

Introduction to Emerging Technologies

Course Module

(EMTE 1012)

CHAPTER 1

Introduction to Emerging Technologies

JU, JiT, Faculty of computing and Informatics By: Temesgen D

Outline

- Introduction to Emerging Technologies
- Evolution of Technologies
- Introduction to the Industrial Revolution (IR)
- The Most Important Inventions of the Industrial Revolution
- Historical Background (IR 1.0, IR 2.0, IR 3.0)
- Role of Data for Emerging Technologies
- Enabling devices and network (Programmable devices)
- List of some Programmable devices
- Human to Machine Interaction
- Disciplines Contributing to Human-Computer Interaction (HCI)
- Future Trends in Emerging Technologies
- Emerging technology trends in 2019
- Some emerging technologies that will shape the future of you and

Chapter objectives

- Develop knowledge about the era of industrial evolutions
- Identify the technological advances that made the industrial revolution possible
- Analyze the changing conditions created by the industrial revolution in both Europe and the united states
- Understand the causes of the Industrial Revolution in Great Britain, continental Europe, and the United States.
- Describe the technological innovations that spurred industrialization
- Identifies and understand the programmable device
- Understand concepts relating to the design of human-computer interfaces in ways making computer-based systems comprehensive, friendly and usable

WHAT IS EMERGING TECHNOLOGY??

Emerging technology is a term generally used to describe a ***new technology***, but it may also refer to the continuing development of existing technology.

Evolution of Technologies

- **Emerging technology:** is a term generally used to describe
 - a new technology
 - continuing development of existing technology
 - technologies that are currently developing, or that are expected to be available within the next five to ten years.
 - Usually reserved for technologies that are creating or are expected to create significant social or economic effects.

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

Industrial Revolution (IR)

- a change from making things by hand to making them in factories.
- Before the Industrial Revolution, people relied on the **horse** and their own **feet** to get around.
- With the invention of the **steam locomotive**, transportation took a huge step forward.
- The revolution started in **England**, with a series of innovations to make **labor more efficient and productive**.
- This shift brought about changes in culture as people moved from **rural** areas to **big cities** in order to work.

Cont.

- The American Industrial Revolution commonly referred to as the Second Industrial Revolution, started sometime between 1820 and 1870. The impact of changing the way items was manufactured had a wide reach.
- Industries such as **textile manufacturing**, **mining**, **glass making**, and **agriculture** all had undergone changes.

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

Cont.

- ❑ Generally, the following industrial revolutions fundamentally changed and transfer the world around us into modern society.
 - ❑ The steam engine,
 - ❑ The age of science and mass production, and
 - ❑ The rise of digital technology
 - ❑ Smart and autonomous systems fueled by data and machine learning

Historical Background

- The **IR** began in Great Britain in the late 1770s before spreading to the rest of Europe. The first European countries to be industrialized after England were Belgium, France, and the German states.

The four types of industries are:

1. **The primary industry** involves getting raw materials e.g. mining, farming, and fishing.
2. **The secondary industry** involves manufacturing e.g. making cars and steel.
3. **Tertiary industries** provide a service e.g. teaching and nursing.

Industrial Revolutions

Industrial Revolution (IR 1.0): The Industrial Revolution is described as a transition to new manufacturing processes.

- first coined in the 1760s,
- 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** and the **rise of the factory system**.

Steam Engine



Industrial Revolution (IR 2.0)

- began somewhere in the 1870s
- also known as the **Technological Revolution**
- 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.
- **Electrical power and telephone system** were introduced.

Electricity transmission line



Industrial Revolution (IR 3.0)

- Began from the late 1950s
- IR 3.0 introduced the transition from mechanical and analog electronic technology to digital electronics.
- 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, hand phones and the Internet.
- These technological innovations have arguably transformed traditional production and business

- Certain practices that were enabled during IR 3.0 is still being practiced until this current day, for example the proliferation of digital computers and



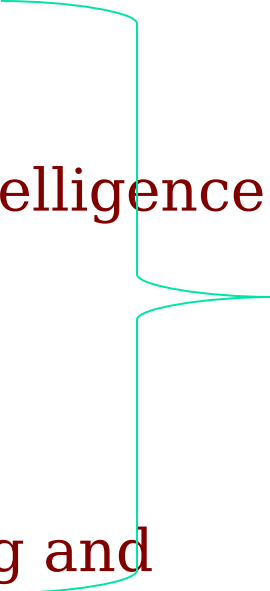
High Tech Electronics

Fourth Industrial Revolution (IR 4.0)

- We are here now and characterized by advanced digital system

Technologies like

- Advanced Artificial Intelligence
- Robotics
- Internet of Things
- additive manufacturing and
- autonomous vehicles



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

- One example that is being widely practiced in industries today is the usage of Computer Numerical Control (CNC) machines.



