

# Problem Solving and Decision Making

SECOND EDITION

Part  
**1**

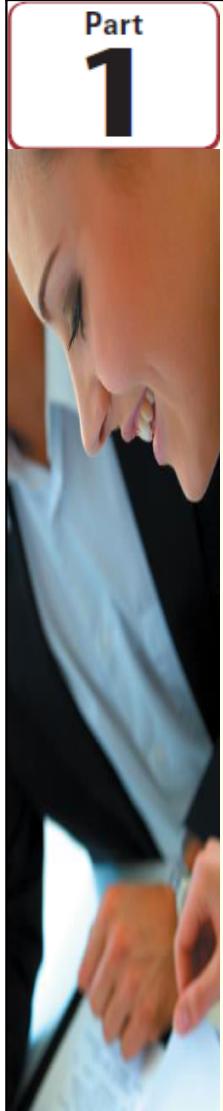


## Part 1: Identifying and Defining Problems

Part  
**1**

### Objectives

- Understand problem solving
- Analyze problems
- Work with problem owners and stakeholders
- Develop effective problem statements



# Objectives

- Determine causes
- Simplify complex problems
- Identify and manage risks
- Avoid problem-solving traps

# Understanding Problem Solving

- A professional in any occupation should be a problem solver
- People who can identify, define, and solve problems are valued members of an organization

# Understanding Problem Solving

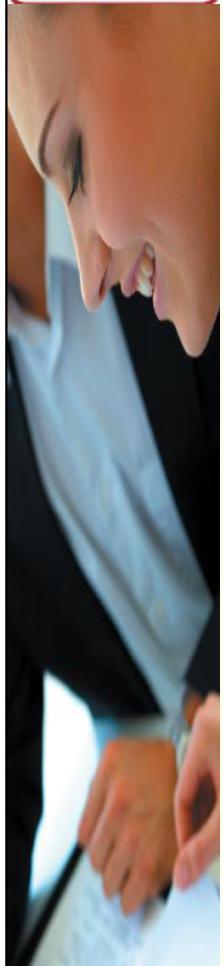
- Guidelines for solving problems:
  - Identify yourself as a problem solver
  - Recognize problems
  - Select an intuitive approach for solving problems
  - Select a systematic approach for solving problems
  - Make decisions

# Understanding Problem Solving

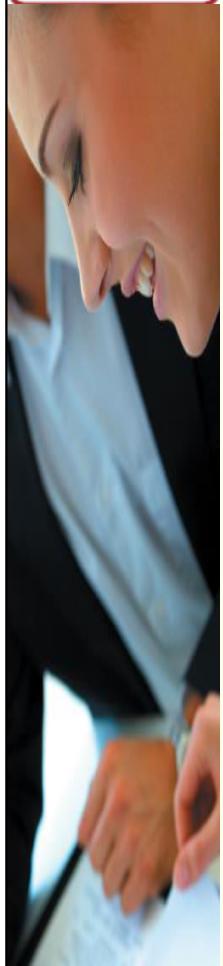
## Basic problem-solving steps

- 1 Identify the problem
- 2 Gather information
- 3 Clarify the problem
- 4 Consider possible solutions
- 5 Select the best option
- 6 Make a decision and monitor the solution

# Analyzing Problems

- 
- Companies rely on employees to identify problems and solve them
  - Much of the effort in problem solving involves understanding what the underlying issues really are
  - Defining the real problem is the first major milestone on the way to a solution

# Analyzing Problems

- 
- Do's and Don'ts for analyzing problems:
    - Look for deficiencies
    - Interview and gather data
    - Observe as much as you can
    - Ask what, not who
    - Have a reality check

# Working with Problem Owners and Stakeholders

- When you solve a problem for someone else, that person is the problem owner
- Stakeholders are people who are also affected or whose involvement you need to resolve the matter

# Working with Problem Owners and Stakeholders

- Do's and Don'ts for working with problem owners and stakeholders:
  - Solicit input from the problem owners
  - Recognize opinions and assumptions
  - Communicate your progress clearly
  - Do your homework carefully
  - Provide choices
  - Promote your solution

# Developing Effective Problem Statements

- A problem statement is a clear, concise description of the problem and the effect you expect from the solution
- The purpose of the problem statement is to describe a single problem objectively
- Include the problem statement in your proposals, progress reports, and discussions with stakeholders

# Developing Effective Problem Statements

- Guidelines for developing problem statements:
  - Describe the ideal situation
  - Briefly summarize the problem
  - Identify symptoms of the problem
  - Describe the size and scope of the problem
  - Identify the consequences
  - Explain any other research or investigation that you may pursue

# Determining Causes

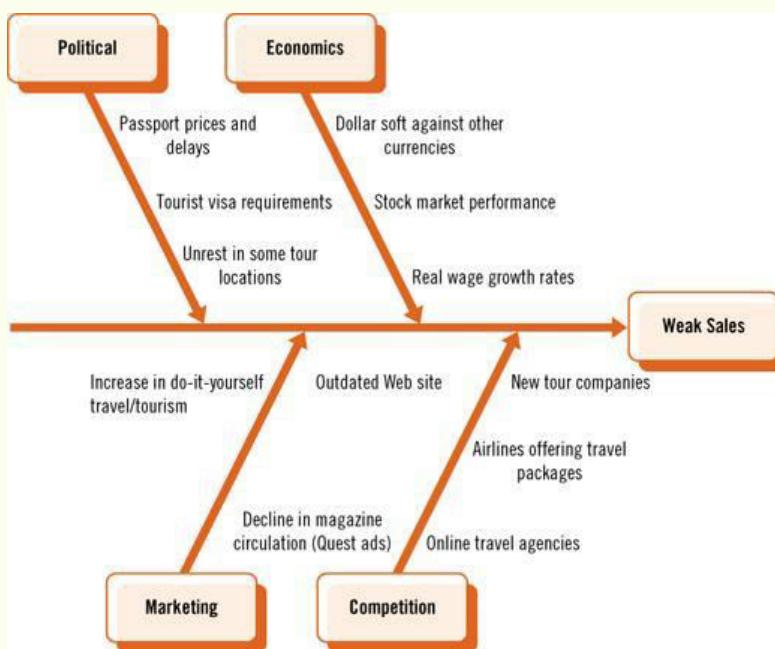
- It is common to overlook the root cause of problems and focus only on symptoms
- Complex situations usually involve interrelated problems, each with a different cause
- To link a problem to its cause, you must perform a root-cause analysis, a study that determines the real basis for the problem

# Determining Causes

- To determine causes:
  - Differentiate between symptoms and causes
  - Look for more than one cause
  - Consider the cost
  - Use the 5 Whys technique
  - Create a cause-and-effect diagram

# Determining Causes

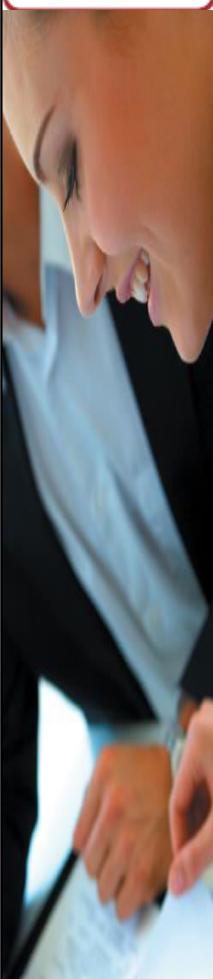
## Cause-and-effect diagram



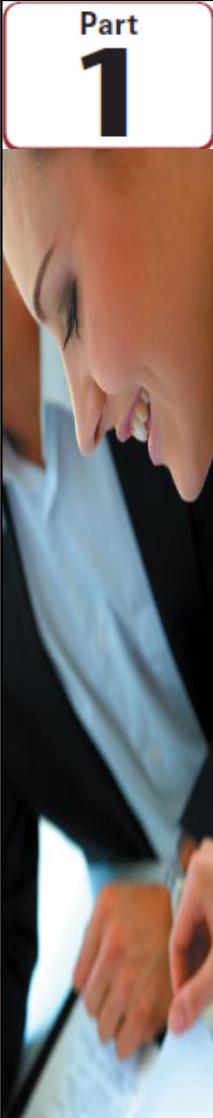
# Simplifying Complex Problems

- Complex problems have no clear boundaries, are unique, and have no single optimal solution
- Complex problems frequently involve multiple stakeholders with competing agendas
- Most complex problems consist of smaller subproblems that affect each other in ways that complicate the larger problems

