

Chapter 17

Making Decisions about Computers, Information, and Society



**INVITATION TO
Computer Science**

6TH
EDITION

Objectives

After studying this chapter, students will be able to:

- Use ethical reasoning to evaluate social issues related to computing
- Describe the viewpoints of music users and music publishers about the issue of music file sharing
- Apply utilitarian arguments to ethical issues
- Explain the social tradeoffs involved in lawful intercept laws and their opposition
- Explain the purpose of a dialectic process
- Use analogies to evaluate ethical issues

Objectives (continued)

After studying this chapter, students will be able to:

- Provide arguments that support and oppose hackers who claim to be performing a social good
- Perform deontological analysis of the duties and responsibilities of parties in an ethical issue
- Describe cyberbullying and why legal remedies are difficult to apply
- Explain the potential downsides of sexting for those engaged in it
- Explain why information online may not be private

Tujuan Instruksional Khusus

- Mahasiswa mengetahui mengenai beberapa kasus yang berkaitan dengan penerapan ilmu komputer dan pengolahan informasi di dalam masyarakat, serta dapat menganalisa dan menjelaskan pendapat dan sikap mereka berdasarkan etika profesi IT terhadap kasus tersebut.
- Mahasiswa mengenal konsep technopreneur sebagai salah satu alternatif profesi yang dapat dijalani oleh profesional di bidang IT.

Introduction

- Social and ethical issues related to information technology are unavoidable
- Develop skills to reason about such issues
- Case studies introduce important ethical issues
 - Describe arguments for and against certain positions
 - Evaluate arguments in terms of ethics

THE EVOLUTION OF TECHNOLOGY & Its Impact on the Development of Social Businesses



We are babies.

1960s

Technology has **little impact**. It is a curiosity.

The company is king, but a benevolent king. Good focus on customer satisfaction, but customers have few options. Communications makes global business difficult so customers make geographic-based decisions.

Little impact



We are still children.

1970s

Technology is for academics and has **little impact**.

Greater focus on margins and revenue. Customers become concerned about monopolies as customer satisfaction has less importance.

Little impact



We are still children, but we can pout to get what we want.

1980s

Technology invades the home and starts to **change behaviors**.

Customers become increasingly concerned about company practices and lack of customer satisfaction. Communications have improved to help customers make more informed decisions and to have better choices.

Change behaviors



Like teenagers, we now have some control but don't know what to do with it yet.

1990s

Technology is now everywhere. A great leap forward. It begins to **connect us** around the globe.

e-Commerce helps give customers a greater - and more informed - range of decisions. Companies use the web to make themselves more accessible but haven't begun truly focusing on customer relationships.

Connect Us



We are growing up, and feeling pretty cool about it.

2000s

Technology enables more seamless communications across the globe. Growth is **explosive**, but like "explosions" is uncontrolled - all over the place.

Social Media allows customers to articulate their satisfaction with companies and make decisions based on the company's behavior, not just on price alone. Companies begin to react and change.

Explosive

FULLY INTEGRATED!!



Welcome to adulthood

2010s

Technology becomes **fully integrated** into our daily lives. We live more fully in a digital world.

Social Businesses are the evolution of companies now keenly aware that how they act and how they engage with customers can be more important than price, that the relationship is part of the value. Companies allow greater transparency into all aspects of the company and use social media channels to effectively engage with customers, but with a focus on **WHAT** the customer wants and **HOW** best to deliver it to the customer.



A woman with long dark hair is sitting at a desk, looking at a laptop. A large, light orange thought bubble rises from her head, containing a list of various IT and technology-related job titles. The bubble is connected to her head by a series of smaller, lighter orange circles. The background is white with blue geometric patterns in the corners.

