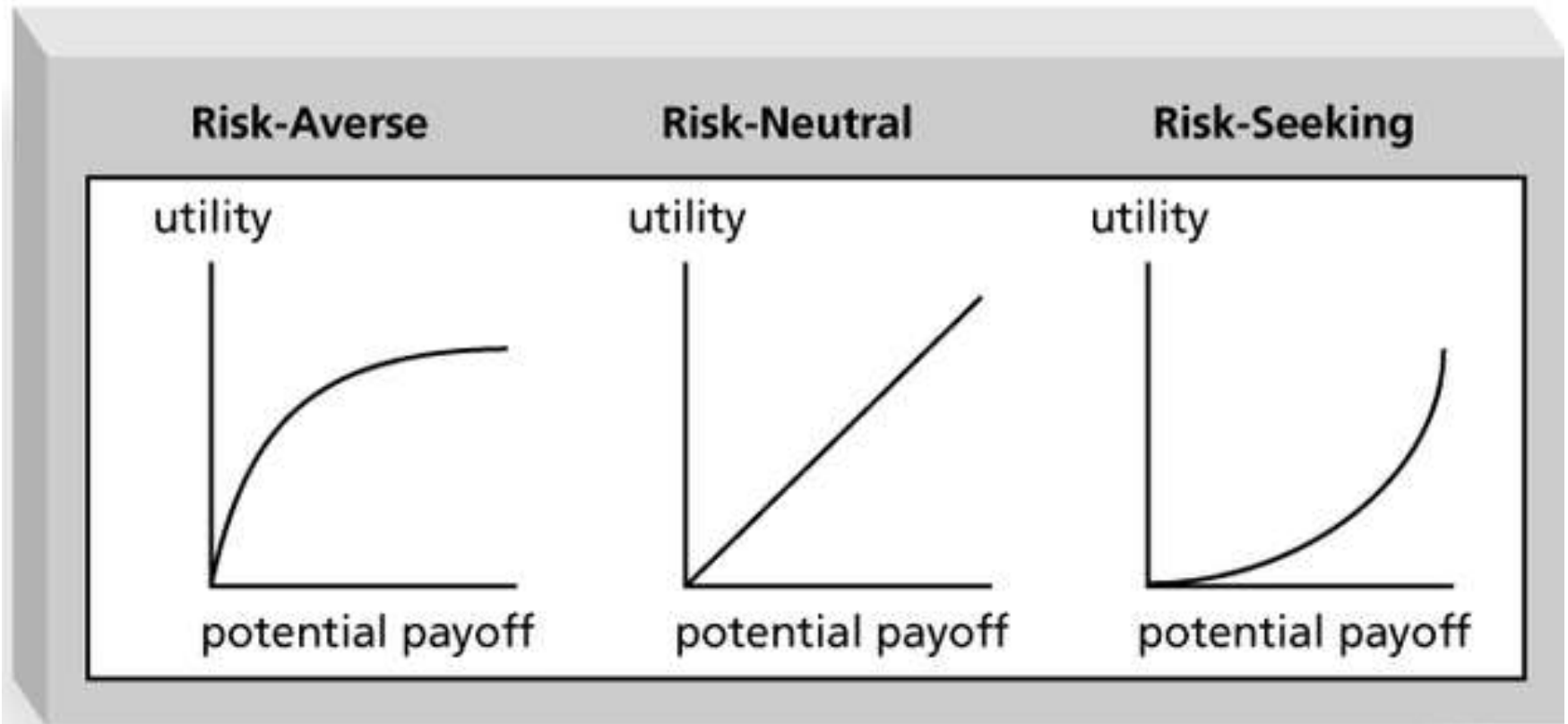
Best Practice

- Some organizations make the mistake of only addressing tactical and negative risks when performing project risk management
- David Hillson (www.risk-doctor.com) 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*

Risk Utility

- **Risk utility** or **risk tolerance** 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
 - The risk-neutral approach achieves a balance between risk and payoff

