Engineering Design *An Introduction*

Chapter 3

Development of the Team

Karsnitz • O'Brien • Hutchinson

Engineering Design *An Introduction*

Utilization of Teams in Industry Today

- Industrial Revolution approach
  - Division of labor
  - Individuals focus on a single task or tasks
- Modern industry uses teams in design and production
  - Team composed of members with expertise in a variety of areas

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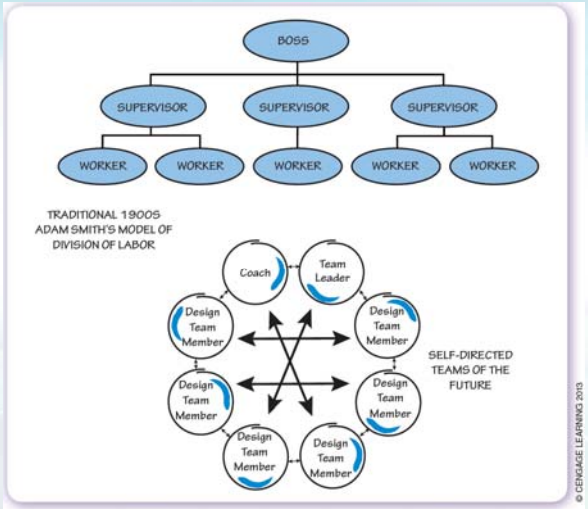

Figure 3-1: Historical view of working styles.

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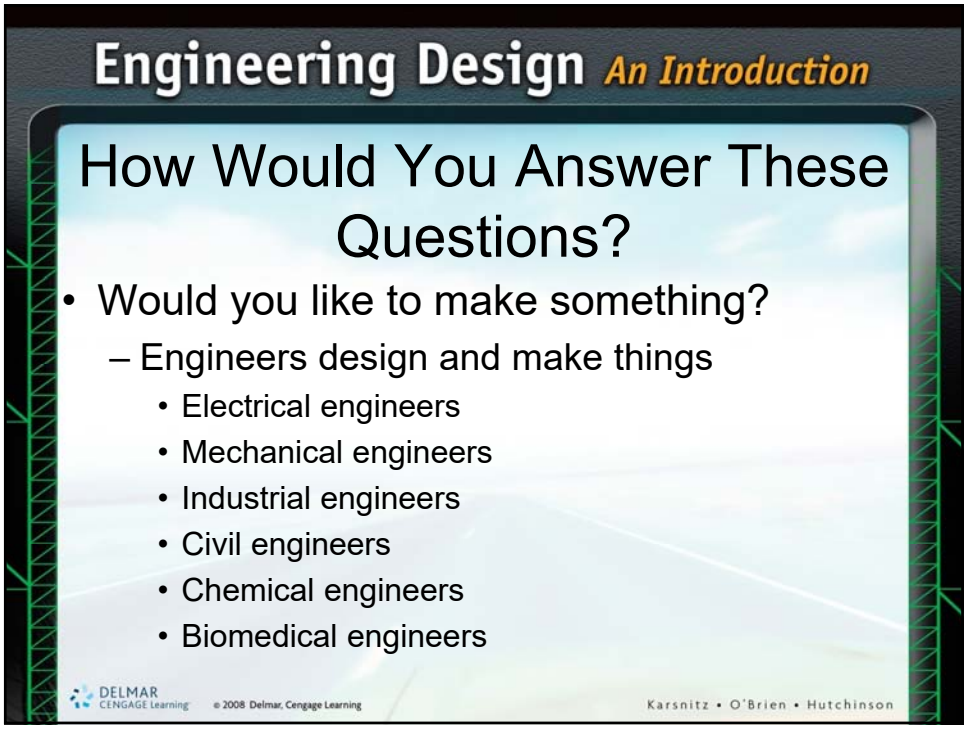
Engineering Professionals