- Systems analyst
- Help desk specialist
- Games designer/programmer
- Search engine optimization expert
- Customer relationship management specialist
- Desktop or mobile application programmer/developer
- Corporate trainer
- Technology salesperson
- Web developer
- Security analyst
- Computer science/IT instructor
- Computer technician
- Network administrator
- Technical project manager
- Digital forensics examiner
- Internet/social media marketing specialist
- Cloud architect
- Computer security specialist/mobile security specialist
- Network security administrator
- User experience designer
- Web designer
- Data scientist
- Web analytics expert

Technology Careers

- IT jobs usually are divided into the following areas:

Management

Research and
software
development

Technical
support
services

Operations

Training/
Support

Information
security
services

Marketing/
Strategy

Technology Careers

Table 12-2 System Development Jobs

Job Title	Job Description
Cloud Architect	Identifies business requirements, strategies, and solutions for cloud storage and services that meet a company's goals or needs
Database Designer	Specifies the structure, interface, and requirements of a large-scale database; determines security and permissions for users
Program and App Developer	Specifies, designs, implements, tests, and documents programs and apps in a variety of fields, including robotics, operating systems, animation, and applications
Systems Analyst	Works closely with users to analyze their requirements, designs and develops new information systems, and incorporates new technologies
Systems Programmer	Installs and maintains operating system software and provides technical support to the programming staff
Web Designer	Designs the layout, navigation, and overall appearance of a website with a focus on user experience; specifies a website's appearance using HTML5, JavaScript, CSS, media, and other web design technologies
Web Developer	Analyzes, develops, and supports the functionality of a website, including applications that often interact with databases or other online resources

Technology Careers

Table 12-3 Technology Operations Jobs

Job Title	Job Description
Computer Technician	Installs, maintains, and repairs hardware and servers; installs, upgrades, and configures software; troubleshoots hardware problems
Help Desk Specialist/ Help Desk Technician	Answers technology-related questions in person, on the phone, or via email or an online chat room
Network Administrator/ Engineer	Installs, configures, and maintains LANs, WANs, wireless networks, intranets, Internet systems, and network software; identifies and resolves connectivity issues
Technical Project Manager	Guides design, development, and maintenance tasks; serves as interface between programmers/developers and management

Technology Careers

Table 12-4 Web Marketing and Social Media Jobs

Job Title	Job Description
Customer Relationship Management (CRM) Specialist	Integrates apps and data related to customer inquiries, purchases, support requests, and behaviors in order to provide a complete application that manages a company's relationships with its customers
Internet/Social Media Marketing Specialist	Directs and implements an organization's use of Internet and social media marketing, including Facebook pages, Twitter feeds, blogs, and online advertisements
Search Engine Optimization (SEO) Expert	Writes and develops web content and website layouts so that they will appear at the beginning of search results when users search for content
User Experience (UX) Designer	Plans and designs software and apps that consider a user's reaction to a program and its interface, including its efficiency, its effectiveness, and its ease of use

Technology Careers

Table 12-5 Data Storage, Retrieval, and Analysis Jobs

Job Title	Job Description
Data Scientist	Uses analytics and other Big Data tools to compile statistics on data that an organization can use to plan product development or create strategies for marketing
Database Analyst	Uses data modeling techniques and tools to analyze and specify data usage
Database Administrator	Creates and maintains the data dictionary; monitors database performance
Digital Forensics Examiner	Collects and analyzes evidence found on computers, networks, mobile devices, and databases
Web Analytics Expert	Collects and measures Internet data, such as website traffic patterns and advertising, and develops reports that recommend strategies to maximize an organization's web presence

Technology Careers

Table 12-6 Information and Systems Security Jobs

Job Title	Job Description
Computer Security Specialist/ Mobile Security Specialist	Responsible for the security of data and information stored on computers and mobile devices within an organization
Network Security Administrator	Configures routers and firewalls; specifies web protocols and enterprise technologies
Security Analyst	Implements security procedures and methods, looks for flaws in security of a company's devices and networks, works with and trains employees at all levels, and assigns permissions and network settings
Security System Project Manager	Develops and maintains programs and tools designed to provide security to a network
Digital Forensics Analyst	Inspects electronic data to recover documents and files from data storage devices that may have been damaged or deleted, in order to use them as evidence in a crime investigation

