



Information Technology Concepts

Chapter 01 – Technology concept

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Chapter 01

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1.1 Introduction

A new concept of man and culture followed the arrival of the industrial society, based on a new division of labour and the institutional introduction of new Technology. This new picture was reflected in such essential documents as the Constitution of Virginia, Article I (1776), the Bill of Rights as part of the Constitution of the United States of America (1788) and the Declaration of the Rights of Man and the Individual (1789). These texts introduced to the fore the basic principle of human rights as natural rights, focused on the acceptance of the intrinsic equality of all members of the human family.¹

During the Second World War, humankind experienced extreme cruelties on a large scale, both from policies based on ideologies which emphasized the supposed inequality of "races," and from the uses of new military technologies. After the turmoil of this war, the Universal Declaration of Human Rights stressed that "All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood" (Article 1). The universality of human rights is, again, emphasized in Article 2: "Everyone is entitled to all the rights and freedoms outlined in the Declaration, without distinction of any kind, such as race, colour, sex, language, religion, political or other opinions, national or social origin, property, birth, or another status."² Human beings, endowed with reason and conscience, are to be treated as ends in themselves, and not as passive victims of conditions and contingencies they cannot control.

Concerning the advent of business culture, the fact that a systematic study of the relationships between technological progress and the creation and successful application of human rights has not been paid much attention to until recently may surprise. On this occasion, we are not shocked. In the meantime, it is essential to remember that in 1968, following an initiative of the international conference on human rights held in Tehran, Iran, as part of the International Year of Human Rights program, the issue of the implications of contemporary Science and technical advances on human rights was placed before the United Nations.³ Following the Conference's findings, the UN General Assembly adopted a resolution inviting the Secretary-General to conduct "continuous and interdisciplinary national and international studies to develop relevant human rights and

fundamental freedom criteria." Specific attention was to be paid to developments in Science and Technology in relation to:

- 1) respect for the privacy of individuals and the integrity and sovereignty of nations in the light of advances in recording and other techniques;
- 2) protection of the human personality and its physical and intellectual integrity in the light of advances in biology, medicine, and biochemistry;
- 3) uses of electronics that may affect the rights of the person and the limits that should be placed on such uses in a democratic society; and, more generally,
- 4) the balance which should be established between scientific and technological progress and the intellectual, spiritual, cultural, and moral advancement of humanity.⁴

This resolution highlights the dangers of civil rights and fundamental liberties threatened by technical advances. However, it must be clear that technical advances in certain situations create opportunities for individual and social decisions and strengthen human rights.⁵

Nevertheless, it is quite evident that present-day innovations in the domains of energy sciences, information technology, and biotechnology occur so rapidly and offer so many new choices for the society that, as Weeramantry says in his seminal contribution to this subject: "Science and Technology have burgeoned in the post-war years into instruments of power, control and manipulation. But the legal means of controlling them have not kept pace. Outmoded and out-manoeuvred by the headlong progress of Technology, the legal principles that should control it are unresponsive and irrelevant." ⁶

Most contributions were dealing with the relationship between technological developments and social and cultural life, analyzing chiefly the negative and positive effects of technological change on society, either directly or indirectly. The only course left to the community seems to be to adjust to the exigencies of Science and Technology, for better or for worse. In these analyses, Science and Technology are considered as autonomous forces over which society has no control. In consequence of the preoccupation with their impact on society, the study of how culture shapes technological developments has been neglected.

In the next sections, we shall discuss the genesis of the model of development that can be considered responsible for this one-sided approach of Western Technology. It is essential to understand this model of development, in which deterministic ideas regarding

Technology play a paramount role if we are to reconsider Western Technology's role in the context of opportunities for choice regarding our social and cultural life. After presenting this "technological imperialistic" or "technological functionalist" model of development and discussing its main shortcomings, we shall show some other models of growth which have been formulated - partly at least- as a reaction to the claims of technological imperialism. The results of this analysis will be used to elucidate and elaborate on the relationship between technological changes and human rights: How can choices be made in a world of technical and social constraints? In what ways can human rights play a pivotal role in the processes of decision-making?