# Simplifying Complex Problems

- 
- To simplify complex problems:
    - Identify the major symptoms
    - Consider each problem individually
    - Rank the subproblems
    - Look for interdependencies
    - Delegate subproblems

# Identifying and Managing Risks

- 
- Any decision you make or solution you implement involves some risk, which is an exposure to a chance of loss or damage
  - Risk is an inevitable part of business, especially when you are introducing creative changes
  - With careful planning, you can often avoid many of these risks or reduce their drawbacks

# Identifying and Managing Risks

- Guidelines for identifying and managing risks:
  - Be aware of potential risks
  - Assess your risk/reward ratio
  - Reduce your risk by testing
  - Develop a fall-back position or a backup plan
  - Keep everyone informed

# Avoiding Problem-Solving Traps

- Solving problems demands the following:
  - Logical thinking
  - Creative thinking
  - Willingness to redefine goals
  - Acceptance of solutions that manage rather than eliminate problems
- Habits and unacknowledged biases impair problem solvers' ability to solve problems

# Avoiding Problem-Solving Traps

- To avoid problem-solving traps:
  - Avoid the positive outcome bias
  - Avoid “not invented here”
  - Avoid the need for quick closure
  - Avoid the bandwagon effect
  - Avoid self-serving bias

# Avoiding Problem-Solving Traps

Avoid the bandwagon, or herd, effect



Herd behavior describes people who act as a group without a planned direction. Stock market bubbles and crashes, mob events, and cultural biases are examples of herd behavior.

# Technology @ Work: Crowdsourcing

- Crowdsourcing characterizes a way of using groups to solve problems
- The groups are usually online communities
- An organization broadcasts a problem to the crowd as an open call for solutions
- The crowd submits solutions, then sorts through them, finding the best ones

# Technology @ Work: Crowdsourcing

- Advantages of crowdsourcing to a company are that it can investigate problems at low cost and produce innovative solutions from a wider range of amateurs and experts than it employs
- Risks to the company are that it might waste time looking for a solution from the crowd, who is not committed to helping the company

# Technology@ Work: Crowdsourcing

- Successful examples of crowdsourcing include proofreading StumbleUpon and Stardust@home
- Guidelines for crowdsourcing:
  - Strength in numbers
  - Collaboration matters
  - Different, not necessarily better
  - Good for the company, not for the crowd

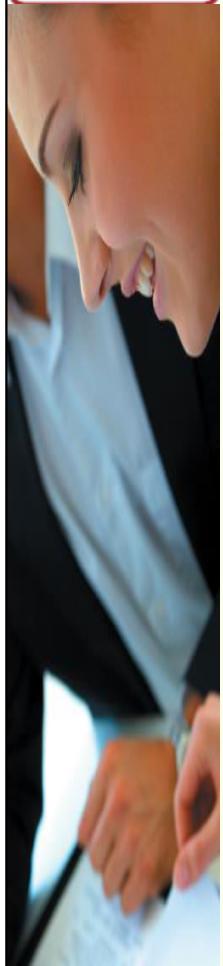
# Technology @ Work: Crowdsourcing

Challenge.gov

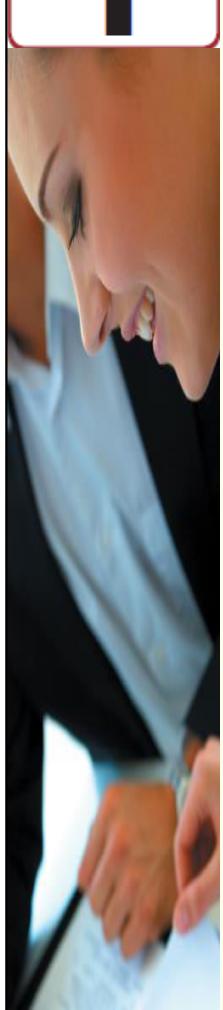


The screenshot shows the homepage of Challenge.gov. At the top, there's a navigation bar with links for Home, Find Challenges, and About. A search bar is located at the top right. Below the header, a main banner features the text "On Challenge.gov, the public and government can solve problems together." with a "SIGN UP AND PARTICIPATE" button and a "Learn More" link. To the right of the banner is a graphic of a person standing next to a lightbulb and a document. The page is divided into sections: "Featured Challenges" (with a "Healthy New Year Video Challenge" by the Office of the National Coordinator for Health Information Technology), "Browse Challenges" (with a "CATEGORIES" section listing Defense (19), Economy (9), Education (28), Energy & Environment (29), and Health (50)), and a footer with the URL "challenge.gov".

# Summary

- 
- Keep problem solving guidelines in mind
  - Analyze problems as the first step in solving them
  - Involve problem owners and stakeholders in the problem solving process
  - Develop effective problem statements

# Summary

- 
- To link a problem to its cause, perform root-cause analysis
  - Simplify complex problems as much as possible
  - Be aware of and manage risk when implementing solutions
  - Avoid problem-solving traps

# Problem Solving and Decision Making

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Part  
**2**



## Part 2: Solving the Problem

Part  
**2**

## Objectives

- Gather and analyze data
- Develop alternatives
- Evaluate options
- Implement the solution



# Objectives

- 
- Monitor and manage the solution
  - Verify the solution
  - Use adaptive techniques
  - Develop ethical solutions

# Gathering and Analyzing Data

- 
- Before you can solve a business problem, you should gather relevant data and analyze it
  - Successful business decisions are based on sound information
  - To systematically gather and analyze the data related to your problem, start by identifying your goal and looking for information related to it

# Gathering and Analyzing Data

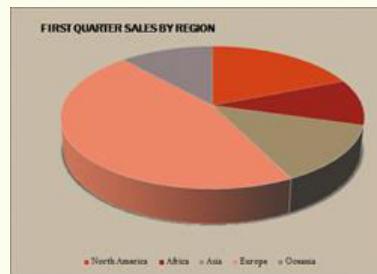
- Guidelines for gathering data:
  - Define your data needs
  - Do not overestimate what you know about the problem
  - Document the data and its sources
  - Examine existing information first
  - Rely on people as your most important resource
  - Consider interrelationships

# Gathering and Analyzing Data

## Viewing data in different ways

 Quest Specialty Travel

Tour	Qtr 1	Qtr 2
Adventure River Expedition	\$ 23,600	\$ 5,900
Alaskan Exploration Cruise	\$ 51,540	\$ -
Active Alaska	\$ 26,970	\$ -
British Columbia	\$ 31,425	\$ 6,285
Canadian Rockies Trek	\$ 18,360	\$ -
Central Mexico and Pacific Coast	\$ 39,950	\$ -
Puerto Rico Active Exploration	\$ 26,340	\$ -
<b>North America</b>	<b>\$ 218,185</b>	
Botswana Safari	\$ 23,970	\$ -
Cape to Cairo Experience	\$ 19,420	\$ -
Egypt and Jordan Adventure	\$ 17,580	\$ 4,395
Exotic Ethiopia	\$ 34,360	\$ 8,590
Ghana by Sea	\$ 26,200	\$ -
<b>Africa</b>	<b>\$ 121,530</b>	
Active China: Hiking in Yunnan	\$ 23,950	\$ -
China Epicurean	\$ 35,400	\$ -
Japan on Two Wheels	\$ 38,370	\$ 12,790



## Developing Alternatives



- After researching a problem and collecting data, start to consider alternatives and solutions
- This creative phase of the process requires imagination and intuition

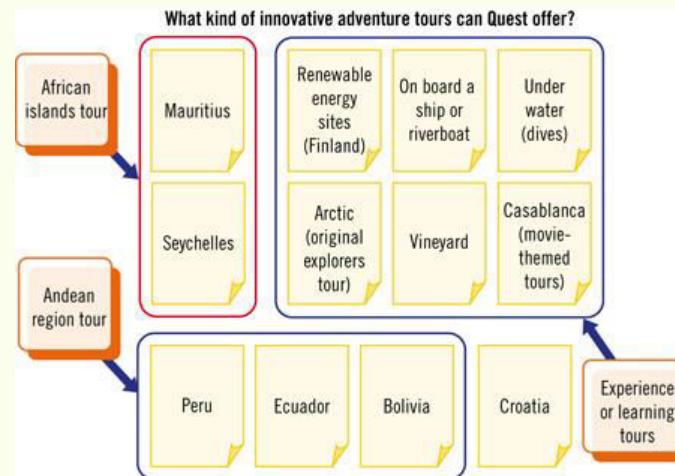
## Developing Alternatives



- Guidelines for developing alternatives:
  - Think creatively
  - Brainstorm ideas
  - Ask others for advice
  - Develop a mind map