Technology Careers

Table 12-7 App Development and Mobile Technologies Jobs

Job Title	Job Description
Desktop or Mobile Application Programmer/Developer	Converts the system design into the appropriate application development language, such as Visual Basic, Java, C#, and Objective C, and toolkits for various platforms
Games Designer/Programmer	Designs games and translates designs into a program or app using an appropriate application development language
Mobile Strategist	Integrates and expands the company's initiatives for mobile users
Mobile Technology Expert	Develops and directs an organization's mobile strategy, including marketing and app development

TOP JOBS FOR COMPUTER SCIENCE DEGREE HOLDERS

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1. Software Applications Developer
 2. Computer Systems Analyst
 3. Computer Programmer
 4. Network Systems Administrator
 5. Database Administrator
 6. Computer Systems Engineers
 7. Software Quality Assurance Engineer
 8. Web Developer
 9. Computer User Support Specialist
 10. Information Security Analyst



Why not

Techno preneurship ?

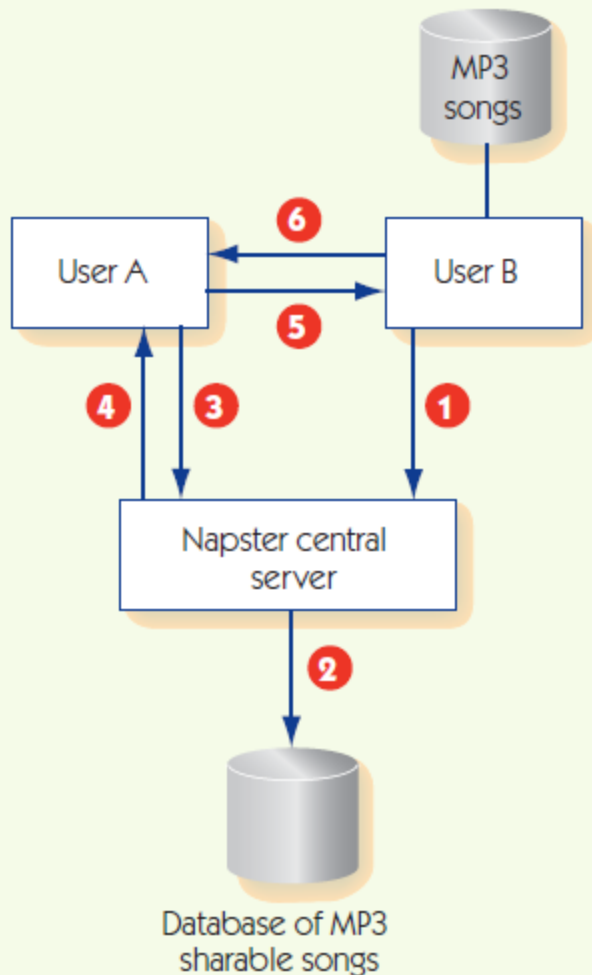


Case Studies

Case 1: The Story of MP3—Compression Codes, Musicians, and Money

- MP3 standard for compressing sound developed in 1987
- Patented and worldwide by early 1990s
- Computer-based MP3 playback in 1997
- WinAmp application free on the Internet in 1998
- Users began transmitting and sharing MP3 music
- Napster file-sharing system developed, 1999
- **Peer-to-peer file sharing:**
 - Software introduces users to each other
 - Sharing happens directly between users

FIGURE 17.1



- 1 User B sends to the Napster central server a list of MP3 data files he/she is willing to share.
- 2 The Napster central server places this information into a database of MP3 songs and their Internet (IP) locations.
- 3 User A connects to the Napster central server and queries it with the name of a song he/she wants to download.
- 4 The Napster central server searches its database and sends User A the names of all machines with this song and their Internet locations.
- 5 User A establishes a connection to User B (or any other machine with this song) and sends a download request message containing the song name.
- 6 User B sends the requested MP3 file to User A, who stores it on his/her machine and listens to it with an MP3 player.

