

Social Aspects of Computing

Topics to Consider

- How have computers changed our lives?
- What new ethical issues are posed by the advent of computing?
- What are the long-term effects of computer technologies?
- Your job: share your opinions!

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Disclaimer: US vs Canada

- Many of the facts and figures concern the US
- However, laws passed in the US reflect on Canadians
- Social trends also similar

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Work and Wealth

- Automation and employment rates
- Using our extra work productivity
- Change in workplace
- Globalization of the job market
- Digital divide

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Automation and Unemployment

- What are some examples of robots and other machines performing jobs that used to be done by humans?

Manufacturing:

- > 43 million jobs disappeared in US between 1979 and 1994
- 1947: 35% of workers in manufacturing, 2002: 12%
- output increases: 1977: 35 person-hours to manufacture a car, 1988: 19.1

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Automation and Unemployment

“White-collar” jobs:

- accountants and bookkeepers replaced by software
- web-accessible pharmacies that use robots to dispense prescriptions
- most of the people downsized in the 1990s had some college education

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Working harder, Making less

- Between 1970 and 1990, the average American increased the number of hours spent at work per year by 163! (an extra *month* of work!)
- Why?
 - As a result of corporate downsizing, facilitated by the introduction of automation and information technology, people work *harder* to keep their jobs
 - Bring work home (“all time becomes work time”)

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Working harder, Making less

- *“Late capitalist society is engaged in a long-term historical process of destroying job security... More than ever, we worry about work and are working longer hours; we are more than ever driven, nervous, seemingly trapped. At the very same time, and paradoxically, the twenty-first century bodes a time of post-work: of automation and work reorganization replacing people at faster and faster rates”*
 - S. Aronowitz, D. Esposito, W. DiFazio
- Do you agree?

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Automation and Job Creation

- Absolute number of manufacturing jobs in the world is increasing, not decreasing!
- Why?

Increased purchasing power:

- Lower production costs mean lower prices for the consumer
- This increases demand for the product; in order to produce more of the product, more employees must be hired; this creates jobs
- Increases real incomes of consumers, increasing demand for other products, creating jobs

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Automation and Employment

- Move from the manufacturing sector to the service sector:
 - drop in number of people involved in manufacturing computer and electronic products offset by the increase in people providing IT services (e.g., Internet service providers, software publishers, telecommunications)

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Increase in Productivity

- Productivity in the US has *doubled* between 1948 and 1990.
- Rather than work 4-hour days, Americans in 1990 owned and consumed twice as much as in 1948, but had less *free* time in which to enjoy these things!
- Number of hours worked per year in the US is significantly higher than that worked in France or Germany. Modern Americans work harder than ancient Greeks, Romans or Western Europeans of the Middle Ages (4th century Roman Empire has 175 public festival days; medieval France had 6 months of holidays; Kapauku of Papua never work 2 days in a row)
- Why work so hard? What about Canadians?

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Workplace Changes

1. Use of computers to automate payroll
 2. Use of computers inside manufacturing units:
 - more responsibility to line workers; decentralization of sales and support functions
 3. Computer networks linked different parts of business (e.g., linking cash registers with inventory systems)
- Effect: “flattened” organizational structure in which any member of the organization may contact another member

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Telework

What is it?

- Employees spend a significant portion of their work day at a distance from the employer of a traditional place of work (working at home, at a “telecenter”, conduct transactions from car)
- 1/5 Americans engage in this
- What do you think are some advantages and disadvantages of telework?

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Telework

Advantages

- increase productivity
- reduce absenteeism
- improve morale
- recruit top employees
- saves overhead
- environment
- saves employees money

Disadvantages

- threatens manager authority
- no face-to-face interaction
- security of information
- less visibility
- isolation
- work longer hours for the same pay

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Monitoring

- How do you do it?
- track Internet usage
- monitor phone calls, emails
- videotaping
- observe keystrokes made by employees
- take snapshots of monitors

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Monitoring

- How do you feel about this? What are situations when this is good?
- Use of wireless networks to track locations of employees: allows assigning the technician closest to problem; upload patient’s file onto approaching doctor’s computer

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Globalization

- Exporting IT (Information Technology) jobs to India
- Why?
 - costs
 - team in Palo Alto finds “bugs” during its day, team in Bangalore fixes “bugs” during its day, etc.
- Ferrester Research: 3,000,000 foreign IT employees by 2015 (70% in India, 20% Philippines, 10% in China)
- What are some arguments for/against free trade/globalization?