# Analyzing Problems

## Brainstorming



# Analyzing Problems

## Mind Map



# Evaluating Options



- Analyze the trade-offs among competing needs and options
- Your goal should be to develop a good solution by evaluating, modifying, and improving on your ideas
- Assess each alternative carefully
- Use objective criteria to avoid making snap decisions

# Evaluating Options



- Steps in evaluation options:
  - Choose an evaluation method
  - Select the criteria
  - Weigh your criteria
  - Rate the alternatives
  - Make a decision

# Implementing the Solution



- Moving from planning to implementation is a significant milestone
- During implementation, you begin to make decisions, take actions, and put your plans into practice
- Communicate clearly and frequently during this stage
- Act decisively rather than planning endlessly

# Implementing the Solution



- Guidelines for implementing a solution:
  - Get approval from the problem owner
  - Develop a plan
  - Notify stakeholders
  - Anticipate opposition
  - Take action

# Monitoring and Managing the Solution



- Most solutions involve related choices, tasks, and the participation of others
- Managers, coworkers, and stakeholders expect you to deal professionally and competently with interruptions, delays, and unexpected events
- Planning for and identifying trouble quickly helps you minimize disruption and problems

# Monitoring and Managing the Solution



- Guidelines for monitoring and managing the solution:
  - Identify key variables
  - Select an appropriate level of monitoring
  - Involve others with the process
  - Be persistent
  - Make corrections promptly

# Monitoring and Managing the Solution

## Levels of monitoring



# Verifying the Solution

- Expect surprises during implementation
- Stay involved with the project and make necessary corrections along the way
- Ask yourself and others:
  - How well is the solution working
  - How realistic are the objectives
  - What is not working as expected

# Verifying the Solution



- Do's and Don'ts of verifying a solution:
  - Define success
  - Test your solution
  - Avoid the problem in the future
  - Learn from the process
  - Take credit for your success

# Using Adaptive Techniques



- Adaptive techniques involve a combination of intuition, logic, and common sense
- Adaptive techniques are less precise than traditional problem-solving methods, but are appropriate in many cases

# Using Adaptive Techniques



- Do's and Don'ts for adaptive techniques:
  - Consider when to use adaptive techniques
  - Manage by exception
  - Stagger your decisions
  - Hedge your bets
  - Delay or defer a solution

# Using Adaptive Techniques



- Appropriate times to use adaptive techniques:
  - You have a limited amount of time to work
  - An exhaustive analysis is not needed
  - The risks are minimal and downside costs are low
  - The solution is easily reversible

# Developing Ethical Solutions



- Ethics are standards of behavior that direct how people should act
- Ethics involves making moral decisions and choosing between right and wrong
- When applied to problem solving, ethical behavior leads to appropriate decisions, not necessarily the optimal ones
- Consider situations from an ethical, as well as a practical, perspective

# Developing Ethical Solutions



- Guidelines for developing ethical solutions:
  - Identify ethical issues
  - Compare costs and benefits
  - Consider other people
  - Serve broad interests
  - Be true to yourself

# Technology @ Work: Mashups



- A mashup is a Web application that combines features or information from more than one source
- Businesses are using mashups to develop views of information that aid in decision making
- Business mashups typically combine data from internal and public sources, and publish the results within the company for employees to use

# Technology @ Work: Mashups



Masher, an online tool for creating mashups

The screenshot shows the Masher website homepage. At the top, there's a navigation bar with links for 'Welcome Guest | Help | Sign up | Login' and 'Home | Studio | Gallery'. The main heading 'MASHER' is prominently displayed. Below it, a 'Welcome!' message is followed by a statement: 'Masher lets you easily create a video by mixing together video clips, music tracks, and photos all for FREE!'. Three large circular icons numbered 1, 2, and 3 guide the user through the process: '1 Mix...', '2 Mash...', and '3 Share...'. Each step has a corresponding icon below it: a camera, musical notes, and film strips for the first step; a computer monitor displaying a collage of images for the second; and social media icons (envelope, speech bubble, Facebook, MySpace) for the third. At the bottom, a note says 'Your video Mash by posting it to sites such as Facebook, MySpace, or by emailing it.' and shows small icons for these platforms.

Courtesy of Masher.com

# Summary



- Gather relevant data and analyze it to find trends, indicators, and other related information
- Develop alternative solutions
- Evaluate all options
- Implementation is a milestone step in the problem solving process
- Carefully monitor and manage the implemented solution

# Summary



- Verify the solution and expect surprises
- Use adaptive techniques when appropriate
- Consider ethics as you develop solutions

# Problem Solving and Decision Making

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Part  
**3**



## Part 3: Thinking Critically

Part  
**3**

### Objectives

- Understand critical thinking
- Identify arguments
- Assess the credibility of an argument
- Explore weaknesses in an argument



# Objectives



- Overcome obstacles to critical thinking
- Avoid deductive reasoning fallacies
- Avoid inductive reasoning fallacies
- Become a critical thinker

# Understanding Critical Thinking



- Critical thinking requires analysis, evaluation, discipline, and rigor
- The goal of critical thinking is often to improve choices and reduce the risk of adopting or acting on a flawed assumption

# Understanding Critical Thinking

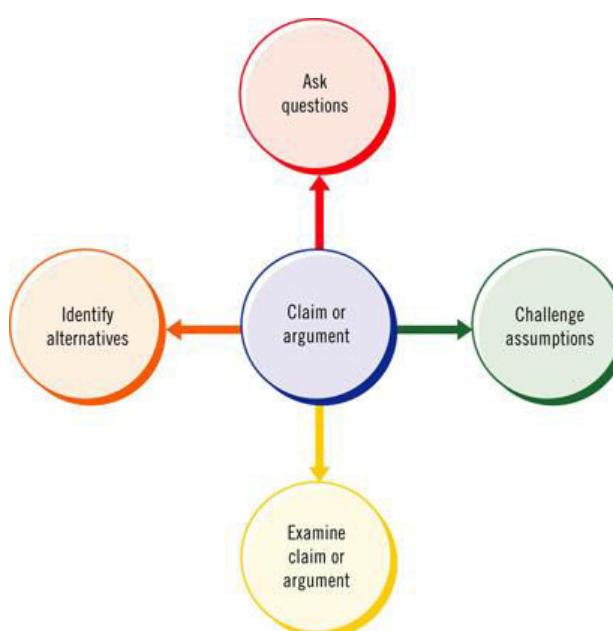


- Ask the following questions to improve your critical thinking:
  - What is critical thinking?
  - What is a claim?
  - What is an issue?
  - What is an argument?
  - What is the difference between facts and opinions?

# Understanding Critical Thinking



## Steps in critical thinking



# Understanding Critical Thinking

## Facts and opinions



# Identifying Arguments

- 
- To organize your ideas when thinking critically, you identify, construct, and evaluate arguments, which are statements or explanations that support your ideas
  - Your premise is what you claim or content
  - The other element of an argument is the conclusion

# Identifying Arguments



- Do's and Don'ts for identifying arguments:
  - Identify the arguments
  - Look for argument indicators
  - Differentiate between an argument and an assertion
  - Recognize deductive arguments
  - Recognized inductive arguments

# Assessing the Credibility of an Argument



- Assess arguments to determine how credible they are
- You determine whether an argument is plausible, authentic, or convincing by evaluating the validity and strength of the supporting evidence

# **Assessing the Credibility of an Argument**



- Steps in assessing the credibility of an argument:
  - Consider the validity of the argument
  - Make sure the argument is sound
  - Assess the credibility of the source
  - Consider reasons based on authority
  - Compare the argument to your background knowledge

# **Exploring Weaknesses in an Argument**



- All arguments have some weaknesses
- Avoid taking an all-or-nothing approach to arguments
- Assess each argument according to its strengths and weaknesses

# Exploring Weaknesses in an Argument



- Do's and Don'ts for exploring weaknesses in an argument:
  - Consider how to test the claims and premises
  - Evaluate the relevance
  - Look for dubious assumptions
  - Compare the argument to other data, observations, and ideas
  - Identify alternative explanations

# Overcoming Obstacles to Critical Thinking



- Learn to recognize typical obstacles to critical thinking so you can anticipate and work through them
- Being flexible, adaptable, and open-minded when working with others helps you avoid egocentric thinking