Figure 11-2: Risk Utility Function and Risk Preference



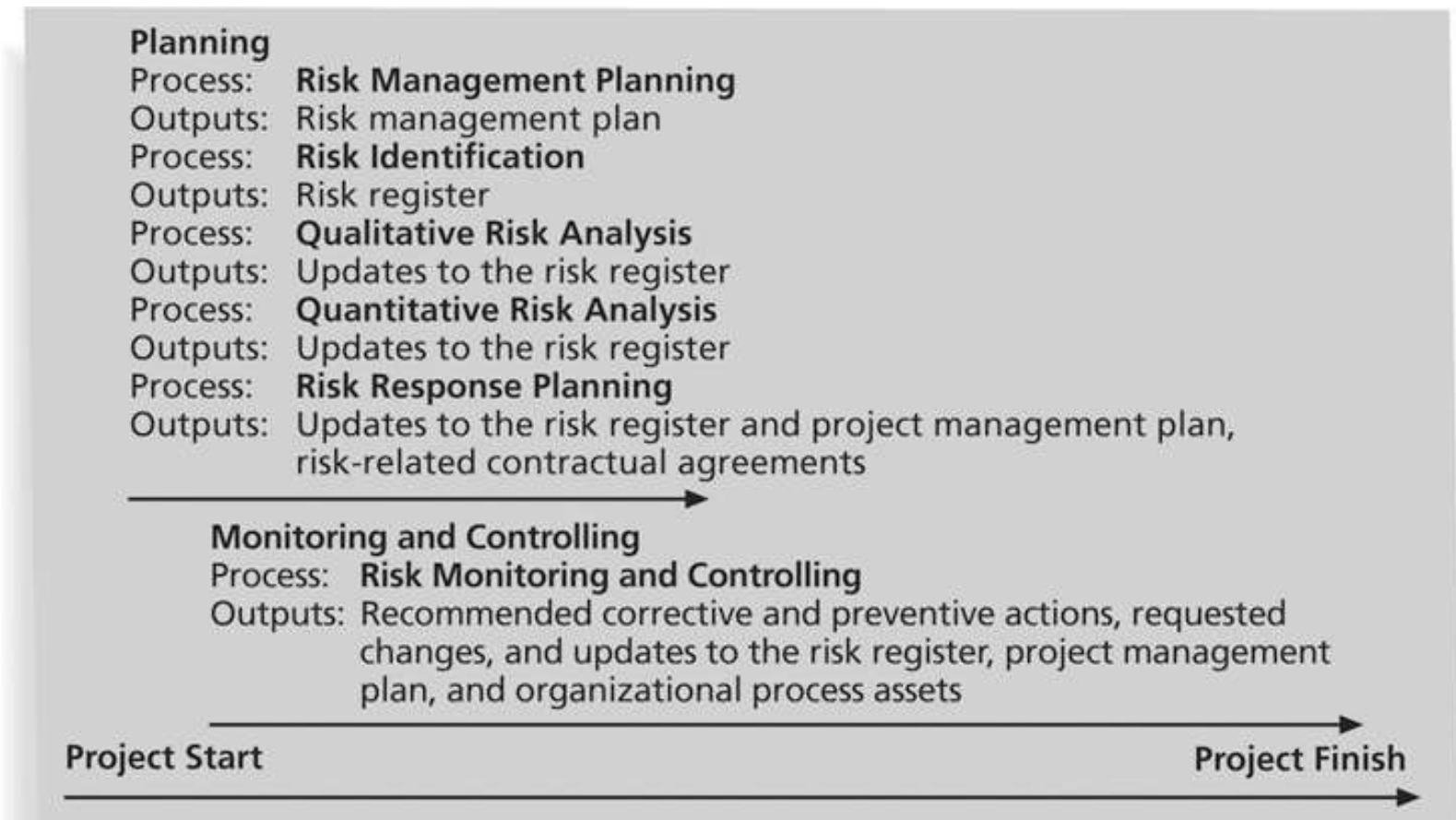
Project Risk Management Processes

- **Risk management planning:** deciding how to approach and plan the risk management activities for the project
- **Risk identification:** determining which risks are likely to affect a project and documenting the characteristics of each
- **Qualitative risk analysis:** prioritizing risks based on their probability and impact of occurrence

Project Risk Management Processes (continued)

- **Quantitative risk analysis:** numerically estimating the effects of risks on project objectives
- **Risk response planning:** taking steps to enhance opportunities and reduce threats to meeting project objectives
- **Risk monitoring and control:** 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

Figure 11-3: Project Risk Management Summary



Risk Management Planning

- The main output of risk management planning is a **risk management plan**—a plan that documents the procedures for managing risk throughout a project
- The project team should review project documents and understand the organization's and the sponsor's approaches to risk
- The level of detail will vary with the needs of the project

Table 11-2: Topics Addressed in a Risk Management Plan

- Methodology
- Roles and responsibilities
- Budget and schedule
- Risk categories
- Risk probability and impact
- Risk documentation

Contingency and Fallback Plans, Contingency Reserves

- **Contingency plans** are predefined actions that the project team will take if an identified risk event occurs
- **Fallback plans** are 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** are provisions held by the project sponsor or organization to reduce the risk of cost or schedule overruns to an acceptable level

Common Sources of Risk in Information Technology Projects

- 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

Table 11-3: Information Technology Success Potential Scoring Sheet

Success Criterion	Relative Importance
User Involvement	19
Executive Management support	16
Clear Statement of Requirements	15
Proper Planning	11
Realistic Expectations	10
Smaller Project Milestones	9
Competent Staff	8
Ownership	6
Clear Visions and Objectives	3
Hard-Working, Focused Staff	3
Total	100

Broad Categories of Risk

- Market risk
- Financial risk
- Technology risk
- People risk
- Structure/process risk

What Went Wrong?

