

The Physiological, Psychological and Social Impacts of Computer Use



Chapter 4 (part one)

Outline

- *Technology and human need*
- *Technological relationships in your life*
- *The Dark side of ICTs and Knowledge*
- *Psychological (HEALTH PROBLEMS) and SOCIAL PROBLEMS*

Technology and Human Needs

- Technology is the **process** by which humans **modify** nature to meet their needs and wants.
- Technology refers to the **processes** and **products** by which humans have **coped with** and **changed** their environment **through out history**.
- It refers not only to the **sophisticated machine** of the 21st C. but also to the **rudimentary stone tools** of the early man

Classes of technology

- With the current level of development the uses of the term have increased to the point where it now encompasses a number of “classes” of technology.
 - **Technology as Objects:** Tools, machines, instruments, weapons, appliances - **the physical devices** of technical performance.
 - **Technology as Knowledge:** The **know-how** behind technological innovation.

Cont...

- **Technology as Activities:** What people **do** - their **skills, methods, procedures, routines**.
- **Technology as a Process:** Begins with a **need** and ends with a **solution**.
- **Technology as a Socio-technical System:** The manufacture and use of objects involving **people** and other **objects** in combination

The Nature of Technology

- **Technology has a number of distinct characteristics**
 1. **It is not exactly mean applied science.**
 - **Although there is certainly a relationship between science and technology, there is, except in certain high technology industries, very little technology that could be classified as applied science.**

Cont...

- ❑ **Technology has different purposes and processes.**
 - ❑ **The explicit purpose of technology is Change in the material environment but that of science is the understanding of nature;**
 - ❑ **Accordingly solutions of technology are more or less effective but that of science are subject to the right or wrong, verifiable or falsifiable issue.**

Cont...

2. It Involves Design: Design is central to technology.

- *Design is that area of human **experience**, **skill** and **knowledge** which is concerned with **man's ability to shape his environment** to suit his material and spiritual needs.*
- It is an **imaginative vision** connected to a practical **implementation plan**.
- It **initiate change** in man-made things

Cont...

- The **design process** in technology is a **sequential process** which
 - begins with the **perception of a need**,
 - continues with the **formulation of a specification**,
 - the **generation of ideas** and a **final solution**, and
 - ends with an **evaluation of the solution**

Cont...

3. It Involves Making:

- The **motivating factor** behind all technological activity is the desire to **fulfill a need**.
- For this reason **all designs** should be **made** or **realized** - whether that be through **prototype, batch- or mass- production**.
- If the need is to be truly fulfilled, the design is to be **legitimately evaluated**, and the design activity is to have been **purposeful** and **worthwhile**.

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4. It is Multi-Dimensional:

- Design and production involve not only the **co-operation** between different **specialists** (between, for example, designer, production engineer and materials scientist), but may involve “**technologists**” in performing a **multitude of functions**, such as:
 - **working** with others,
 - operating within **budgets**,
 - persuading **decision makers**,
 - communicating to **clients**

Cont...

5. It Is Concerned With Values:

Technology is informed by **values** at every point.

- **Value decisions** may be called for not only in relation to the specific **design criteria** (i.e. **aesthetic**, **ergonomic** and **economic** judgments, suitability for purpose and ease of manufacture) but also in relation to the **rightness** or **wrongness** of a particular solution in **ethical terms**.

Cont...

6. It is socially Shaped/Shaping:

- Technological enterprises are **determined** neither by advances in **knowledge** nor simply by the **identification of needs**, but by **social interests**.
- Of the **potential new technologies** available at any one time only a few are **developed** and become **widely implemented**.
- In this way technology is **shaped by society**, by **consumer choice**.

Cont...