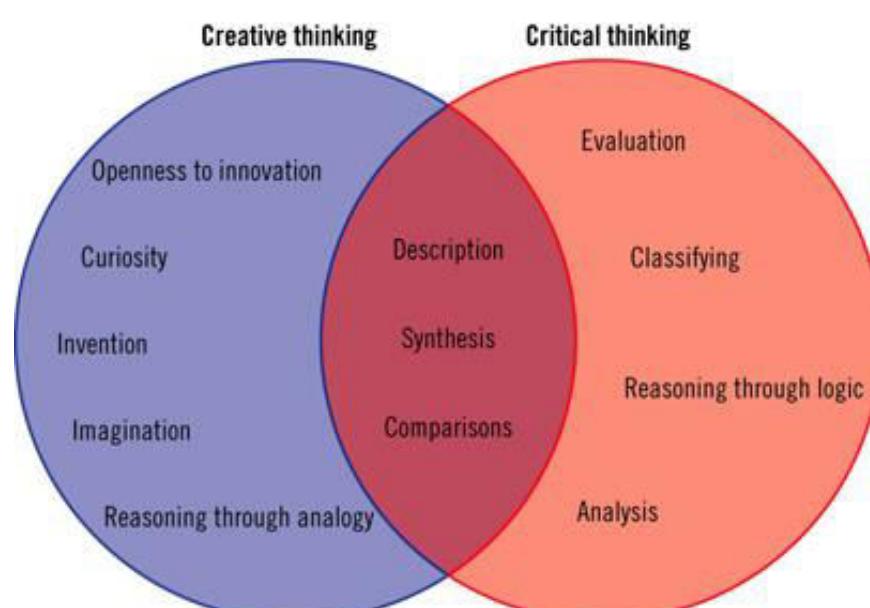
# Overcoming Obstacles to Critical Thinking



- Do's and Don'ts for overcoming obstacles to critical thinking:
  - Avoid egocentric thinking
  - Be aware of your social conditioning
  - Identify outliers
  - Avoid normalization
  - Respect your emotions

# Overcoming Obstacles to Critical Thinking

Creative and critical thinking



# Avoiding Deductive Reasoning Fallacies



- A fallacy is an invalid argument that is presented so that it appears valid
- Skilled communicators can make flawed arguments sound reasonable
- Critical thinkers should consider the premises and conclusions with special care
- Deductive arguments can have flaws that make the arguments invalid

# Avoiding Deductive Reasoning Fallacies



- Guidelines for avoiding deductive reasoning fallacies:
  - Avoid the slippery slope
  - Be aware of false dilemmas
  - Straighten out circular reasoning
  - Clear up equivocation

# Avoiding Inductive Reasoning Fallacies



- The conclusions of an inductive argument are only as good as the quantity and quality of the premises
- Inductive arguments are prone to fallacies
- The premises must contain sufficient evidence, and the conclusion must fit the facts

# Avoiding Inductive Reasoning Fallacies



- Do's and Don'ts for avoiding inductive reasoning fallacies:
  - Avoid hasty generalizations
  - Separate cause and effect
  - Look for false causes
  - Consider the composition

# Avoiding Inductive Reasoning Fallacies

## Hasty generalization



# Becoming a Critical Thinker

- Developing thinking and problem-solving skills is a gradual process that requires conscious effort on your part
- Changing thinking habits and practices is a long-range project and something you should commit to throughout your life

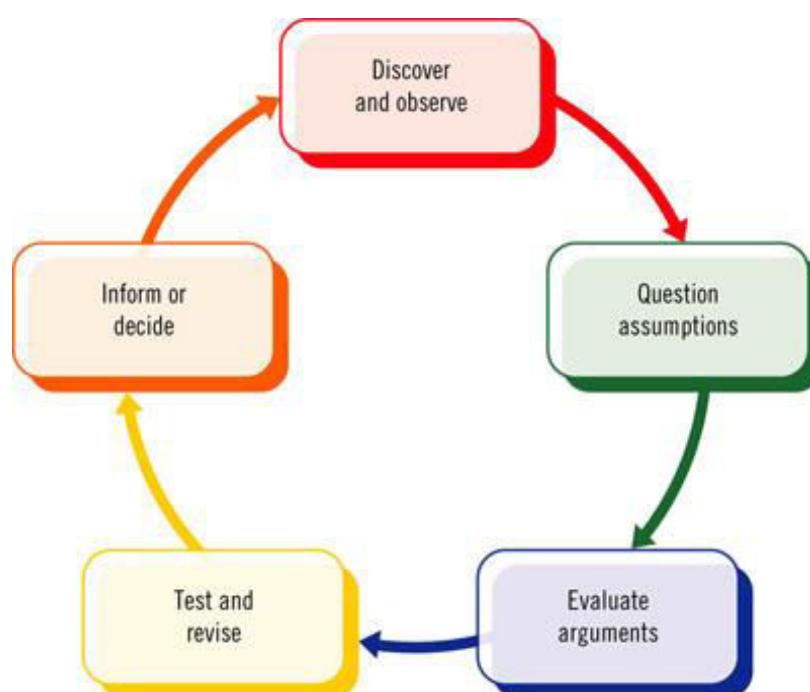
# Becoming a Critical Thinker



- Do's and Don'ts for becoming a critical thinker:
  - Develop intellectual humility
  - Be a critic, not a cynic
  - Challenge your assumptions and beliefs
  - Work through complex issues and problems
  - Have confidence in your reasoning ability

# Becoming a Critical Thinker

## Critical thinking habits



# Technology @ Work: Electronic Books

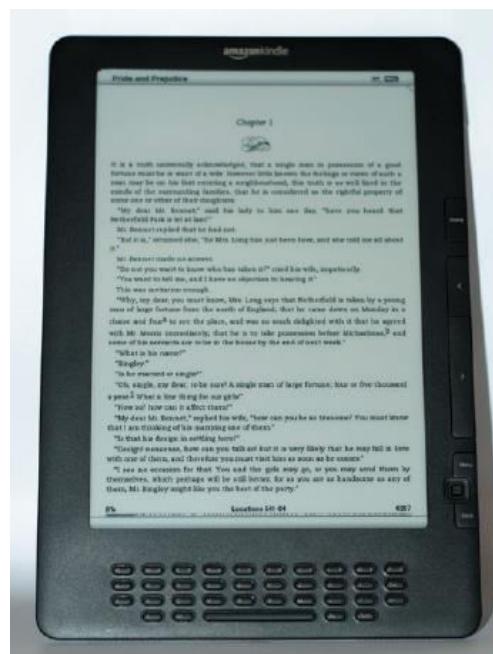


- An electronic book (e-book) is usually a combination of a hardware device you can hold in your hand and software that allows you to read the pages of a book
- Some e-books are designed to be used with mobile phones and smart phones that can connect to the Internet

# Technology @ Work: Electronic Books



- The most popular dedicated platform for e-books is the Amazon Kindle



# Technology @ Work: Electronic Books



- Advantages and disadvantages of e-books:
  - Enhance research and thinking
  - Provide a more engaging medium
  - Require electronic device and software
  - Change the reading experience

## Summary



- Critical thinking requires analysis, evaluation, discipline, and rigor
- To organize ideas when thinking critically, you identify, construct, and evaluate arguments
- Assess arguments to determine how credible they are
- All arguments have weaknesses

# Summary



- You develop critical thinking as a skill over time through practice and repeated application
- Deductive arguments can have flaws that make the arguments invalid
- The conclusions of an inductive argument are only as good as the quantity and quality of the premises
- Developing thinking and problem-solving skills is a gradual process

ILLUSTRATED COURSE GUIDES

# Problem Solving and Decision Making

SECOND EDITION



**Part 4: Group Decision Making and Problem Solving**

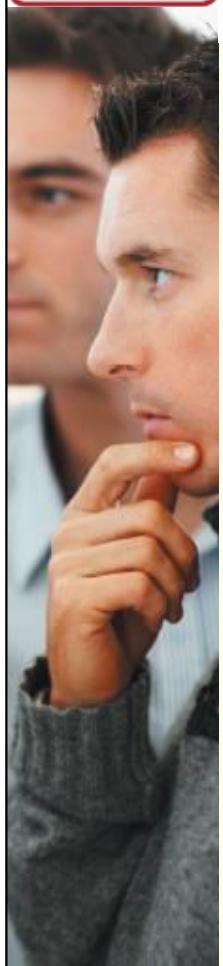
# Objectives

- 
- Understand group dynamics
  - Evolve from a group to a team
  - Use divergent thinking
  - Use convergent thinking

# Objectives

- 
- Reach closure
  - Avoid common group traps
  - Work with large groups
  - Build sustainable agreements

## Understanding Group Dynamics

- 
- You cannot accomplish complex tasks alone
  - Organizations use groups and teams to make decisions, solve problems, and accomplish goals
  - A group is made up of two or more people who interact with each other, share expectations and obligations, and develop a common identity as a group

