

TECHNOLOGY, GLOBALIZATION AND ETHICS

CHALLENGES TO DEVELOPMENT

Sudarsan Padmanabhan, Ph.D.

IIT Madras

What is technology?

- Technology is “the organization of knowledge, people, and things to accomplish specific practical goals.”
- The term ‘technology’ is assigned to a broad sweep of processes such as finance, production, marketing, research and development, construction, and personnel management, to name a few.

Technology – the term

- Technology stems from the Greek term *techne* which means art, craft or skill. *Techne* is derived from the Indo-European root *teks* which means to weave or fabricate. The term 'textile' also stems from *teks*. Some archaeologists argue that weaving even predates agriculture, dating back to 35,000 B.C.

Purpose of technology

- The term *techne* itself signifies a purpose. Technology is the skill and technique that is utilized to achieve a certain set of objectives. For example, a fabric is produced by twisting a fibre, weaving, and dyeing the twisted fibres. Hence, technology is an ensemble of techniques to produce useful things.

Technological Systems

- 1. Human activity form
- 2. Resources, tools and materials
- 3. Technological products or artifacts
- 4. Ends, functions or valences
- 5. Background knowledge, skills and
- 6. Social context and organizations in which the technology is relevant

1. Human activity form

- Techniques, skills, methods, practices
- Know-how is different from know-that
- Chimpanzees use sticks to gather insects.
- Humans use technology for much broader goals and on a much larger scale.
- The human activity form determines the tools that are developed and in turn develop technology. (know-how)

2. Resources, Tools and Materials

- Resources, tools and materials help us accomplish things that we otherwise would not be able to accomplish.
- Humans transform the materials with the aid of the tools.
- Tools increase the repertoire of human activity form.

3. Technological Products

- Technology requires resources. Earth has provided humans with resources for a long time. People did not seem to realize the earth has only finite resources.
- The term infrastructure implies an environment that could be used to develop more technologies and apply them to solve problems.

Artifacts

- “By acting upon either natural or artificial resources, through techniques, we alter them in various ways and thus create artifacts.” – Morton Winston
- There is a difference between a clay pot and a microchip. In the case of the latter, its applications are multiple and newer innovations could be achieved with it.

4. Valence of an artifact

- Most artifacts could have multiple uses. This is called polypotency.
- For example, computers could be used for a variety of purposes such as playing computer games, chatting, emailing, designing, typing documents, guiding missiles or rockets, etc.

Instrumental or Intrinsic End

- Floppy or CDs or Pen drives are used to store data and they are not valued otherwise. (Instrumental)
- But the reason I work is in order to lead a comfortable and good life. There is nothing beyond that. All my work is geared towards that end. (Intrinsic)

5. Background Knowledge

- Background knowledge come under the category of know-that.
- For example, Newton's first law. Just reading and understanding Newton's first law is only a factual understanding termed know-that. But, then applying that law to calculate the escape velocity and launching rockets to Moon is because of the know-how.

6. Social Context

- A technologically advanced society demands a clear division of labour to coordinate common goals.
- Interestingly, the government, collectorate, panchayats, schools, colleges, hospitals, and corporations are all social and political technologies that seek to optimize the social goods.

Technological Revolution

- Fire is said to have been discovered 1.5 million years ago.
- 2.5 millions years ago tools were made of stones.
- Hunter gatherer societies also innovated on tools to make food, clothing and shelter.

Civilization and Technology

- Around 10,000 BC technological innovations occurred in the river valleys of Asia Minor and North Africa.
- Civilization means building cities, which also requires economy, law and order, morality, art and commerce.
- Technology became imperative for agriculture, irrigation, construction, medicine and travel.

Professionalization

- A settled society would not have the advantage of moving in search of food if a crop fails.
- A sedentary society needs specialization of labor since human and material resources need to be pooled.
- Hence, technology became imperative to feed, clothe and shelter a large group.

Danger to Settled Societies

- Flood, Droughts, Insects, Famine
- Labor intensive nature of technologies such as animal or human drawn ploughs, water irrigation, harvesting, construction of buildings, roads and granaries
- Need larger families to share labor

The Industrial Revolution

- The first step of globalization was industrial revolution where animals were replaced with machines, coal and then gasoline was used as fuel. Then with the arrival of electric power there was a mass migration of labor from rural to urban centres.
- Labor was abundant and hence specialization was sought.

The Factories

- The Industrial Revolution necessitated management of human, financial, and material resources.
- The factories required concentration of power, labor and raw materials on a much larger scale than the traditional system of agriculture.

Factories

- Factories required roads, railways, ships, and a massive infrastructure.
- Since factories needed huge labor, the living style of the laborers changed.
- Monetary system was upgraded to serve the consumer and the producer.
- After coal-powered steam engines, more efficient gasoline IC engines came about.

From Machine to Information Age

- This is called the third wave. Computers and telecommunication completely transformed the world. With the invention of the internet, the world has been flattened.
- Computers were initially used only in accounting and inventory management.
- The next stage was improving efficiency.

Information Age

- Industrial engineering benefited a lot from computers. Scheduling various stages of production was perfected by the Japanese. The Japanese called this type of management “just-in-time” approach. This approach increased productivity, profits, and efficiency.

Applications of Computer

- Artificial intelligence – everywhere from guided missiles, robots, automated tools, autopilots, antilock brakes
- Connecting people across the globe
- Changed the media both print and electronic media forever
- ARPANET OR INTRANET was invented by the US Dept of Defense to warn against

Intranet - Internet

- For electronically connected warning system between the Supercomputers during the Cold War
- The purpose was to decentralize communication so that surviving computer centers could communicate in the event of a nuclear strike by the USSR

Perils of Technology

- The use of technology creates ethical issues. For example, take a gun. It has several applications.
- Weapon for personal protection, criminal activity, paper weight, hunting gun, target practice
- Chemical and biological weapons can only create mass casualties.

Ethical Concerns

- Four kinds
- First, how do we reconcile traditional ethical values with the recent technological advances
- For example, the Indo-US Nuclear Agreement (123 Agreement)
- Euthanasia, abortions

Ethical Issues

- Second issue is that of aggregation problem. Production of massive urban waste and its disposal. Recycling is an option but very expensive. Plastic, lead, poisonous chemicals, water management, food production, transportation and pollution are some issues.

Ethical Issues

- The third issue is of that of *distributive justice*. This is a thorny issue. How do we make technologies accessible to the majority rather than a minority population?
- Public libraries, schools, colleges
- Rural technology development
- Technology literacy

Ethical Issues

- The fourth issue is that of *sustainable technologies*. One reason to oppose the Nuclear Deal is that the nuclear waste that has been produced would last for 10,000 years which would be jeopardize our future generations.

Source

- Morton E. Winston and Ralph D. Edelbach, *Society, Ethics, and Technology*, California: Thomson-Wadsworth, 2006.