- KPMG, a large consulting firm, published a study in 1995 that found that 55 percent of **runaway** projects—projects that have significant cost or schedule overruns—did *no risk* management at all; 38 percent did some (but half did not use their risk findings after the project was underway); and 7 percent did not know whether they did risk management or not
- The timing of risk management is also an important consideration

Risk Breakdown Structure

- A **risk breakdown structure** is a hierarchy of potential risk categories for a project
- Similar to a work breakdown structure but used to identify and categorize risks

Figure 11-4: Sample Risk Breakdown Structure

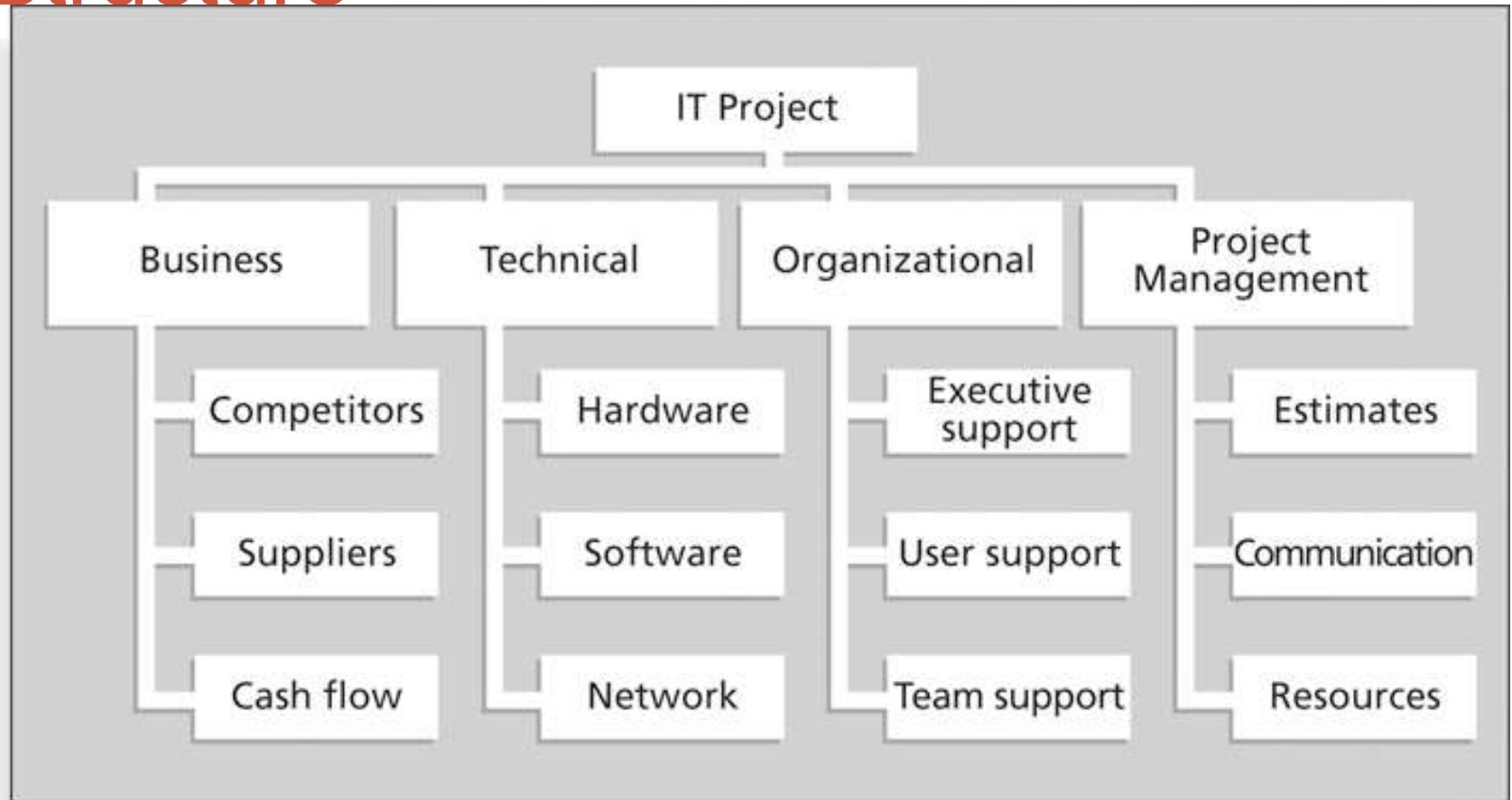


Table 11-4: Potential Negative Risk Conditions Associated With Each Knowledge Area

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

Risk Identification

- **Risk identification** is the process of understanding what potential events might hurt or enhance a particular project
- Risk identification tools and techniques include:
 - Brainstorming
 - The Delphi Technique
 - Interviewing
 - SWOT analysis