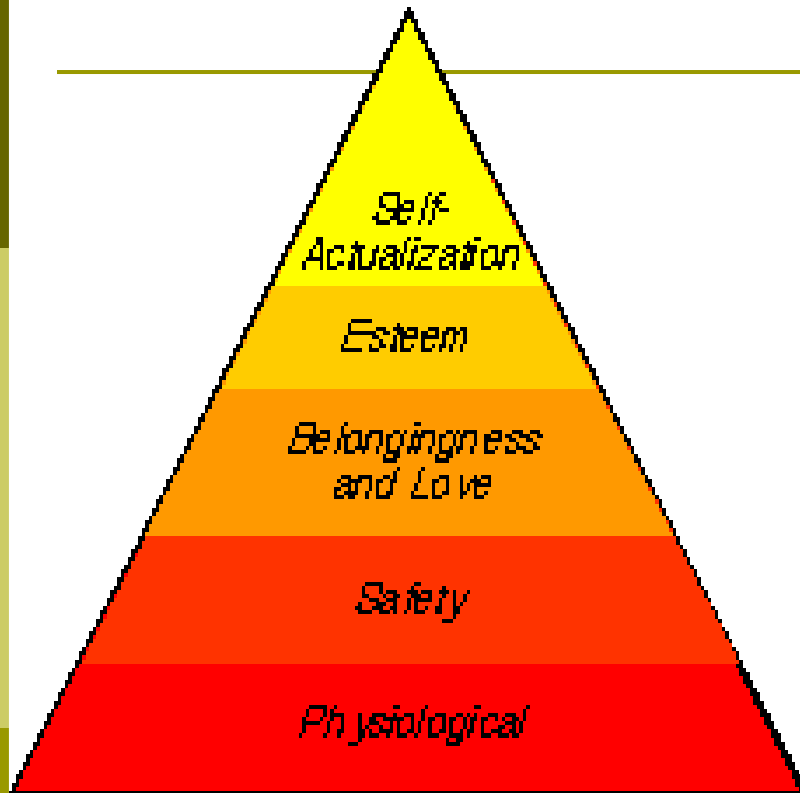
- This is the argument of **social-determinism**.
- A product that is **of no particular use** to society or is **poorly designed** or **too expensive**, even **too far ahead of its time**, will not be sold.
- In other words, technological devices, although introduced into society, are not **forced upon it**.

Cont...

- Yet it could also be argued that **technology shapes society** – This is the idea of **technology determinism**. For example:
 - the technology of the **motorcar** has shaped our environment and our whole way of life.
 - **television** is a technology have had a major effect upon society, causing a complete **new pattern of leisure** to emerge, and **avoiding the distance** between nations.

Human Needs

- Let's begin by reviewing Maslow's model.
- The levels of Maslow's Hierarchy of Needs range from
 - the lowest level **physiological needs** to
 - the highest, called **self-actualization**.



Self-actualization

Our need to **actualize our potential** as humans. Because each of us is unique, this need expresses itself **uniquely** for each individual.

Esteem

Our needs for **achievement, adequacy, recognition, status, appreciation, and mastery.**

Belongingness and love

Our needs to **give and receive affection**, to relate to other people, family and friends.

Safety

Our needs for **security, stability** and **freedom** from fear and anxiety.

Physiological

Our fundamental needs for food, water, sleep, touch, shelter, sex and exercise.

Maslow's model

- According to the model of human needs developed by A. H. Maslow there are three types of overlapping set of needs:
 - **Biological/physiological needs:** including food, water, shelter, clothing, air.
 - **Social Needs:** includes safety and security and a sense of love and belongingness
 - **Psychological Needs;** includes self-esteem and self-actualization

Cont...

- **Basic biological needs** are **strongest determinants** of our actions when we are **children**.
- As our **personalities develop**, the **"higher" cognitive** and **psychological needs** become more important.

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- For example, we may ignore our **hunger** in order to finish a **computer program** before dinner.
- Maslow's theory assumes a **moral progression**:
 - From **personalities organized to satisfy immediate wants** to those oriented towards **acting responsibly in the social world**.

Cont...

- While all social theorists would agree with Maslow that individuals have **biological**, **social**, and **psychological** needs, **not all would agree with his selection, or his priorities.**
 - Some theorists would **add competition** or **territoriality** to the list;
 - Others would argue about whether **self-esteem** is based on **social status** or on **private, internal** feelings of satisfaction.

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- Others would question whether the **needs for personal identity** are "higher" than the **social needs** to fulfill the obligations and gain the benefits of group membership.
- Environmentalists would argue that there is a **higher need to preserve and protect the earth** for future generations;
- Philosophers and theologians would make a case for an even higher level of **spiritual need**.