- Article in the *IEEE Spectrum*:
  - Asked high school students to consider if engineering was in their future
  - See Figure 3-2 in the text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How Would You Answer These Questions?
• Would you like to make something?
– Engineers design and make things
• Electrical engineers
• Mechanical engineers
• Industrial engineers
• Civil engineers
• Chemical engineers
• Biomedical engineers
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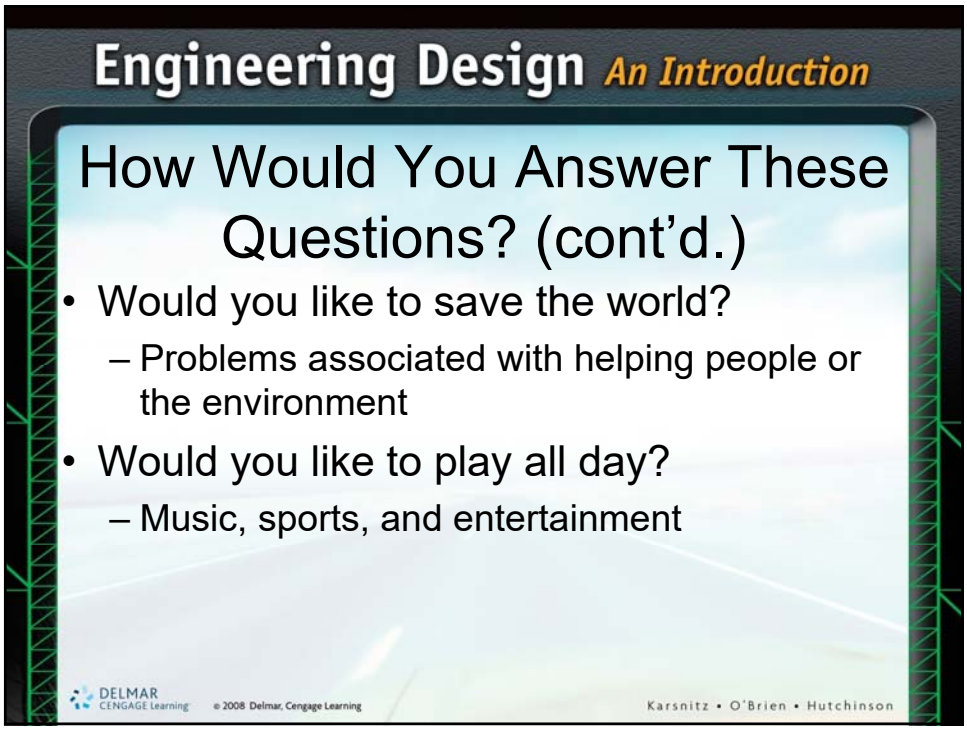
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How Would You Answer These Questions? (cont'd.)
• Would you like to save the world?
– Problems associated with helping people or the environment
• Would you like to play all day?
– Music, sports, and entertainment
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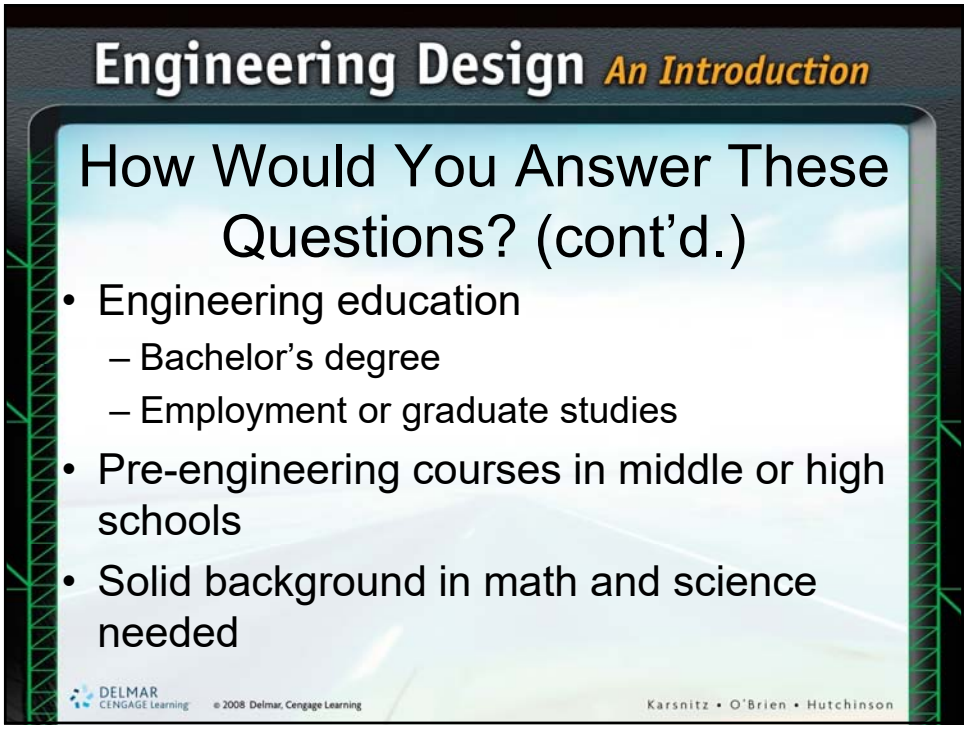
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How Would You Answer These Questions? (cont'd.)
• Engineering education
– Bachelor's degree
– Employment or graduate studies
• Pre-engineering courses in middle or high schools
• Solid background in math and science needed