Peer-to-peer file sharing system created by Napster

Case Studies

Case 1: The Story of MP3—Compression Codes, Musicians, and Money (continued)

- Recording companies filed suit against Napster, 1999
- Lawsuit claimed Napster was a conspiracy to encourage mass infringement of copyright
- **Facts:**
 - Most shared music was copyrighted
 - Many artists opposed sharing---no revenue for them
 - Some artists supported sharing

Case Studies

Case 1: The Story of MP3—Compression Codes, Musicians, and Money (continued)

- Napster **claims**:
 - Napster was just a “common carrier”
 - Napster reported song locations, was not involved in actual sharing
 - They were not responsible for users’ behaviors
 - Swapping files this was should be “fair use” under copyright law
- Napster lost the case and appeals, and closed in 2001

Case Studies

Case 1: The Story of MP3—Compression Codes, Musicians, and Money (continued)

- Other sharing systems (Kazaa) arose
- Paying to download music grew, iTunes
- Sharing movies, legally or not, growing issue
- Downloading images from the web for personal use
- The ethical (not legal) question:
 - *Is it ethical to swap copyrighted MP3 music files?*

Case Studies

Case 1: The Story of MP3—Compression Codes, Musicians, and Money (continued)

- **Ethics**: the study of how to decide if something is morally right or wrong
- How do we judge right or wrong?
- **Consequentialism** focuses on the consequences of an act: on the whole good or bad outcomes
- **Utilitarianism**: look at overall good for everyone

Case Studies

Case 1: The Story of MP3—Compression Codes, Musicians, and Money (continued)

Utilitarian argument that MP3 copying is OK

- There are many more music users than publishers
- Music users are happy to get free access
- Publishers get publicity for their products
- File sharing is akin to hearing a song on the radio
- Many users buy a song after listening to it
- Drop in sales may relate more to purchasing song-by-song rather than by album

Case Studies

Case 1: The Story of MP3—Compression Codes, Musicians, and Money (continued)

Utilitarian argument that MP3 copying is not OK

- Early on MP3 sharing encouraged CD sales, but long-term trend is reduction in sales
- iTunes and Amazon sell one song at a time to compete with illegal file sharing
- If publishers cannot profit, then less music will be made
- Copyright protection is the law, and MP3 sharing is clearly illegal; encouraging illegal behavior is wrong

Case Studies

Case 1: The Story of MP3—Compression Codes, Musicians, and Money (continued)

- **Dialectic:** a dialogue that explores an issue from both sides to lead to greater understanding
- Here:
 - Facts are that music sales have dropped continuously
 - Long-term, argument that less music would be published is a strong one
 - Lesser-known artists may use file sharing to get better known, depend on income from performances
 - Rethink the music industry from a new viewpoint

Case Studies

Case 2: The Athens Affair—Privacy vs. Security

- Law enforcement needs to wiretap suspects' phones
- Modern use of cell phones and VoIP complicates phone taps
- However, most/all phone calls go through computer systems
- Laws require all telecommunications to support “lawful intercept” systems for wiretaps

Case Studies

Case 2: The Athens Affair—Privacy vs. Security (continued)

- Built-in LI systems are a target for hackers
- In Greece hackers wiretapped 100 major business and political leaders
- No trace of who did it or why
- Ethical question:
 - *How does the decision to require LI software impact privacy and security?*

Case Studies

Case 2: The Athens Affair—Privacy vs. Security (continued)

Ethical reasoning by analogy

- Analogy-making is familiar to everyone
- Analogies are never perfect: what aspects are important?
- Apply decisions from one problem to another
- Identify what doesn't fit; often important aspect of problem