Brainstorming

- **Brainstorming** is a technique by which a 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

Delphi Technique

- The **Delphi Technique** is 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, such as brainstorming

Interviewing

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

SWOT Analysis

- SWOT analysis (strengths, weaknesses, opportunities, and threats) can also be used during risk identification
- Helps identify the broad negative and positive risks that apply to a project

Risk Register

- The main output of the risk identification process is a list of identified risks and other information needed to begin creating a risk register
- A **risk register** is:
 - A document that contains the results of various risk management processes and that is often displayed in a table or spreadsheet format
 - A 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

- An identification number for each risk event
- A rank for each risk event
- The name of each risk event
- A description of each risk event
- The category under which each risk event falls
- The root cause of each risk

Risk Register Contents (continued)

- Triggers for each risk; **triggers** are indicators or symptoms of actual risk events
- Potential responses to each risk
- The **risk owner** or person who will own or take responsibility for each risk
- The probability and impact of each risk occurring
- The status of each risk

Table 11-5: Sample Risk Register

[illegible]

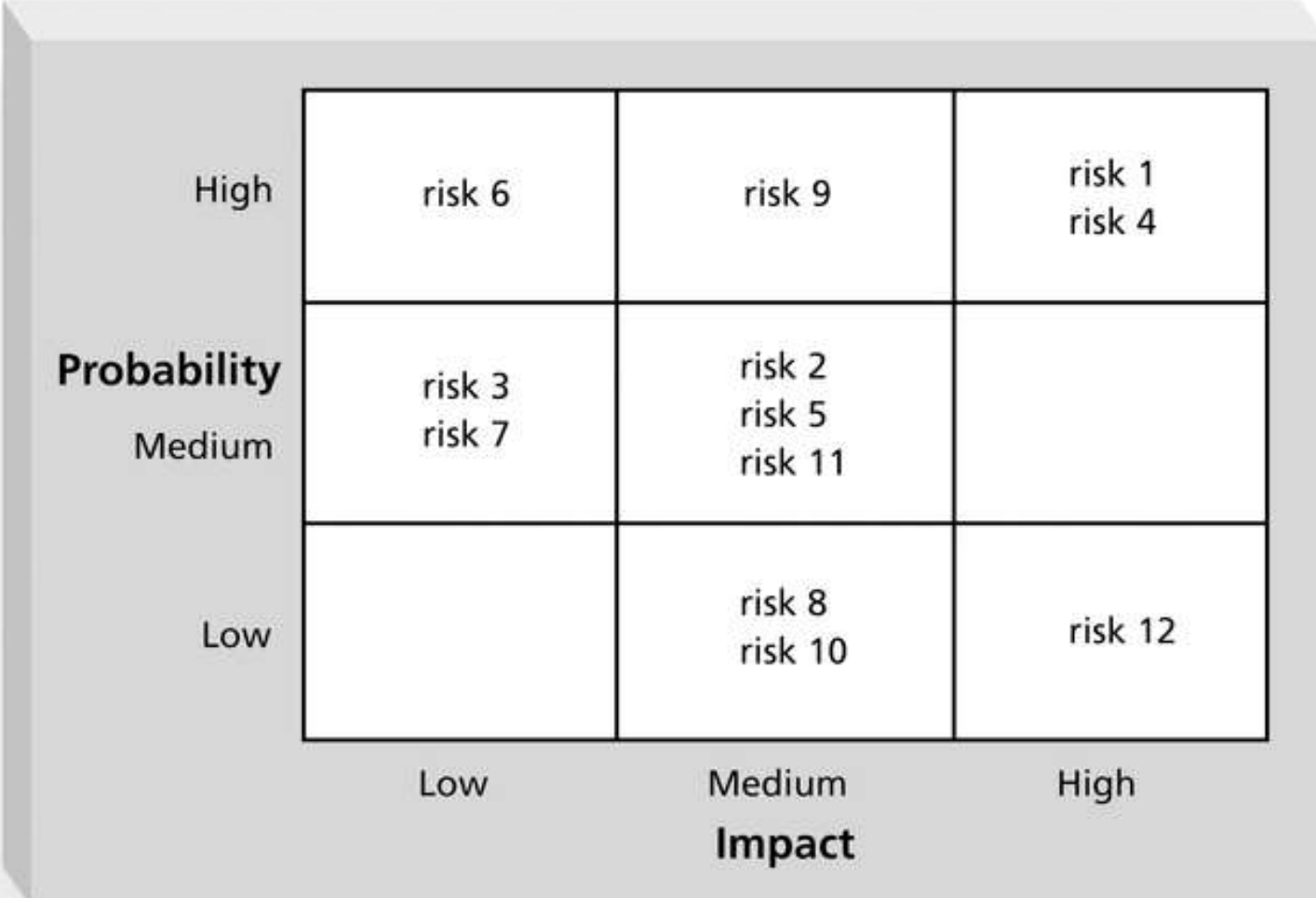
Qualitative Risk Analysis

- Assess the likelihood and impact of identified risks to determine their magnitude and priority
- Risk quantification tools and techniques include:
 - Probability/impact matrixes
 - The Top Ten Risk Item Tracking
 - Expert judgment