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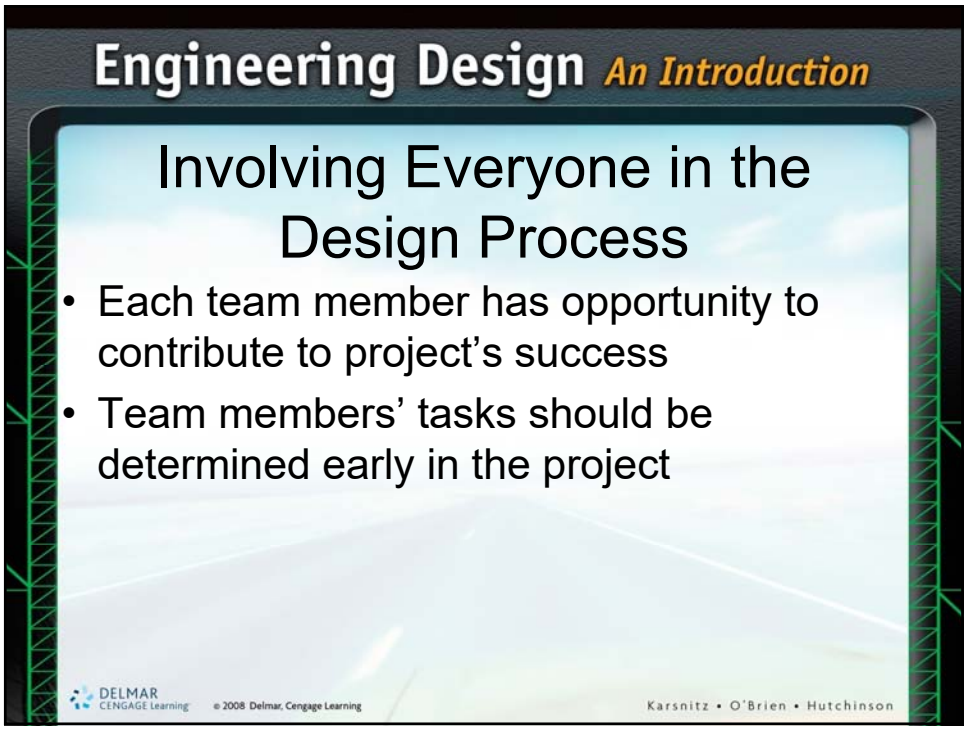
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Involving Everyone in the Design Process
• Each team member has opportunity to contribute to project's success
• Team members' tasks should be determined early in the project
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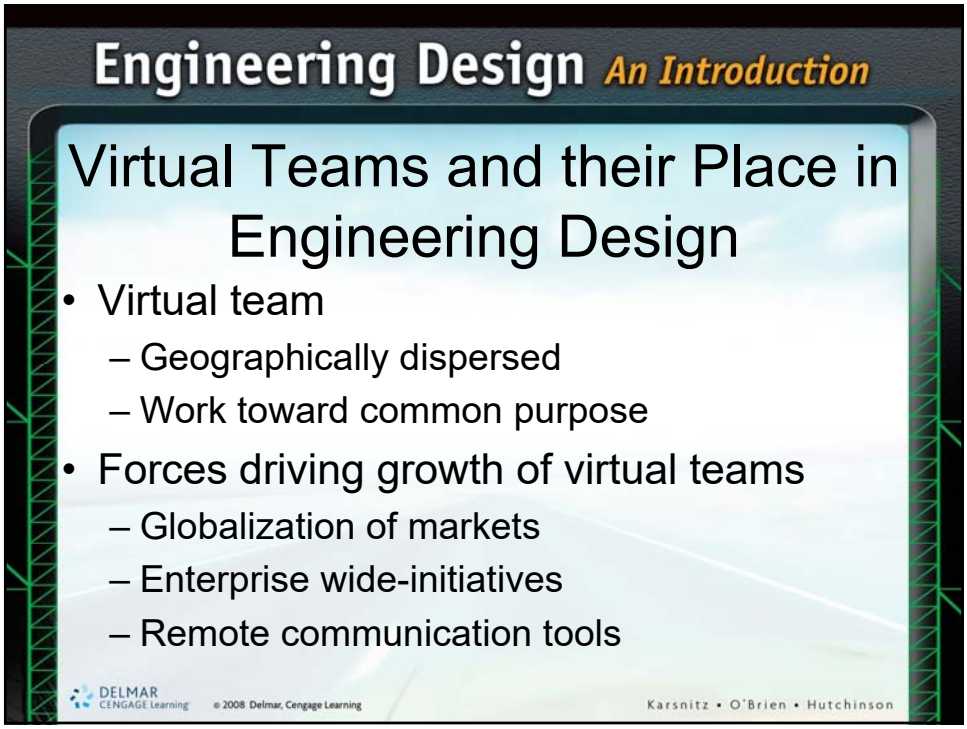
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Virtual Teams and their Place in Engineering Design
• Virtual team
– Geographically dispersed
– Work toward common purpose
• Forces driving growth of virtual teams
– Globalization of markets
– Enterprise wide-initiatives
– Remote communication tools
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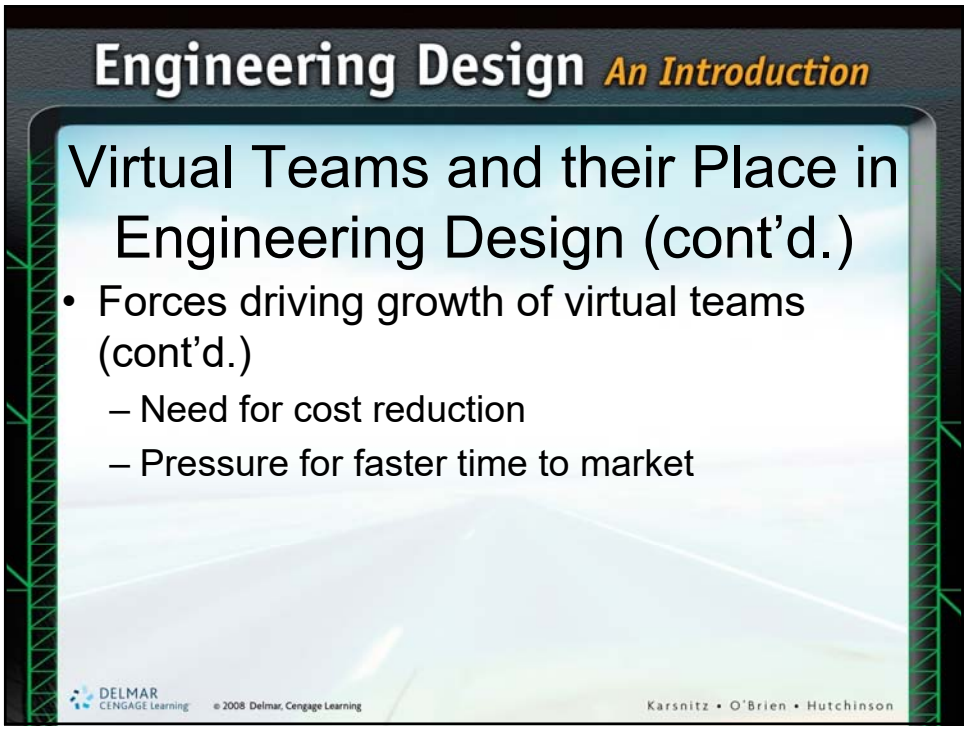
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Virtual Teams and their Place in Engineering Design (cont'd.)
• Forces driving growth of virtual teams (cont'd.)
– Need for cost reduction
– Pressure for faster time to market
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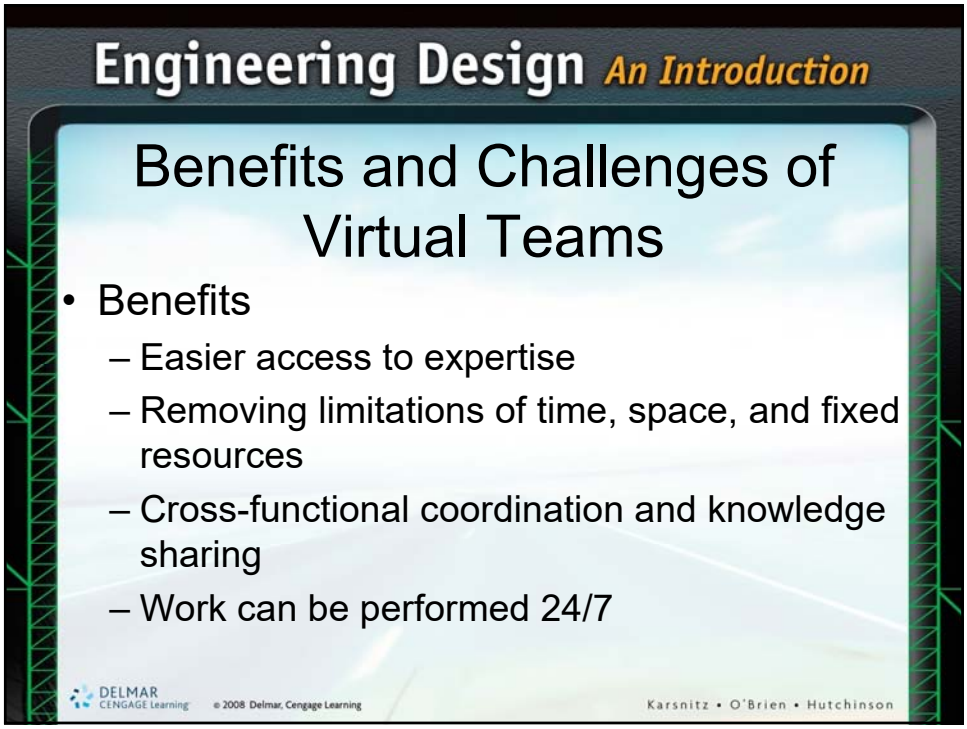