In this contribution, much attention is given to the origin, development, and socio-cultural impacts of the Enlightenment model of development. This emphasis on this Western model of action is a deliberate choice based on the following reasons:

- a) the model elucidates the specific characteristics of Western Technology and the impact of its diffusion throughout the world within a historical perspective;
- b) the model is still a powerful instrument in the minds and hands of innovating elites in and outside the Western world, notwithstanding its theoretical and intellectual shortcomings;
- c) the presentation of this model reveals, we hope, its strong ideological bias and the concomitant need to deconstruct it to find new courses of action;
- d) it is expected that this presentation emphasizes a contrast between the "Western view" of technological development and the models implied by the case studies in this volume.

1.2 The Definition of the Concept of Technology

When we speak about the relationships between Technology and human rights, it is evident that we have to deal with the interrelations between some very complex phenomena: Technology, science, society or systems of communities, and methods of rights of a universal nature.

To begin with the concept of Technology, nearly all human societies have, or have had, technologies which are often very elaborate. As we know, archaeologists have used the occurrence of characteristic technologies as the basis for the classification of prehistorical societies. These classifications are primarily based on artefacts left behind by the peoples who once used them. Because of the task in hand, however, we have no use for a general definition of Technology which includes only artefacts or the material

products of inventions. Our description of Technology must enable us to distinguish between the use of Technology in pre-industrial and industrial societies and between industrial communities and post-industrial ones in terms of such factors as flexibility, rigidity, or its pervasiveness in social life.

In a broad sense, the concept of Technology may refer to those aspects of culture which relate to the manipulation of the natural environment by man or "that whole collection of ways in which the members of a society provide themselves with the material tools and goods of their society - the collection of artefacts and concepts used to create an advanced socio-politico-economic structure." ⁷ As we shall explain, such a definition is not adapted to our purposes, as it is too broad.

To clarify the questions relating to the interactions between Technology and society, we distinguish between:

- 1) Technology assets of physical objects, designed and constructed by man. In an industrial society this term refers especially to "artificial things, and more particularly to modern machines: artificial things that
 - a) require engineering knowledge for their design and production; and
 - b) perform large amounts of operations themselves." ⁸

In this context, the term may also be used to refer to inventions and processes with extensive potentialities for application, such as laser technology, chip technology, and DNA recombinant technology, and the applications of such technologies within existing or new machines and production processes.

- 2) Technology as a term which refers to human activities in connection with the utilization of artefacts. Moreover, Technology implies the knowledge required to use these technical things. "Technological 'things' are meaningless without the 'know-how' to use them, repair them, design them and make them. As such this know-how can, partly at least, ... be systematized and taught, as in the various disciplines of engineering." ⁹
- 3) Finally, "technology" may refer to a body of knowledge that is necessary to generate new rules for the design, construction, and application of technical possibilities to different types of problems (such as, for example, the control of environmental pollution). Here the term technology refers to the theory of the application (logia), not just to "artificial things," the ways in which they are used in practice and the transmission of this practical knowledge ("technics": German,

die Technik; French, la technique) as is emphasized in the first and second meaning of the concept "technology."

The third word stresses the creation of 'software,' compared to the 'hardware' side of Technology prevalent in the first two definitions of Technology. Besides, the difference between "Scientific" and "Technology" continues to disappear while the third sense of Technology prevails. Bell's post-industrial societies review shows this as he states, "The fundamental position of scientific understanding has been decisive for coordinating decisions and leading progress – the importance of analytical theory and the codification of research into symbol systems that can be used to illuminate many complexes, various, and abstract systems as in any axiomatic method."¹⁰

Bell emphasizes the importance of the creation of modern intellectual technologies that allow the management of structured complexity - the complexity of vast organizations and processes, the complexity of several variables in theory - and the detection and application of rational choice strategy in nature-based games and games between humans. Bell suggests that [translation] "by the end of the century [a modern intellectual technology] could be as influential in human relations for the last century and a half."¹¹

From this, it follows that not only is the contrast between 'scientific' and 'technology' blurred in the third sense of Technology, but this importance has clear connections with an evolving modern model of development, in which these intellectual innovations have a pivotal role. As such, the third importance of Technology includes certain types of machinery (infrastructure) and a certain manner in which manufacturing hardware has been constructed in one plant or another workplace. As Hill observes, this means "the division of labour and organization that is integrated into the effective infrastructure or is required for efficient service."¹² Habermas, approaching Bell's encompassing delineation of Technology, states that Technology means "scientifically rationalized control of objectified processes. It refers to the system in which research and Technology are coupled with feedback from the economy and the administration."¹³ In this sense, it is worth noting that the division of labour and arrangement of work should not be viewed, as is often suggested, as the inherent result of technology logic," but the result of decision-making on infrastructure and management.

