Ch.2

The Ethical Point of View
- **Most everyone shares "core values", desiring:** Life & Happiness & Ability to accomplish goals
- **Two ways to view world** Selfish point of view: consider only own self and its core values
  - **Ethical point of view:** respect other people and their core values

- **Society** Association of people organized under a system of rules || **Rules:** advance the good of members over time
- **Morality** A society's rules of conduct || What people ought / ought not to do in various situations
- **Ethics** Rational examination of morality & Evaluation of people's behavior

Why Study Ethics?
- **Ethics:** a way to decide the best thing to do
- **Workable ethical theory:** produces explanations that might be persuasive to a skeptical, yet open-minded audience

Perfect and Imperfect Duties
- **Perfect duty:** duty obliged to fulfill without exception **Example: Telling the truth**
- **Imperfect duty:** duty obliged to fulfill in general but not in every instance **Example: Helping others**

Bentham: Weighing Pleasure/Pain Intensity || Duration || Certainty || Propinquity || Fecundity || Purity || Extent

Kinds of Rights
1. **Negative right:** A right that another can guarantee by leaving you alone
2. **Positive right:** A right obligating others to do something on your behalf
3. **Absolute right:** A right guaranteed without exception
4. **Limited right:** A right that may be restricted based on the circumstances

Correlation between Types of Rights Positive rights tend to be more limited || Negative rights tends to be more absolute

Objectivism vs. Relativism
- **Objectivism:** Morality has an existence outside the human mind
- **Relativism:** Morality is a human invention
- Kantianism, utilitarianism, and social contract theory examples of objectivism

Not a workable ethical theories

	Subjective Relativism	Cultural Relativism	Divine Command Theory	Ethical Egoism
Definition	Each person decides right and wrong for himself or herself	What is "right" and "wrong" depends upon a society's actual moral guidelines	Good actions: those aligned with God's will Bad actions: those contrary to God's will	Each person should focus exclusively on his or her self-interest
Case for	• Well-meaning and intelligent people disagree on moral issues • Ethical debates are disagreeable and pointless	• Different social contexts demand different moral guidelines • It is arrogant for one society to judge another	• We owe obedience to our Creator • God is all-good and all-knowing • God is the ultimate authority	• It is practical since we are already inclined to do what's best for ourselves • It's better to let other people take care of themselves • The community can benefit when individuals put their well-being first • Other moral principles are rooted in the principle of self-interest
Case against	• Blurs distinction between doing what you think is right and doing what you want to do • Makes no moral distinction between the actions of different people • SR and tolerance are two different things • Decisions may not be based on reason	• It doesn't explain how moral guidelines are determined • What if there are no cultural norms? • It provides no way out for cultures in conflict • Only indirectly based on reason	• Different holy books disagree • Society is multicultural, secular • Some modern moral problems not addressed in scripture • Based on obedience, not reason	• We know a lot about what is good for someone else • Self-interest can lead to blatantly immoral behavior • Other moral principles are superior to principle of self-interest • People who take the good of others into account lead happier lives

workable ethical theories

	Kantianism	Act Utilitarianism	Rule Utilitarianism	Social Contract Theory
Definition	**Categorical Imperative (1st Formulation)** Act only from moral rules that you can at the same time will to be universal moral laws **2nd Formulation of Categorical Imperative** Act so that you treat both yourself and other people as ends in themselves and never only as a means to an end.	An action is right (or wrong) to the extent that it increases (or decreases) the total happiness of the affected parties.	We ought to adopt moral rules which, if followed by everyone, will lead to the greatest increase in total happiness	We implicitly accept a social contract In ideal society, no one above rules That prevents society from enacting bad rules
Case for	• Rational • Produces universal moral guidelines • Treats all persons as moral equals	• Focuses on happiness • Down-to-earth (practical) • Comprehensive	• Compared to act utilitarianism, it is easier to perform the utilitarian calculus. • Not every moral decision requires performing utilitarian calculus. • Moral rules survive exceptional situations • Avoids the problem of moral luck	• Framed in language of rights • Explains why people act in self-interest without common agreement • Provides clear analysis of certain citizen/government problems
Case against	• Sometimes no rule adequately characterizes an action • Sometimes there is no way to resolve a conflict between rules • Kantianism allows no exceptions to perfect duties	• Unclear whom to include in calculations • Too much work • Ignores our innate sense of duty • Susceptible to the problem of moral luck	• Utilitarianism ignores the problem of an unjust distribution of good consequences. • All consequences must be measured on a single scale.	• No one signed contract • Some actions have multiple characterizations • Conflicting rights problem • May unjustly treat people who cannot uphold contract

Ch.3

How Email Works
- Email: Messages embedded in files transferred between computers
- Email address: Uniquely identifies cyberspace mailbox
- Messages broken into packets
- Routers transfer packets from sender's mail server to receiver's mail server

