



What is Risk?

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

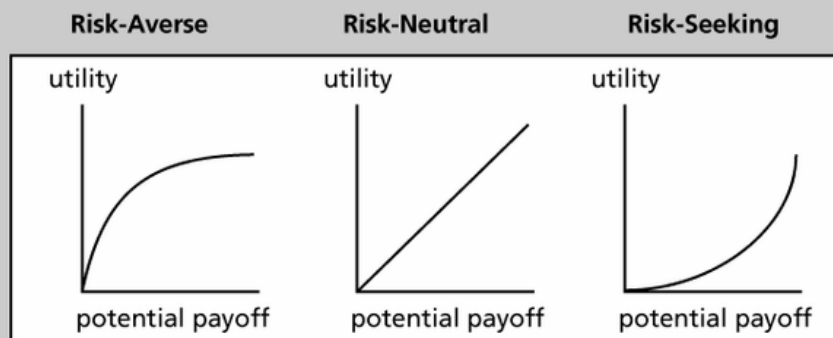
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Risk Utility

- **Risk utility** or **risk tolerance** is the amount of satisfaction or pleasure received from a potential payoff
 - Utility rises at a decreasing rate for a person who is **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

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Risk Utility Function and Risk Preference



What is Project Risk Management?

The goal of project risk management is to minimize potential risks while maximizing potential opportunities. Major processes include

- **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 their characteristics
- **Qualitative risk analysis:** characterizing and analyzing risks and prioritizing their effects on project objectives
- **Quantitative risk analysis:** measuring the probability and consequences of risks
- **Risk response planning:** taking steps to enhance opportunities and reduce threats to meeting project objectives
- **Risk monitoring and control:** monitoring known risks, identifying new risks, reducing risks, and evaluating the effectiveness of risk reduction

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Risk Management Planning

- The main output of risk management planning is a **risk management plan** that describes the process of how to approach and plan for risk on a project.
- **Risk Mitigation** is reducing the impact of a risk event by reducing the probability of its occurrence
- **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
- **Contingency reserve** or allowances are provisions held by the project sponsor that can be used to mitigate cost or schedule risk if changes in scope or quality occur

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Questions Addressed in a Risk Management Plan

- *Why* is it important to take/not take this risk in relation to the project objectives?
- *What* is the specific risk, and what are the risk mitigation deliverables?
- *How* is the risk going to be mitigated? (What risk mitigation approach is to be used?)
- *Who* are the individuals responsible for implementing the risk management plan?
- *When* will the milestones associated with the mitigation approach occur?
- *How much* is required in terms of resources to mitigate risk?

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Risk Management Process



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Change Request Form

CHANGE REQUEST		
Project <u>Y2K-Machine Dept.</u>	Date <u>3/29/</u>	
Originator _____	Phone _____	Ext. <u>4942</u>
Impact Areas		Baseline Impact
Deliverable # <u>1.3M</u>	Scope <input type="checkbox"/> Contingency <input type="checkbox"/>	
Work package # <u>1.313M</u>	Budget <input checked="" type="checkbox"/> Staff <input checked="" type="checkbox"/>	
Cost account # <u>1.31M</u>	Schedule <input checked="" type="checkbox"/> Equipment <input checked="" type="checkbox"/>	
Organization unit <u>IS-M Dept.</u>		
Description of change		
<u>Install XP compatible chip in six computer controlled milling machines</u>		
Justification (Include impact if not implemented)		
<u>Reprogramming is higher cost than estimated, and risk of old chips failing is higher than estimated.</u> <u>(Eliminating reprogramming cost is -\$10,000. Cost of XP chips installed is +\$15,000.)</u>		
Disposition	Priority	Funding Source
<input checked="" type="checkbox"/> Approve	<input type="checkbox"/> Emergency	Mgmt. reserve \$ _____
<input type="checkbox"/> Approve as amended	<input checked="" type="checkbox"/> Urgent	Budget reserve \$ <u>5,000</u>
<input type="checkbox"/> Disapprove	<input type="checkbox"/> Routine	Other \$ _____
<input type="checkbox"/> Deferred		
Authorized <u>E.L.</u>	Scheduled start <u>4/7/</u>	
Date <u>4/3/</u>	Scheduled finish <u>5/10/</u>	

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Common Sources of Risk on Information Technology Projects

