

Introduction to Emerging Technologies

Chapter 1 Introduction

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Britannica dictionary defines **revolution** as “in **social** and **political science**, a **major**, **sudden**, and hence typically violent alteration in government and in related associations and structures”.



The term is used by **analogy** in such expressions as the **Industrial Revolution**, where it refers to a **radical** and **profound change** in

economic relationships and
technological conditions.

Introduction

E.g. a definition of

There are **different** emerging technologies **attempt**
to define for education

Emerging
Technology (ET) **technologies** concepts, innovations,

• **Emerging**

are tools, in different areas, and advancements

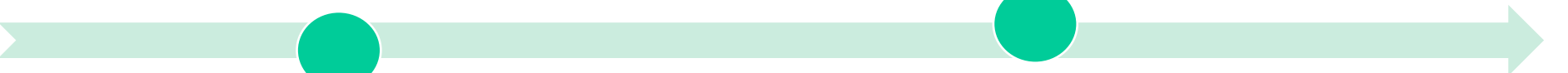
such as media,

utilized in

business, science, diversengs to serve varied **educational**
setti or education. education-related
purposes

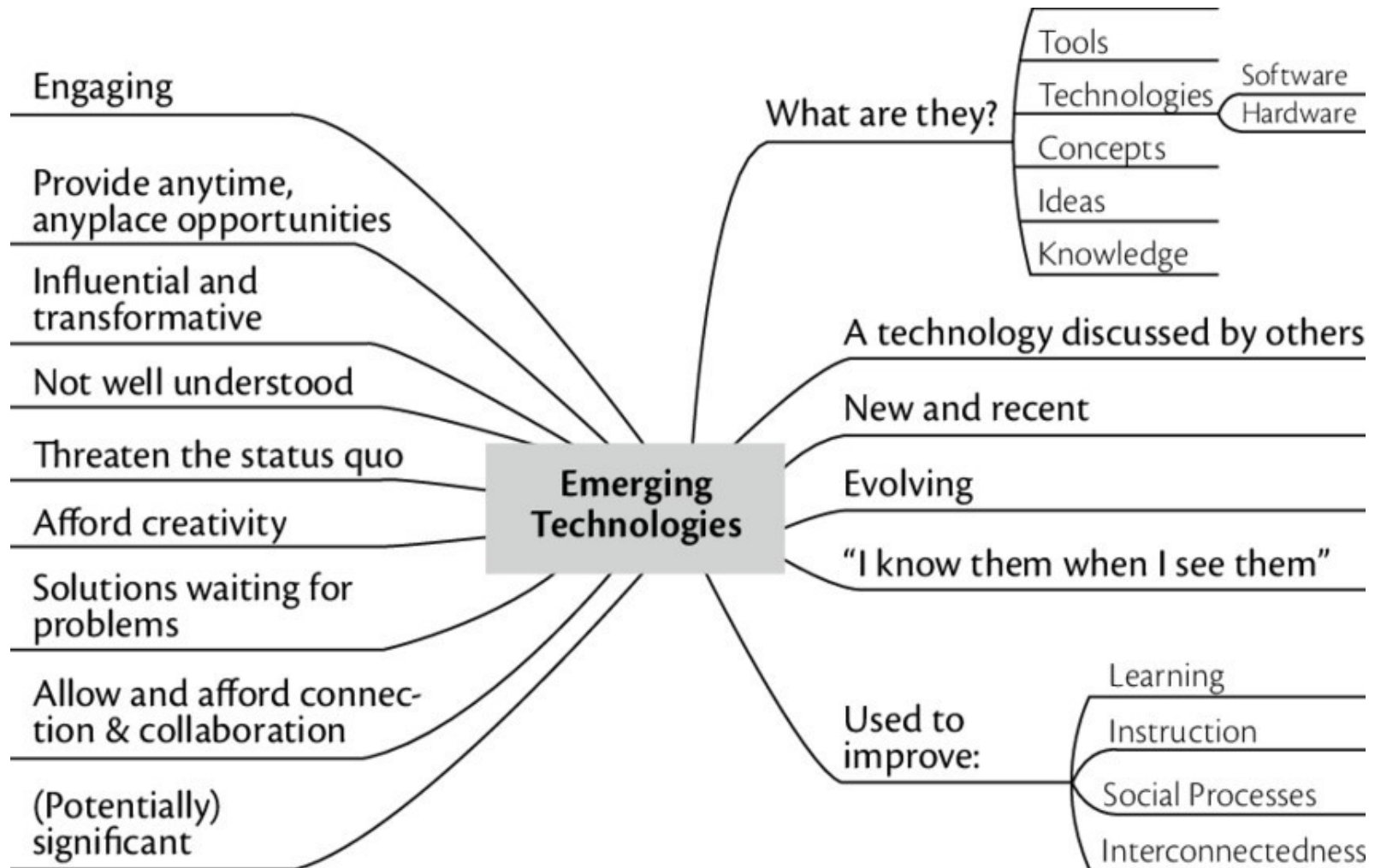
Introduction

ET is generally defined as **technologies** that are **currently developing**, or that are expected to be **available**, that are **creating** or **expected to create significant social** or **economic effects**.



ET is a **technology** based on **new ideas** that are in **development** and **testing**.

Testing is used to **determine** if the products give the **intended results**.
If so, products can be mass produced.



Technological evolution

Technological evolution is a theory of **radical transformation** of society through **technological development**.

It is the **changes over** time in **technology** that give humans increased control over their environment.

