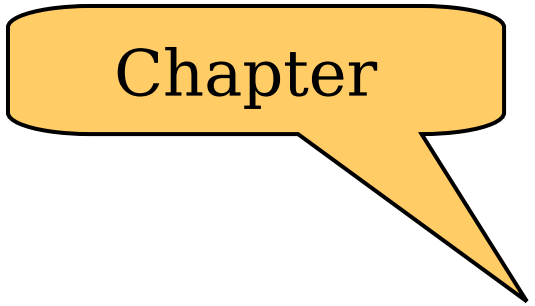
Introduction to Emerging Technologies



Chapter .

Introduction to emerging technologies

01

02

Introduction to Data science

Core Competence topic

03

AI
Artificial Inelegant

0
4

Internet of things (IoT)

Introduction

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

There are **different attempt** to define **Emerging Technology (ET)** in different areas, such as media, business, science, or education.

E.g. a definition of emerging technologies for education

- **Emerging technologies** are tools, concepts, innovations, and advancements utilized in diverse **educational** setti ngs to serve varied education-related purposes

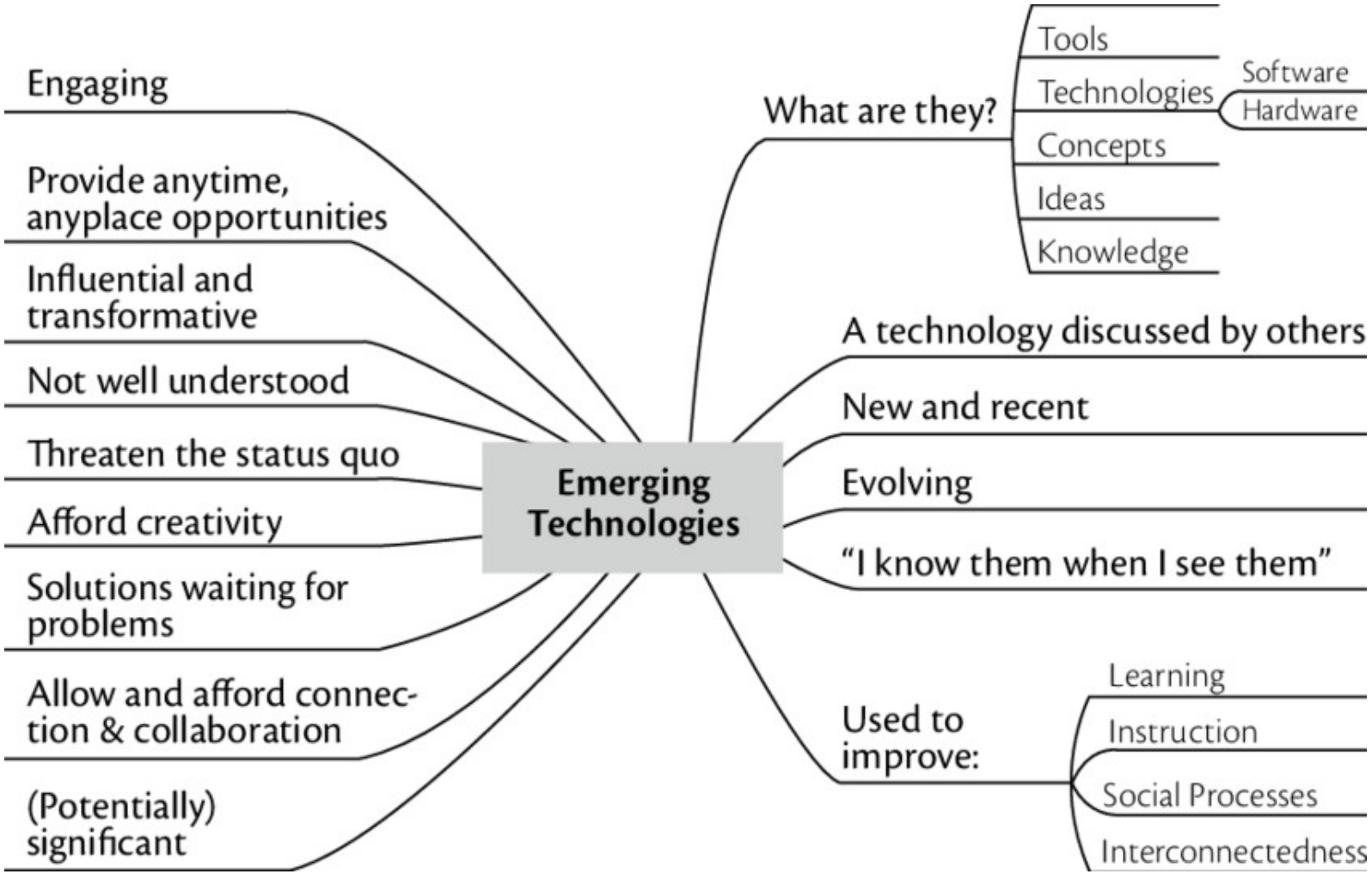
Introduction

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.


