Lecture Topic 7: Evaluating and Controlling Technology (Chapter 7, Baase's Textbook)

CS 4513

Contents

1. Information, Knowledge and Judgment
2. Computers and Community
3. The Digital Divide
4. Evaluations of the Impact of Computer Technology
5. Making Decisions about Technology

1. Information, Knowledge and Judgment

1.1. Evaluating Information on the Web (1)

1.1.1. Expert Information or the "Wisdom of the Crowd"?

- A lot of information on the Web, but much of it is wrong;
- Wikipedia (online encyclopedia): popular but can we rely on its accuracy and objectivity?
  - Huge, free, participatory, noncommercial, ad-free, and written by volunteers;
  - Open, volunteer, instant-publishing systems cannot prevent errors and vandalism as easily as publishers of printed books;
  - Articles on technology, science, history and literature are more likely to be reliable than those on politics and sensitive current events;
  - Users must learn to appropriately deal with side effects or weaknesses of new paradigms.

1.1. Evaluating Information on the Web (2)

1.1.2. The "Wisdom of the Crowd"

- How can we distinguish good sources of information on the Web?
- Search engines and other services rank sites and bloggers by the number of people who visit them;
- Critics argue that popularity, voting and consensus do not determine truth; but there is no magic formula that tell us what is true and reliable on the Web;
- Large number of people visit a web site does not guarantee quality, but the number of visitors does provide some information (why do newspapers published seller lists for books?)
- One good step is to determine who sponsors the site;
- Ultimately we must find sites, reviewers, ratings, editors, experts, and other sources we trust;
- Good judgment and skepticism are always useful.

1.1. Evaluating Information on the Web (3)

1.1.3. Vulnerable Viewers

- People who have less ability to analyze arguments and make good judgments, e.g. children;
- What risks does bad information pose to children who find it on the Web?
- What can we do to improve the quality of information?
- Basic social and legal forces help (to a degree):
  - Freedom of speech: to provide responses, corrections, alternative viewpoints, etc.
  - Teachers, parents, competition, fraud and libel laws, volunteers to write, review and correct online information;
- What else can we do to reduce access by vulnerable people to dangerously wrong information?

1.1. Evaluating Information on the Web (4)

1.1.4. Responsibilities of Site Operators

- What are the ethical responsibilities of sponsors of information sites?

- They must take reasonable care to ensure the information they provide is accurate

- A site should have a mechanism to review content and filter out or remove dangerous material;

- A site should make clear which information is supplied by users and what has, or has not, been verified;

- Operators of sites that display material based on rankings or votes should anticipate manipulation and prepare to protect against it.

1.1. Evaluating Information on the Web (5)

1.1.5. Manipulation of Images

- Special effects have long added to the creativity and enjoyment of entertainment; so where is the problem?

- People can use the same technology for deception and fraud;

- The ease with which we can modify digital images and video raises ethical and social issues about deception;

- Video-manipulation tools (and increased bandwidth) provide the opportunity for "forging" people;

- Altered images have become a problem in many areas, e.g. news, science research;

- Is it acceptable to alter images if the purpose is artistic, or to enhance or improve the image or video without changing the meaning?

- Faking photos is not new, thus the ethical issues are not new, but now many more people face them because image manipulation has become so easy;

- The public must become more aware of the possibility of fakery and must develop a reasonable skepticism.

1.2. Writing, Thinking, and Deciding (1)

1.2.1. Abdicating Responsibility

- People are often willing to let computers do their thinking for them;
- Examples: businesses make decision about loan and insurance policy approvals with the help of risk analysis software; school districts make decisions about the progress of students on the basis of computer-graded and –calibrated tests;
- Abdicating of responsibility to exercise judgment and a reasonable amount of skepticism has serious consequences;
- People sometimes make bad decisions because of ignorance of the kinds of errors that limitations of the system can cause (e.g. law enforcements agencies arrested people when a check of an FBI database showed an arrest warrant for someone with a similar name);
- It is critical to remember that, in complex fields, such as medicine and law enforcement, computer systems might provide valuable information and ideas but might not be good enough to substitute for an experienced professional's judgment.

1.3. Computer Models (1)

1.3.1. Evaluating Models

- People use computers extensively to model and simulate both physical systems, such as the design for a new car or the flow of water in a river, or trend of weather, and intangible systems, such as parts of the economy;
- Computer models have obvious social and economic benefits, but they vary enormously in quality;
- It is important for both computer professionals and the public to have some idea of what is in such computer programs, where their uncertainties and weaknesses might lie, and how to evaluate their claims;
- It is the professional and ethical responsibility of those who design and develop models for public use to honestly and accurately describe the results, assumptions and limitations of their models;
- The following questions help us determine the accuracy and usefulness of a model:
  - How well do the modelers understand the underlying science or theory of the system they are studying? How well understood are the relevant properties of the materials involved? How accurate and complete are the data?
  - Models necessarily involve assumptions and simplifications of reality. What are the assumptions and simplifications in the model?
  - How closely do the results or predictions of the model correspond with results from physical experiments or real experience?