Technology Revolution

1610s, The word generally, defined as broad concept

technology

comes from **application** of means the

knowledge to turn **process of**

“**techno-logía**” **resource** into **goods** **developing**

“**techne**” and **service** that

but

Evolution

ek word

and

art skill

society needs

craft

wants solve a

logía

problem

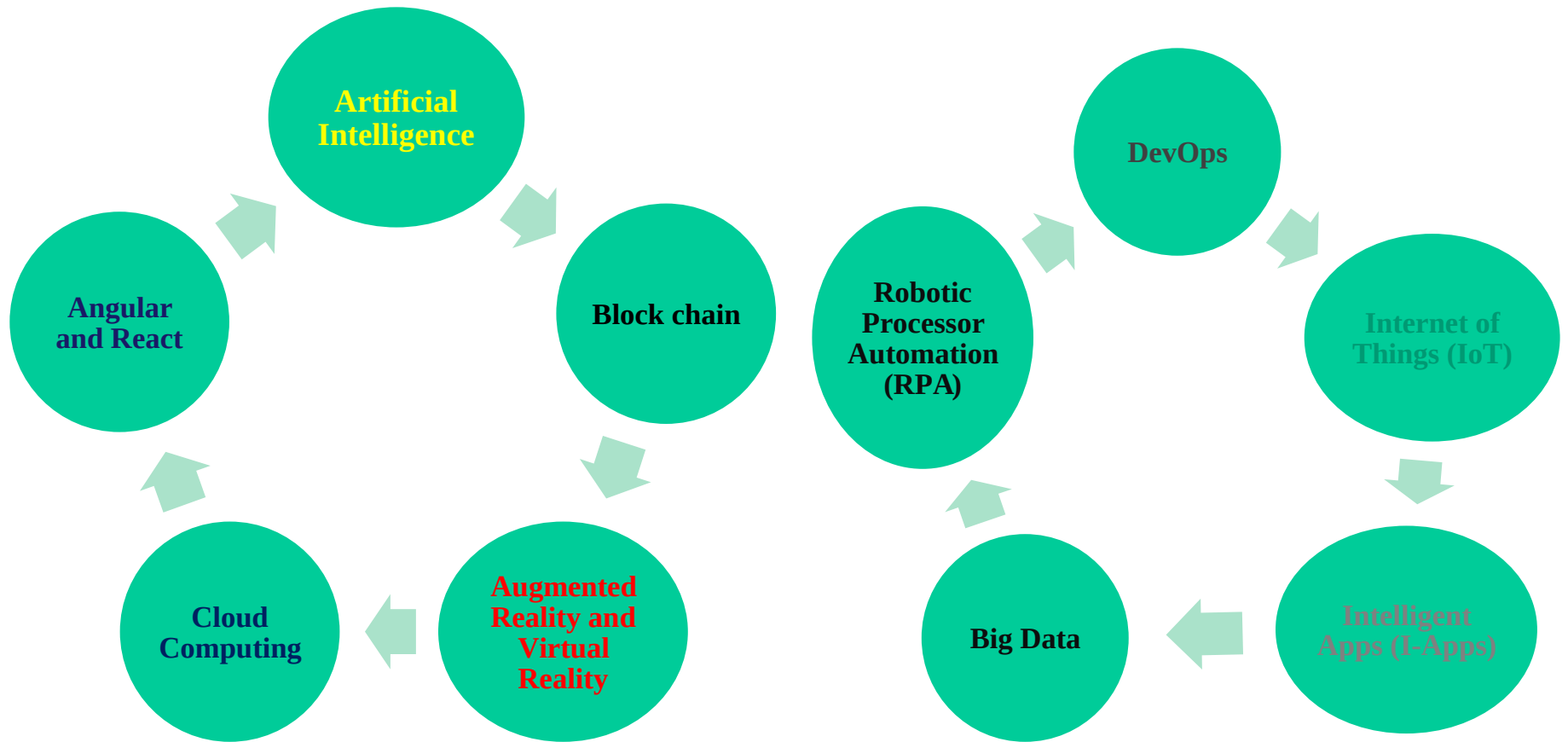
study of

perform a specific

function



List of some currently available emerged technologies

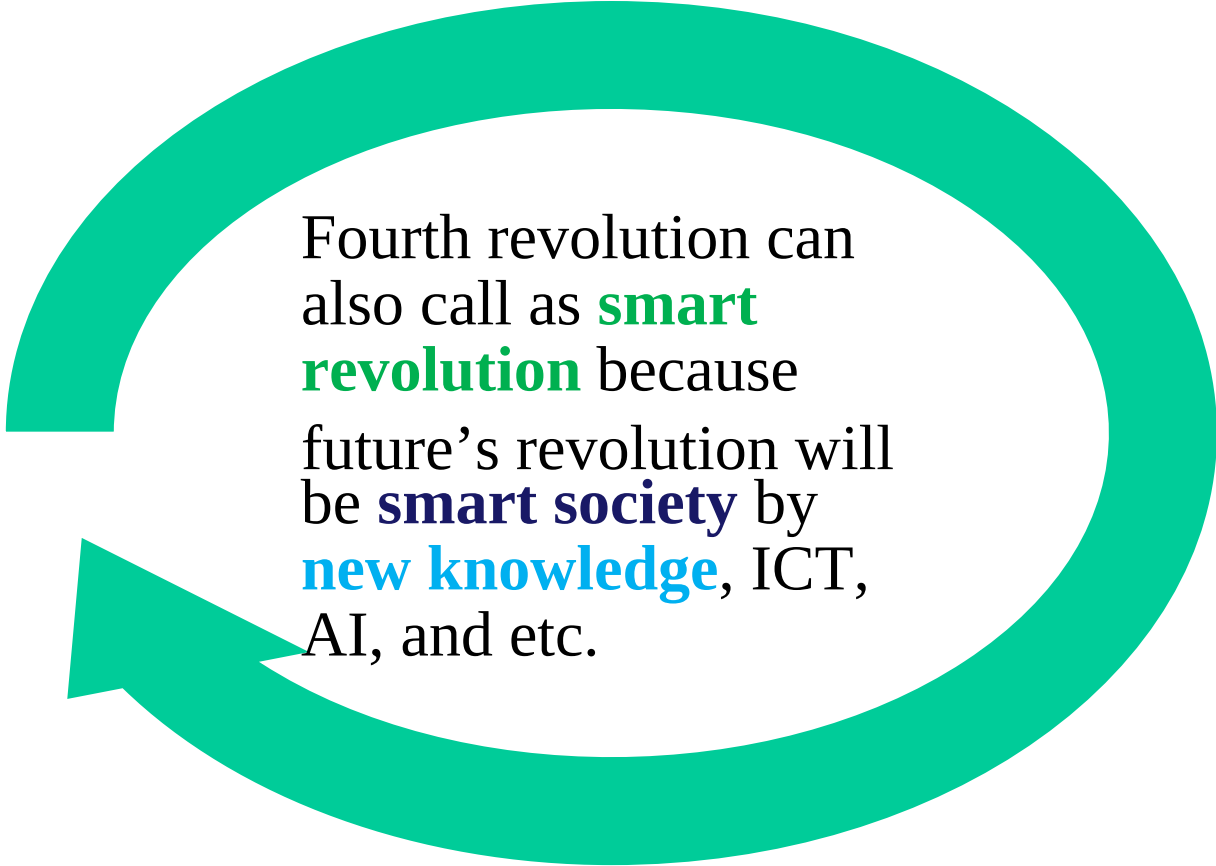


Introduction

Therefore, we can **divide** **revolution of technology** into profound change in our human being life into **4-steps** such as :

- **Agriculture revolution** (First revolution),
- **Industrial revolution** (Second revolution),
- **Information revolution** (Third revolution), and
- **knowledge revolution** (Fourth revolution) that will come in the future.

Introduction



Fourth revolution can also call as **smart revolution** because future's revolution will be **smart society** by **new knowledge**, ICT, AI, and etc.

Agriculture revolution was started from 16000. Human being make a life with a **hunting**, getting a **catch fruit** and **vegetable**, and others.