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Benefits and Challenges of Virtual Teams
• Benefits
– Easier access to expertise
– Removing limitations of time, space, and fixed resources
– Cross-functional coordination and knowledge sharing
– Work can be performed 24/7
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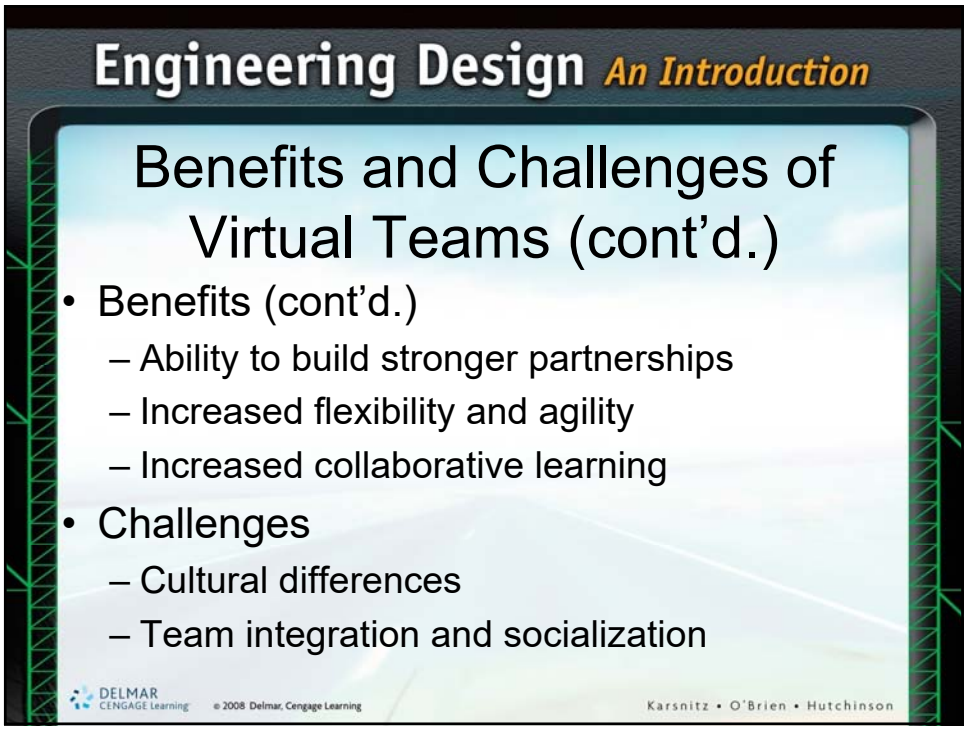
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Benefits and Challenges of Virtual Teams (cont'd.)
• Benefits (cont'd.)
– Ability to build stronger partnerships
– Increased flexibility and agility
– Increased collaborative learning
• Challenges
– Cultural differences
– Team integration and socialization
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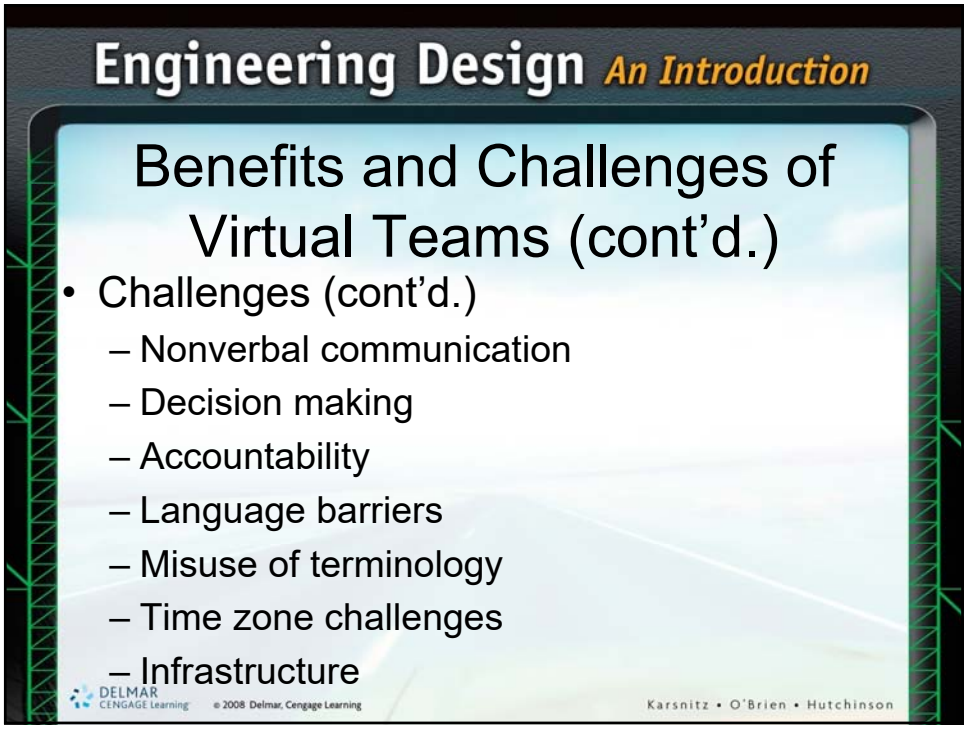
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Benefits and Challenges of Virtual Teams (cont'd.)
• Challenges (cont'd.)
– Nonverbal communication
– Decision making
– Accountability
– Language barriers
– Misuse of terminology
– Time zone challenges
– Infrastructure
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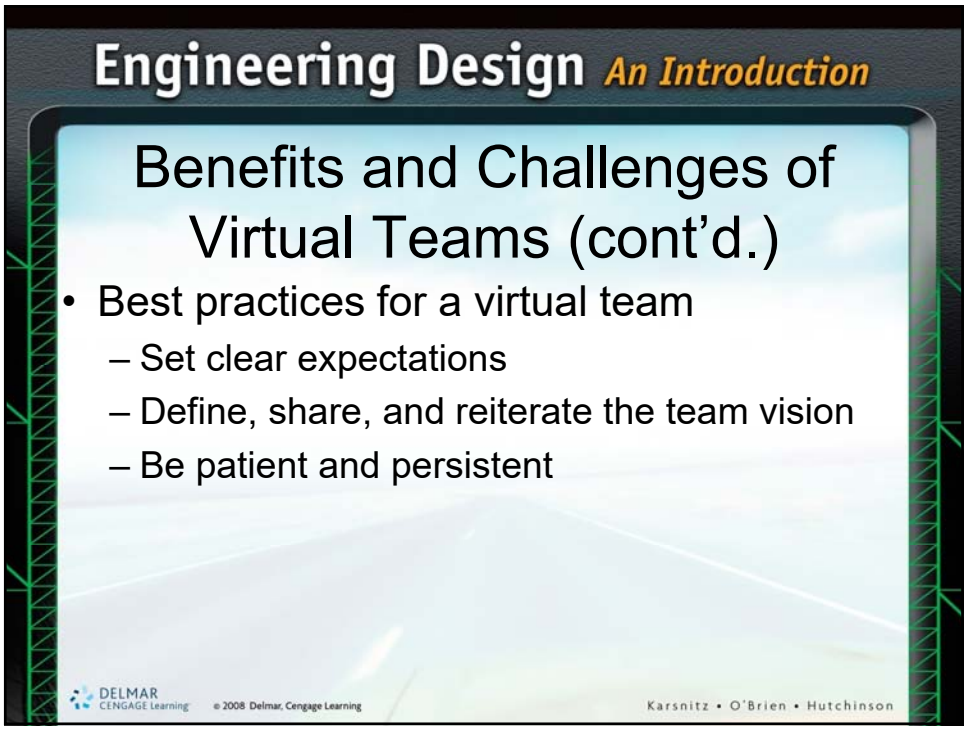
