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Chapter 1 :- Introduction to Emerging Technologies

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Definition

- **Emerging technology** is a term generally used to describe a **new technology**, but it may also refer to the continuing development of existing technology; it can have slightly different meanings when used in different areas, such as media, business, science, or education.
- **The term commonly refers** to technologies that are currently **developing**, or that are **expected to be available within the next five to ten years**, and is usually reserved for technologies that are creating or are expected to create **significant social or economic effects**.
- Technological evolution is a **theory of radical transformation of society through technological development**.

The Term of Technology and Evolution?

- ❖ **Technology:** "discourse or treatise on an art or the **arts**," from Greek **tekhnologia** "systematic treatment of an art, craft, or technique," originally referring to grammar, from tekhnō- (see **techno-**) + **-logy**. The meaning "science of the mechanical and industrial arts" is first recorded in 1859.
- ❖ **Evolution:** evolution means the process of developing by gradual changes. This noun is from **Latin evolutio**, "an unrolling or opening," combined from the **prefix e-**, "out," plus **volvere**, "to roll."

List of some currently available emerged technologies

- ✓ Artificial Intelligence
- ✓ Blockchain
- ✓ Augmented Reality and Virtual Reality
- ✓ Cloud Computing
- ✓ Angular and React
- ✓ DevOps
- ✓ Internet of Things (IoT)
- ✓ Intelligent Apps (I-Apps)
- ✓ Big Data
- ✓ Robotic Processor Automation (RPA)

Introduction to the Industrial Revolution (IR)

- The Industrial Revolution was a period of major industrialization and innovation that took place during the late 1700s and early 1800s.
- An Industrial Revolution at its core occurs when a society shifts from using tools to make products to use new sources of energy, such as coal, to power machines in factories.
- Generally, the following industrial revolutions fundamentally changed and transfer the world around us into modern society.
 1. The steam engine,
 2. The age of science and mass production, and

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The Most Important **Inventions of the Industrial Revolution are:**

- ✓ **Transportation:** The Steam Engine, The Railroad, The Diesel Engine, The Airplane.
- ✓ **Communication.** The Telegraph. The Transatlantic Cable. The Phonograph. The Telephone.
- ✓ **Industry:** The Cotton Gin. The Sewing Machine. Electric Lights.

Industrial Revolution (IR 1.0)

- ✓ **The Industrial Revolution (IR)** is described as a transition to **new manufacturing processes**.
- ✓ IR was first coined in the 1760s, during the time where this revolution began.
- ✓ **The transitions in the first IR included:**
 - Going from hand production methods to machines.
 - The increasing use of steam power .
 - The development of machine tools.
 - The rise of the factory system.

Industrial Revolution (IR 2.0)

- ✓ The Second IR, also known as the **Technological Revolution**, began somewhere in the 1870s.
- ✓ **The advancements in IR 2.0 included:**
 - The development of methods for manufacturing interchangeable parts and widespread adoption of pre-existing technological systems such as telegraph and railroad networks.
 - This adoption allowed the vast movement of people and ideas, enhancing communication.
 - Moreover, new technological systems were introduced, such as electrical power and telephones.

Industrial Revolution (IR 3.0)

- ✓ IR 3.0 introduced the transition from mechanical and analog electronic technology to digital electronics, which began from the late 1950s.
- ✓ Due to the shift towards digitalization, IR 3.0 was given the nickname, “**Digital Revolution**”.
- ✓ The core factor of this revolution is the mass production and widespread use of digital logic circuits and its derived technologies such as the **computer**, **handphones** and the **Internet**.

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✓ Certain practices that were enabled during IR 3.0 is still being practiced until this current

Fourth Industrial Revolution (IR 4.0)

- IR 4.0 characterized by **advancements in various technologies** such as **robotics**, **Internet of Things**, **additive manufacturing** and **autonomous vehicles**.
- ✓ **These Technologies are called - cyber-physical systems.**
 - ✓ **A cyber-physical system is a mechanism that is controlled or monitored by computer-based algorithms, tightly integrated with the Internet and its users.**

Major breakthrough that is associated with IR 4.0 are:

- The usage of Computer Numerical Control (CNC) machines.
- These machines are operated by giving it instructions using a computer.
- The adoption of Artificial Intelligence (AI), where we can see it being implemented into our smartphones.

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AI is one of the main elements that give life to Autonomous Vehicles and Automated Robots.

Role of Data for Emerging Technologies

- **Data** is regarded as the **new oil and strategic** asset since we are living in the age of big data, and drives or even determines the future of science, technology, the economy, and possibly everything in our world today and tomorrow.
- Data have not only triggered tremendous hype and buzz but more importantly, presents enormous challenges that in turn bring incredible **innovation and economic opportunities**.
- This reshaping and paradigm-shifting are driven not just by data itself but all other aspects that could be created, transformed, and/or adjusted by understanding, exploring, and utilizing data.