This life style continues till first **agriculture revolution**.

This life style continues to **agriculture** and **settles down** at one place.

However, this life style of human being had been closed because the **agricultural revolution** was

developed through
plant and **crop** at one
place.

Agriculture revolution

Timeline of the Agricultural Revolution

- The **first agricultural revolution** is the period of **transition** from a **hunting-and-gathering society** to **one based on stationary farming**.
- The **technology developed** for this period includes **tools to cultivate the land**.

First agriculture
simple metal

- The **second agricultural revolution** went **hand** in hand with the **Industrial Revolution** in the 18th and early 19th.
- **New technology** was introduced to agriculture for **mass crop**.
- Farmers were no longer to limited farms and commercial farming became an idea **worth**

exploring.

• The technology developed for this revolution includes the **seed drill**, which enabled farmers to **easily plant rows**, **new fertilizers** were also introduced as well as **artificial feed**.

- The **green Revolution** was the introduction of **advanced technology** and **agricultural practices** to **farms** to make farms more efficient.

• This revolution was sparked by the increasing awareness

that the Earth is not **renewable** and that farms could not keep expanding outward and efficiency of land.





olution:
without

- The **current agriculture** is **changing** because of **AI** and **ICT**. That is, **AI** and **ICT** is introducing to agriculture to **analyze** and to **adjust humidity, temperature** without weather condition.
 - Current agriculture do not have competitiveness
- recognition of customer's taste

Introduction to the Industrial Revolution (IR)

Industrial revolution

is **defined** as

the **changes** in

manufacturing and

transportation that began with

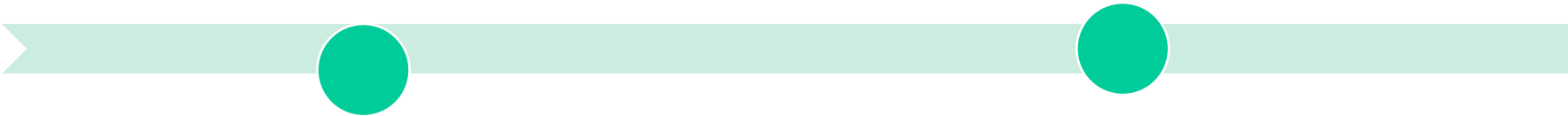
fewer things being

made by hand but

instead made using

machines in larger-

scale factories.



Duration : 1700s
and early
1800s, **started in**
England , with a
series of
innovations to
make **labor more**
efficient and
productive

Introduction to the Industrial Revolution (IR)

Technical advances also change the way **humans** produce things.

The step into **production technology**, which was completely different from the past, is also called the **industrial revolution**.