Probability/Impact Matrix

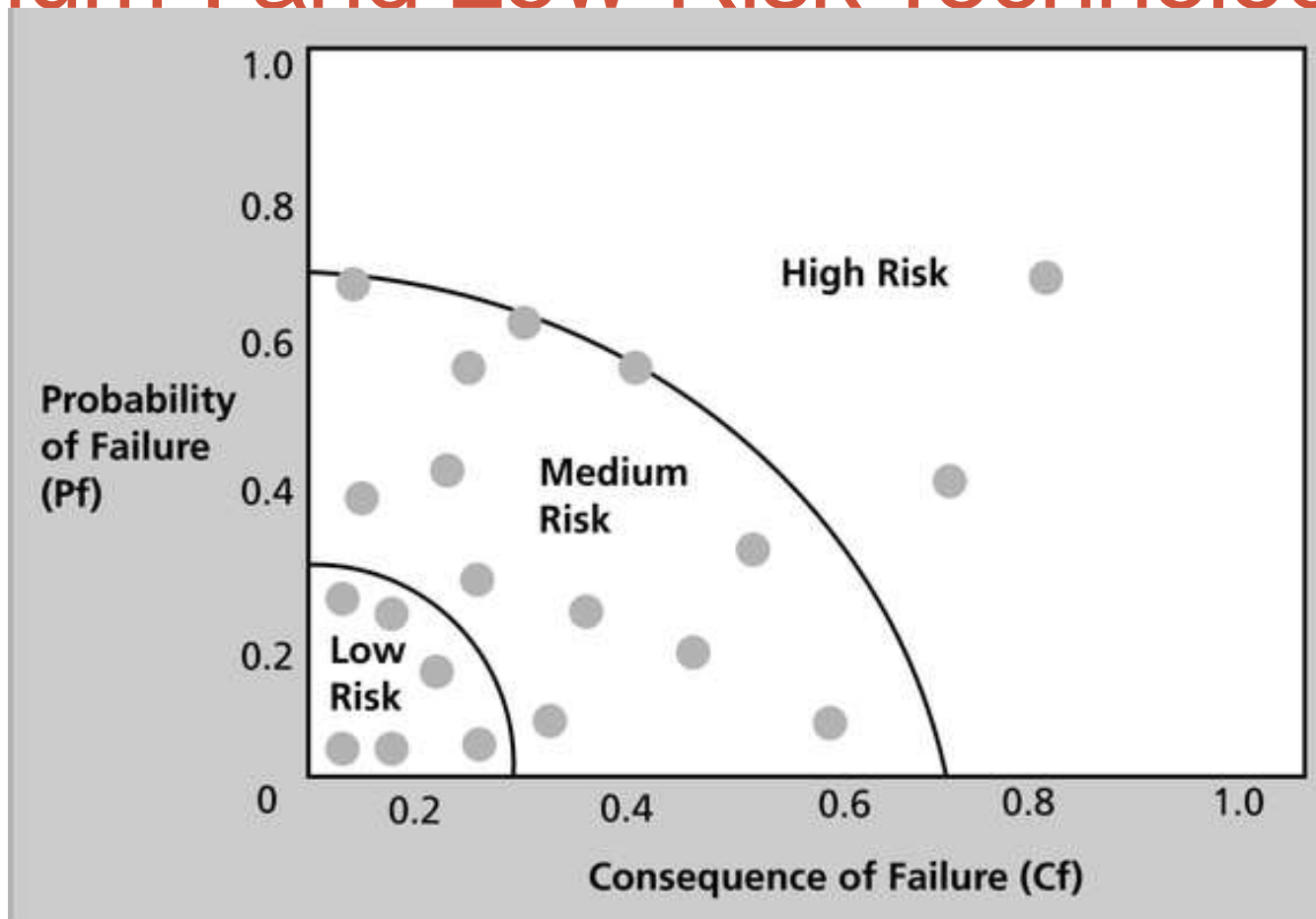
- A **probability/impact matrix** or **chart** lists the relative probability of a risk occurring on one side of a matrix or axis on a chart and the relative impact of the risk occurring on the other
- List the risks and then label each one as high, medium, or low in terms of its probability of occurrence and its impact if it did occur
- Can also calculate **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



Probability	High	risk 6	risk 9	risk 1 risk 4
	Medium	risk 3 risk 7	risk 2 risk 5 risk 11	
	Low		risk 8 risk 10	risk 12
		Low	Medium	High
		Impact		