## Understanding Group Dynamics

- 
- Real groups have social or professional bonds and common interests, values, or backgrounds
  - The way that people work and interact with each other is known as group dynamics

# Understanding Group Dynamics

- 
- Organizations are embracing group projects and teamwork for the following reasons:
    - Diversity
    - Rich experience base
    - Enhanced organizational memory
    - Error detection
    - More creative solutions
    - Greater acceptance of decisions and outcomes

# Evolving from a Group to a Team

- 
- People often form themselves into groups, but they may or may not work well together
  - A group that is working well together is functioning as a team
  - A team is a group of people who organize themselves to work cooperatively on a common objective
  - Most groups pass through stages of cohesion and understanding before they do useful work

## Evolving from a Group to a Team

- 
- Guidelines for evolving from a group to a team:
    - Expect socializing
    - Encourage organizing and forming
    - Facilitate information sharing and processing
    - Collaborate to solve problems

## Using Divergent Thinking

- 
- The collective knowledge of a group is greater than that of a single person
  - Groups seldom behave creatively on their own
  - The team leader or a facilitator needs to engage the group in activities that foster creativity and collaboration
  - Divergent thinking describes thought processes or methods used to generate ideas

# Using Divergent Thinking

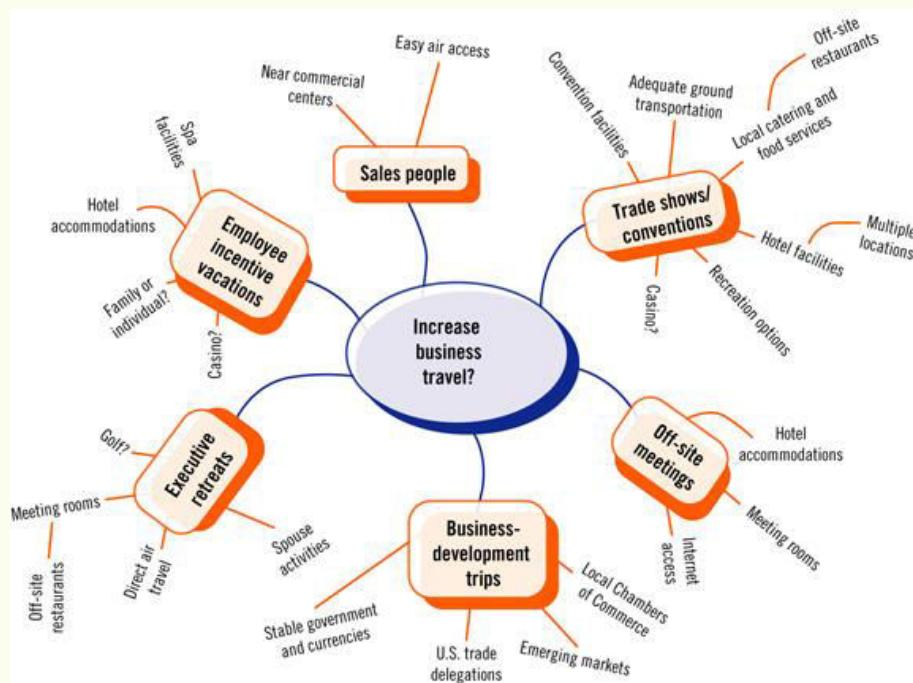
- Divergent thinking techniques generate many ideas that are often not related to one another
- Divergent thinking is usually spontaneous, free flowing, and unorganized

# Using Divergent Thinking

- Techniques for divergent thinking:
  - Brainstorming
  - Group mind mapping
  - Free writing
  - Journaling

# Using Divergent Thinking

## Group mind map



# Using Convergent Thinking

- Divergent thinking is used in the early stages of problem solving
- Convergent thinking techniques narrow the options to a manageable set

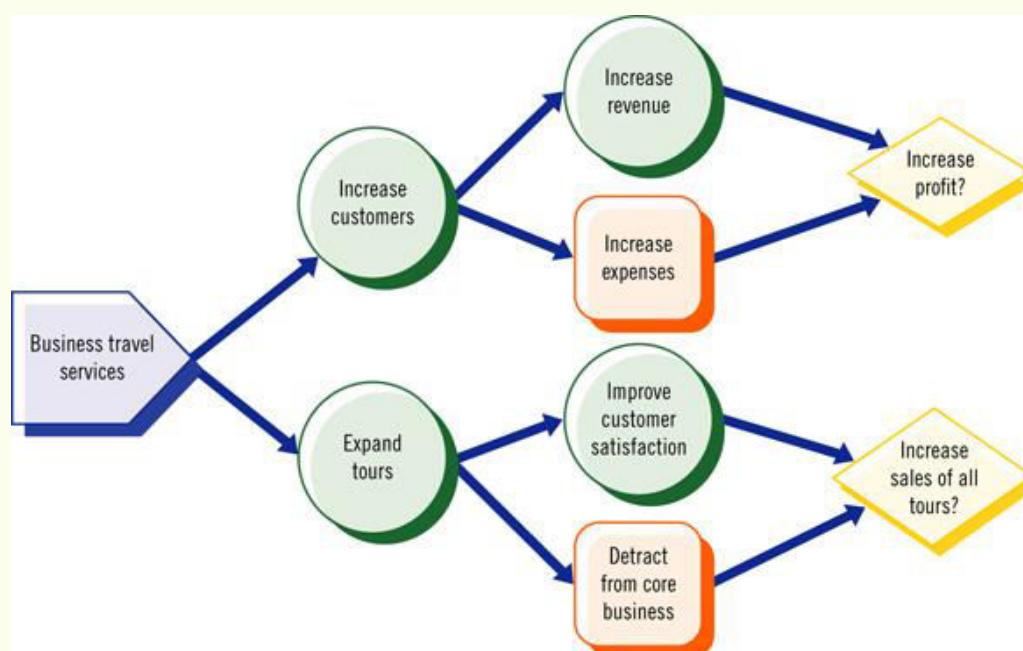
# Using Convergent Thinking

- Guidelines for using convergent thinking:

- Cull your ideas
- Identify the pros and cons
- Perform a cost-benefit analysis
- Create an impact analysis
- Use reverse brainstorming

# Using Convergent Thinking

## Impact analysis



## Reaching Closure

- 
- Some groups are designed to be ongoing concerns that move from one issue to the next
  - Some groups address a particular concern and are disbanded once the problem is solved
  - It's common for a group to artificially prolong a process and not reach closure as efficiently as it could
  - A team leader needs to provide direction to help the group develop closure

## Reaching Closure

- 
- Tips for reaching closure:
    - Use a command style
    - Use a consultative approach
    - Use consensus decision making
    - Select appropriate voting methods

## Avoiding Common Group Traps

- 
- Some groups fall into traps that slow progress and distract members from the problem-solving objectives
  - The difficulties of participating in or managing a group are different from the challenges of solving problems on your own

## Avoiding Common Group Traps

- 
- Guidelines for avoiding common group traps:
    - Organize the overhead
    - Watch out for stress
    - Avoid the Superman complex
    - Look out for groupthink

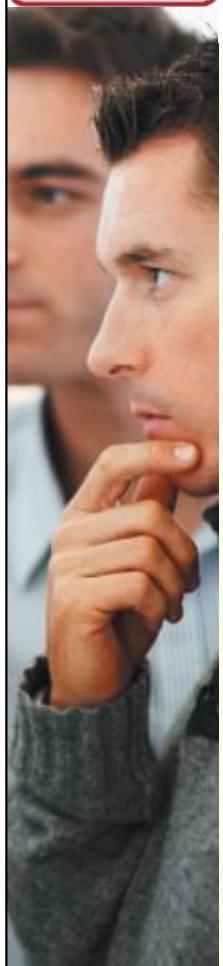
# Working with Large Groups

- 
- Large groups and those with members in more than one location require extra time for planning, organizing, and managing
  - As companies grow, merge, and evolve, they use large and geographically distributed groups more often
  - Managing and/or participating in a large group requires good communication skills

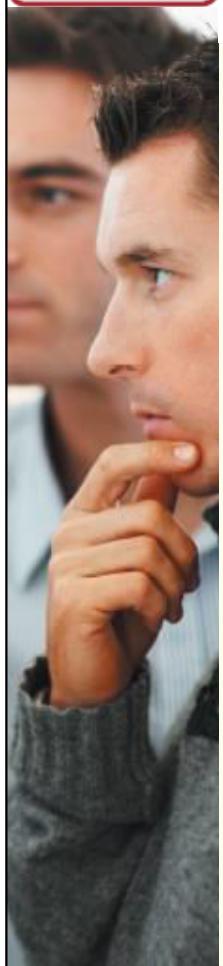
# Working with Large Groups

- 
- Guidelines for working with large groups:
    - Manage the logistics
    - Expand communication channels
    - Build consensus
    - Meet online
    - Distribute documents and supporting material electronically