Discussion

- **How can the technology satisfies human needs?**

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- The physical world contains **resources that we use** to satisfy **biologically** and **socially** defined **needs**.
 - Through the **process of technological innovation** societies have developed **new tools** to deal with the **physical world**.
 - For instance the tools are used to solve problems in the areas of:
 - **Food and shelter**, those are basic to our **biological** needs.
 - **economic production and distribution**, that are central to **human interaction** within a society,
 - **War and peace**, another important element in human interaction

Cont...

- Since **computer** is one of the tools we can ask how computer use **satisfies** or **frustrates** individual need.
 - The **physiological requirements** of human beings are **not** usually **directly met** by computers.
 - However, Computers **indirectly** contribute to the **production** and **distribution** of clothing and food.

Cont...

- ❑ Computers may also be used to regulate **furnaces** and **thermostats** to provide for a **tolerable temperature**.
- ❑ **Sensory input** can also be considered a **physiological need**, since the human organism **cannot interact** with its environment **without information**.
- ❑ Computer based sensors are used to detect all kinds of things: speed, movement, weight, pressure, temperature, humidity, wind, smoke, light, shapes, images, etc and transmit it to the computer

Cont...

- In relation to **social requirements** (safety and sense of love and belongingness):
 - Computers act on this level of need through their **effects on institutions and relationships**. (e.g. creating virtual community).
 - Theories of technological innovation do not assume that an **environmental problem**, such as food shortages, will automatically **produce a technical solution**, like improved agriculture.
 - Instead, these problems provide societies with a **strong incentive to innovate**.

The physiology and psychology of the human/computer interaction

- Ergonomics is the study of physical relationship between people and their work environment.
- Ergonomics became common in the 1990s as a result of the wide application of computers in offices and due to the negative impact caused by the use of this technology.

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- Ergonomics has sub-fields:
 - **Hardware** Ergonomics: User-equipment related problems including work station design
 - **Software** Ergonomics: Problems in communication with the computer
 - **People ware** Ergonomics: Psychological impacts of computer use

Cont...

- ❑ The physical and psychological problems caused by the computer use can be solved by designing an **ergonomically correct equipment, furniture, facilities, and man-machine interfaces.**
- ❑ The goal is improving: Health condition, Efficiency, Comfort, Safety

Cont...

- Therefore, ergonomics is concerned with **fitting the job environment** to the worker
- The economic implication of Ergonomics are:
 - Medical cost reduction,
 - Less absenteeism,
 - Higher productivity

The physiology of the human/computer interaction

- ❑ Use of a computer is a physical activity involving: hands, eyes, ears, and body.
- ❑ Computer use causes physical stress or damage due to:
 - ❑ **Static effort:** Expended by keeping the **body in an upright position** and in maintaining the **position of the shoulders and the neck. (Prolonged posture/prolonged state of muscle concentration)**. The muscles are **not** permitted to **relax** and it may imply a **constrained posture**.
 - ❑ **Dynamic effort:** Expended by the muscles of the **hand, fingers and wrist**.

Discussion

- What Are the major physiological problems that occur as a result of the human/computer interaction?

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- **Repetitive Stress Injuries (RSIs):**
- **Back and Neck Pains:**
- **Computer Vision Syndrome (CVS):**

Cont...

- ❑ This results in a decrease in the **productivity** of people.
- ❑ The major physiological problems that occur as a result of the human/computer interaction are:
 1. **Repetitive Stress Injuries (RSIs):** Caused by a **repeated movement/ an over use of human joints.**
 - ❑ When **muscles** are forced through **fast** and **repetitive** motions. e.g. typing on computer.
 - ❑ Most of the time such injuries occur on **wrist, hand, arm.**
 - ❑ **Keyboard operators** are in one of the highest risk categories in relation to this problem.

Cont...

- **RSIs disorders** include,
 - **Muscle strain and tendonitis which is**
Caused by **hitting** the key **too hard and** It is **painful** but **not crippling**
 - Solution: Rest, Anti-inflammatory medication, Change in typing technique
 - **Carpal Tunnel Syndrome (CTS):** Caused by **pressure** on the **nerve** in the wrist
Produces **damage** and **pain** to **nerves** and **tendons** in the hand. It is **disabling** and requires **surgery**
 - Solution: keeping keying in speed at a reasonable level and taking regular breaks.

