INTRODUCTION TO EMERGING TECHNOLOGIES **(EMTE1011/1012)**

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ASSESSMENT

- Assignment /Quiz /Attendance 20%
- Test 30%
- Final Exam 50%

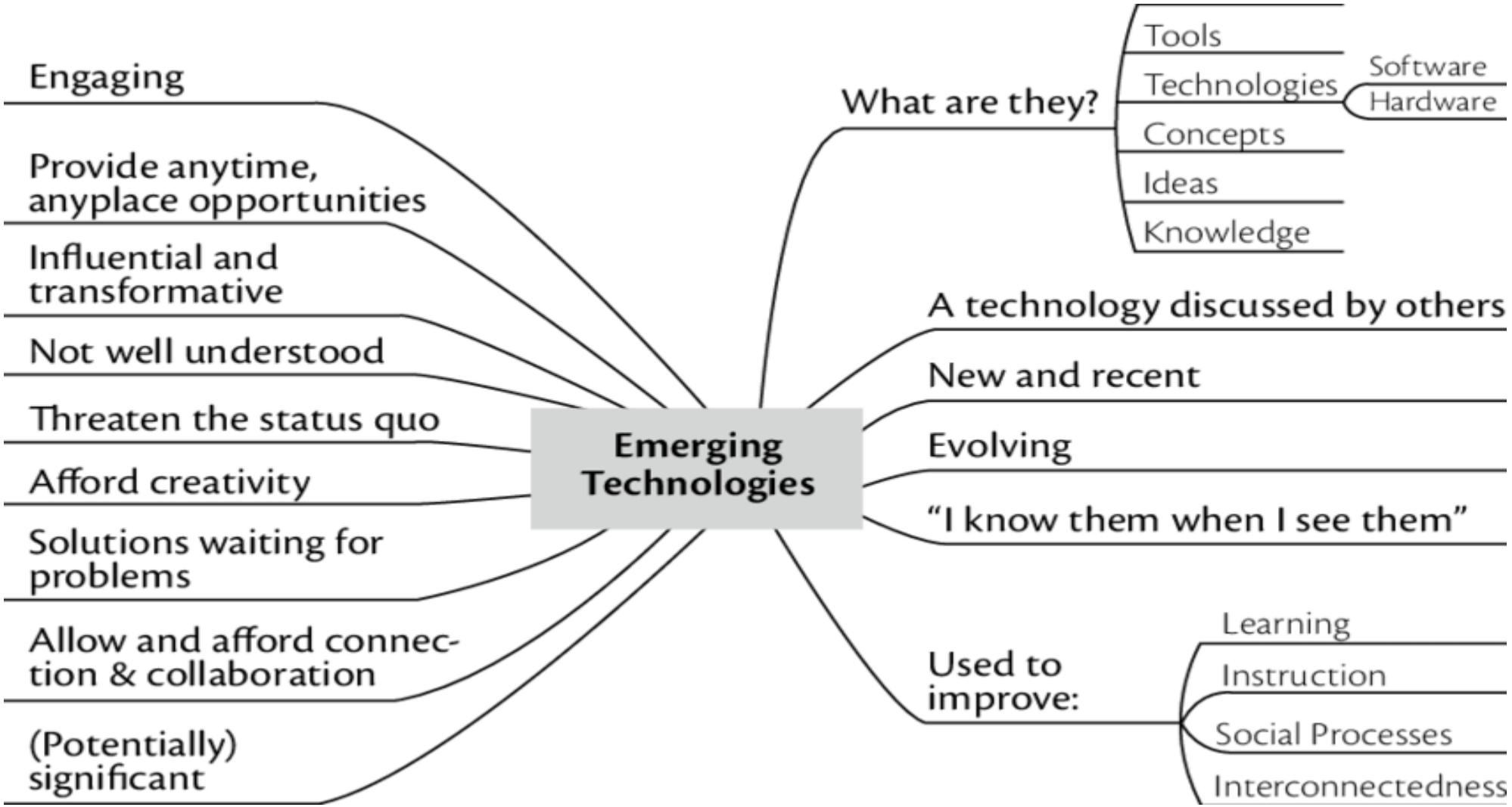
WHAT IS EMERGING TECHNOLOGY (ET)

INTRODUCTION

- There are different attempt to define 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** settings 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 connection & 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

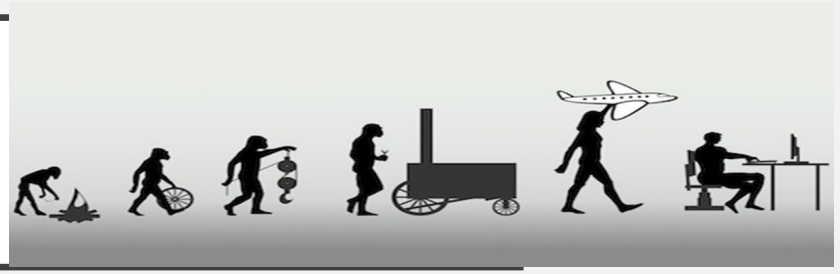
- Technological evolution is a theory of radical transformation of society through technological development.
- It is the changes over time in technology that give humans increased control over their environment. E.g.