Case Studies

Case 2: The Athens Affair—Privacy vs. Security (continued)

Analogy #1: LI is like requiring everyone to record their face-to-face conversations

- Focused on VoIP (e.g., Skype)
- Similarities between VoIP and face-to-face:
 - Forms of communication
 - Meant to include a limited number
 - Possible for others to listen in
 - Easy access for others (requiring recordings) allows abuses by government or hackers

Case Studies

Case 2: The Athens Affair—Privacy vs. Security (continued)

Analogy #1: LI is like requiring everyone to record their face-to-face conversations

- Decisions about face-to-face conversations:
 - Private conversations are not monitored routinely
 - Monitoring only with court order and probable cause
 - We do NOT record all conversations all the time
- Implications by analogy for VoIP:
 - LI systems go beyond rules for private conversations
 - Without LI, law enforcement can still monitor as with face-to-face conversations

Case Studies

Case 2: The Athens Affair—Privacy vs. Security (continued)

Analogy #1: LI is like requiring everyone to record their face-to-face conversations

- Problems with the analogy
 - This argument would apply to normal phone tapping
 - Society accepts the need for some phone taps
 - What features of analogy don't work?
 - Fourth party involvement: telecommunications provider
- Need an analogy that includes a middleman

Case Studies

Case 2: The Athens Affair—Privacy vs. Security (continued)

Analogy #2: LI is like suspicious activity reporting in banking

- U.S. banks must notify government when they see suspicious transactions
- Similarities between LI and SAR
 - Both are critical resources for criminals, and require the help of external (law-abiding) entity
 - Information helps to connect suspects with each other and discover networks of suspects

Case Studies

Case 2: The Athens Affair—Privacy vs. Security (continued)

Analogy #2: LI is like suspicious activity reporting in banking

- Decision about suspicious activity reporting:
 - Banks should be required to report suspicious activity
- Implications by analogy:
 - Telecom companies should be required to report suspicious activity

Case Studies

Case 2: The Athens Affair—Privacy vs. Security (continued)

Analogy #2: LI is like suspicious activity reporting in banking

- Problems with the analogy:
 - Who initiates the sending of information differs (banks initiate, not government)
 - The information provided is very different
 - Banks provide times, dates, and participants
 - Full recording of a conversation is much more details
- Supports storage of detailed call records
- Does not support storage of whole conversations

Case Studies

Case 2: The Athens Affair—Privacy vs. Security (continued)

After analogies, consider three **possible solutions**:

1. Require all VoIP systems to implement LI
2. Do not require LI; use physical eavesdropping
3. Require VoIP providers to report suspicious activities, but do not record conversations

Case Studies

Case 2: The Athens Affair—Privacy vs. Security (continued)

Interested parties:

- VoIP creators/providers
 - Increased costs to build and store data; possible privacy lawsuits
- Law enforcement
 - Monitoring saves time and money, allows them to do job better
- The public
 - Monitoring helps law enforcement, but decreases privacy and perhaps safety

Case Studies

Case 2: The Athens Affair—Privacy vs. Security (continued)

Utilitarian analysis

- VoIP creators/providers
 - Option 2 is best for them, option 3 is worst
- Law enforcement
 - Option 1 is best
- The public
 - Option 2 reduces police effectiveness
 - Option 1 allows for abuses
 - Option 3 may also reduce police effectiveness

Case Studies

Case 3: Hackers—Public Enemies or Gadflies?

- Hackers: people who break into computer systems, launch Internet worms and viruses, vandalize web sites, etc.
- Some hackers are clearly criminals
 - Purposeless vandalism
 - Identity theft
 - Outright theft
- Some hackers engage in “**hacktivism**”
- Can hacking a computer be a social good?