Figure 11-6: Chart Showing High-, Medium-, and Low-Risk Technologies



Top Ten Risk Item Tracking

- **Top Ten Risk Item Tracking** is a qualitative risk analysis tool that helps to identify risks and maintain an awareness of risks throughout the life of a project
- Establish a periodic review of the top ten project risk items
- List 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

Table 11-6: Example of Top Ten Risk Item Tracking

RISK EVENT	MONTHLY RANKING			RISK RESOLUTION PROGRESS
	RANK THIS MONTH	RANK LAST MONTH	NUMBER OF MONTHS IN TOP TEN	
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	After previous project manager quit, assigned a new one to lead the project
Poor cost estimates	4	4	3	Revising cost estimates
Poor time estimates	5	5	3	Revising schedule estimates

Watch List

- 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 on a quantitative basis

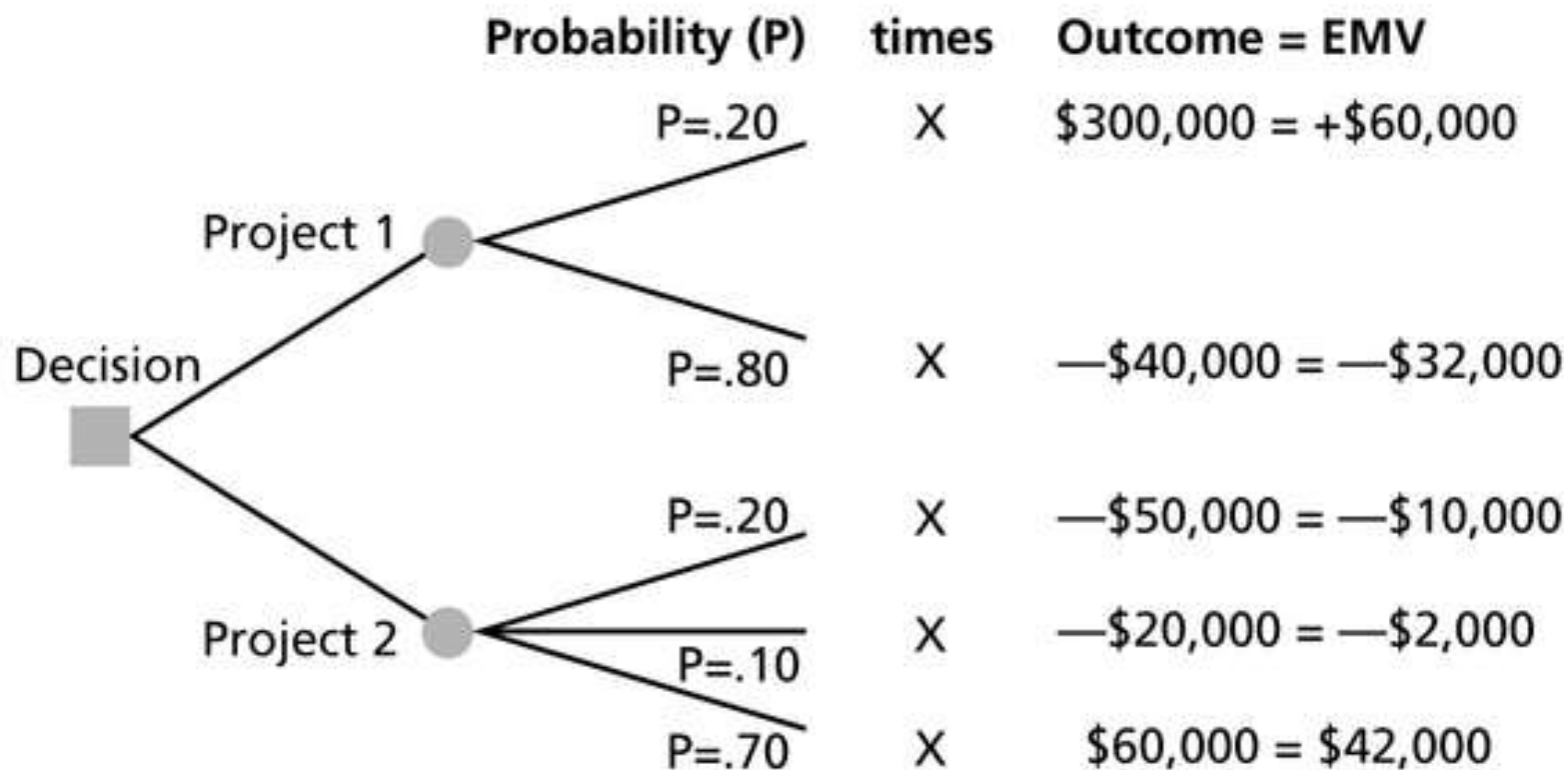
Quantitative Risk Analysis

- 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 include:
 - 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