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Benefits and Challenges of Virtual Teams (cont'd.)
• Best practices for a virtual team
– Set clear expectations
– Define, share, and reiterate the team vision
– Be patient and persistent
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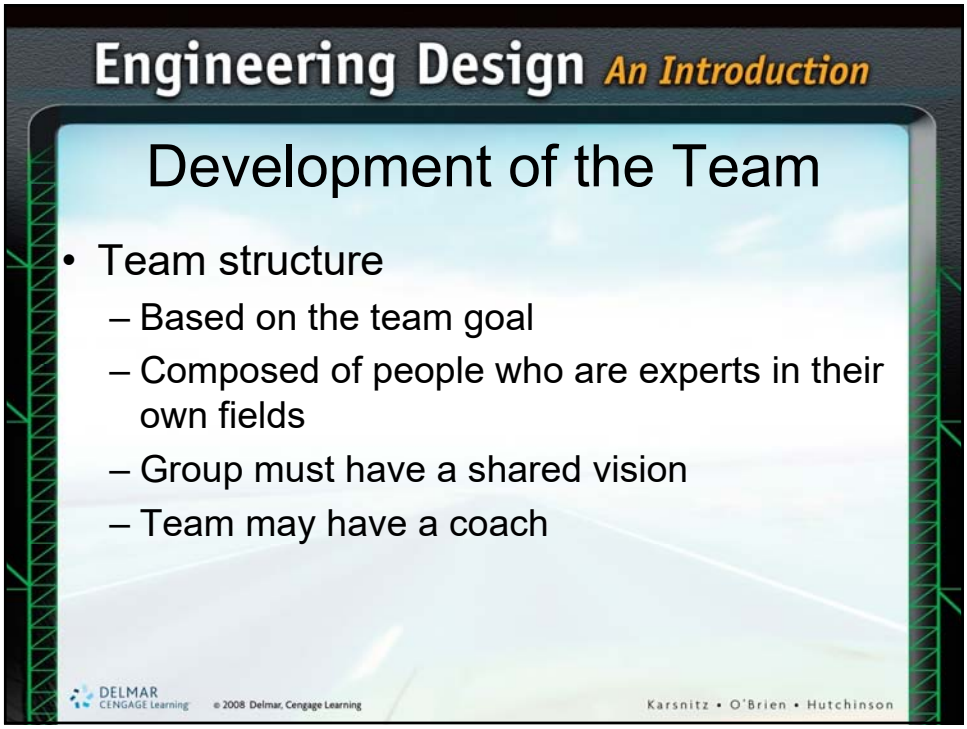
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Development of the Team
• Team structure
– Based on the team goal
– Composed of people who are experts in their own fields
– Group must have a shared vision
– Team may have a coach
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Team Success
• Team success depends on synergy
– Everyone working together as a team
• Effective leadership is important
• Self-directed team
– Led by the team itself
• Common vision
– Leads to motivation, better teamwork
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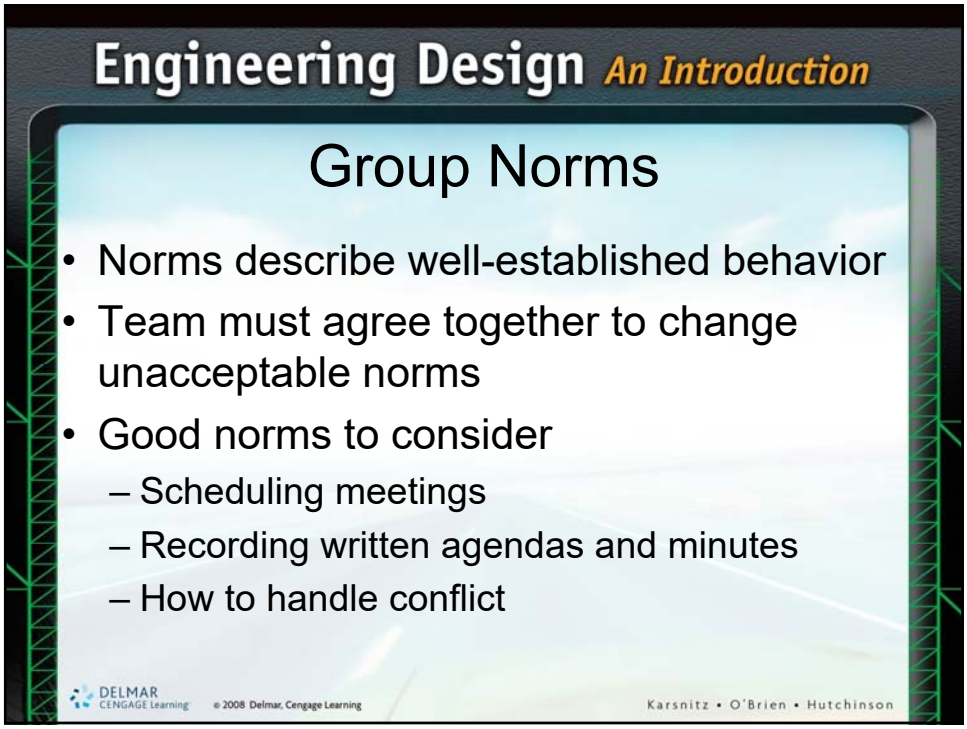
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Group Norms
• Norms describe well-established behavior
• Team must agree together to change unacceptable norms
• Good norms to consider
– Scheduling meetings
– Recording written agendas and minutes