The **new production technologies** fundamentally changed the working conditions and lifestyles of people.

**Industrial revolutions are
categorized from the first IR to
Industry 4.0.**

Introduction to the Industrial Revolution (IR)

The steam engine,

-

- The age of science and mass

production

changed the
world around
and us into
modern
society.

- The rise of digital technology ,
- Smart and autonomous systems
fueled by data and machine
learning.



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.



The Most Important Inventions of the Industrial Revolution

Historical Background (IR 1.0, IR 2.0, IR 3.0)

The **industrial revolution began** in **Great Britain** in the late 1770s before spreading to the rest of Europe.



The evolution is due in part to an **increase** in **food production**, which was the key outcome of the **Agricultural Revolution**.



The first European countries to be industrialized after England were **Belgium**, **France**, and the **German** states.

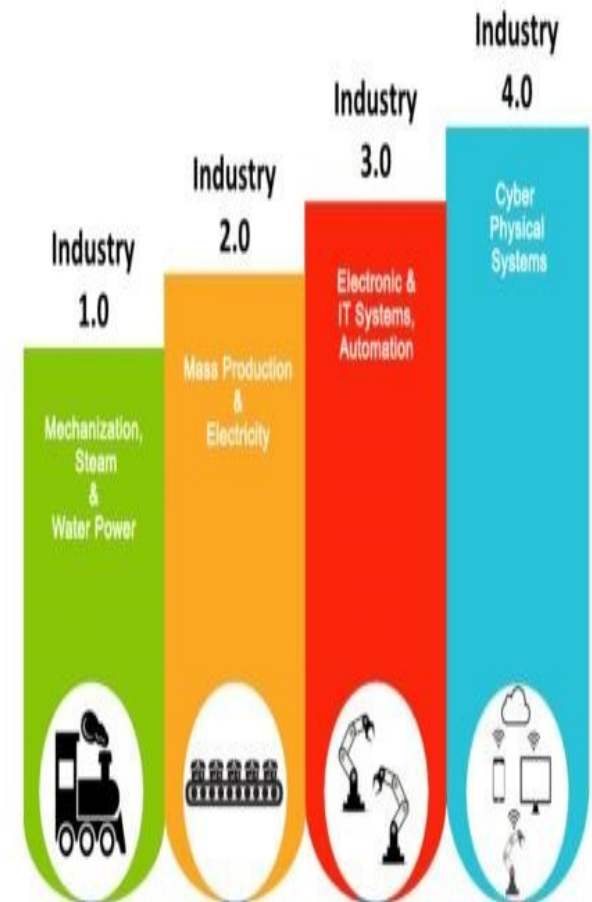


The final cause of the **Industrial Revolution** was the effects created by the **Agricultural Revolution**.

The four types of industries are:

The primary industry involves getting **raw materials** e.g. mining, farming, and fishing.

The secondary industry involves **manufacturing and Electrical power introduced** e.g. making cars and steel.



Tertiary industries provide a **service** and **digital logic circuit** e.g. teaching and nursing.

The quaternary industry involves **research** and **development** industries , Networking Cyber Security e.g. IT.

Industrial Revolution (IR 1.0)

- IR was first coined in the 1760s, during the time where this revolution began
- Transition to new manufacturing processes
 - Hand production methods to **machines**

- The increasing use of steam power
- The development of machine tools
- Rise of the factory system

Industrial Revolution (IR 1.0)

- The **First Industrial Revolution** began in the 18th century through the use of **steam power** and **mechanization** of **production**.
- What before produced threads on simple spinning **wheels**, the **mechanized version** achieved **eight times** the volume in the same time.
- The use of it for **industrial purposes** was the greatest breakthrough for **increasing human productivity**.

- Instead of **weaving looms powered by muscle, steam-engines** could be used for power.
- Developments such as the **steamship** or (some 100 years later) the steam-powered locomotive brought about further massive changes because humans and goods could move great distances in fewer hours

Industrial Revolution (IR 2.0)

- The **Second Industrial Revolution** began in the 19th century(somewhere in the 1870s) through the **discovery** of **electricity** and **assembly line production**.
- The **development** of methods for **manufacturing interchangeable parts** and **widespread adoption** of pre-

existing **technological systems** such as **telegraph** and **railroad networks**.