The Spam Epidemic (1/3)
- Spam: Unsolicited, bulk email || Spam is profitable

The Spam Epidemic (3/3)
- **How firms get email addresses**
  1. Web sites, chat-room conversations, newsgroups
  2. Computer viruses harvest addresses from PC address books
  3. Dictionary attacks
  4. Contests
- Most spam sent out by bot herders who control huge networks of computers
- Spam filters block most spam before it reaches users' inboxes

Attributes of the Web
1. It is decentralized   2. Every Web object has a unique address   3. It is based on the Internet

Forms of Direct Censorship
1. Government monopolization   2. Prepublication review   3. Licensing and registration

Challenges Posed by the Internet 1. Many-to-many communications   **2.** Dynamic connections   **3.** Huge numbers of Web sites
4. Extends beyond national borders, laws   **5.** Hard to distinguish between minors and adults

Web Filters Web filter: Software that prevents display of certain Web pages **&** May be installed on an individual PC

Methodologies
1. Maintain "black list" of objectionable sites
2. Examine content for objectionable words/phrases

Sexting Definition: sexually suggestive text messages or emails with nude or nearly nude photographs

Identity Theft (1/2)
- **Identity theft:** When a person uses another person's electronic identity
- Leading form of identity theft is credit card fraud

- Financial institutions contribute to problem by making it easy to open new accounts
- **Phishing:** Use of email to attempt to deceive people into revealing personal information

Chat-Room Predators

- **Chat room:** Supports real-time discussions among many people connected to network
- Instant messaging and chat rooms replacing telephone for many people

Cyberbullying Cyberbullying: Use of the Internet or phone system to inflict psychological harm

Is Internet Addiction Real?

- Traditional definition of addiction: Compulsive use of harmful substance or drug & Knowledge of its long-term harm
- Others disagree, noting
  1. Computer use is generally considered a positive activity
  2. Excessive use does not lead to criminal activity
  3. More accurate to call excessive use a compulsion

Contributing Factors

1. **Social factors** Peer groups
2. **Situational factors** Stress & Lack of social support and intimacy & Limited opportunities for productive activity
3. **Individual factors** Tendency to pursue activities to excess & Lack of achievement & Fear of failure

Ch.4

What Is Intellectual Property?

- **Intellectual property:** any unique product of the human intellect that has commercial value
  – Books, songs, movies || Paintings, drawings || Inventions, chemical formulas, computer programs

Benefits of Intellectual Property Protection	Limits to Intellectual Property Protection
1. Some people are altruistic; some are not	1. Giving creators rights to their inventions stimulates creativity
2. Allure of wealth can be an incentive for speculative work	2. Society benefits most when inventions in public domain
3. Authors of U.S. Constitution recognized benefits to limited intellectual property protection	3. Congress has struck compromise by giving authors and inventors rights for a limited time

Trade Secret

- **Confidential piece of intellectual property that gives company a competitive advantage**
- Never expire | Not appropriate for all intellectual properties

Trademark, Service Mark

- **Trademark:** Identifies goods   **Service mark**: Identifies services

Patent A public document that provides detailed description of invention **&** Provides owner with exclusive right to the invention **&** Owner can prevent others from making, using, or selling invention for 20 years

Copyright

- **Provides owner of an original work five rights**
  1. Reproduction 2. Distribution 3. Public display 4. Public performance 5. Production of derivative works

Fair Use Concept

- **Courts consider four factors**
  1. Purpose and character of use
  2. Nature of work
  3. Amount of work being copied
  4. Affect on market for work

4.5 New Restrictions on Use

Digital Rights Management

– Actions owners of intellectual property take to protect their rights
– **Approaches**
  1. Encrypt digital content
  2. Digital marking so devices can recognize content as copy-protected

4.6 Peer-to-Peer Networks

Peer-to-Peer Networks Facilitate Data Exchange

– Peer-to-peer network
– Transient network
– Connects computers running same networking program
– Computers can access files stored on each other's hard drives
– How P2P networks facilitate data exchange
– Give each user access to data stored in many other computers
– Support simultaneous file transfers among arbitrary pairs of computers
– Allow users to identify systems with faster file exchange speeds

Napster

– Peer-to-peer music exchange network

BitTorrent

– Broadband connections: download much faster than upload
– BitTorrent speeds downloading
  – Files broken into pieces
  – Different pieces downloaded from different computers

- Used for downloading large files
  - Computer programs
  - Television shows
  - Movies

Legal Music Services on the Internet
- Subscription services for legal downloading
- Some based on monthly fee; some free
- Consumers pay for each download

4.7 Protections for Software

Violations of Software Copyrights
- Copying a program to give or sell to someone else
- Preloading a program onto the hard disk of a computer being sold
- Distributing a program over the Internet

Software Patents (2/3)
- **Secondary market for software patents**
  - **Patent trolls:** Companies that specialize in buying patents and enforcing patent rights

