

Chapter 5: Technology and Society

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Socially Conscious Engineer

ABET set new criteria

In 2000, the Accreditation Board for Engineering and Technology (ABET), the organization that accredits engineering schools in the United States, **formulated a new set of criteria** that it would use in deciding whether to ac- credit the academic programs in engineering schools.

- Criterion 6 requires engineering students to have an **understanding of professional and ethical responsibility.**
- Criterion 8 requires the same students to have **the broad education necessary to understand the impact of engineering solutions in a global and societal context.**
- Criterion 10 requires students to have **a knowledge of contemporary issues.**



What Is Technology?

Technology-as-tools Idea

- When we begin to think about a definition of technology, the first idea that comes to us is probably that technology is the making and using of **tools**.
- Humans have, in fact, often been called **tool-making beings**. So-called primitive humans made arrowheads, instruments of war, and, later, carts and other implements that we could call tools.
- It suggests that humans are firmly in control of technology: We make tools **to accomplish purposes** that we set. **Tools do not use us; we use tools.**
- **Technology is neutral** from the standpoint of social and value issues. *Example:* computers can be used to invade privacy and engage in identity theft, but they can also facilitate communication, store vast amounts of information
- Try to find the problem with this definition....



Definition 2

Engineering Definition

- Technology is the **application of science** to the solution of practical problems.
- Although this definition gives an important insight into the nature of modern technology, **it is not applicable to all technology.**
- **For example:** The inventors of the 17th and 18th centuries were not usually well-versed in mathematical physics. Instead, they were practical peopletinkerers who found **solutions to problems by intuition and trial and error.** **Thomas Edison did his creative work without knowing the electromagnetic theory of James Clark Maxwell.** In fact, Edison thought physicists had little to contribute to technology.



Definition 3

Technology as System

- Technology is best understood as a system composed of physical objects and tools, knowledge, inventors, operators, repair people, managers, government regulators, and others. [i.e. broader definition].
- The definition views technology as **firmly embedded in a social network**.
- It implies that **we cannot understand a technology without understanding the society of which it is a part**, and it carries at least the suggestion that technology both influences and is influenced by the larger society.



Technological determinism

- Technological development has a life of its own, an internal logic that cannot be controlled by individual humans or even the whole society.
- Technological determinism is a theory that aims to provide a **causative link between technology and a society's nature**. It tries to explain as to whom or what could have a controlling power in human affairs.
- It has strong contradiction with responsibility of engineers: **If there is little individuals or even the society can do about the course of technological development, if technology is going to go on its merry way regardless of what we might do, why assume responsibility for it?**



Technological optimism

Technological optimism is the view that the effects of technology on human well-being are almost altogether good.

Technological pessimism

- Technological pessimism, on the other hand, takes a more **negative view** of the effects of technology on human life.
- Even though many technological pessimists say they **do not want to be considered as simply against technology**, they are much more likely to **point out the undesirable aspects of technological development**.



TECHNOLOGICAL OPTIMISM

February 2000, the National Academy of Engineering (NAE) identified the 20 greatest engineering achievements of the 20th century.

- electrification
- water supply and distribution
- electronics
- radio and television
- agricultural mechanization
- computers
- the telephone
- air conditioning and refrigeration
- highways
- spacecraft
- the Internet
- imaging (medical)
- household appliances
- health technologies
- petroleum and petroleum technologies
- laser and fiber optics
- nuclear technologies
- high-performance materials



TECHNOLOGICAL OPTIMISM (Cont.1)

- These technologies have vastly improved the quality of our lives.
- Surely, technology is a gift to the millions of human beings whom it has liberated from lives of bone-grinding toil, poverty, starvation, and early death.
- Technological optimism is evident in the history of America and Europe since the industrial revolution.
- Technological development is taking place before our eyes. **India** is a good example in this regard.



TECHNOLOGICAL OPTIMISM (Cont.2)

Case India

- Approximately 5 million new mobile phone connections are added each month.
- Approximately 450 shopping malls are under construction.
- Three of Indias largest companies by stock market valuation are in an industry that barely existed in 1991 **information technology**. This is an industry that, according to some experts, **can do for India what automobiles did for Japan and oil did for Saudi Arabia.**
- A young software engineer who has graduated from one of Indias elite institutes of technology is in high demand.



TECHNOLOGICAL OPTIMISM (Cont.3)

It says:

No doubt technological growth will be **accompanied by harm to the environment and social disruption**. **But** we are considering the role of technological development in the **liberation of millions of people from disease and poverty**, most of us would probably **consider the effects of technology to be overwhelmingly on the positive side**.



TECHNOLOGICAL PESSIMISM

- Shift from unbridled optimism to careful consideration.
- Technology carries risks.
- These risks include:
 - an excessive pride in human power.
 - a failure to acknowledge dependence on providence.
 - tendency to confuse the **unreal** world of material things with ultimate reality.



2 themes of Technology

- ① technology is associated with a dominating, controlling frame of mind: thus making distance from the closeness of Nature.

Example:

Driving on a highway in an air-conditioned car. On the other hand, struggling to climb a mountain.

