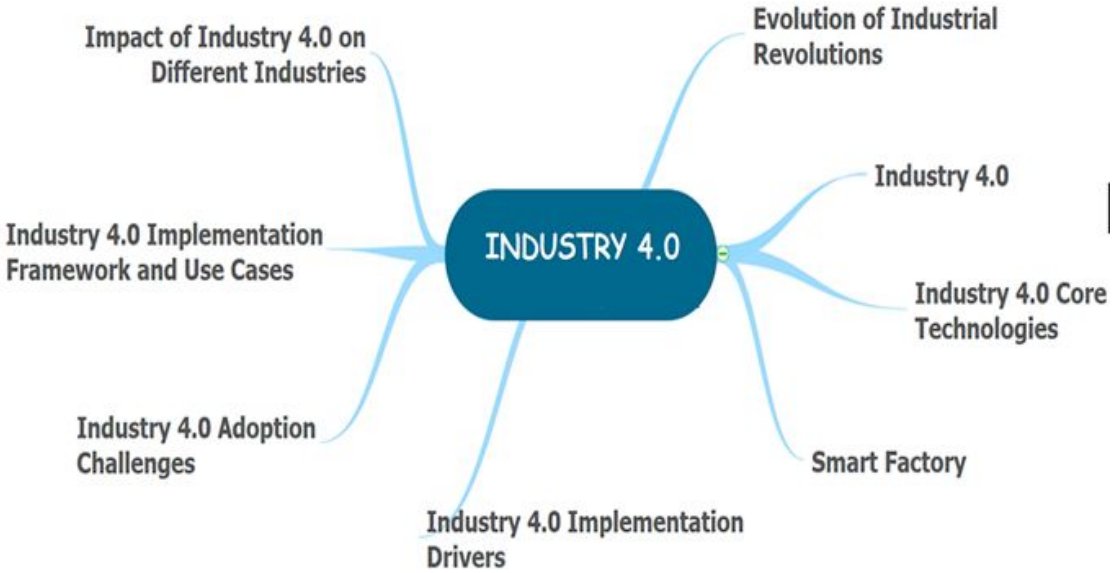
Industry 4.0

Topic: Introduction, Historical context, key technologies

COURSE OUTLINE



Revolution:

Instantaneous and complete shift

First shift- Foraging to Farming (10,000 years ago)

Industrial Revolution:

Development of new technology and approaches which affects the production, transportation and communication

HISTORY OF INDUSTRIAL REVOLUTION-I

- Industrial Revolution – a change from making things by hand to making them in factories.

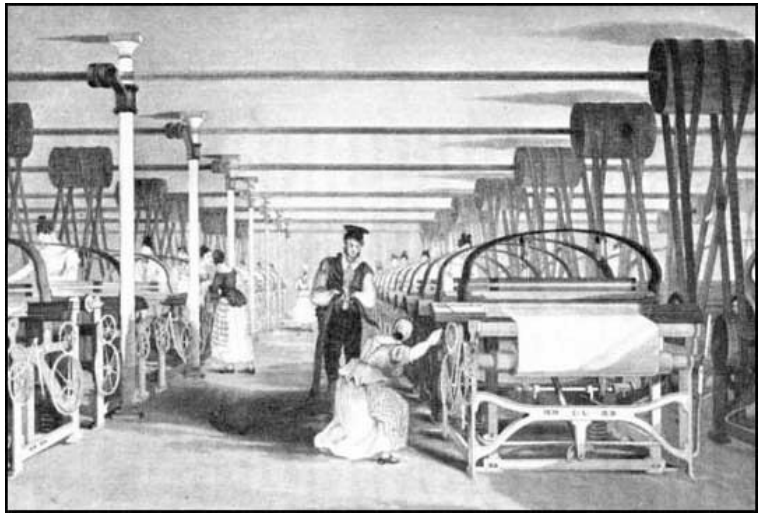
AN ORIGINAL STEAM ENGINE

INDUSTRY 1.0: 1st Industry Revolution (1760-1840)
MECHANIZATION

- Started in Great Britain
- Machine and tools replaced animals and human labour
- Driven by steam and internal combustion engine
- Widespread use of iron and steel for machinery
- Mechanisation of spinning wheels resulted 8 times increase in output
- Adaptation of coal powered factory system
- Development of canals and roads for transportation.

HISTORY OF INDUSTRIAL REVOLUTION-II

- With the invention of the spinning jenny and the power loom, the textile industry took off. Clothes could now be made far faster than ever before.