Consequences of Proprietary Software
- Increasingly harsh measures being taken to enforce copyrights
- Copyrights are not serving their purpose of promoting progress
- It is wrong to allow someone to "own" a piece of intellectual property

Open-Source Definition
- No restrictions preventing others from selling or giving away software
- Source code included in distribution
- No restrictions preventing others from modifying source code
- No restrictions regarding how people can use software

Beneficial Consequences of Open-Source Software
- Gives everyone opportunity to improve program
- New versions of programs appear more frequently
- Eliminates tension between obeying law and helping others
- Programs belong to entire community
- Shifts focus from manufacturing to service

Examples of Open-Source Software
- BIND | Apache | Sendmail | Android operating system for smartphones | Firefox | OpenOffice.org | Perl, Python, Ruby, TCL/TK, PHP, Zope | GNU compilers for C, C++, Objective-C, Fortran, Java, and Ada

Impact of Open-Source Software
- Linux putting pressure on companies selling proprietary versions of Unix
- Linux putting pressure on Microsoft and Apple desktops

Ch.5

Perspectives on Privacy

Defining Privacy
- Privacy related to notion of access
- Access
  - Physical proximity to a person
  - Knowledge about a person
- Privacy is a "zone of inaccessibility"
- Privacy violations are an affront to human dignity
- Too much individual privacy can harm society

Harms of Privacy	**Benefits of Privacy**
- Cover for illegal or immoral activities - Burden on the nuclear family - Hidden dysfunctional families - Ignored people on society's fringes	- Individual growth - Individual responsibility - Freedom to be yourself - Intellectual and spiritual growth - Development of loving, trusting, caring, intimate relationships

Is There a Natural Right to Privacy? Conclusion: Privacy is not a natural right, but it is a prudential right

5.3 Information Disclosures

Public Records
- **Public record:** information about an incident or action reported to a government agency for purpose of informing the public
- **Examples:** birth certificates, marriage licenses, motor vehicle records, criminal records, deeds to property
- Computerized databases and Internet have made public records much easier to access

Records Held by Private Organizations
- Credit card purchases
- Purchases made with loyalty cards

- Voluntary disclosures
- Posts to social network sites

Data Gathering and Privacy Implications

- Facebook tags || Enhanced 911 services || Rewards or loyalty programs || Body scanners || RFID tags
- Implanted chips || OnStar || Automobile "black boxes" || Medical records || Digital video recorders || Cookies and flash cookies

Facebook Tags

- **Tag:** Label identifying a person in a photo
- Facebook allows users to tag people who are on their list of friends
- Facebook uses facial recognition to suggest name of friend appearing in photo

Enhanced 911 Services

- Cell phone providers in United States required to track locations of active cell phones to within 100 meters
- Allows emergency response teams to reach people in distress

Rewards or Loyalty Programs

- Shoppers who belong to store's rewards program can save money on many of their purchases
- Computers use information about buying habits to provide personalized service
  - **ShopRite computerized shopping carts with pop-up ads**

Body Scanners

- Some department stores have 3-D body scanners
- Computer can use this information to recommend clothes
- Scans can also be used to produce custom-made clothing

RFID Tags

- **RFID:** Radio frequency identification

Implanted Chips

- **Taiwan:** Every domesticated dog must have an implanted microchip
  - Size of a grain of rice; implanted into ear | Chip contains name, address of owner
  - Allows lost dogs to be returned to owners

OnStar

- OnStar manufactures communication system incorporated into rear-view mirror
- Emergency, security, navigation, and diagnostics services provided subscribers
- Two-way communication and GPS
- Automatic communication when airbags deploy
- Service center can even disable gas pedal

Automobile "Black Boxes"

- Modern automobiles come equipped with a "black box"
- **Maintains data for five seconds:**
  - Speed of car
  - Amount of pressure being put on brake pedal
  - Seat belt status
- After an accident, investigators can retrieve and gather information from "black box"

Medical Records

- Advantages of changing from paper-based to electronic medical records
- Quicker and cheaper for information to be shared among caregivers
  - Lower medical costs
  - Improve quality of medical care

Digital Video Recorders

- TiVo service allows subscribers to record programs and watch them later
- TiVo collects detailed information about viewing habits of its subscribers

Cookies

- **Cookie:** File placed on computer's hard drive by a Web server and Contains information about visits to a Web site
- Allows Web sites to provide personalized services and Put on hard drive without user's permission

Flash Cookies

- **Flash cookie:** File placed on your computer's hard drive by a Web server running the Adobe Flash Player
- **Flash cookie** can hold 25 times as much information as a browser cookie
- **Flash cookies** not controlled by browser's privacy controls and Some Web sites use flash cookies as a way of backing up browser cookies. If you delete browser cookie, it can be "respawned" from the flash cookie

Data Mining

- Searching records in one or more databases, looking for patterns or relationships Can be used to profiles of individuals and Allows companies to build more personal relationships with customers