This was a critical argument since it ensures that in consideration of the relationship between technical transition and human rights, we should not have to confine ourselves

to concerns about the pressing need to develop policies to defend people where their fundamental rights and freedoms are at stake. Besides, we should focus on the principles on which technological advances and implementations are based and on the desirability to enhance the consistency of these decisions in compliance with human rights. For many - if not all - developed countries, such thought is particularly significant because it stresses the role of preference and cultural diversity in the economic development process.

We also addressed a few meanings of the meaning of "technology" in this section briefly. We illustrate that the term is used in various contexts, from references to tangible things or artifacts to control mechanisms that embrace complicated social processes. The concept of technology' also relies on the form of culture considered (e.g. pre-modern, industrial, post-industrial). From this summary, we infer that it is essential to be alert to signs of altering ties between technological progress and social change while examining various ideas or models on social growth and technological change.

1.3 What is Information Technology?

1.3.1 Technology

Technology is an application of science which studies and develops an engineering's capabilities with specific steps and techniques in a field. Technology is the application of science and engineering to the development of machines and procedures to expand and enhance human productivity, or at least to boost social performance in many respects.

"Technology remains one of our most misunderstood terms in the world, though. It seems appropriate as an explanatory category for our comprehension of the past and beyond of humankind. We are presumably happy to say that since the Palaeolithic people have had Technology and animals have been found as tool users, from crows to chimpanzees. A surprisingly new vintage is a "technology" category as a performer, while cognitive words – Technology, art and so on – have a long history.

1.3.2 Data

Regardless of industry, data is driving the future, and a massive number of technologies across multiple sectors heavily depend on it to thrive.

Based on the definition of data from TechDifferences, data is "raw, unanalyzed, unorganized, unrelated, uninterrupted material which is used to derive information after analyzation". Essentially, data is straight facts, observations, statistics, characters, symbols, images, numbers, and more that are collected and can be used for analysis. Data

left alone is not very informative, and in that sense, it isn't significant, but it gains purpose and direction after it is interpreted to derive significance.

Whether qualitative or quantitative data is a set of variables that help construct outcomes. Another critical characteristic of data is that's freestanding and does not depend on any other concept to exist, unlike information which only exists because of data and is entirely dependent on it.

Data and information are measured in bits and bytes. It can be represented in structured/unstructured tables, graphs, trees, etc., and doesn't have significance until it is analyzed to meet a specified user's needs.

1.3.3 Information

If data is the atom, information is the matter. Information is the set of data that has already been processed, analyzed, and structured in a meaningful way to become useful. Once data is processed and gains relevance, it becomes information that is fully reliable, certain, and useful.

According to this Forbes article, information is prepared data that has been processed, aggregated and organized into a more human-friendly format that provides more context. Information is often delivered in the form of data visualizations, reports, and dashboard.

Information addresses the requirements of a user, giving it significance and usefulness as it is the product of data that has been interpreted to deliver a logical meaning. We've stated, information cannot exist without its building block: data. Once data is transformed into information, it doesn't contain any useless details as its whole purpose is to possess specific context, relevance, and meaning.

Ultimately, the purpose of processing data and turning it into information is to help organizations make better, more informed decisions that lead to successful outcomes. To collect and process data, organizations use Information Systems (IS), which are a combination of technologies, procedures, and tools that assemble and distribute information needed to make decisions.

1.3.4 Knowledge

Knowledge means the familiarity and awareness of a person, place, events, ideas, issues, ways of doing things or anything else, which is gathered through learning, perceiving or discovering. It is the state of knowing something with cognizance through the understanding of concepts, study and experience.

In a nutshell, knowledge connotes the confident theoretical or practical understanding of an entity along with the capability of using it for a specific purpose. Combination of information, experience and intuition leads to knowledge which has the potential to draw inferences and develop insights, based on our experience and thus it can assist in decision making and taking actions.