- ② A second theme of technological pessimism is that technology tends to fragment human experience and thus destroy the meaningfulness of much that we (should) do.



Example:

In former times, at least according to a commonly accepted idealized picture, the family gathered around the evening meal as a unit. A blessing was commonly offered, thereby recognizing a form of transcendence, problems and issues of the day were commonly discussed, and **family bonds were renewed**. **Today**, due to the microwave and pre-prepared foods, family members often eat by themselves and do so **on the run**.



COMPUTER TECHNOLOGY:PRIVACY AND SOCIAL POLICY

Some important terms

- Informational privacy : Like a fence between two areas.
- Physical privacy : It is visible and tangible (can be moved physically)
- Decisional privacy: Freedom from governmental or other outside interference to make decisions.
- Proprietary privacy: ability to control the use of ones name, likeness, or other aspects of ones identity



Privacy versus Social Utility (i.e. personal data)

There should exist a balanced approach. Some guidelines (from Privacy Act) are:

- 1 The existence of data systems containing personal information **should be public knowledge.**
- 2 Personal information should be collected **for narrow, specific purposes only.**
- 3 Personal information should be collected **only with the informed consent** of the persons.
- 4 Personal information **should not be shared** with third parties **without notice.**
- 5 Those who collect personal data should **ensure the security and integrity of personal data** systems.



Data Protection Directive (officially Directive 95/46/EC)

- Protection of individuals with regard to the **processing of personal data**) and **on the free movement of such data** was a European Union directive adopted in 1995 which regulates the processing of personal data within the European Union.
- It is an important component of EU privacy and **human rights law**.
- In 1980, in an effort to create a comprehensive data protection system throughout Europe, the Organization for Economic Cooperation and Development (**OECD**) issued its **Recommendations**.



OECD Recommendations prior to the formation of Data Protection Directive

- ① **Notice:** data subjects should be given notice when their data is being collected
- ② **Purpose:** data should only be used for the purpose stated and not for any other purposes
- ③ **Consent:** data should not be disclosed without the data subjects consent
- ④ **Security:** collected data should be kept secure from any potential abuses
- ⑤ **Disclosure:** data subjects should be informed as to who is collecting their data
- ⑥ **Access:** data subjects should be allowed to access their data and make corrections to any inaccurate data
- ⑦ **Accountability:** data subjects should have a method available to them to hold data collectors accountable for not following the above principles



OWNERSHIP OF COMPUTER SOFTWARE AND PUBLIC POLICY

Conflict between Lotus Development Corporation & Paperback International

On June 28, 1990 an important decision was rendered with regard to a lawsuit between Lotus Development Corporation, the creator of the **Lotus 1-2-3 spread-sheet**, and Paperback International, the creator of the **VP Planner spreadsheet**. Lotus had sued Paperback International for infringement of its copyright on Lotus 1-2-3. **Paperback had copied the entire menu structure of the Lotus 1-2-3 program.**



Lotus Development Corporation & Paperback International (Cont.1)

Lotus Argument

The manual of the VP-Planner even contained the following statement:

VP-Planner is designed to work like Lotus, 1-2-3, keystroke for keystroke . . . VP- Planners worksheet is a feature-for-feature workalike for the 1-2-3. It does micros. It has the same command tree. It allows the same kind of calculations, the same kind of numerical information. Everything 1-2-3 does, VP-Planner does.



Lotus Development Corporation & Paperback International (Cont.2)

Paperback's Argument

Paperback, in turn, alleged that **only the part of a computer program written in some computer language, such as C, is copyrightable**. It argued that the more graphic parts of a program, such as the overall organization of the program, the structure of the programs command system, the menu, and the general presentation of information on the screen, are not copyrightable.



Lotus Development Corporation & Paperback International (Cont.3)

Final Verdict

District Judge Keaton ruled that **VP-Planner** had infringed on the **Lotus copyright**.



Should Software Be Protected?

Ownership

- If I own something, I may control its use and (as a consequence) exclude others from its use if I wish.
- **For instance:** Because I own my car, I may control its use and exclude you from using it if I wish. If I want to make money from your use of my car, then I have the right to charge you a fee for its use.

Intellectual Property (IP)

A number of definitions:

- **Intellectual property (IP)** refers to creations of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce.[given by: World Intellectual Property Organization (WIPO)]
- Intellectual property (IP) refers to creations of the intellect for which a monopoly is assigned to designated owners by law.



Should Software Be Protected?

Justification

- It promotes the progress of technology.
- By the ethics of respect for persons: We might call it **the labor theory of ownership**. (Example: A man purchases a piece of land and uses his Intellect to grow crops...)



How Should Software Be Protected?

Intellectual property rights (IPRs) are the rights granted to the creators of IP, and include:

- patents
- copyright
- trademarks
- industrial design
- geographical indication
- trade secrets



Patents

Formal Definition

A patent is a form of right granted by the government to an inventor, giving the owner the right to exclude others from making, using, selling, offering to sell, and importing an invention for a limited period of time, in exchange for the public disclosure of the invention.

Some important properties

- granted by the government
- it gives right to exclude others
- actions include: making, using, selling, offering to sell, and importing an invention.
- given for a limited period of time (normally 20 years).