Google's Personalized Search

- Secondary use: Information collected for one purpose use for another purpose
- Google keeps track of your search queries and Web pages you have visited
  - It uses this information to infer your interests and determine which pages to return

Collaborative Filtering

- Form of data mining

- Analyze information about preferences of large number of people to predict what one person may prefer
  - **Explicit method:** people rank preferences
  - **Implicit method:** keep track of purchases
- Used by online retailers and movie sites

Ownership of Transaction Information

- Who controls transaction information? Buyer? || Seller? || Both?
- **Opt-in:** Consumer must explicitly give permission before the organization can share info
- **Opt-out:** Organization can share info until consumer explicitly forbid it
- **Opt-in is** a barrier for new businesses, so direct marketing organizations prefer opt-out

Microtargeting

- Political campaigns determine voters most likely to support particular candidates
  - Voter registration
  - Voting frequency
  - Consumer data
  - GIS data
- Target direct mailings, emails, text messages, home visits to most likely supporters

Ch.6

Solove's Taxonomy of Privacy

- **Information collection:** Activities that gather personal information
- **Information processing:** Activities that store, manipulate, and use personal information that has been collected
- **Information dissemination**: Activities that spread personal information
- **Invasion:** Activities that intrude upon a person's daily life, interrupt someone's solitude, or interfere with decision-making

6.2 U.S. Legislation Restricting   Information Collection

Employee Polygraph Protection Act

- Prohibits private employers from using lie detector tests under most conditions
- Cannot require test for employment
- **Exceptions**
  - Pharmaceutical companies and security firms may give test to certain classes of employees
  - Employers who have suffered a theft may administer tests to reasonable suspects
  - Federal, state, and local governments exempt

Children's Online Privacy Protection Act

- Reduces amount of public information gathered from children
- Online services must gain parental consent before collecting information from children 12 and under

Census Records Census required to ensure every state has fair representation

Internal Revenue Service Records

- **Income tax forms** contain a tremendous amount of personal information: income, assets, to whom you make charitable contributions, medical expenses, and more

4th Amendment to U.S. Constitution

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized."

6.5 U.S. Legislation Authorizing   Wiretapping

Electronic Communications Privacy Act

- Allows police to attach two kinds of surveillance devices to a suspect's phone line
  - Pen register: displays number being dialed
  - **Trap-and-trace device:** displays caller's phone number

Stored Communications Act

- Part of Electronic Communications Privacy Act
- Government does not need a search warrant to obtain from an Internet service provider email messages more than 180 days old

Communications Assistance for Law Enforcement Act

- Designed to ensure police can still do wiretapping as digital networks are introduced
- FBI asked for new abilities, such as ability to intercept digits typed by caller after phone call placed

6.6 USA PATRIOT Act

USA PATRIOT Act

− **Provisions**	− **Critics say Act undermines 4th Amendment rights**
1. Greater authority to monitor communications 2. Greater powers to regulate banks 3. Greater border controls 4. New crimes and penalties for terrorist activity	1. Pen registers on Web browsers 2. Roving surveillance 3. Searches and seizures without warrants 4. Warrants issued without need for showing probable cause

Code of Fair Information Practices

- No secret databases

- People should have access to personal information in databases
- Organizations cannot change how information is used without consent
- People should be able to correct or amend records
- Database owners, users responsible for reliability of data and preventing misuse

Legislation for Private Institutions
- Fair Credit Reporting Act
- Fair and Accurate Credit Transactions Act
- Financial Services Modernization Act

Fair Credit Reporting Act
- Promotes accuracy and privacy of information used by credit bureaus
- **Major credit bureaus:** Equifax, Experian, Trans Union

Financial Services Modernization Act
- **Privacy-related provisions**
    - Privacy policies must be disclosed to customers
    - Notices must provide an opt-out clause
    - Companies must develop procedures to protect customers' confidential information

Definition of Data Mining
Process of searching through one or more databases looking for patterns or relationships among the data

IRS Audits
- **Computer matching:** matching tax form information with information provided by employers, banks, etc.
- **Data mining:** searching through forms to detect those that appear most likely to have errors resulting in underpayment of taxes

Health Insurance Portability and Accountability Act
- Limits how doctors, hospitals, pharmacies, and insurance companies can use medical information
- Health care providers need signed authorization to release information
- Health care providers must provide patients with notice describing how they use medical information

Ch.7

7.2 Hacking

Hackers, Past and Present
- **Original meaning of hacker:** explorer, risk taker, system innovator
- **Modern meaning of hacker:** someone who gains unauthorized access to computers and computer networks

Obtaining Login Names and Passwords
- Eavesdropping
- Dumpster diving
- Social engineering

Computer Fraud and Abuse Act
    - Transmitting code that damages a computer
    - Accessing any Internet-connected computer without authorization
    - Transmitting classified government information
    - Trafficking in computer passwords
    - Computer fraud
    - Computer extortion