Emerging Technologies
Engaging
Provide anytime, anyplace opportunities
Influential and transformative
Not well understood
Threaten the status quo
Afford creativity
Solutions waiting for problems
Allow and afford connec-tion & collaboration
(Potentially) significant
What are they?
Tools
Technologies
Software
Hardware
Concepts
Ideas
Knowledge
A technology discussed by others
New and recent
Evolving
"I know them when I see them"
Used to improve:
Learning
Instruction
Social Processes
Interconnectedness

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

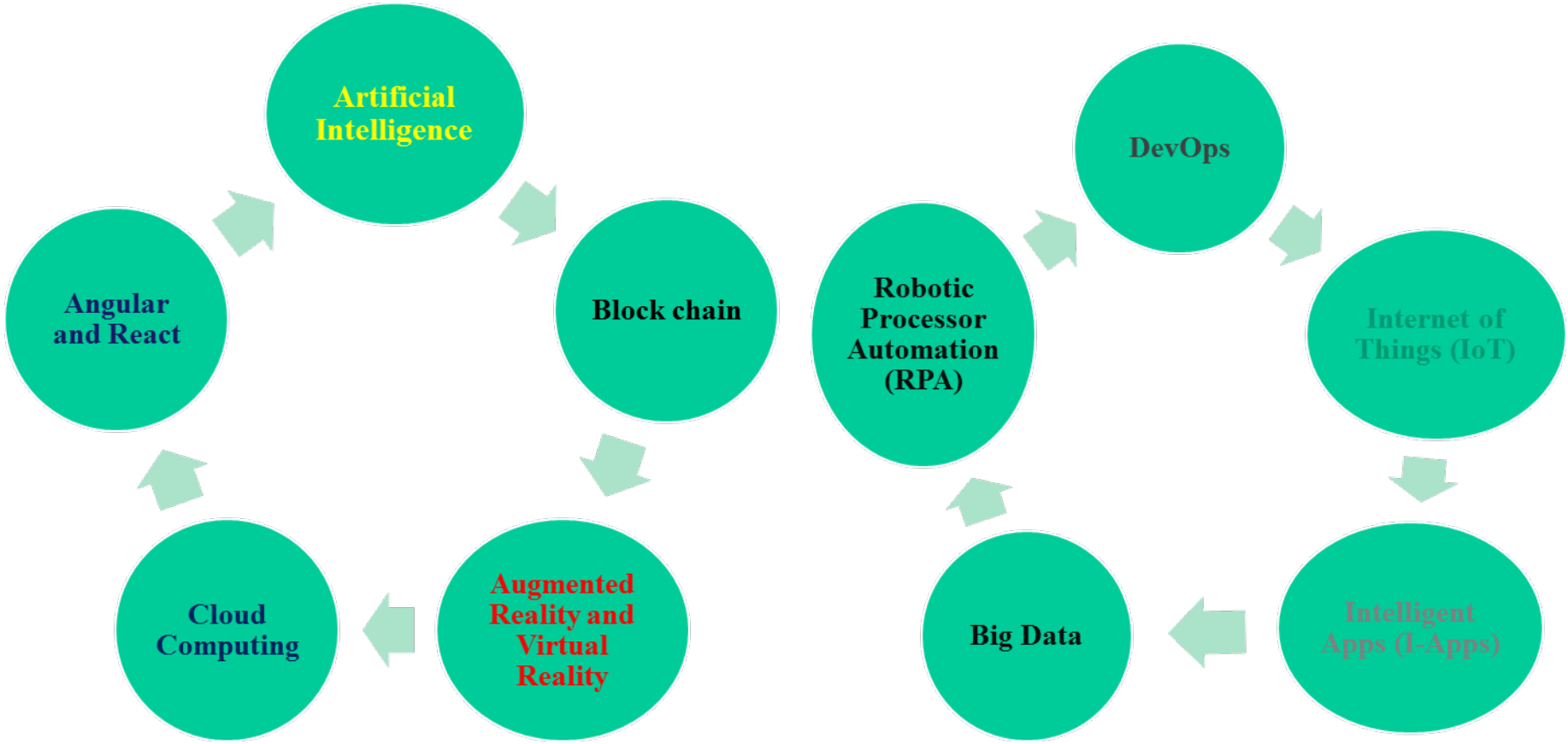
1610s, The word **technology** comes from Greek word "**techno-logía**" and "**techne**" means ***art, skill*** *or* ***craft*** and "**logía**" means ***study of***.