Case Studies

Case 3: Hackers—Public Enemies or Gadflies? (continued)

WikiLeaks

- Protects government and corporate whistle-blowers
- Provides a secure way to share sensitive documents anonymously
- Video of U.S. firing on Reuters employees
- U.S. diplomatic cables
- One million confidential/secret U.S. government documents
- WikiLeaks is a public corporation with known leadership

Case Studies

Case 3: Hackers—Public Enemies or Gadflies? (continued)

Anonymous

- Primarily interested in freedom of speech
- No official leader or organizing body
- Amorphous, secret membership
- DOS attack in retribution for sanctions against WikiLeaks
- Attacks on government sites in Tunisia, Egypt, Libya
- Publication of e-mails from corporations

Case Studies

Case 3: Hackers—Public Enemies or Gadflies? (continued)

Analogy: Breaking into a computer is like breaking into someone's house

- Similarities:

- Intruders are there without permission
- Owners take precautions to discourage intrusion
- Both are against the law

- Differences

- Burglars take physical objects, depriving owner
- Hackers, here, **copy** intellectual property
- No threat of violence with hacking

Case Studies

Case 3: Hackers—Public Enemies or Gadflies? (continued)

Utilitarian arguments

- Owner of information loses control over it
- Hacker gains access to information
- Owner must increase security
 - Increased awareness of vulnerability may be good
 - Increased security only required because of hackers
- Hard to see consequences
- Must we distinguish between “good hackers” and “bad hackers”?

Case Studies

Case 3: Hackers—Public Enemies or Gadflies? (continued)

Deontological arguments

- **Deontology**: the study of duty and obligation
- Focus on duties of actor and effect on other's rights
- Categorical imperative (Kant):
 - Never treat a fellow human merely as a means to an end
- Focus on intent of an action, not consequences
- Hackers for personal gain are unethical; ignore them
- Focus on hackers who claim benign intent

Case Studies

Case 3: Hackers—Public Enemies or Gadflies? (continued)

Parts of the hacker ethic (Steven Levy):

- “All Information Should Be Free”
 - To make decisions, people need good information
 - Hackers should always spread information
- “Mistrust Authority—Promote Decentralization”
 - Bureaucracies and rules prevent things from getting done
 - Each hacker should act individually as she or he sees best

Case Studies

Case 3: Hackers—Public Enemies or Gadflies? (continued)

Ethical critique of hacker ethic

- The information being shared does not belong to the hacker
- Does not respect other people's wishes or safety
- Rules exist because we, as a society, expect electronic privacy
- Why should their ethic override other people's wishes
- Does hacking treat other people as a means to an end?

Case Studies

Thinking Straight About Technology and Ethics

- “Paramedic Ethics:” know a little and know when to ask
- Ask these questions when facing an ethical problem:
 - Who are the stakeholders in this situation?
 - What does each stakeholder have to gain or lose?
 - What duties and responsibilities are important?
 - Can you think of an analogous situation? Does it clarify the situation?
 - Make a decision or repeat in dialectic form

Case Studies

Case 4: Genetic Information and Medical Research

- Fictional ethical situation:

Family doctor asks you to participate in a study of genetic diversity and disease by donating some skin cells. Cells are identified by a randomly assigned number and your zip code. Should you donate?

- Who are the stakeholders?

- You
- Family doctor
- Pharmaceutical company, “PHARM CO”
- Skin cell donors to study, in general
- People with genetic disease

Case Studies

Case 4: Genetic Information and Medical Research (continued)

- What is at stake?
 - You lose a few skin cells
 - Your privacy:
 - PHARM CO may seek to learn your identity
 - Transmission of genetic data could be intercepted
 - Your doctor might be paid for finding participants
 - PHARM CO may develop new drugs
 - Drugs could help people with genetic diseases

Case Studies

Case 4: Genetic Information and Medical Research (continued)

- Identify duties and responsibilities
 - Doctor has duty to treat you and protect your privacy
 - You have a duty to pay doctor and follow instructions
 - PHARM CO has duty to develop safe drugs
 - PHARM CO has promised to pay doctors for finding participants
 - PHARM CO has promised to respect your privacy

Case Studies

Case 4: Genetic Information and Medical Research (continued)

- More complex duties and responsibilities
 - Should you get royalties if your information leads to a profitable drug?
 - Does PHARM CO own genetic information, or should it be shared freely?
 - Why is zip code is part of encoding?
 - Do you have a duty to help cure disease?