Enabling Devices and Network (Programmable Devices)

In the world of digital electronic systems, **there are four basic kinds of devices:**

1. Memory.
2. Microprocessors.
3. Logic.
4. Networks.

✓ **Memory** devices **store random information** such as the contents of a spreadsheet or database.

✓ **Microprocessors** execute software instructions to perform a wide variety of tasks such as running a word processing program or video game.

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- ✓ **Logic devices** provide specific functions, including device-to-device interfacing, data communication, signal processing, data display, timing and control operations, and almost every other function a system must perform.
- ✓ **The network is** a collection of computers, servers, mainframes, network devices, peripherals, or other devices connected to one another to allow the sharing of data.
- ✓ **Example of a network** is the Internet, which connects millions of people all over the world.
- **Programmable devices:** refer to chips that incorporate field programmable logic devices (FPGAs),
 - Complex programmable logic devices (CPLD) and Programmable logic devices (PLD). There are also devices that are the analog equivalent of these called field-programmable analog arrays

Why Is A Computer Referred To As A Programmable Device?

- ✓ Because what makes a computer a computer is **that it follows a set of instructions**.
- ✓ Many electronic devices are computers that perform only one operation, but they are still following instructions that reside permanently in the unit.

List of Some Programmable Devices

- ✓ A **programmable logic device (PLD)** is an electronic component used to build reconfigurable digital circuits. Unlike integrated circuits (IC) which consist of logic gates and have a fixed function, a PLD has an undefined function at the time of manufacture.
- ✓ Before the PLD can be used in a circuit it must be programmed (reconfigured) by using a specialized **program**

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- ✓ Achronix Speedster SPD60
- ✓ Actel's
- ✓ Altera Stratix IV GT and Arria II GX
- ✓ Atmel's AT91CAP7L
- ✓ Cypress Semiconductor's programmable system-on-chip (PSoC) family
- ✓ Lattice Semiconductor's ECP3
- ✓ Lime Microsystems' LMS6002
- ✓ Silicon Blue Technologies
- ✓ Xilinx Virtex 6 and Spartan 6 Xmos Semiconductor L series

Service Enabling Devices (SEDs)

- ❖ A full range of network-related equipment referred to as **Service Enabling Devices (SEDs)**, which can include:
 - ✓ Traditional channel service unit (CSU) and data service unit (DSU)
 - ✓ Modems
 - ✓ Routers
 - ✓ Switches
 - ✓ Conferencing equipment
 - ✓ Network appliances (NIDs and SIDs)
 - ✓ Hosting equipment and servers

Human to Machine Interaction

- ✓ **Human-machine interaction (HMI)** refers to the communication and interaction between a human and a machine via a user interface.
- ✓ Nowadays, natural user interfaces such as gestures have gained increasing attention as they allow humans to control machines through natural and intuitive behaviors
- **What is interaction in human-computer interaction?**
- ✓ **HCI** (human-computer interaction) is the study of how people interact with computers and to what extent computers are or are not developed for successful interaction with human beings.
- **How do users interact with computers?**

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The user interacts directly with **hardware for the human input and output such as displays**, e.g.

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- ✓ The user interacts with the computer over this software interface using the given **input** and **output** (I/O) hardware.
- ❑ As its name implies, **HCI consists of three parts:**
 1. The user.
 2. The computer itself.
 3. the ways they work together.
- ❑ **How important is human-computer interaction?**
- ✓ **The goal of HCI is to improve the interaction between users and computers** by making computers more user-friendly and receptive to the user's needs.
- ✓ **The main advantages of HCI** are simplicity, ease of deployment & operations and cost savings for smaller set-ups. They also reduce solution design time and integration complexity.

Disciplines Contributing to Human-Computer Interaction (HCI)

- ✓ **Cognitive psychology:** Limitations, information processing, performance prediction, cooperative working, and capabilities.
- ✓ **Computer science:** Including graphics, technology, prototyping tools, user interface management systems.
- ✓ **Linguistics.**
- ✓ **Engineering and design.**
- ✓ **Artificial intelligence.**
- ✓ **Human factors.**

Some Emerging Technologies That Will Shape the Future Of You And Your Business.

- ✓ The future is now or so they say, So-called emerging technologies are taking over our minds more and more each day.
- ❑ **These are very high-level emerging technologies though.**
- ✓ Chatbots
- ✓ Virtual, Augmented & Mixed Reality
- ✓ Blockchain.
- ✓ Ephemeral Apps and
- ✓ Artificial Intelligence.

Thank

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