Technology is a broad concept , but generally, defined as the **use** or **application** of **knowledge** to **turn resource** into **goods** and **service** that **society needs** or **wants** or **solve a problem** or **perform a specific function**.

Evolution means the **process of developing** by gradual changes



List of some currently available emerged technologies

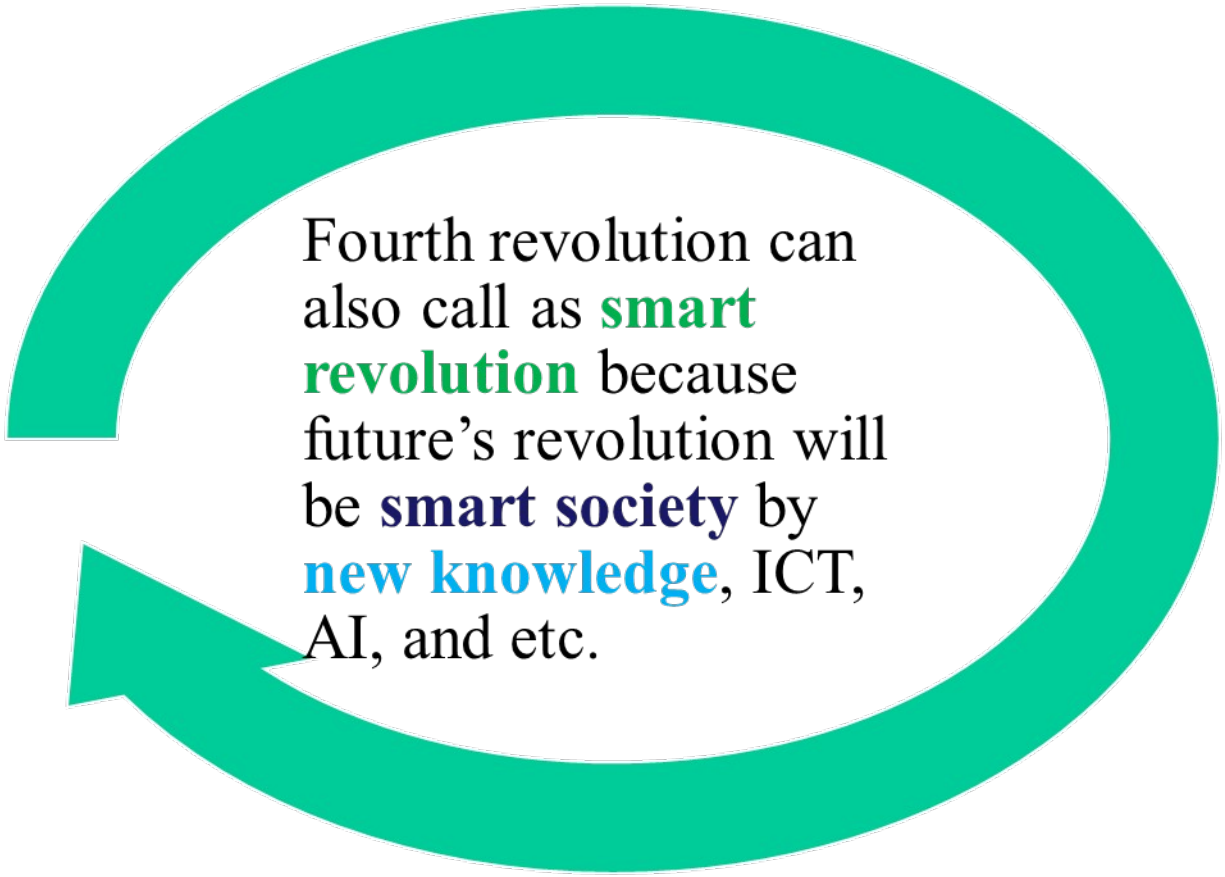


Introduction

Therefore, we can **divide revolution** of **technology** 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



Agriculture revolution

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 to **agriculture** and **settles down** at one place.

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

However, this life style of human being had been closed because the **agricultural revolution** was **developed** through **plant** and **crop** at one place.

Timeline of the Agricultural Revolution

First agriculture 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 simple **metal tools** to **cultivate the land**.

Second agriculture revolution:

- 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**.

Third agriculture revolution:

- 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.

Fourth agriculture revolution:

- 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 without 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 following revolution are fundamentally changed the world around us into modern society.

- The steam engine,
- The age of science and mass production
- The rise of digital technology , and
- Smart and autonomous systems fueled by data and machine learning.