- **Electrical power introduced**

Industrial Revolution (IR 2.0)



(1863-1947) carried over these entire automobile, took the idea principles into now the vehicles Of mass automobile were produced in

production production and partial steps on the

conveyor belt - from a drastically altered

Industrial Revolution (IR 3.0)

- **Began from the late 1950s. “Digital Revolution”**
- **Factor**
 - The **mass production**
 - **Digital logic circuits** and its derived technologies such as the **computer**, **hand phones** and the **Internet**.
 - Still being practiced until this current day, for example
 - the proliferation of digital computers and digital record
- Since the introduction of these technologies, we are now able to **automate** an **entire production process** - without human assistance.

- Known examples of this are **robots** that perform programmed sequences without human intervention

Fourth Industrial Revolution (IR 4.0)

- Advancements
 - **Robotics, Internet of Things (IoT)**
 - **A cyber-physical system**
- Mechanism that is controlled or monitored by computer-based algorithms, – **Computer Numerical Control (CNC) machines.**

– **Artificial Intelligence- for Autonomous Vehicles and Automated Robots**

- This is characterized by the **application** of **information** and **communication technologies** to industry and is also known as "Industry 4.0".
- It builds on the developments of the Third Industrial Revolution.
- Production systems that already have **computer technology** are expanded by a **network connection** and have a digital twin on the Internet so to speak.

Fourth Industrial Revolution (IR 4.0)

- This is the next step in production automation.
- The **networking** of all systems leads to "**cyber-physical production systems**" and therefore **smart factories**, in which production systems, components and people communicate via a network and production is nearly autonomous.

Role of Data for Emerging Technologies

- **Data**, in today's business and technology world, is **essential**.
- 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.
- **Scientific** methods is **based** on **data**
- The **world** is **full of data**. **Every action** that you do is **data**. **Every word** you speak is a **data**. You

walk, you dance, you speak, you sleep, you study, everything is data.

- So, **data acts** as an **input** and in this world, whatever systems exist, it will take data as an input

Enabling devices and network (Programmable devices)

- **Memory: store information**
- **Microprocessors: Execute software**

In the world **instruction** tasks such as running a

word processing to perform a wide variety of of

digital program or video game

electronic • logic: provide specific functions,

including systems, device-to-device interfacing,
data

there are

communication, signal processing, data
display, timing and control operations, and

four basic almost every other function a system must
kinds perform.

- **Networks** servers, mainframes, network devices, : **collection of computers**,

peripherals, or other devices
connected to one another to allow
the sharing of data.

List of some Programmable devices

- Achronix Speedster SPD60

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

Human to Machine Interaction

- **Human-machine interaction (HMI)** : refers to the **communication** and **interaction between** a **human** and a **machine** via a **user interface**.
- **HCI (human-computer interaction)**: 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?:** The **user** interacts **directly** with **hardware** for the **human input** and

output such as **displays**, e.g. through a graphical user interface. The user interacts with the computer over this software interface using the given input and output (I/O) hardware.

Human to Machine Interaction

- How important is human-computer interaction?
 - **Improve** the **interaction between users** and **computers** by **making computers** more **user-friendly** and receptive to the user's needs.

- Advantages
 - **Simplicity**, ease of **deployment** & operations, reduce solution design time and integration complexity and cost savings for smaller set-ups.

Disciplines Contributing to Human-Computer Interaction (HCI)

- **Cognitive psychology**: Limitations, information processing, performance prediction, cooperative working, and capabilities

- **Computer science:** graphics, technology, prototyping tools, user interface management systems.
- Linguistics.
- Engineering and design.
- Human factors
- Artificial intelligence.

5. Future Trends in Emerging Technologies

- Emerging technology trends – Augmented

Analytics in 2019 – Digital Twins

- 5G Networks – Enhanced Edge
- Artificial Intelligence (AI) Computing and
- Autonomous Devices
- Immersive Experiences in
- Block chain

Smart
Spaces

Thank You!!!