– How to handle conflict
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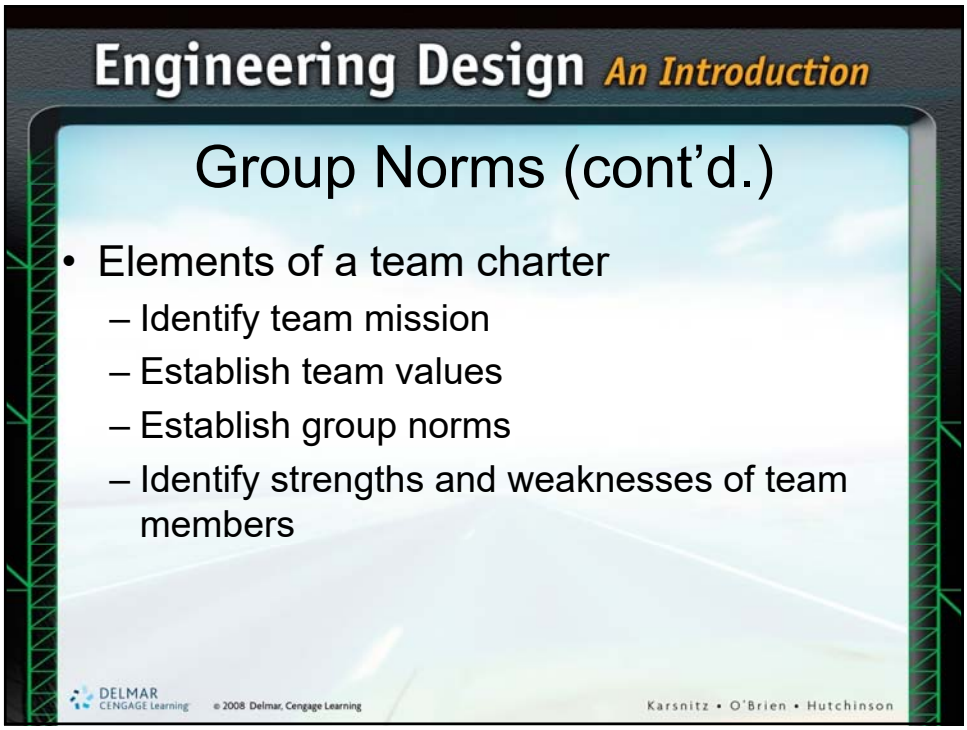
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Group Norms (cont'd.)
• Elements of a team charter
– Identify team mission
– Establish team values
– Establish group norms
– Identify strengths and weaknesses of team members
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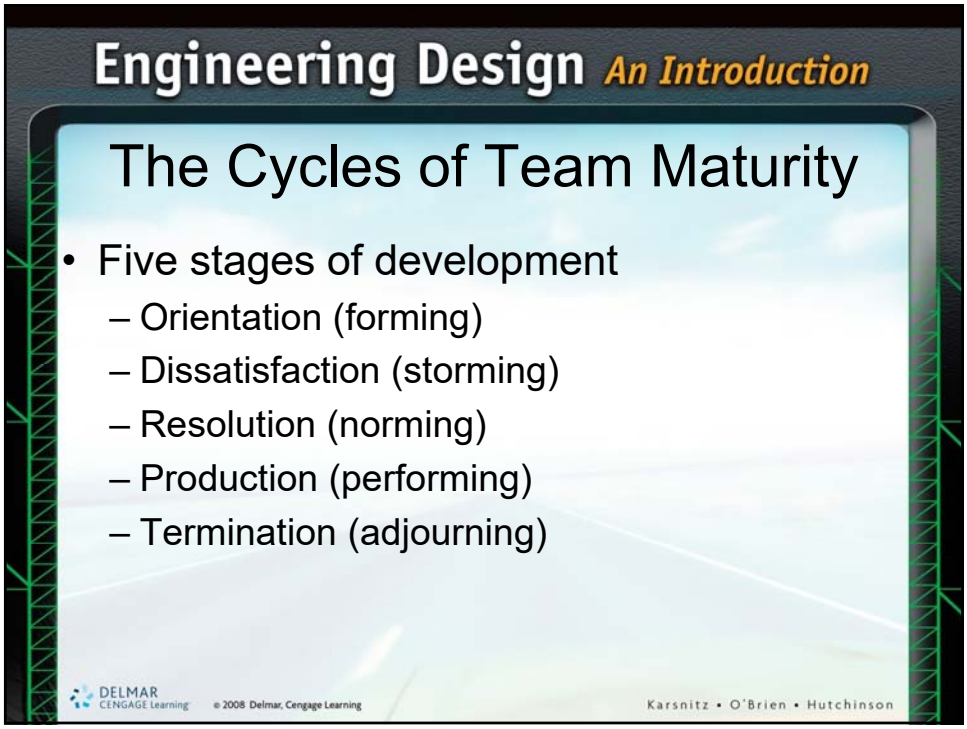
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The Cycles of Team Maturity
• Five stages of development
– Orientation (forming)
– Dissatisfaction (storming)
– Resolution (norming)
– Production (performing)
– Termination (adjourning)
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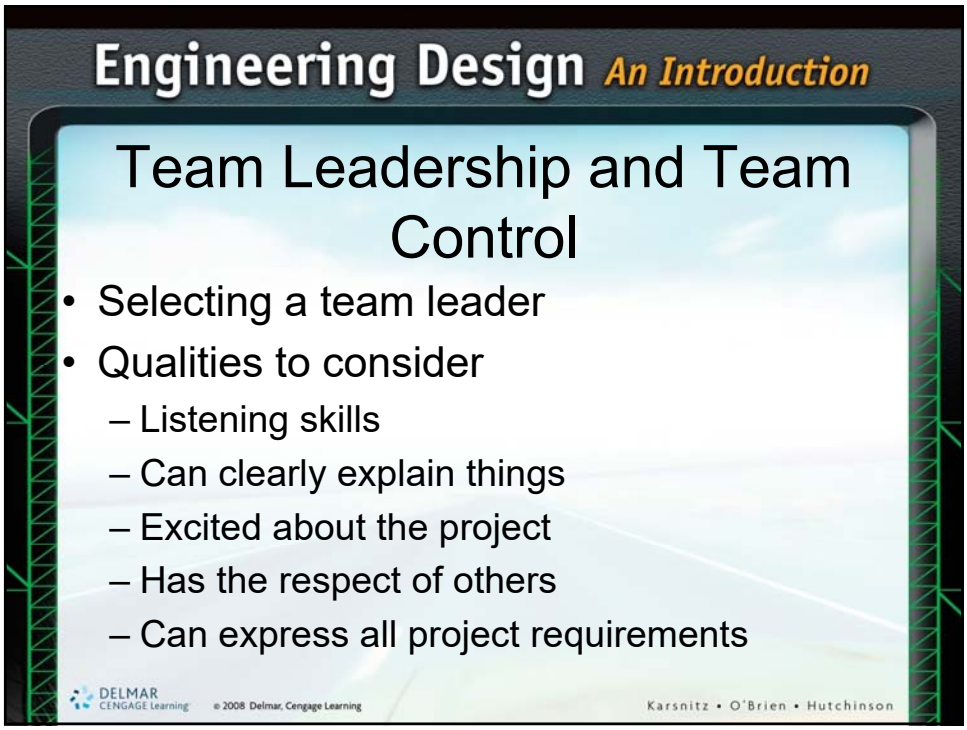
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Team Leadership and Team Control
• Selecting a team leader
• Qualities to consider
– Listening skills
– Can clearly explain things
– Excited about the project
– Has the respect of others
– Can express all project requirements
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Table 3-2: From coach to team leader