The Most Important Inventions of the Industrial Revolution



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.

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**.

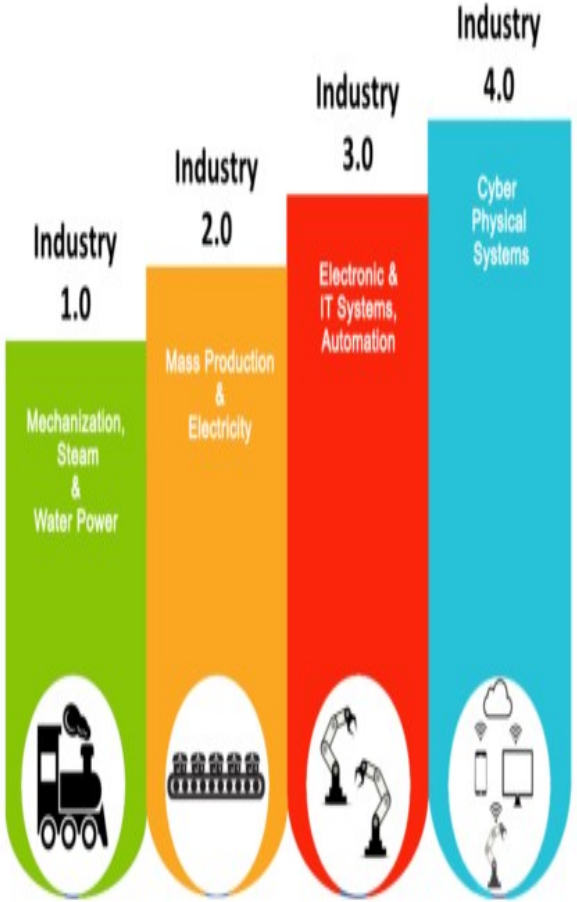
The four types of industries are:

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**, s**team-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)

Henry Ford (1863-1947) took the idea of mass production from a slaughterhouse.

Henry Ford carried over these principles into automobile production and drastically altered it in the process.

While before one station assembled an entire automobile, now the vehicles were produced in partial steps on the conveyor belt - significantly faster and at lower cost.

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)

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

- **Memory**: **store information**
- **Microprocessors**: **Execute software instructions** to perform a wide variety of tasks such as running a word processing program or video game
- **logic**: **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.
- **Networks**: **collection of computers**, servers, mainframes, network devices, 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-on-chip (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
  - **Simplicit**y, ease of **deploymen**t & 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 in 2019
  - 5G Networks
  - Artificial Intelligence (AI)
  - Autonomous Devices
  - Block chain
  - Augmented Analytics
  - Digital Twins
  - Enhanced Edge Computing and
  - Immersive Experiences in Smart Spaces

Thank You!!!