- Several studies show that IT projects share some common sources of risk
- **People Risk**—inadequate skills; inexperience
- **Structure Risk**—change in the business structure
- **Technology Risk**—using new/untested technology; is the project feasible?
- **Market Risk**—Competition; product marketability
- **Financial Risk**—Can project meet NPV, ROI, Payback estimates? Can company afford the project

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Risk Identification

- Risk identification is the process of understanding what potential unsatisfactory outcomes are associated with a particular project
- Several risk identification tools and techniques include
 - **Brainstorming**—Not to be confused with water on the brain; brain-drain; etc.
 - **Interviewing**—Fact finding technique
 - **SWOT analysis**—Strategic Planning
 - **Checklists**—Using “Lessons Learned”
 - **Diagramming**—cause/effect, flow charts, fishbone (Ishakawa) etc.

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Potential Risk Conditions Associated With Each Knowledge Area

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 of quality requirements; inadequate scope control
Time	Errors in estimating time or resource availability; poor allocation and management of float; early release of competitive products
Cost	Estimating errors; inadequate productivity, cost, change, or contingency control; poor maintenance, security, purchasing, etc.
Quality	Poor attitude toward quality; substandard design/materials/workmanship; inadequate quality assurance program
Human Resources	Poor conflict management; poor project organization and definition of responsibilities; absence of leadership
Communications	Carelessness in planning or communicating; lack of consultation with key stakeholders
Risk	Ignoring risk; unclear assignment of risk; poor insurance management
Procurement	Unenforceable conditions or contract clauses; adversarial relations

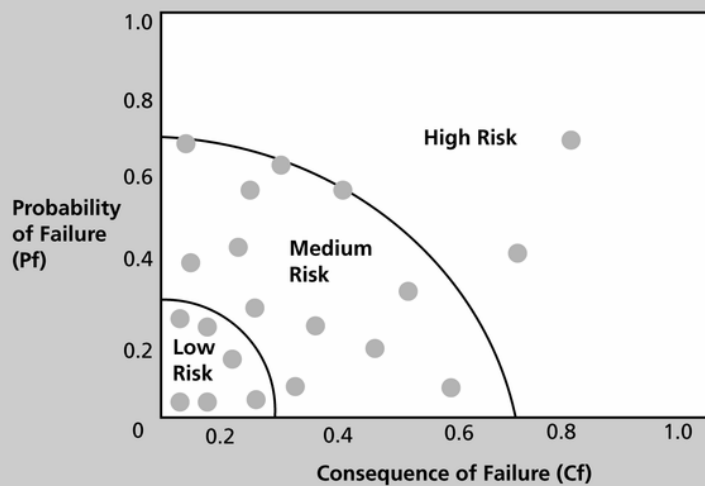
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Quantitative Risk Analysis

- 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 10 Risk Item Tracking technique*
 - *Expert judgment*

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Chart Showing High-, Medium-, and Low-Risk Technologies



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Top 10 Risk Item Tracking

- *Top 10 Risk Item Tracking* is a tool for maintaining an awareness of risk throughout the life of a project
- Establish a periodic review of the top 10 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

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Expert Judgment

- Many organizations rely on the intuitive feelings and past experience of experts to help identify potential project risks
- Experts can categorize risks as high, medium, or low with or without more sophisticated techniques

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Quantitative Risk Analysis

- Often follows qualitative risk analysis, but both can be done together or separately
- Large, complex project involving leading edge technologies often require extensive quantitative risk analysis
- Main techniques include
 - *Decision tree analysis*
 - *Simulation*

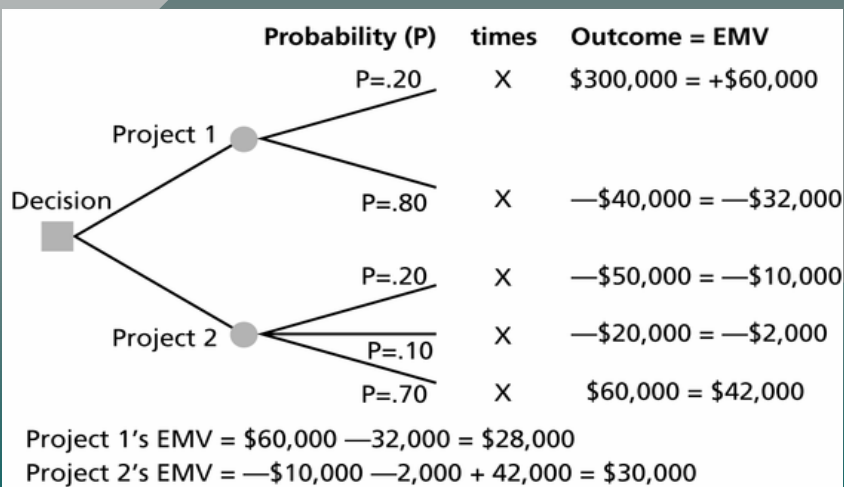
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Decision Trees and Expected Monetary Value (EMV)