Coach	Team Leader
Lead the team from dependence to interdependence on the whole team	Maintain a working role in the team
Manage conflict	Manage conflict
Build synergy and team trust	Maintain synergy and trust
Promote risk taking and help team members identify their personal strengths	Monitor the team purpose, goals, and objectives
Clear the path for the team to function	Facilitate the team meetings
Listen and mediate	Encourage risk taking and individual initiatives for the benefit of the team

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Information Sharing as It Relates to Teams

- Communication
  - Keeps all parts of the design process on track
- Poor communication:
  - Usually results in a crisis

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Making Team Communications Work
• Mutual understanding of team goals
• Examples of communication norms
– All team members share opinions
– All vital communication is in writing
– Reach important decisions through consensus
– Celebrate and give positive feedback for good ideas
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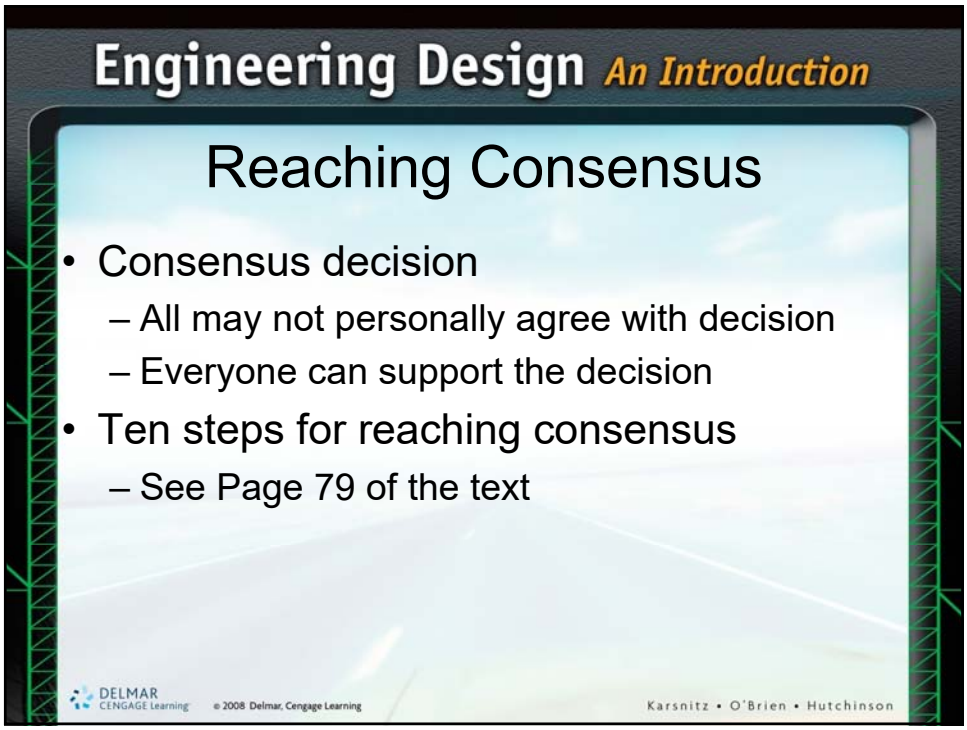
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Reaching Consensus
• Consensus decision
– All may not personally agree with decision
– Everyone can support the decision
• Ten steps for reaching consensus
– See Page 79 of the text
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Using Feedback for Furthering Open Communications