# **Building Sustainable Agreements**

- 
- The final step a problem-solving group performs is developing an implementation plan, also called an action plan
  - The action plan summarizes the activities the group and other members of the organization agree to perform to make sure the project succeeds

# **Building Sustainable Agreements**

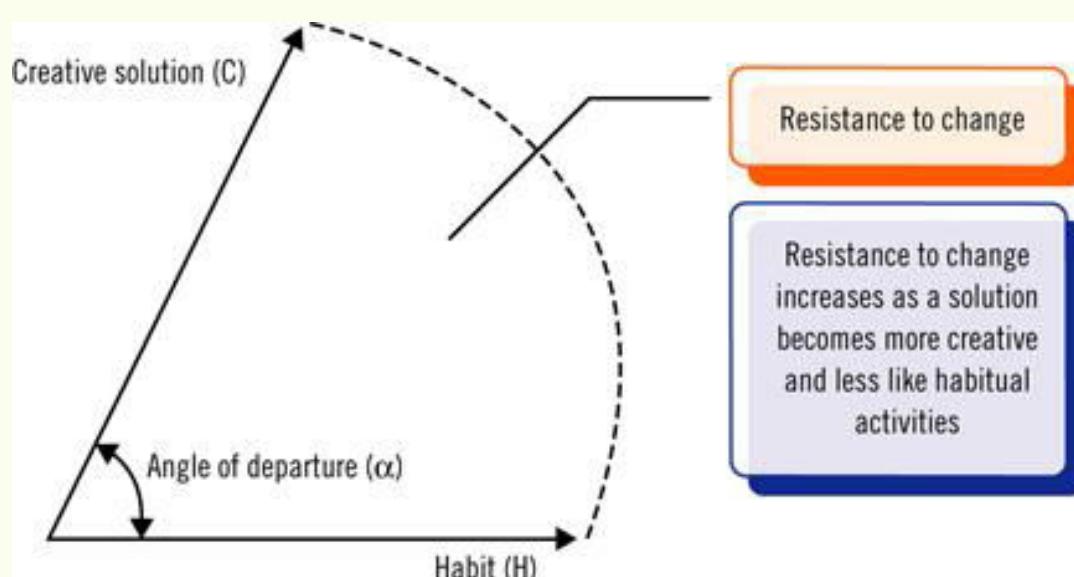
- 
- Remember that action plans represent change and people and organizations tend to resist change
  - Involve members of the team and others in the organization to build an agreement that can be sustained as the problem is solved

# Building Sustainable Agreements

- Do's and Don'ts for building sustainable agreements:
  - Overcome fear
  - Communicate openly
  - Manage the pace
  - Avoid stressful times

# Building Sustainable Agreements

Overcoming resistance to change



# Technology@Work: Online Scheduling Tools



- Online scheduling tools such as Doodle and Google calendar can simplify the time-consuming task of scheduling meetings
  - In most online scheduling tools, the meeting organizer uses an online calendar to select meeting times
  - The organizer uses e-mail to notify everyone who needs or wants to attend the meeting
  - Participants respond by selecting times that are most convenient for them

# Technology@Work: Online Scheduling Tools



# Scheduling an event in Doodle

# Summary

- 
- The way people work and interact with each other is called group dynamics
  - A group that functions well is a team
  - Divergent thinking describes thought processes and methods used to generate ideas
  - Convergent thinking techniques narrow the options to a manageable set

# Summary

- 
- A team needs a leader to help it reach closure
  - There are common traps that groups can fall into
  - Working with a large group can be complicated
  - The final step in problem-solving is building a sustainable agreement

# Problem Solving and Decision Making

SECOND EDITION

Part  
**5**



## Part 5: Decision Support Tools

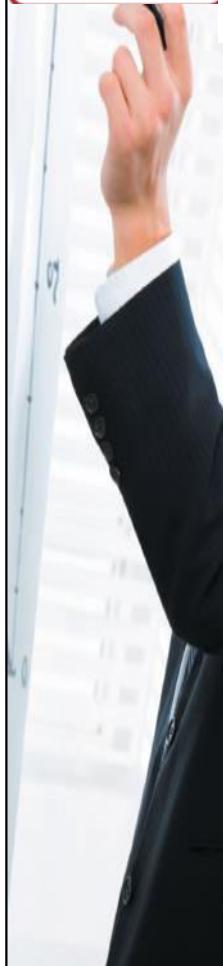
Part  
**5**

## Objectives

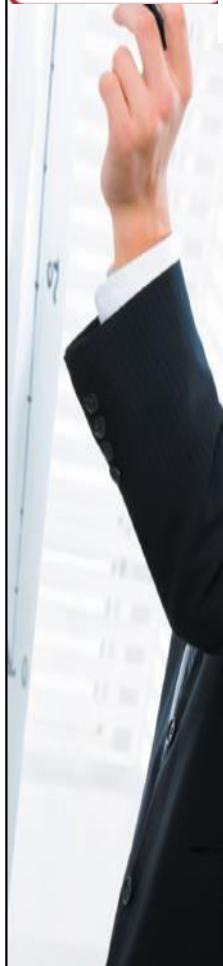
- Understand decision support systems
- Model decisions quantitatively
- Describe data objectively
- Work with formulas and functions



# Objectives

- 
- Perform what-if analyses
  - Weigh factors
  - Create decision trees
  - Use graphics to display data

## Understanding Decision Support Systems

- 
- A decision support system (DSS) is interactive software designed to help you compile useful information from raw data, documents, and business knowledge
  - A DSS is ideal for analyzing complex problems that involve sets of data and demand a systematic decision-making approach

# Understanding Decision Support Systems

- Decision support tools offer the following benefits for decision makers:
  - Add objectivity to making decisions
  - Improve efficiency for complex decisions
  - Encourage exploration and discovery
  - Provide support for particular decisions
  - Help communicate decisions to other interested people

## Modeling Decisions Quantitatively

- Once you've gathered all the data related to the problem, you can model your decisions quantitatively
- Modeling decisions quantitatively means you represent the decision and its factors using numbers
- Modeling decisions can help you see patterns in data, make objective choices, and provide substantiation for decisions

# Modeling Decisions Quantitatively

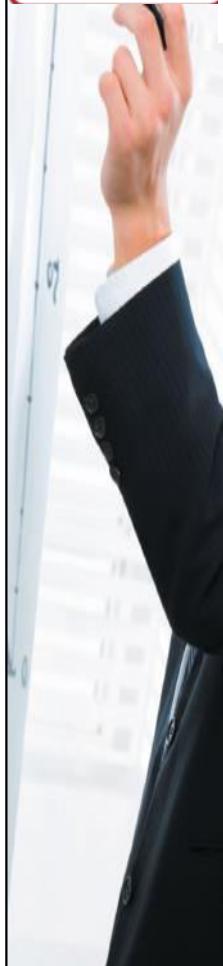
- Guidelines for modeling decisions quantitatively:
  - Assign numeric values to your data
  - Compare apples to apples
  - Rate subjective variables
  - Use a decision model

# Modeling Decisions Quantitatively

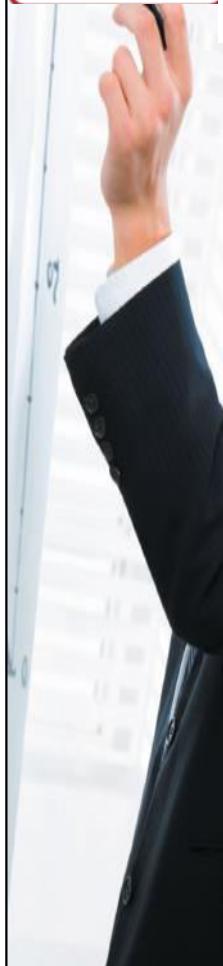
Decision model

	A	B	C	D
<b>Decision Model: Quest Branch Office</b>				
1				
2		Los Angeles	Chicago	
3	Staff preference	45	38	
4	Proximity to clients	40	40	
5	Building features	35	42	
6	Amenities	30	42	
7	<b>Total</b>	<b>150</b>	<b>162</b>	
8				
9	Rent per month	\$ 2,200.00	\$ 1,800.00	
10	Taxes	\$ 448.00	\$ 725.00	
11	Utilities	\$ 500.00	\$ 450.00	
12	Salary	\$ 800.00	\$ 650.00	
13	<b>Total</b>	<b>\$ 3,948.00</b>	<b>\$ 3,625.00</b>	
14				