2. Computers and Community

2. Computers and Community

- Critics of the Internet worry that computers reduce face-to-face gathering and that the Web hurts local community vibrancy;
- How serious are these problems? Does the Internet make people narrow and unsocial? Is working on a computer more isolating than reading a book? Is the Internet destroying communities?
  - Now, with the popularity of social-networking sites, cell phone, instant messaging, sharing of photos and other material, the Web is a very social place;
  - Automated and online services reduce the opportunities for personal interaction with local merchants and neighbors in the course of ordinary daily activities, but they free time that we can fill with activities shared with people we know well and associate by choice;
  - Change creates new options and causes some old options to disappear. Those prefer a new option see it as progress; those who prefer a lost option view the change as bad; neither side's preference is inherently or absolutely better than the other;
  - People have different likes and dislikes, different priorities, different lifestyles
  - Thoughtful criticism of the impact of the Internet on community can make us think about our own activities, choices and trade-offs;
  - Individualism and strength of community are not in opposition;
  - Coercive manipulation of people's choices and activities breeds resentment rather than community.

3. The Digital Divide

3. The Digital Divide (1)

Digital Divide:

- Refers to the fact that some groups of people have access to and regularly use computer, information, and communications technology, while others do not.

3. The Digital Divide (2)

3.1. Trends in Computer Access

- Poor children and children of some ethnic minorities have less access to computers both in schools and at home;

- Access in rural and remote regions lag the cities;

- Factors: cost and ease of use
  - With lower prices, more useful applications, and ease of use, ownership and Web access spread quickly;
  - Computer technology reached more households faster than earlier technologies (Television, Radio, Telephone, Electricity, Automobiles) (e.g. Television took 25 years, Radio 27 years, Telephone 35 years to reach 25% of U.S. households while World Wide Web took 7 years);

- Individuals, businesses, community organizations, and government programs contributed to the spread of computers and Internet access.

3. The Digital Divide (3)

3.2. The Global Divide and the Next Billion Users

- Lack of access to the Internet in much of the world has the same causes as lack of telephones, health care, education, and so on: poverty, isolation, and sometimes, politics;

- Nonprofit organizations and huge computer companies have ongoing projects to spread computer access to more people in developing countries
  - Example: One Laptop per Child (one.laptop.org): distributes inexpensive, rugged laptops with specially designed software to millions of children in developing countries;
  - Example: Intel World Ahead program (http://www.intel.com/content/www/us/en/company-overview/world-ahead.html): designs low-cost computers, increases high-speed Internet access, and trains students and teachers in developing countries;

- Bringing new technology to poor countries is not simply a matter of money to buy standard equipment
  - PCs and laptops must work in extreme heat (or cold), extremes of humidity, and dusty or rainy environments;
  - Power requirements must be very low (in some areas, power is irregular and current fluctuates; in others, there is no power);
  - Displays must be readable in bright sunlight.

4. Evaluations of the Impact of Computer Technology

4.1. The Neo-Luddite View of Computers, Technology and Human Needs (1)

- In England, 1811-1812, people (called Luddites) burned factories and mills in efforts to stop the technologies and social changes that were eliminating their jobs;

- The term Luddite has long been a derisive description for people who oppose technological progress.

4.1 The Neo-Luddite View of Computers, Technology and Human Needs (2)

4.1.1 Luddite Criticism of Computer Technology (1)

- Among Luddite criticisms:
  - Computers cause massive unemployment and deskilling of jobs;
  - Computers "manufacture needs," i.e., we use them just because they are there, not because they satisfy real needs;
  - Computers cause social inequity;
  - Computers cause social disintegration; they are dehumanizing; they weaken communities and lead to isolation of people from each other;
  - Computers separate humans from nature and destroy the environment;
  - Computers benefit big business and big government most;
  - Use of computers in schools thwarts development of social skills, human values, and intellectual skills in children; they create an "ominous uniformity of knowledge" consistent with corporate values;
  - Computers do little or nothing to solve real human problems.

4.1 The Neo-Luddite View of Computers, Technology and Human Needs (3)

4.1.1 Luddite Criticism of Computer Technology (2)

- Computers do eliminate some jobs and that the pace of computerization causes disruptions, but the case that computers cause massive unemployment is not convincing;

- Blaming computers for social inequity in the world ignores thousands of years of history;

- Inadequate information is not the source of most social problems, but access to information and communication can assist in solving problems and is not likely to hurt;

- The argument that capitalists or technologies manipulate people to buy things they do not really want displays a low view of the judgment and autonomy of ordinary people;

- The Luddite view of the appropriate way of life puts little value on modern comforts and conveniences or on the availability of a large variety of goods and services.