Sidejacking
- **Sidejacking:** hijacking of an open Web session by capturing a user's cookie
- **Sidejacking** possible on unencrypted wireless networks because many sites send cookies "in the clear"
- Internet security community complained about sidejacking vulnerability for years, but ecommerce sites did not change practices

7.3 Malware

Viruses
- Virus: Piece of self-replicating code embedded within another program (host). Viruses associated with program files
    - Hard disks, floppy disks, CD-ROMS
    - Email attachments
- *How viruses spread* Diskettes or CDs | Email | Files downloaded from Internet

Antivirus Software Packages
- Allow computer users to detect and destroy viruses | Must be kept up-to-date to be most effective | Many people do not keep their antivirus software packages up-to-date | Consumers need to beware of fake antivirus applications

Worm Self-contained program **and** Spreads through a computer network **and** Exploits security holes in networked computers

Cross-site Scripting **Another way malware may be downloaded without user's knowledge**
- Problem appears on Web sites that allow people to read what others have posted
- Attacker injects client-side script into a Web site
- Victim's browser executes script, which may steal cookies, track user's activity, or perform another malicious action

Drive-by Downloads
- Unintentional downloading of malware caused by visiting a compromised Web site
- Also happens when Web surfer sees pop-up window asking permission to download software and clicks "Okay"

Trojan Horses and Backdoor Trojans
- **Trojan horse:** Program with benign capability that masks a sinister purpose

– **Backdoor Trojan:** Trojan horse that gives attack access to victim's computer

Rootkits

– **Rootkit:** A set of programs that provides privileged access to a computer
– Activated every time computer is booted and Uses security privileges to mask its presence

Spyware and Adware

– **Spyware:** Program that communicates over an Internet connection without user's knowledge or consent
– Monitor Web surfing
– Log keystrokes
– Take snapshots of computer screen
– Send reports back to host computer
   Adware: Type of spyware that displays pop-up advertisements related to user's activity
– **Backdoor Trojans often used** to deliver spyware and adware

Bots

– **Bot:** A kind of backdoor Trojan that responds to commands sent by a command-and-control program on another computer
– **First bots supported legitimate activities**
   – Internet Relay Chat
   – Multiplayer Internet games
– **Other bots support illegal activities**
   – Distributing spam
   – Collecting person information for ID theft
   – Denial-of-service attacks

Botnets and Bot Herders

– **Botnet:** Collection of bot-infected computers controlled by the same command-and-control program
– Some botnets have over a million computers in them
– **Bot herder:** Someone who controls a botnet

Defensive Measures

– **Security patches:** Code updates to remove security vulnerabilities
– **Anti-malware tools:** Software to scan hard drives, detect files that contain viruses or spyware, and delete these files
– **Firewall:** A software application installed on a single computer that can selectively block network traffic to and from that computer

7.4 Cyber Crime and Cyber Attacks

Phishing and Spear-phishing

– **Phishing:** Large-scale effort to gain sensitive information from gullible computer users
   – **New development:** phishing attacks on Chinese e-commerce sites
– Spear-phishing: Variant of phishing in which email addresses chosen selectively to target particular group of recipients

SQL Injection

– Method of attacking a database-driven Web application with improper security
– Attack inserts (injects) SQL query into text string from client to application
– Application returns sensitive information

Denial-of-service and Distributed Denial-of-service Attacks

– **Denial-of-service attack:** Intentional action designed to prevent legitimate users from making use of a computer service
– Aim of a DoS attack is not to steal information but to disrupt a server's ability to respond to its clients
– **Distributed denial-of-service attack:** DoS attack launched from many computers, such as a botnet

Cyber Crime

– Criminal organizations making significant amounts of money form malware

Supervisory Control and Data Acquisition (SCADA) Systems

– Industrial processes require constant monitoring
– Computers allow automation and centralization of monitoring
– Today, SCADA systems are open systems based on Internet Protocol
   – Less expensive than proprietary systems
   – Easier to maintain than proprietary systems
   – Allow remote diagnostics

7.5 Online Voting

Benefits of Online Voting	– Risks of Online Voting
– More people would vote	– Gives unfair advantage to those with home computers
– Votes would be counted more quickly	– More difficult to preserve voter privacy
– No ambiguity with electronic votes	– More opportunities for vote selling
– Cost less money	– Obvious target for a DDoS attack
– Eliminate ballot box tampering	– Security of election depends on security of home computers
– Software can prevent accidental over-voting	– Susceptible to vote-changing virus or RAT
– Software can prevent under-voting	– Susceptible to phony vote servers
	– No paper copies of ballots for auditing or recounts

8.1 Introduction

Computer systems are sometimes unreliable	Effects of computer errors
– Erroneous information in databases – Misinterpretation of database information – Malfunction of embedded systems	– Inconvenience – Bad business decisions – Fatalities

Two Kinds of Data-related Failure
1. A computerized system may fail because wrong data entered into it
2. A computerized system may fail because people incorrectly interpret data they retrieve

Position of Privacy Advocates
– Number of records is increasing
– More erroneous records → more false arrests
– Accuracy of NCIC records more important than ever

8.3 Software and Billing Errors

Errors When Data Are Correct
– Assume data correctly fed into computerized system
– System may still fail if there is an error in its programming

Analysis: E-Retailer Posts Wrong Price, Refuses to Deliver
– Amazon.com in Britain offered iPaq for £7 instead of £275
– Orders flooded in
– Amazon.com shut down site, refused to deliver unless customers paid true price
– Was Amazon.com wrong to refuse to fill the orders?