Neolithic	10,000	Domestication of plants and animals and the rise of agricultural communities
Bronze & Iron Ages	5,000	Beginning of technology based on metals: copper then bronze then iron
Industrialization	200	Beginning of the industrial age

TECHNOLOGICAL CONVERGENCE

- Technological convergence in this instance is as the interlinking of computing and other information technologies, media content, and communication networks that has arisen as the result of the evolution and popularization of the Internet as well as the activities, products and services that have emerged in the digital media space.

TECHNOLOGY



- 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

- Artificial Intelligence
- Block chain
- 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)

- **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.

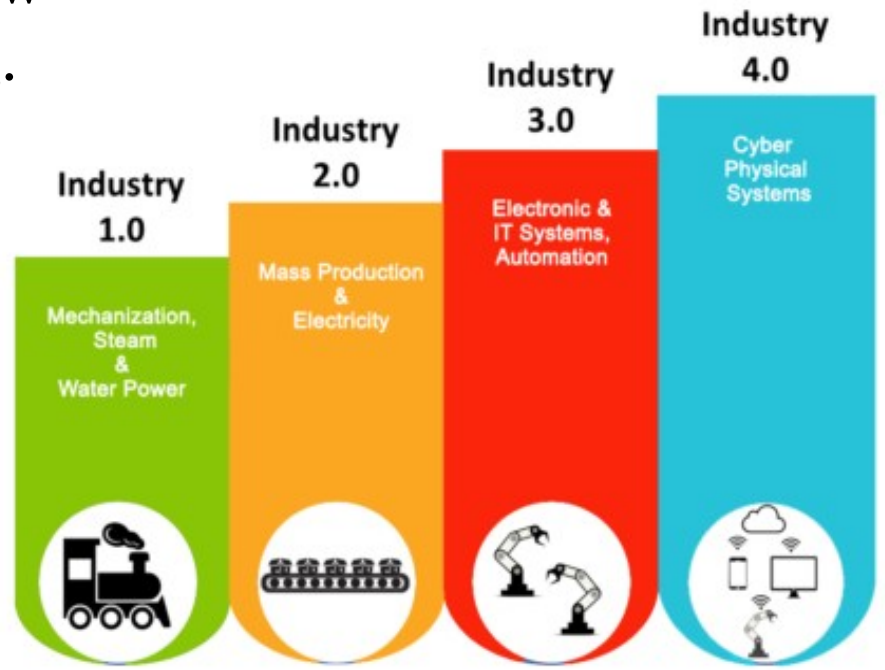
THE FOUR TYPES OF INDUSTRIES ARE:

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

The secondary industry involves manufacturing e.g. making cars and steel.

Tertiary industries provide a service e.g. teaching and nursing.

The quaternary industry involves research and development industries 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.
- Steam power was already known.

INDUSTRIAL REVOLUTION (IR 1.0)

- 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)

- 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.
- a.k.a “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

INDUSTRIAL REVOLUTION (IR 3.0)

- 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)

- IR 4.0 was coined by Klaus Schwab, the founder and executive chairman of World Economic Forum, in the year 2016
- 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

FOURTH INDUSTRIAL REVOLUTION (IR 4.0)

- 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 indispensable.
- 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

ROLE OF DATA FOR EMERGING TECHNOLOGIES

- 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

ENABLING DEVICES AND NETWORK (PROGRAMMABLE DEVICES)

- **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
  - 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 in 2019
  - 5G Networks
  - Artificial Intelligence (AI)
  - Autonomous Devices
  - Block chain
- Augmented Analytics
- Digital Twins
- Enhanced Edge Computing and
- Immersive Experiences in Smart Spaces

ET THAT WILL SHAPE THE FUTURE

- Some emerging technologies that will shape the future of you and your business
  - Augmented Reality, Virtual Reality, Internet Of Things, Blockchain, Artificial Intelligence, Chabot's, Ephemeral Apps and
  - These technologies are already shaping our life whether we like it or not

END OF CHAPTER 1