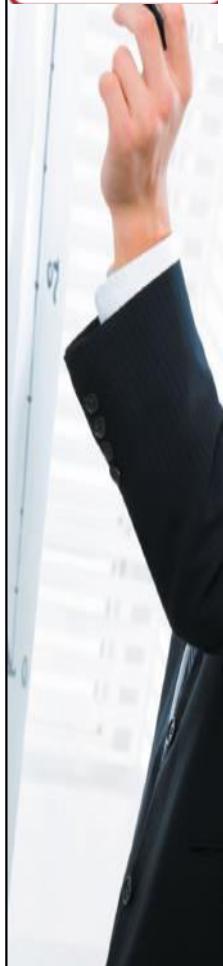
# Describing Data Objectively

- 
- Most people can visualize images, concepts, and trends more easily than large sets of numbers
  - When presenting data to support a decision, provide the audience with an objective description of the data
  - You can use statistics to explain and compare the characteristics of data

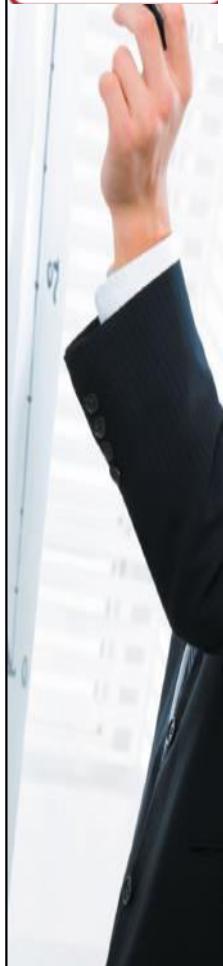
# Describing Data Objectively

- 
- Terms to describe data:
    - Arithmetic mean: the average value of a set of data
    - Median: the point that separates the higher values from the lower values
    - Mode: the value that occurs most frequently
    - Standard deviation: a measure of the variability of a set of data

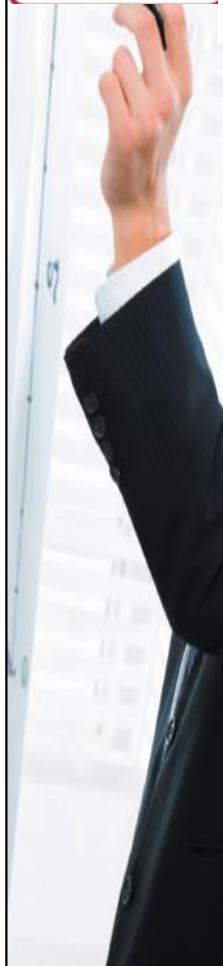
# Working with Formulas and Functions

- 
- You can use mathematics to help you analyze and compare data
  - Mathematicians use formulas to manipulate numeric and symbolic data
  - A formula typically defines a calculation that you perform on one or more variables

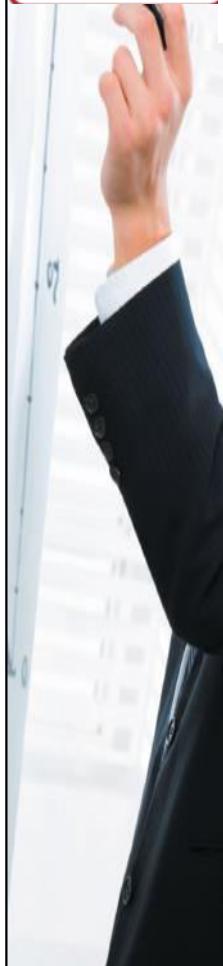
# Working with Formulas and Functions

- 
- Formulas can help identify the best choices and solutions
  - To model quantitative decisions, you can use an electronic spreadsheet, which supports a wide variety of formulas and functions

# Working with Formulas and Functions

- 
- Guidelines for working with formulas and functions:
    - Format your formulas
    - Use cell references
    - Double-check your mathematical operators and order
    - Simplify with functions

# Performing What-If Analyses

- 
- A what-if analysis allows you to study how changing one or more values affects the results
  - What-if analyses allow you to test scenarios or possibilities to make a decision

# Performing What-If Analyses

- Guidelines for performing what-if analyses:
  - Identify decision variables
  - Identify the constants
  - Identify output variables
  - Test several scenarios
  - Assess your results using common sense

# Performing What-If Analyses

What-if analysis with two scenarios

	A	B	C	D	E	F
1	Quest Specialty Travel					
2	Revenue Scenarios					
3						
4		Scenario 1: Add 500 business trips				
5	Current Sales		Future Sales			
6	Trips sold	3000	Trips sold	3500		
7	Average price per trip	\$ 1,000	Average price per trip	\$ 1,325		
8	Revenue	\$3,000,000	Revenue	\$4,637,500		
9						
10		Scenario 2: Sell 12% more trips				
11	Current Sales		Future Sales			
12	Trips sold	3000	Trips sold	3360		
13	Average price per trip	\$ 1,000	Average price per trip	\$ -		
14	Revenue	\$3,000,000	Revenue	\$ -		
15						

# Weighing Factors

- 
- Sometimes more than one variable can affect results in a decision model
  - You can assign weights to variables

# Weighing Factors

- 
- Guidelines for weighing factors
    - Identify the most important decision variables
    - Determine the appropriate weights
    - Normalize variables
    - Consider the runners-up

# Creating Decision Trees

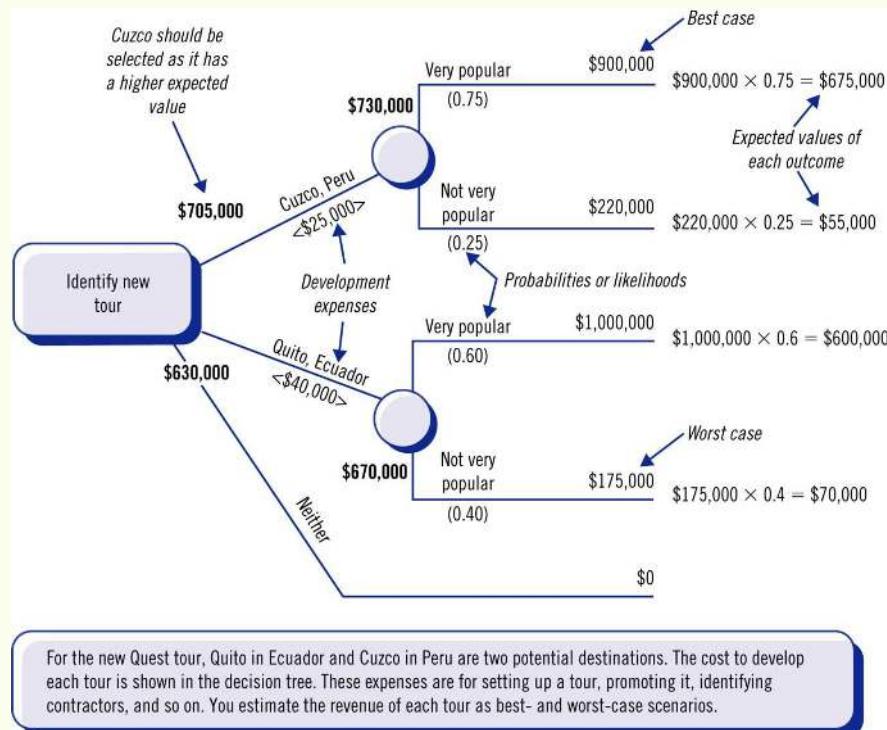
- 
- A decision tree is a support tool that models decisions using a treelike diagram
  - Each branch of the tree represents an option and its benefits, cost, and likelihood
  - Organizations use decision trees to identify the strategy or choice that will lead them to a desired goal
  - Decision trees create a simple summary of a complex decision

# Creating Decision Trees

- 
- Guidelines for creating a decision tree:
    - Start with your primary decision
    - Identify your options
    - Consider the results
    - Assign values and probabilities
    - Calculate the value for each option

# Creating Decision Trees

## Decision tree



# Using Graphics to Display Data

- By representing data, decision, and solutions graphically you can see trends, relationships, and results that are hard to detect in a list of numbers
- Drawings, charts, and other illustrations help make your case clearer and easier for others to understand
- Software such as spreadsheets and presentation graphics programs provide tools to help you visualize and display data