Rule Utilitarian Analysis	Kantian Analysis
Imagine rule: A company must always honor the advertised price Consequences More time spent proofreading advertisements Companies would take out insurance policies Higher costs → higher prices All consumers would pay higher prices Few customers would benefit from errors **Conclusion** Rule has more harms than benefits Amazon.com did the right thing	Buyers knew 97.5% markdown was an error They attempted to take advantage of Amazon.com's stockholders They were not acting in "good faith" Buyers did something wrong

8.4 Notable Software System Failures
Patriot Missile Designed as anti-aircraft missile

Software Errors
– **Race condition:** order in which two or more concurrent tasks access a shared variable can affect program's behavior
– **Two race conditions in Therac-25 software**
  – Command screen editing
  – Movement of electron beam gun

Post Mortem
– **Software lessons**
  – Difficult to debug programs with concurrent tasks
  – Design must be as simple as possible
  – Documentation crucial
  – Code reuse does not always lead to higher quality

8.6 Computer Simulations

Uses of Simulations
– Simulations replace physical experiments
  – Experiment too expensive or time-consuming
  – Experiment unethical
  – Experiment impossible
  – Model past events - Understand world around us - Predict the future

Validating Simulations
– **Verification:** Does program correctly implement model?   **Validation:** Does the model accurately represent the real system?
– **Validation methods**
  1. Make prediction, wait to see if it comes true
  2. Predict the present from old data
  3. Test credibility with experts and decision makers

8.7 Software Engineering

Specification	Development	Validation (Testing)

– Determine system requirements
– Understand constraints
– Determine feasibility
– **End products**
  – High-level statement of requirements
  – Mock-up of user interface
  – Low-level requirements statement
	– Create high-level design
	– Discover and resolve mistakes, omissions in specification
	– CASE tools to support design process
	– Object-oriented systems have advantages
	– After detailed design, actual programs written
	– Result: working software system
		– Ensure software satisfies specification
		– Ensure software meets user's needs
		– Challenges to testing software
		  – Noncontinuous responses to changes in input
		  – Exhaustive testing impossible
		  – Testing reveals bugs, but cannot prove none exist
		– Test modules, then subsystems, then system

Ch.9

9.1 Introduction
– **Informally, profession a vocation requiring :** High level of education & Practical experience
– We pay professionals well ; Doctors & Lawyers
– **We trust professionals to…**
  – Correctly ascertain and treat problems
  – Take actions for the good of their clients

Characteristics of a Profession
1. Initial professional education   2. Accreditation   3. Skills development   4. Certification   5. Licensing
  6. Professional development   7. Code of ethics   8. Professional society

Computer-Related Careers
1. Certification and licensing not required
2. College degree not required
3. Apprenticeship not required
4. Membership in professional society optional
5. No specific requirements for continuing education
6. Most computer programmers, system analysts, etc. are part of teams
7. Ability to harm public can be similar to members of mature professions

9.3 Software Engineering Code of Ethics
Preamble of Code
– Software engineers have opportunities to do good or do harm Software engineer's ought to be committed to doing good
– Eight principles identify key ethical relationships and obligations within these relationship

Eight Principles Identify Morally Responsible Relationships
1. Public 2. Client and employer 3. Product 4. Judgment 5. Management 6. Profession 7. Colleagues 8. Self

Act Consistently with Public Interest	Act in Best Interest of Client, Employer	Ensure Products Meet Highest Standards
1.01 "Accept full responsibility for own work" 1.02 Balance competing interests 1.03 Approve software only if it is safe 1.04 Disclose actual/potential dangers 1.05 "Cooperate in efforts to address" public concerns 1.06 "Be fair and avoid deception in all statements" 1.07 Consider factors that diminish access to software 1.08 "Volunteer professional skills to good causes"	2.01 Act within areas of competence 2.02 Don't use software obtained illegally 2.03 Only use property in authorized ways 2.04 Ensure documents are approved 2.05 Respect confidentiality 2.06 Promptly report problems with project 2.07 Report issues of social concern 2.08 Refuse outside work detrimental to job 2.09 Put employer's/client's interests first, unless overriding moral concern	3.01 Aim for "high quality, acceptable cost and a reasonable schedule," making trade-offs clear 3.02 "Ensure proper and achievable goals" 3.03 Face up to "ethical, economic, cultural, legal and environmental" issues 3.04 Ensure you are qualified for proposed work 3.05 Use appropriate project methodologies 3.06 Follow the most appropriate professional standards 3.07 "Strive to fully understand the specifications" 3.08 Ensure the specifications are correct and approved 3.09 "Ensure realistic quantitative estimates of cost, scheduling, personnel, quality and outcomes" 3.10 "Ensure adequate testing, debugging, and review of software and related documents" 3.11 "Ensure adequate documentation" 3.12 Develop software and documents that respect privacy of those affected by software 3.13 Use only accurate data appropriately acquired 3.14 Maintain data integrity 3.15 Use same standards for software maintenance as software development