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.
- Drives or even determines the future of science, technology, the economy, and possibly everything in our world today and tomorrow.
- Fields like **data science** getting more attention currently.
- Data science involve multiple disciplines such as **computing**, **informatics**, **statistics**, **business**, **social science**, and **health/medical science**.

Enabling Devices and Network (Programmable Devices)

- **Four basic components in digital system**
 - Memory
 - Microprocessors
 - Logic, and
 - Networks.
- **Memory devices** store random information such as the contents of currently running programs.
- **Microprocessors** execute software instructions to perform a wide variety of tasks such as running system or application software's.

Cont.'

- **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.
- An excellent example of a network is the [Internet](#), which connects millions of people all over the world

- Programmable devices usually refer to chips that incorporate **field programmable logic devices (FPGAs)**, **complex programmable logic devices (CPLD)** and



Figure 1.5 programmable device

- There are also devices that are the analog equivalent of

Cont.'

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 re-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

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)
- ❑ Routers
- ❑ Switches
- ❑ Modems
- ❑ 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.
- **Human can interact with machine using the following ways**
 - Natural language(text to speech or speech to text)
 - Graphical user interface(menu, form and web based interface)
 - Command line interface and others
- **HCI (human-computer interaction)** is the study of how people interact with computers and to what extent

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 **the software interface** using the given input and output (I/O) hardware.
- 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** and **operations** and **cost savings** for smaller

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**

Future Trends in Emerging Technologies

■ Emerging technology trends in 2019

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

Emerging technologies that will shape the future of you and your business

- Chatbots,
- virtual/augmented reality,
- blockchain,
- Ephemeral Apps and
- Artificial Intelligence

Activity 1.9

- *Barfly discussed these emerging technologies how it could be shaping the future of you and your business*
 - *Chatbots*
 - *Virtual, Augmented & Mixed Reality*
 - *Blockchain. The blockchain frenzy is real*
 - *Ephemeral Apps and*
 - *Artificial Intelligence.*



**END OF CHAPTER
ONE !!**

Chapter One Review Questions

1. Where did the Industrial Revolution start and why did it begin there?
2. What does “emerging” mean, emerging technologies and how are they found?
3. What makes “emerging technologies” happen and what impact will they have on Individuals, Society, and Environment?
4. Discussed the economic and ideological causes of the American, the French, and the Chinese Revolutions, and to see the larger historical contexts in which these events took place?
5. Discuss and compare the course of the American, the French, and the Chinese revolutions and analyze the reasons for and significance of the different outcomes of these three revolutions?

Chapter One Review

Questions

6. Discuss the successes and the shortcomings of the conservative reaction to the French Revolution as seen in the actions of the Congress of Vienna and the Holy Alliance?
7. How do recent approaches to “embodied interaction” differ from earlier accounts of the role of cognition in human-computer interaction?
8. What is the reason for taking care of design a good computer-human interface?
9. Discuss the pros and cons of human-computer interaction technology?

References

- E. S. Ruiz and F. M. U. R. Perez, “German carro fernandez, sergio martin gutierrez, elio sancristobal ruiz, francisco mur perez, and manuel castro gil ©,” no. June, pp. 51–58, 2012.
- F. Griffiths and M. Ooi, “The fourth industrial revolution - Industry 4.0 and IoT [Trends in Future I&M],” IEEE Instrum. Meas. Mag., vol. 21, pp. 29–43.
- J. Hoerni, “Semiconductors and the second industrial revolution,” pp. 38–39, 1982.
- J. Wan et al., “Software-Defined Industrial Internet of Things in the Context of Industry 4.0,” vol. 16, no. 20, pp. 7373–7380, 2016.