Project 1's EMV = \$60,000 — 32,000 = \$28,000

Project 2's EMV = —\$10,000 — 2,000 + 42,000 = \$30,000

Simulation

- Simulation 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
- To use a Monte Carlo simulation, you must have three estimates (most likely, pessimistic, and optimistic) plus an estimate of the likelihood of the estimate being between the most likely and optimistic values

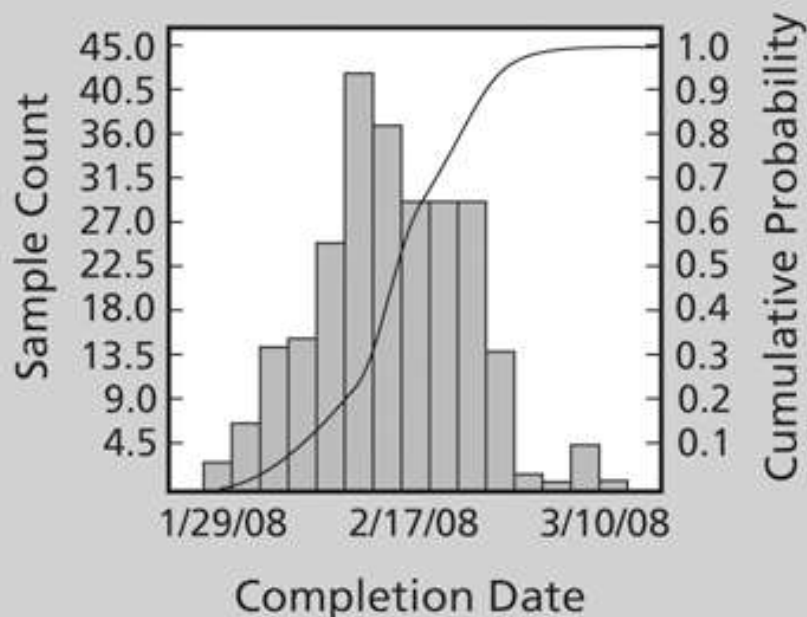
Steps of a Monte Carlo Analysis

1. Assess the range for the variables being considered
2. Determine the probability distribution of each variable
3. For each variable, select a random value based on the probability distribution
4. Run a deterministic analysis or one pass through the model
5. Repeat steps 3 and 4 many times to obtain the probability distribution of the model's results

Figure 11-8: Sample Monte Carlo Simulation Results for Project Schedule

Date: 1/14/08 11:13:56 AM
 Number of Samples: 250
 Unique ID: 1
 Name: Widget

Completion Std Deviation: 5.2d
 95% Confidence Interval: 0.6d
 Each bar represents 2d



Completion Probability Table

Prob	Date	Prob	Date
0.05	2/4/08	0.55	2/17/08
0.10	2/8/08	0.60	2/18/08
0.15	2/9/08	0.65	2/19/08
0.20	2/10/08	0.70	2/22/08
0.25	2/11/08	0.75	2/22/08
0.30	2/12/08	0.80	2/23/08
0.35	2/15/08	0.85	2/24/08
0.40	2/15/08	0.90	2/25/08
0.45	2/16/08	0.95	2/26/08
0.50	2/17/08	1.00	3/10/08