Maintain Integrity in Professional Judgment	Promote Effective Project Management	Advance the Profession

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4.01 "Temper all technical judgments by the need to support and maintain human values" 4.02 Understand and agree with documents before endorsing them 4.03 Remain objective when evaluating software or related documents 4.04 Do not engage in deceptive financial practices 4.05 Disclose conflicts of interest 4.06 Do not participate in decisions in which you, your employer, or your client has a potential conflict of interest	5.01 Ensure good project management procedures 5.02 Ensure software engineers know standards 5.03 Ensure software engineers know policies and procedures for protecting confidential information 5.04 Take employees' abilities into account before assigning work 5.05 Ensure reasonable estimates are made 5.06 Give full and accurate information to potential employees 5.07 Pay employees fairly 5.08 Do not unjustly prevent a qualified person from taking a job 5.09 Work out fair intellectual property agreements 5.10 Provide employees charged with misconduct due process 5.11 Do not ask someone to do anything violating the Code 5.12 "Do not punish anyone for expressing ethical concerns about a project"	6.01 Help create an environment supporting ethical conduct 6.02 "Promote public knowledge of software engineering" 6.03 Participate in professional activities 6.04 Support others who are trying to follow this Code 6.05 Do not promote self-interest at expense of profession, client, or employer 6.06 Obey all laws unless there is an overriding public interest 6.07 Do not deceive others regarding the characteristics of software 6.08 Take responsibility for finding, correcting, and reporting errors in software and documentation 6.09 Ensure others know you are committed to the Code and what that means 6.10 Do not associate with businesses and organizations that are in conflict with Code 6.11 Understand violating the Code is inconsistent with being a professional 6.12 Share concerns about Code violations with the people involved 6.13 "Blow the whistle" when no alternative to reporting significant Code violations

Be Fair to and Supportive of Colleagues	Participate in Lifelong Learning
7.01 "Encourage colleagues to adhere to this Code" 7.02 "Assist colleagues in professional development" 7.03 Give others the credit they deserve 7.04 Be objective when reviewing the work of others 7.05 Give colleagues a fair hearing 7.06 Help colleagues remain aware of work practices 7.07 Do not unfairly interfere with another's career, but protect the public interest 7.08 Bring in experts for situations outside your own area of competence.	8.01 Stay current with developments in field 8.02 Improve ability to create high quality software 8.03 Improve ability to produce high quality documentation 8.04 Improve understanding of software and documentation used in work 8.05 Improve knowledge of relevant standards 8.06 Improve knowledge of this Code and its application 8.07 Do not treat others unfairly because of prejudices 8.08 Do not influence others to break the Code 8.09 "Recognize that personal violations of this Code are inconsistent with being a professional software engineer"

Origin of Virtue Ethics
- **Intellectual virtue:** developed through education
- **Moral virtue:** developed by repeating appropriate acts
- **Some virtues:** Benevolence, courage, fairness, generosity, honesty, loyalty, patience, tolerance
- **A person of strong moral character**
  - possesses many virtues
  - knows right thing to do in each situation

Strengths of Virtue Ethics
- Provides a motivation for good behavior
- Provides a solution to the problem of impartiality
  - Some virtues are partial (e.g., generosity)
  - Other virtues must be impartial (e.g., honesty)

Alternative, Discipline-Independent List of Fundamental Principles
1. Be impartial.   Disclose information that others ought to know.
2. Respect the rights of others.   Treat others justly.
3. Take responsibility for your actions and inactions.   Take responsibility for the actions of those you supervise.
4. Maintain your integrity.   Continually improve your abilities.
5. Share your knowledge, expertise, and values.