- A **decision tree** is a diagramming method used to help you select the best course of action in situations in which future outcomes are uncertain
- **EMV** is a type of decision tree where you calculate the expected monetary value of a decision based on its risk event probability and monetary value

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Expected Monetary Value (EMV) Example



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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 optimistic and most likely values

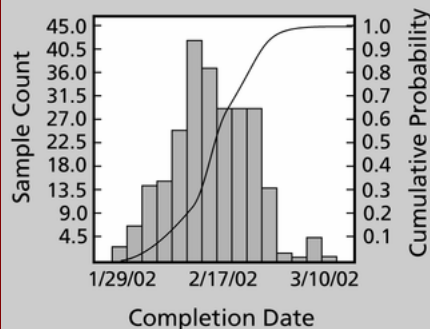
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Sample Monte Carlo Simulation Results for Project Schedule

Date: 4/14/02 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	2/4/02	0.55	2/17/02
0.10	2/8/02	0.60	2/18/02
0.15	2/9/02	0.65	2/19/02
0.20	2/10/02	0.70	2/22/02
0.25	2/11/02	0.75	2/22/02
0.30	2/12/02	0.80	2/23/02
0.35	2/15/02	0.85	2/24/02
0.40	2/15/02	0.90	2/25/02
0.45	2/16/02	0.95	2/26/02
0.50	2/17/02	1.00	3/10/02

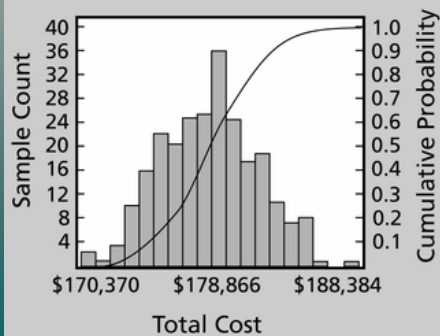
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Sample Monte Carlo Simulations Results for Project Costs

Date: 4/14/02 11:44:56 AM
 Number of Samples: 250
 Unique ID: 1
 Name: Widget

Cost Std Deviation: \$3,290
 95% Confidence Interval: \$408
 Each bar represents \$1,000

Completion Probability Table



Prob	Cost	Prob	Cost
0.05	\$173,748	0.55	\$179,327
0.10	\$174,472	0.60	\$179,556
0.15	\$175,266	0.65	\$180,015
0.20	\$175,693	0.70	\$180,518
0.25	\$176,362	0.75	\$180,984
0.30	\$176,940	0.80	\$181,611
0.35	\$177,597	0.85	\$182,387
0.40	\$177,963	0.90	\$183,208
0.45	\$178,508	0.95	\$184,528
0.50	\$178,973	1.00	\$188,384

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Risk Response Planning

- After identifying and quantifying risk, you must decide how to respond to them
- Four main strategies:
 - **Risk avoidance:** eliminating a specific threat or risk, usually by eliminating its causes
 - **Risk acceptance:** accepting the consequences should a risk occur
 - **Risk transference:** shifting the consequence of a risk and responsibility for its management to a third party
 - **Risk mitigation:** reducing the impact of a risk event by reducing the probability of its occurrence

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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		

Risk Monitoring and Control

- **Monitoring** risks involves knowing their status
- **Controlling** risks involves carrying out the risk management plans as risks occur
- **Workarounds** are unplanned responses to risk events that must be done when there are no contingency plans
- The main outputs of risk monitoring and control are corrective action, project change requests, and updates to other plans

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Risk Response Control

- Risk response control involves executing the risk management processes and the risk management plan to respond to risk events
- Risks must be monitored based on defined milestones and decisions made regarding risks and mitigation strategies
- Sometimes workarounds or unplanned responses to risk events are needed when there are no contingency plans

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