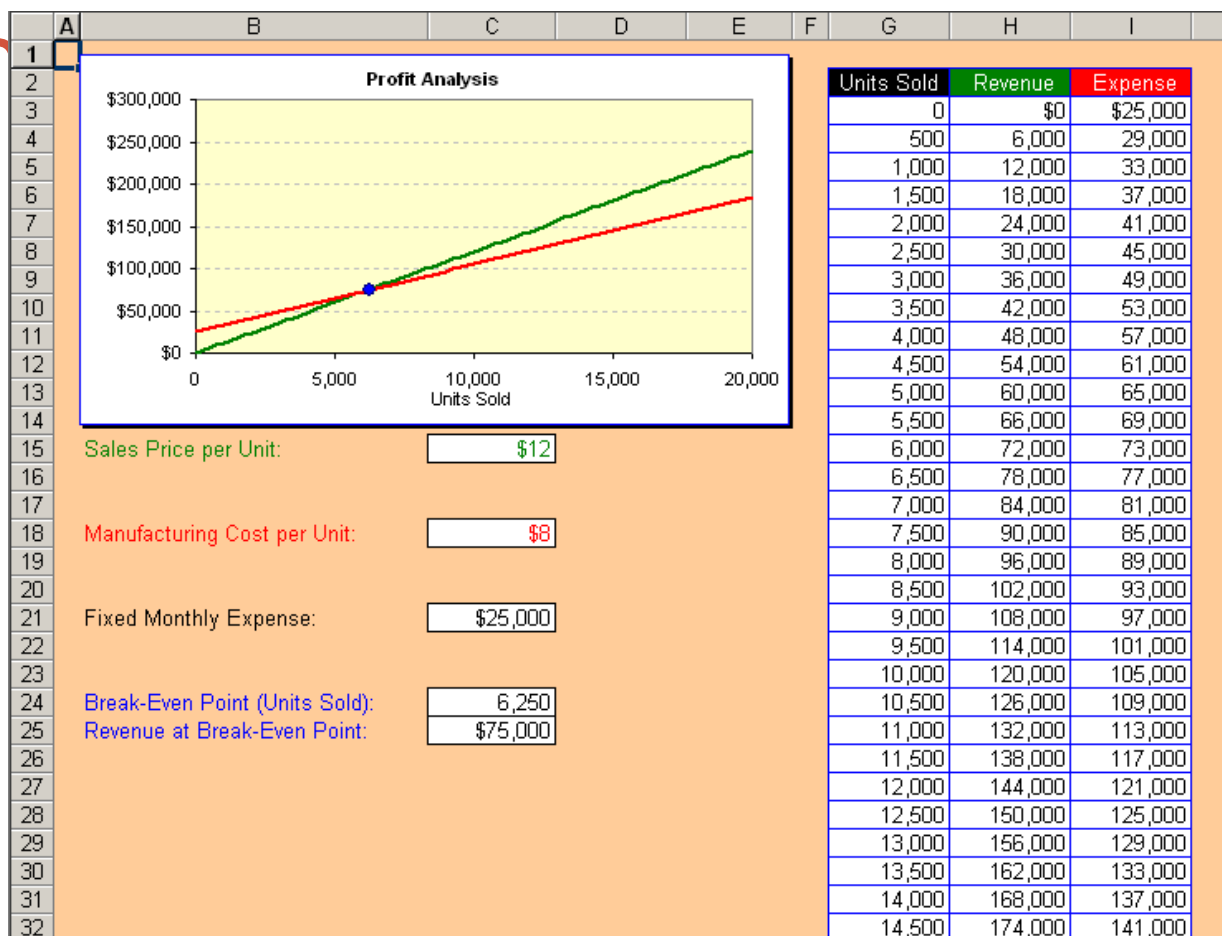
What Went Right?

- A large aerospace company used Monte Carlo simulation to help quantify risks on several advanced-design engineering projects, such as the National Aerospace Plan (NASP)
- The results of the simulation were used to determine how the company would invest its internal research and development funds
- Although the NASP project was terminated, the resulting research has helped develop more advanced materials and propulsion systems used on many modern aircraft

Sensitivity Analysis

- **Sensitivity analysis** is a technique 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, or for determining break-even points based on different assumptions
- Spreadsheet software, such as Excel, is a common tool for performing sensitivity analysis

Figure 11-9: Sample Sensitivity Analysis for Determining Break-Even Point



Risk Response Planning

- After identifying and quantifying risks, you must decide how to respond to them
- Four main response strategies for negative risks:
 - Risk avoidance
 - Risk acceptance
 - Risk transference
 - Risk mitigation

Table 11-7: General Risk Mitigation Strategies for Technical, Cost, and Schedule Risks

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, project goals understanding, and team support	Select the most experienced project manager
Increase the frequency of project monitoring	Increase project manager authority	
Use WBS and CPM		

Response Strategies for Positive Risks

- Risk exploitation
- Risk sharing
- Risk enhancement
- Risk acceptance

Residual and Secondary Risks

- It's also important to identify residual and secondary risks
- **Residual risks** are risks that remain after all of the response strategies have been implemented
- **Secondary risks** are a direct result of implementing a risk response

Media Snapshot

- A highly publicized example of a risk response to corporate financial scandals, such as those affecting Enron, Arthur Andersen, and WorldCom, was legal action
- The Sarbanes-Oxley Act is considered the most significant change to federal securities laws in the United States since the New Deal
- This Act has caused many organizations to initiate projects and other actions to avoid litigation

Risk Monitoring and Control

- Involves executing the risk management process to respond to risk events
- **Workarounds** are unplanned responses to risk events that must be done when there are no contingency plans
- Main outputs of risk monitoring and control are:
 - Requested changes
 - Recommended corrective and preventive actions
 - Updates to the risk register, project management plan, and organizational process assets

Using Software to Assist in Project Risk Management

- Risk registers can be created in a simple Word or Excel file or as part of a database
- More sophisticated risk management software, such as Monte Carlo simulation tools, help in analyzing project risks
- The PMI Risk Specific Interest Group's Web site at *www.risksig.com* has a detailed list of software products to assist in risk management

Results of Good Project Risk Management

- Unlike crisis management, good project risk management often goes unnoticed
- Well-run projects appear to be almost effortless, but a lot of work goes into running a project well
- Project managers should strive to make their jobs look easy to reflect the results of well-run projects