# Using Graphics to Display Data

- Popular types of graphics that display data:
  - Bar charts
  - Line charts
  - Area charts
  - Pie charts
  - Scatter plots

# Using Graphics to Display Data

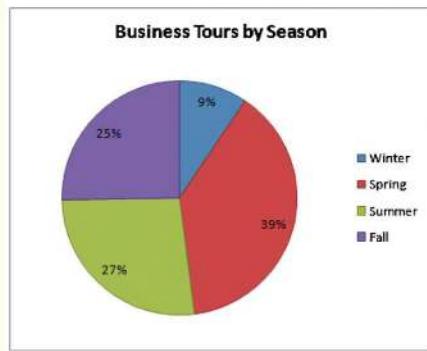
## Types of charts



a. Bar chart



b. Line chart



c. Pie chart



d. Scatter chart

## **Technology@Work: Spreadsheet Tools**

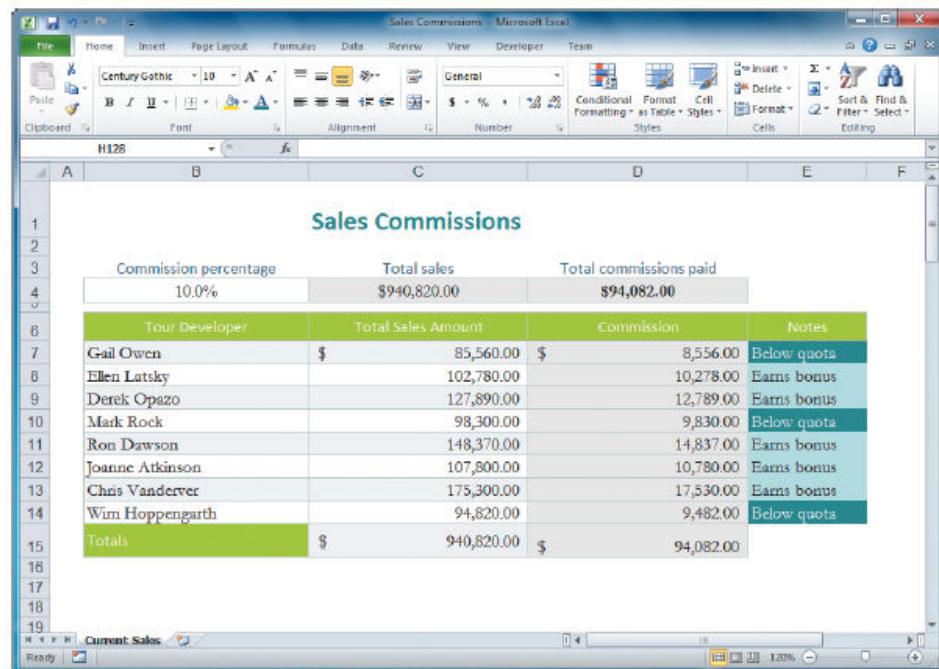
- You can use spreadsheet software to create and format numeric data and calculations, such as for budgets, commission calculators, schedules, and income statements
- Types of spreadsheet software:
  - Microsoft Excel
  - OpenOffice Calc
  - Google Spreadsheet
  - Gnumeric
  - Apple Numbers

## **Technology@Work: Spreadsheet Tools**

- You can use spreadsheets to track numeric information, perform calculations, perform what-if analyses, and create charts
- Spreadsheets are especially helpful when recording and analyzing financial information

# Technology@Work: Spreadsheet Tools

## Microsoft Excel



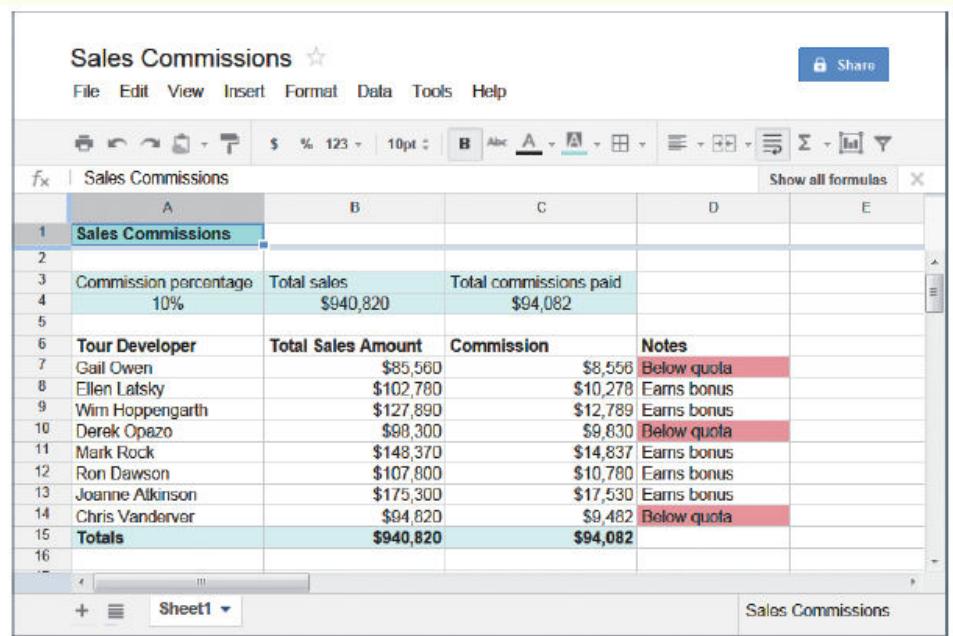
A screenshot of Microsoft Excel showing a spreadsheet titled "Sales Commissions". The spreadsheet includes a header row with "Commission percentage" (10.0%), "Total sales" (\$940,820.00), and "Total commissions paid" (\$94,082.00). Below this is a table with columns for "Tour Developer", "Total Sales Amount", "Commission", and "Notes". The notes column contains entries like "Below quota", "Earns bonus", and "Earns bonus". The total row shows "Totals" with values \$940,820.00 and \$94,082.00.

Commission percentage	Total sales	Total commissions paid	
10.0%	\$940,820.00	\$94,082.00	
Tour Developer	Total Sales Amount	Commission	Notes
Gail Owen	\$85,560.00	\$8,556.00	Below quota
Ellen Latsky	\$102,780.00	\$10,278.00	Earns bonus
Derek Opazo	\$127,890.00	\$12,789.00	Earns bonus
Mark Rock	\$98,300.00	\$9,830.00	Below quota
Ron Dawson	\$148,370.00	\$14,837.00	Earns bonus
Jeanne Atkinson	\$107,800.00	\$10,780.00	Earns bonus
Chris Vanderver	\$175,300.00	\$17,530.00	Earns bonus
Wim Hoppenarth	\$94,820.00	\$9,482.00	Below quota
<b>Totals</b>	<b>\$940,820.00</b>	<b>\$94,082.00</b>	

Used with permission from Microsoft Corporation

# Technology@Work: Spreadsheet Tools

## Google Spreadsheets



A screenshot of Google Spreadsheets showing a spreadsheet titled "Sales Commissions". The spreadsheet includes a header row with "Commission percentage" (10%) and "Total sales" (\$940,820). Below this is a table with columns for "Tour Developer", "Total Sales Amount", "Commission", and "Notes". The notes column contains entries like "Below quota", "Earns bonus", and "Earns bonus". The total row shows "Totals" with values \$940,820 and \$94,082.

Commission percentage	Total sales	Total commissions paid	
10%	\$940,820	\$94,082	
Tour Developer	Total Sales Amount	Commission	Notes
Gail Owen	\$85,560	\$8,556	Below quota
Ellen Latsky	\$102,780	\$10,278	Earns bonus
Wim Hoppenarth	\$127,890	\$12,789	Earns bonus
Derek Opazo	\$98,300	\$9,830	Below quota
Mark Rock	\$148,370	\$14,837	Earns bonus
Ron Dawson	\$107,800	\$10,780	Earns bonus
Jeanne Atkinson	\$175,300	\$17,530	Earns bonus
Chris Vanderver	\$94,820	\$9,482	Below quota
<b>Totals</b>	<b>\$940,820</b>	<b>\$94,082</b>	

Courtesy of Google Corporation

# Summary

- 
- A decision support system is interactive software designed to help you compile useful information to make decisions
  - Modeling decisions quantitatively means you represent a decision and its factors using numbers
  - It's important to provide an objective description of data

# Summary

- 
- You can use formulas and functions to model a decision
  - A what-if analysis allows you to study how changing one or more values affects the results
  - You can assign weights to variables to help in decision making
  - A decision tree models decisions using a treelike diagram
  - Graphics can help make data more accessible