4.2 Accomplishments of Technology

- Computer technology critics: multinational corporations, centralized corporate power, and government benefit most from computers; computers have little value to ordinary workers;

- In reality, computer technology has contributed much to human well-being in many areas: health, education, entertainment, etc.;

- A report of a United Nations Conference on Trade and Development observes that developing economies can make productivity gains worth billions of dollars by encouraging the growth of electronic commerce.

5. Making Decision about Technology

5.1. Questions

- Computer technology critics: big corporations and governments make decisions about uses of the technology without sufficient input or control by ordinary people; we should not use a new technology at all until we have studied it;
- These lead to basic questions:
  - Can a society choose to have certain specific desirable modern inventions while prohibiting others or prohibiting whole technologies?
  - How well can we predict the consequences of a new technology or application?
  - Who would make the decisions?

5.2. The Difficulty of Prediction (1)

- Computers were designed to calculate ballistics trajectories for the military;
- The PC was originally a tool for doing computation and writing documents;
- No one but a few visionaries imagined most of their current uses;
- Each new technology find new and unexpected uses: e.g. when physicists began developing WWW, who would have predicted online auctions, social networking or sharing home video?
- The above computing technology critics ignore human responsibility and choice, innovation, discoveries of new uses, unexpected consequences, and social action to encourage or discourage specific applications;

5.2. The Difficulty of Prediction (2)

- The history of technology is full of wildly wrong predictions:
  - I think there is a world market for maybe five computers (Thomas J. Watson, chairman of IBM, 1943);
  - Computers in the future may…only weigh 1.5 tons (Popular Mechanics, 1949)
  - There is no reason for any individual to have a computer in their home (Ken Olson, president of Digital Equipment Corp, 1977);

- If we are to permit the government or experts of the people via a majority vote to prohibit the development of certain technologies, it is essential at least that we be able to estimate the consequences – both risks and benefits – of the technology fairly accurately; but we cannot do this. The experts cannot do it;

- But what if a technology might threaten the survival of the human race?

5.3. Intelligent Machines and Super-Intelligent Humans – or the End of the Human Race? (1)

5.3.1. The Technology Singularity

- The term refers to the point at which AI or some combined human-machine intelligence advances so far that we cannot comprehend what lies on the other side;

- Some technologists see the human race transforming into an unrecognizable race of super-intelligent, genetically engineered creatures within this century; some see this as a welcome advance; others find it horrifying, and others unlikely; some see this as potential threats to the survival of the human race;

- Once robots can improve their design and build better robots, will they "outcompete" humans? Will they replace the human race? and will it happen soon, say within 20 years or so?

5.3. Intelligent Machines and Super-Intelligent Humans – or the End of the Human Race? (2)

5.3.2. Responding to the Threats of Intelligent Machines (1)

- Whether the singularity occurs within a few decades, or later, or not at all, many in the relevant fields foresee general-purpose intelligent machines within our lifetime;

- We cannot prepare for the aftermath of the singularity, but we can prepare for more gradual developments;

- It is valuable to think about potential problems of superintelligent systems and intelligence enhancement for humans well before they confront us so that we can design for better protections:

  – Will software bugs or other malfunctions kill thousands of people?

  – Will hackers hack brains?

  – Will a large division open up between the superintelligent and the merely humanly intelligent?

5.3. Intelligent Machines and Super-Intelligent Humans – or the End of the Human Race? (3)

5.3.2. Responding to the Threats of Intelligent Machines (2)

- What protections do people who fear for the future of the human race recommend?

- Bill Joy, co-founder of Sun Microsystems suggested "relinquishment": to limit development of the technologies that are too dangerous, by limiting our pursuit of certain kinds of knowledge;

- Enforcing relinquishment would be extraordinarily difficult, if not impossible as

  - Intelligent robots and related technologies have huge numbers of potentially beneficial applications, many of which save lives and improve quality of life;

  - At which point would governments stop pursuit of knowledge and development?

  - If we develop the technology to a point where we get controlled, useful applications, how will we prevent visionary or insane scientists, hackers, aggressive governments, or terrorists from circumventing the controls and going beyond the prohibited levels?

  - Relinquish means not only that we might lose development of innovative, beneficial products and services, but also we might lose many basic liberties.

6. Observations

6. Observations

- Does this mean that no one should make decisions about whether it is good to develop a particular application of a new technology?

- NO! but the arguments and examples suggest two things:

  - We limit the scope of decisions about development of new technology, perhaps to particular products, and

  - The decision-making process be decentralized and non-coercive, to reduce the impact of mistakes, avoid manipulation by entrenched companies who fear competition, and prevent violations of liberty.

End of Topic 7