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Globalization

Advantages

- Increased competition
- Regional specialization
- Increasing prosperity in underdeveloped nations
- Global stability

Disadvantages

- Lower wages, poor working conditions
- Loss of manufacturing and white-collar jobs overseas
- Removal of trade barriers can hurt workers because of competition

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Digital Divide

- Some people have access to modern information technology while others do not
- Global and Social divide
- Is life without computers so bad?
 - small Irish town supplied with computers
 - Need to take into account local culture, including language, literacy and community values

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Intellectual Property

Friends share all things

-Pythagoras

Today's pirates operate not on the high seas but on the Internet

- Recording Industry Association of America (RIAA)

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Intellectual Property

- *Any unique product of the human intellect that has any commercial value*
- Examples: books, songs, movies, paintings, inventions, chemical formulas, computer programs
- People have the right to own property. Do people also have the right to own intellectual property?

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Intellectual Property

- Generally, authors and inventors given rights to their creations, but only for a finite period of time
- After this time elapsed, work enters the public domain and becomes cheaper
- “Happy Birthday to You” copyrighted until 2030!

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Video and Audio

- DVDs: movies encrypted using CSS encryption scheme
- DVD players inside PCs and Macintoshes have licensed copies of the decryption software
- Not available under Linux, so 16-year-old Norwegian Jon Johansen wrote a computer program to decode CSS
- Program published in a magazine, that was subsequently successfully sued
- Jon acquitted on trial, as he had the right to access the information on a DVD he had purchased

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Video and Audio

- Copyproofing CDs
 - Encode patterns into the audio data that, when decoded by a computer, translates into annoying sounds that ruin the quality of sound
 - Exploit difference in the way CD-ROMs and CD audio players read data
 - Programmers busy “hacking” these; successful to date
- Another obstacle?

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MP3s

- What is the debate surrounding MP3s?
- **Controversy:** The ability to use a computer to encode CD music into MP3 files and pass it on to others by burning a CD or simply transmitting it over the Internet

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RIAA

- The Recording Industry Association of America (RIAA) is the trade group that represents the U.S. recording industry
- RIAA members (**Sony, Time Warner, Universal, BMG, EMI**) create, manufacture and/or distribute approximately 90% of all legitimate sound recordings produced and sold in the United States

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Napster and its successors

- 1999: RIAA sues Napster for copyright infringement, asking for damages each time a user copied songs
- 2001: US Federal Court ruled that Napster must stop its users from trading copyrighted material; Napster not able to detect 100% of sharing copyrighted material
- 2002: Napster officially shut down

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Napster and its successors

- Effect on the music industry?

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Napster and its successors

- What are the differences in the Peer-to-Peer implementations of Napster and KaZaA?
- 2003: 261 most active KaZaA users sued
- US Court of Appeals rules that KaZaA did not have to identify its customers
- MP3 spoofs make downloads using peer-to-peer networks unreliable
- Do you believe that copying and sharing music is a crime?

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Software

- 1976: explicitly recognized that software may be copyrighted
- Copyright law violated when:
 - You copy a program give or sell to someone
 - You preload a program onto the hard disk of a computer being sold
 - You distribute a program over the Internet
- 1981: software may be patented

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Proprietary Software

- Benefits? Harmful consequences?
- Benefits:
 - people work harder and are more creative if they compete with others to produce the best product (?)
- Harm (as per R. Stallman, Open Source initiator):
 - harsh measures to enforce copyrights are infringing on our liberties
 - copyrights are not promoting progress
 - cooperation more important than copyright

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Open Source Software

- Source code to the program must be available
- No restrictions preventing people from modifying the source code
- Depending on type of license (GNU, Apache, etc.) :
 - possible restrictions preventing others from selling or giving away the software
 - possible restrictions on software use
 - may or may not be transformed to proprietary software

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Open Source Software

- Depending on the license, companies may be allowed to make money by providing additional services, such as: making software easy to install, providing an accompanying manual, or for providing technical support
- What are the benefits of open source software?

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Open Source Software

- *“When programmers can read, redistribute, and modify the source code for a piece of software, the software evolves. People improve it, people adapt it, people fix bugs. And this can happen at a speed that, if one is used to the slow pace of conventional software development, seems astonishing.”*
- *We in the open source community have learned that this rapid evolutionary process produces better software than the traditional closed model, in which only a very few programmers can see the source and everybody else must blindly use an opaque block of bits.”*

• www.opensource.org

Open Source Software

- Examples?
- Programming languages: Perl, Python, PHP
- Compilers
- Web Server software
- Email programs
- Operating systems
- Type-setting systems
- Web browsers
- etc.