Overview of Whistleblowing
- **Whistleblower** Tries to report harmful situation through authorized channels
  - Rebuffed by organization
  - Makes disclosure through unauthorized channels
- **Whistleblowers punished for their actions**

- o Lose job or all chances of advancement
- o Financial and emotional hardship

Motives of Whistleblowers
- People become whistleblowers for different reasons and Morality of action may depend on motives
- Good motive**; Desire to help the public**
- Questionable motives**; Retaliation & Avoiding punishment**

Corporate Response to Whistleblowing
- **Whistleblowing has many harms**
  1. Bad publicity
  2. Disruption of organization's social fabric
  3. Makes it hard for people to work as team
- If company causes harm, public can use legal remedies to seek damages

Whistleblowing as Organizational Failure
- Whistleblowing harms organization; **Bad publicity & Ruined careers & Erodes team spirit**
- Whistleblowing harms whistleblower; **Retaliation & Estrangement**

Moral Responsibility
- Exclusive Responsibilities ; **Role responsibility & Causal responsibility & Legal responsibility**
- Moral responsibility ; **Must be borne by people & Is not exclusive**
- Michael McFarland: A team should be held to a higher level of moral responsibility than any of its members

Ch.10

10.1 Introduction

Information technology and automation affecting workplace	Impacts of information technology on society
1. Increases in productivity 2. Globalization of job market 3. Organization of companies 4. Telework 5. Workplace monitoring	1. Digital divide 2. Winner-take-all effects

Effects of Increase in Productivity
- **In medieval or ancient times**
  - o Low caloric intake meant pace of work was slow
  - o Work was seasonal and intermittent
  - o Laborers resisted working if they had enough money
  - o When wages rose, laborers worked less

Rise of the Robots?
- **Artificial intelligence:** Field of computer science focusing on intelligent behavior by machines

Organizational Changes
- **Information technology integration into firms**
  - o Automating back office functions (e.g., payroll)
  - o Improving manufacturing
  - o Improving communication among business units
- **Results**
  - o Flattened organizational structures
  - o Eliminating transactional middlemen (supply-chain automation)

Winners, Losers in the Workplace of the Future

Higher Demand	Lower Demand
Computer engineers	Bank clerks
Computer support specialists	Procurement specialists
Systems analysts	Financial records processing staff
Database administrators	Secretaries, stenographers, and typists
Desktop publishing specialists	Communications equipment operators
	Computer operators

Telework Employees work away from traditional place of work
Examples Home office & Commuting to a telecenter & Salespersons with no office

Advantages of Telework	Disadvantages of Telework
1. Increases productivity	1. Threatens managers' control and authority
2. Reduces absenteeism	2. Makes face-to-face meetings impossible
3. Improves morale	3. Sensitive information less secure
4. Helps recruitment and retention of top employees	4. Team meetings more difficult
5. Saves overhead	5. Teleworkers less visible
6. Improves company resilience	6. Teleworkers "out of the loop"

7. Helps environment	7. Isolation of teleworkers
8. Saves employees money	8. Teleworkers work longer hours for same pay

Temporary Work
– Companies less committed to employees and Lay-offs not taboo as they once were
– Companies hiring more temporary employees
  o Saves money on benefits
  o Makes it easier to downsize

Monitoring
  o Purpose: Identify inappropriate use of company resources and Can also detect illegal activities
– Other uses of monitoring
  1. Gauge productivity (10% of firms)
  2. Improve productivity
  3. Improve security

Multinational Teams
– Advantages of multinational teams 1. Company has people on duty more hours per day   2. Cost savings
– Disadvantage of multinational teams 1. Poorer infrastructure in less developed countries

Globalization Basics
– Globalization: Process of creating a worldwide network of businesses and markets
– Globalization causes a greater mobility of goods, services, and capital around the world

Arguments for Globalization	Arguments against Globalization
1. Increases competition 2. People in poorer countries deserve jobs, too 3. It is a tried-and-true route for a poor country to become prosperous 4. Global jobs reduce unrest and increase stability	1. Makes the United States subordinate to the World Trade Organization 2. Forces American workers to compete with foreigners who do not get decent wages and benefits 3. Accelerates exodus of manufacturing and white-collar jobs from United States 4. Hurts workers in foreign countries

Foreign Competition
– China is world's number one producer of computer hardware

Concept of the Digital Divide
– Digital divide: Some people have access to modern information technology while others do not
– Underlying assumption: people with access to telephones, computers, Internet have opportunities denied to those without access
– Concept of digital divide became popular with emergence of World Wide Web

Evidence of the Digital Divide

– Global divide	– Social divide
1. Access higher in wealthy countries 2. Access higher where IT infrastructure good 3. Access higher where literacy higher 4. Access higher in English-speaking countries 5. Access higher where it is culturally valued	1. Access higher for young people 2. Access higher for well-educated people

Models of Technological Diffusion
– Technological diffusion: rate at which a new technology is assimilated
  o Group A: highest socioeconomic status Group B: middle socioeconomic status Group C: lowest socioeconomic status

Net Neutrality
Tiered service: Charging more for high-priority routing of Internet packets

The Winner-Take-All Phenomenon
– Winner-take-all: a few top performers have disproportionate share of wealth
– Causes
  1. IT and efficient transportation systems
  2. Network economies
  3. Dominance of English language
  4. Changing business norms

Reducing Winner-Take-All Effects
– Limit number of hours that stores remain open
– Businesses form cooperative agreements to reduce positional arms races Example: salary caps on pro sports teams
– More progressive tax structures
– Campaign finance reform