- Positive, constructive feedback
  - Necessary for personal and team growth
  - Two-way process

Figure 3-13: Example of team feedback.

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Table 3-3: Using Feedback

Giving Feedback
1. Focus feedback to team results.
2. Base your perceptions on specific incidents and facts. Avoid opinions.
3. To avoid defensive positioning, involve the other person in the conversation.
4. Develop a plan of action that is jointly agreed upon.
5. Summarize the communication and the plan of action.
6. Let other people know you appreciate their participation and openness.
Receiving Feedback
1. Listen carefully to the major areas being addressed.
2. View the feedback as an opportunity for growth.
3. Ask for clarification by asking questions and paraphrasing key points.
4. Prove your point of view of the situation while remaining objective. Avoid making excuses.
5. Offer your ideas about how to improve or change the situation.
6. Schedule a follow-up meeting to give a progress report.
7. Thank the person for wanting to help you by giving you feedback.

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Team Communications Should Be Organized

- Format for team communications
  - What, who, why, how, where, when, and what
  - Also called the "3-1-3 method" (www-h-www)

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Table 3-4: Tips for positive communication when confronting negative or inappropriate behavior

Always be honest.
Focus on behavior, not on the person.
Keep it team-oriented—the problem is "our" problem because we operate as a team.
Keep the confrontation positive.
Focus confrontation as missed opportunities for the team rather than criticism of individual performance.
Validate others' feelings of frustration and anger.
Remain calm.
Don't get angry in return.
Don't talk loudly.
Build a bridge of commonality to stand on: "We are in this together and I understand."
Be clear on resolutions and individuals' responsibilities.

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Listening Skills Complete the Communication Loop
• Hearing vs. listening
• Active listening techniques
– Use body language to indicate you are listening
– Minimize distractions
– Listen to the entire message
– Use verbal cues to reinforce the communication
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Listening Skills Complete the Communication Loop (cont'd.)
• Techniques for active listening (cont'd.)
– Confirm the message
– Maintain confidentiality
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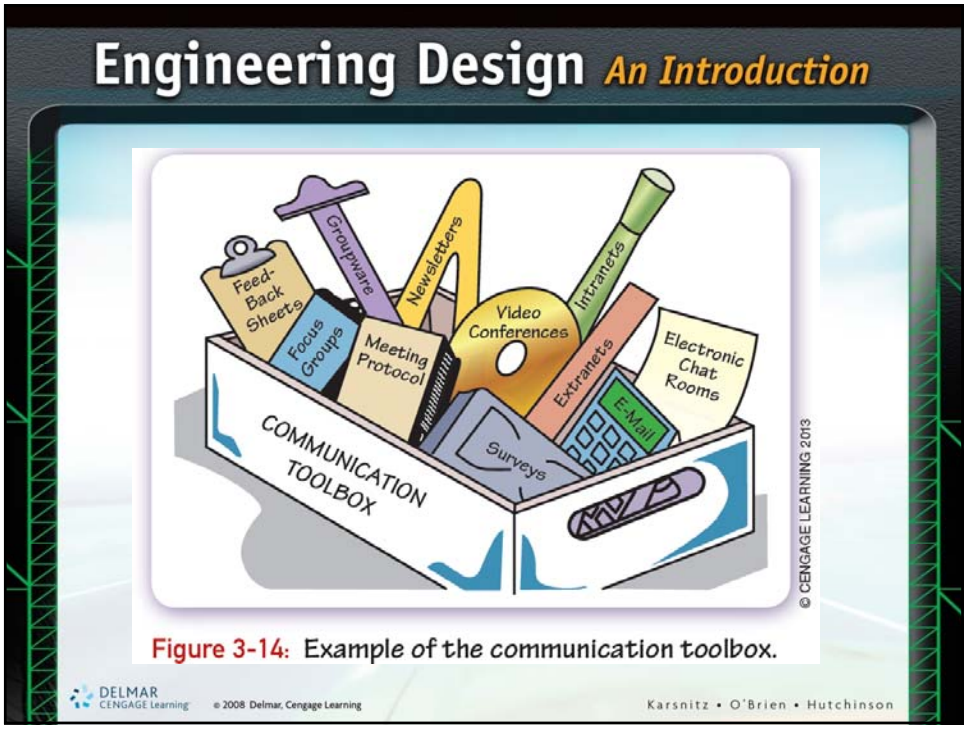
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Feed-Back Sheets
Groupware
Newsletters
Intranets
Focus Groups
Meeting Protocol
Video Conferences
Extranets
Electronic Chat Rooms
E-Mail
Surveys
COMMUNICATION TOOLBOX
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Figure 3-14: Example of the communication toolbox.
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