Case Studies

Case 4: Genetic Information and Medical Research (continued)

- Think of analogies
 - Compare to Red Cross blood donations
 - Both involve confidential health information
 - Both ask for volunteer donors
 - Both have collectors and users who are paid
 - Both involve altruistic reasons for donation
 - Blood is the valuable item, genetic information in skin cells is the value
 - Company might or might not find usefulness in cells
 - Company driven by profit and loss

Case Studies

Case 4: Genetic Information and Medical Research (continued)

- Think of analogies
 - Compare to for-profit companies that solicit money for a charity
 - Confidentiality is an issue for both
 - In both, volunteers are asked to donate by someone with financial interest in the donation
 - Both involve altruistic motivations
 - One involves donated money, the other does not
 - Doctor and pharmaceutical roles don't quite match for-profit company

Case Studies

Case 4: Genetic Information and Medical Research (continued)

- Make a decision or loop again
 - Must you decide right now (while at the doctor)?
 - Should you do more research?
 - Should you ask others?
- Might choose to decline unless you know more about PHARM CO's use of your information, especially given the financial interests of other stakeholders

Personal Privacy and Social Networks

- Apply the reasoning from case studies to more personal ethical issues
- **Cyberbullying**: humiliating, taunting, threatening, invading someone's privacy online
- **Sexting**: sending sexually explicit messages or images using cell phones or tablet computers
- Privacy expectations for public postings to social networks

Personal Privacy and Social Networks (continued)

- Cyberbullying examples
 - Megan Meier committed suicide after being harassed on MySpace. Harasser was mother of former friend
 - Information posted to Craigslist led to young girl receiving sexual phone calls and e-mails
 - Tyler Clementi committed suicide after his roommate posted a recording of a sexual encounter with another man
- Laws lag behind the problem
- First amendment protections complicate the issue

Personal Privacy and Social Networks (continued)

- Sexting between consenting adults is legal
 - Images intended to be private between two individuals may not stay that way
 - Once something is posted on the Internet, it is there forever
- Sexting involving minors may be considered child pornography, even if perpetrator is the “child”

Personal Privacy and Social Networks (continued)

- Privacy expectations with public postings online:
 - Student posted nasty story on MySpace about her hometown, she deleted it six days later
 - Hometown high school principal saw the story, gave it to the local newspaper
 - Newspaper printed it as a letter to the editor
 - Family was threatened, lost business, had to move away
- Courts found that she should have no expectation of privacy when making a public posting on MySpace

Personal Privacy and Social Networks (continued)

- Assume that anything sent or posted online
 - May become widely distributed and public
 - Will last forever
- Don't post something if:
 - You don't want a large number of people to see it
 - You would be embarrassed to have it widely circulated (to parents, employers, etc.)
 - The material could be considered libelous or defamatory
 - The information is private and of a sexual nature

Summary

- Computer technology intrinsically involves new social and ethical issues
- **Ethical reasoning** provides a framework for analyzing ethical issues
- **Utilitarianism** evaluates an act based on its consequences
- A **dialectic** is a comparative discussion of opposing sides intended to clarify and improve understanding
- **Reasoning by analogy** can clarify issues of an ethical problem

Summary (continued)

- **Deontological reasoning** focuses on intent rather than outcomes
- Ethical issues with information technology include:
 - Copyright protections in an era of file sharing
 - Personal privacy and lawful intercept laws
 - Hackers who claim to be a social good
 - Privacy and the protection of personal information
 - Cyberbullying, sexting and distribution of online postings