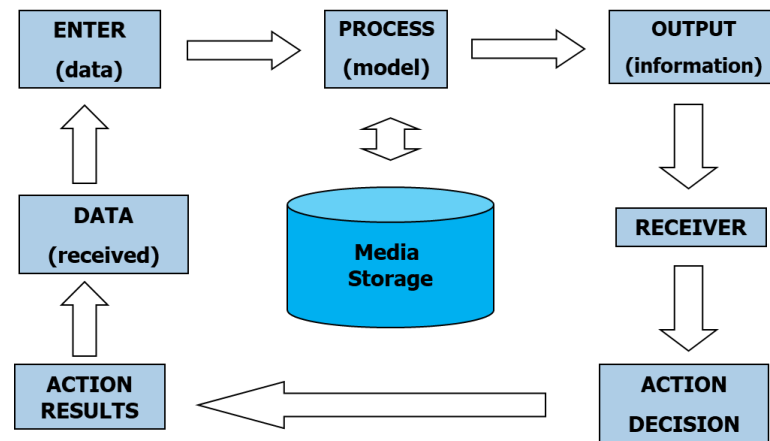


Figure 1. Information process

1.4 Information Technology

According to Oxford dictionary in 1995, Information technology is the development, study, or use of electronic equipment, especially computers, for storing, accessing, analyzing and sending information, including words, number, and picture. Besides, information technology is A set of tools that help you work with information and perform tasks related to information processing (Haag & Keen, 1996).

Another quote from researchers about information technology:

- a technology that is not only on computer technology (hardware and software) that will be used to process and store information but includes communication technology to transmit or disseminate information (Martin, 1999)
- any technology that is applied to process and transmit information in electronic form (Lucas, 2000)
- the understanding of information technology is a technology that combines computing (computers) with high-speed communication lines that carry files, sound, and video (William & Sawyer, 2003).

We can summarize that information technology is the product of human invention during the information transmission period, in which data is given easier, more common and stored longer.

1.5 Information Technology Components

1.5.1 Hardware (computer hardware)

Computer hardware refers to the physical parts of a computer and related devices. Internal hardware devices include motherboards, hard drives, and RAM. External hardware devices include monitors, keyboards, mouse, printers, and scanners.

The internal hardware components of a computer are sometimes referred to as components, and external hardware is typically referred to as peripherals. They all fit into the computer hardware group together. On the other side, software consists of computer-operated systems and applications. Because software is operating on computer hardware, the software also has device specifications that list the minimum appropriate hardware to run the software.

1.5.2 Software

Computer software is a general term that describes computer programs. Related terms such as software programs, applications, scripts, and instruction set all fall under the category of computer software. Therefore, installing new programs or applications on your computer is synonymous with installing new software on your computer.

The software can be challenging to describe since it is "virtual," or not physical like computer hardware. Instead, software consists of lines of code written by computer programmers who have been assembled into a computer program. Computer programs are stored as binary data that is copied to the hard drive of the device when it is installed. Since software is automated and does not take up any physical space, updates are often faster (and therefore cheaper) than computer hardware.

1.5.3 Artificial Intelligence/ People

When thinking about information systems, it is easy to get focused on the technology components and forget that we must look beyond these tools to understand how they integrate into an organization fully. A focus on the people involved in information systems is the next step. From the front-line help-desk workers to systems analysts, to programmers, all the way up to the chief information officer (CIO), the people involved with information systems are an essential element that must not be overlooked.

1.5.4 Material, Data, and Information

You can think of data as a collection of facts. For example, your street address, the city you live in, and your phone number are all pieces of data. Like software, data is also intangible. By themselves, pieces of data are not very useful. But aggregated, indexed, and organized together into a database, data can become a powerful tool for businesses. All of the definitions presented at the beginning of this chapter focused on how information systems manage data. Organizations collect all kinds of data and use it to make decisions. These decisions can then be analyzed as to its effectiveness, and the organization can be improved.

1.6 Information Technology Functions

There are six about information technology function

- a. capture, information technology to capture an information. Refers to the gathering of data
- b. processing, information technology to process material or data. Examine the details of the data gathered
- c. produce, information technology to produce an usefull information. Refers to putting the data gathered in a useful form in order to gain meaningful output
- d. storage, recording data and information documentation into a storage device. Making data and information accessible and long storage.
- e. retrieve, information technology for the search, retrieval and transfer of recorded knowledge.
- f. tranmission, information technology to transfer data and information from one location to another.

There are three role of information technology for humankind

- Information technology replaces the role of humans.
- Technology strengthens the role of humans.
- Information technology has a role to play in restructuring human role.

1.7 Positive and Negative Impact of Information Technology

There are several positive impact of information technology

- Communication media
- Data exchange media
- Media for searching information or data

- Learning Media
- Ease of transactions and doing business
- Etc.

Negative impact of information technology

- Pornography
- Fraud/deception
- Gambling
- Information Falsification
- Profocation
- Etc.