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Open Source Software

- Critique?
- If a particular project does not attract a critical mass of developers, the overall quality can be poor
- Different groups of users can make enhancements to a software that are incompatible with each other
- Usually has a weak graphical user interface
- Poor mechanism for stimulating innovation (research and development needs financial stimulation)
- No accountability for quality of product

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Open Source Software

- Despite all this, Linux is much more secure and stable than Windows (personal opinion ☺)



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“Collaboration across space and time. Creative co-authorship with people you’ve never met. Standing on the shoulders of your peers. It’s what the Internet is all about.”

www.creativecommons.org

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Privacy

- What is it?
 - A “**zone of inaccessibility**” surrounding an individual
- Where to draw the line?
 - public vs. private life (what about politicians?)
 - too much privacy? (facilitating business deals among members of a single ethnic group)
- Harms
 - plan immoral activities, limited social engagement
- Benefits
 - individuality, responsibility for one’s actions

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Privacy in the Information Age

- What “private” information can be publicly accessed?
 - phone numbers, addresses
- Public information
 - census records
 - tax records
 - criminal records

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Using Technology for Collecting Private Information

- Automobile “black boxes”
- Enhanced 911 service requires cell phone providers to track the locations of users
- Radio Frequency ID: tiny wireless transmitters instead of bar codes
- Personal safety and location system for the elderly
- What are some problems?
- Implant microchips into children?



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Collecting Private Information on the WWW

- Cookies:
 - contain information about your visit to a site
 - used to provide customized services the next time you used the site
- Spyware:
 - comes with free software
 - program that communicates over the WWW without your knowledge or consent
 - can monitor Web surfing, log keystrokes, take snapshots of computer screen, summon advertisements

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Cryptography

- Symmetric Encryption
 - single private key used for encryption and decryption
- Public Key Cryptography
 - message encrypted with public key and decrypted with private key
 - mathematically possible to determine the private key from the public key, although would take a very long time (2,000 years) for strong encryption
- US forbids exportation of strong encryption technology (as it is unable to break it)

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Spam

- 2003: 40% of all emails was spam
- > 100 times cheaper than sending a flyer in the mail
- Spammers get addresses
 - when you agree to receive “occasional offers or services from the company’s marketing partners”
 - by performing dictionary attacks (those emails that don’t bounce back are considered valid)
 - crawling the web
 - buying from others

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Spam

- Difficult to trace and identify:
 - change originating email address and IP address
 - body of message may contain legit information, while the advertising is in an image attachment
- Fighting spam
 - Mail Abuse Prevention System: non-for-profit organization against spam maintains a blacklist of spammers that they share with third parties
 - Is this a good idea?

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Internet

- What are some issues with respect to the content one finds on the Internet?
 - freedom of expression
 - minors
 - chat-room predators
 - false information
 - altered communication style

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Viruses

- A *computer virus* is a self-replicating computer program written to alter the way a computer operates, without permission or knowledge of the user
- When user executes a program infected with a virus, the virus executes first, finds another executable program and infects it, etc.
- 2003: 45% of executable files downloaded from Kazaa contained viruses

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Worms and Trojan Horses

- *Worms*: spreads through a computer network by exploiting vulnerabilities in the computers connected to the network
- *Trojan horses*: impostor files that claim to be desirable, but are, in fact, malicious. While a Trojan horse does something beneficial, it is performing malicious actions in the background
 - open an Internet connection and let hackers use the computer
 - gain access to passwords or other personal info stored on the computer

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Computer Reliability

- Illusion of precision

- It is not difficult to make many people who are not in the computer field believe that any numeric result generated by a computer is correct
- As a result, many people willingly accept values generated by a computer as infinitely accurate
- Errors leading to severe system failures

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Computer Reliability

“The major difference between a thing that might go wrong and a thing that cannot possibly go wrong is that when a thing that cannot possibly go wrong goes wrong it usually turns out to be impossible to get at or repair”

- Douglas Adams

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Computer Reliability

- Notable system failures:

- 1996: Ariane 5 (satellite launch vehicle) self-destructs
 - converted a 64-bit real value to a 16-bit integer value, exceeding the maximum to be stored
 - no mechanism to handle this exception, so onboard computers crashed
 - horizontal velocity achieved by Ariane 5 was too high to be stored in 16 bits (deemed impossible by software designers)
 - \$1 billion in losses

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Computer Reliability

- Therac-25 radiation therapy machine
 - some operators were entering commands too quickly
 - 6 people given massive radiation overdoses, 3 died
 - re-used code, not hardware
- Robot mission to mars, 1999
 - one team of programmers used metric units, the other British units
 - spaceship received too much thrust and burnt up in the atmosphere

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Computer Reliability

- What other famous computer bugs do you know?
 - Y2K
 - 2003 North American blackout
 - AT&T long distance network crash, 1990
 - Patriot missile bug

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Conclusions

- Do you feel that computer technologies are having a positive impact on our society?

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Text

- M. Quinn. Ethics for the Information Age. Pearson Education, 2005.

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