Cont...

2. **Back and Neck Pains:**

- Caused by Improper **chairs**,
- Improper **position of keyboards and display screen and the postural fatigue** that is caused by seating for a prolonged time

Cont...

3. **Computer Vision Syndrome (CVS):** Consists

- **eyestrain,**
- Loss of visual sharpness,
- Difficulty in focusing,
- Headache,
- Sore eyes,
- Double vision,
- Redness and watering of the eyes.

Cont...

- The **causes** of the problem:
 - Using computers for **extended periods**,
 - Being **too close** to the screen,
 - **Poor resolution** of displayed characters (reading **small character** size on the screen),
 - **Poor contrast** between text and background on the monitor,
 - Noticeable **screen flickers**, **Poor lighting** system (too bright or too dull).

Design parameters for an Ergonomic Workstation (as a solution to the above problems)

- ❑ **Proper Design of furniture:** like **chair** with adjustable, back support, seat height, padded arm rest
- ❑ **Keyboard: Thin and detachable,** Positioned **low enough** to keep **wrist straight, shoulders relaxed**

Cont...

- ❑ **Mouse or Trackball:** With **easy reach**, At the **same height as keyboard**
- ❑ **Vision:**
 - Adequate amount of **light** (use ordinary light rather than fluorescent light),
 - **Avoid glare** (keep the screen away from windows),
 - Use **control knobs** ON the monitor,
 - Improving **character fonts**,
 - **Proper contrast** between **character** and **background** (dark character on light background is recommended),
 - Improving **display resolutions** (color combination that are easier for eyes),
 - **Frequent vision breaks** (looking away from the screen occasionally)

the psychology of the human/computer interaction

- The stresses experienced by computer users are not only physical but also psychological.
- It is mainly caused by:
 1. **Computer anxiety:**
 - Is the psychological state of individuals who have negative reactions towards using computers.
 - Studies in the area of computer anxiety have produced a variety of labels for the phenomenon and for those affected by it.
 - CA is known as computerphobia, technophobia, cyberphobia, technostress or computer resistance.

Cont...

- ❑ The individual who experiences CA is known as a technophobe, computerphobe and considered to be computer illiterate.
- ❑ The computer user fears becoming too dependent on technology, losing control of, or being replaced by the computer.
- ❑ Stress, embarrassment, frustration, irritation, panic and the fear of exposing one's ignorance are all part of the feelings associated with computer anxiety.

Cont...

2. Addictive use of the computer (Internet addiction): Internet Addiction is a broad term covering a wide-variety of behaviors. There are five specific types of Internet addiction

- ▣ **Cybersexual Addiction** – Individuals who are either engaged in viewing, downloading, and trading online **pornography**.

Cont...

- **Cyber-Relational Addiction** – Individuals who suffer from **Chat Room Addiction** become over-involved in **online relationships**.
 - These relationships are established **at the expense** of **real life relationships** with family and friends.
 - In many instances, this will lead to marital discord and family instability.
- **Net Gaming** –includes obsessive online **gambling, gaming, shopping, or stock trading** behaviors.

Cont...

□ **Information Overload –**

- The wealth of data available on the World Wide Web has created a new type of **compulsive behavior** regarding **excessive web surfing** and **database searches**.
- Individuals will spend **greater amounts of time** searching and collecting data from the web and organizing information.

Cont...

□ **Computer Addiction –**

- In the 80s, **computer games** such as **Solitaire** and **Minesweeper** were programmed into computers and researchers found that **obsessive computer game playing** became problematic in organizational settings as employees spent most days playing rather than working.
- These games are not interactive nor played online

Cont...

3. Frightens of the integration of a man and a machine.
 - We don't want to be machines ourselves. We don't want to be like hackers who use 'too much' computers and become selfish machines without human emotions.
 - Those man-machines can't interact in 'the normal life'.
 - They can't separate good and bad, they can't communicate, they can't love.

Cont...

4. Response time:

- Since interaction with the computer is often interpreted by the user as "conversation", a slow computer can have a psychological effect.
- User productivity increases when "conversational" response times are decreased.

5. Noise from printers or from a computer power units