Water power used in power looms to weave cloths

INDUSTRY 2.0: 2nd Industry Revolution (1830-1947)
MASS PRODUCTION/TECHNOLOGY REVOLUTION

- Introduction of assembly line and mass production in factories.
- Introduction to electricity and petrolium as sources of energy
- Invention of automobile, telegraph, telephone, radio
- Shipping made easy by railways and telegraph lines
- New materials like stainless steel, rare earth metals and plastics are used
- Improved standard of living with focus on public health

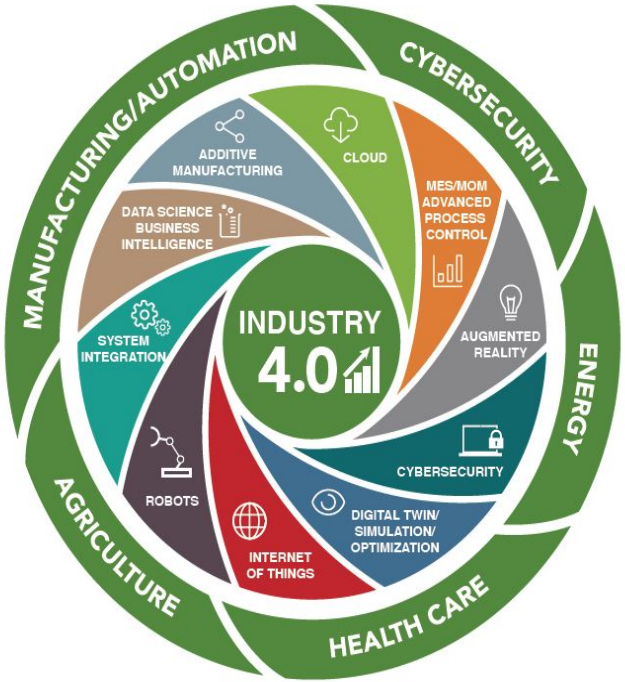
HISTORY OF INDUSTRIAL REVOLUTION-III

- SCADA, PLC, CAD etc. are started as automation and design tools

INDUSTRY 3.0: 3rd Industry Revolution (1947-2015)
DIGITIZATION and AUTOMATION

- Also known as digital revolution
- Shift from mechanical and analogue technology to digital technology
- Electronics and Robotics integrated into manufacturing procedure
- Rise in telecommunication and computers
- New energy sources such as nuclear and renewable are explored
- Invention of Internet and World-Wide-Web
- Widespread factory automation using robots and PLCs
- Computers; semi conductors, main frame computing, personal devices, internet

HISTORY OF INDUSTRIAL REVOLUTION-IV



INDUSTRY 4.0: 4th Industry Revolution (2015 -)
Convergence of Digital-Biological-&-Physical innovations

- The rise of interconnectivity and advanced automation
- Invention of advanced technologies such as Internet of Things(IOT), Artificial Intelligence(AI), Big data analytics, advanced robotics , Cloud computing etc.
- Example: Gene editing (CRISPR), self-driving vehicles, aditive manufacturing (3D printing, Digital twins, etc.
- Use of smart M2M (Machine to machine) communication enables self-diagnosis, real time analysis.

DEFINATION OF 4th INDUSTRIAL REVOLUTION

INDUSTRY 4.0: 4th Industry Revolution (2015 -)

- A fundamental change in the industrial structure that integrates the physical, biological, and digital worlds based on big data and which affects all fields, including the economy and industry.

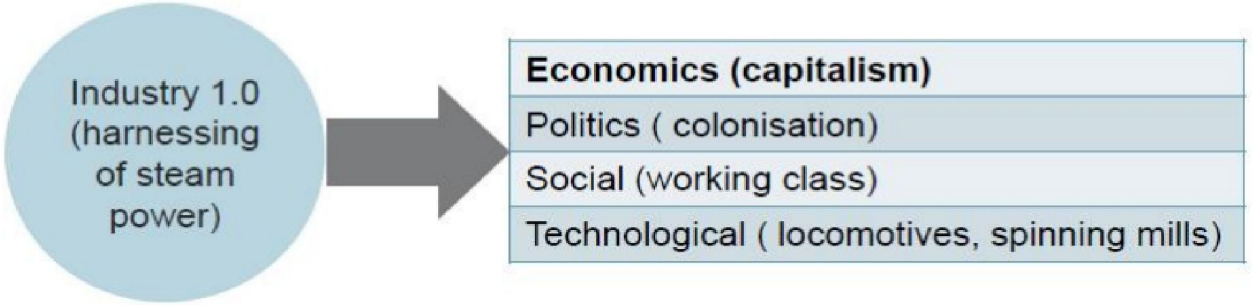
EXAMPLE OF 4th INDUSTRIAL REVOLUTION

- First, a clear example is Nate-On, a messenger service of SK Telecommunication.
- Nate-On was a major player dominating the PC-based messenger market in the mid-2000s but missed the opportunity to enter first into the mobile-based messenger service market.
- The reason for hesitating to develop a mobile-based messenger was worry about the expected decrease in revenue from text-message services.
- The price for this move turned out to be quite high.
- In other words, the opportunity to preoccupy the app-based messenger market was taken by KakaoTalk.
- However, at the time, Nate-On did not preemptively enter the market, despite having established infrastructure and existing users. Therefore, KakaoTalk, which is used by the majority of the Korean people, took over the place, and KakaoTalk's market capitalization currently stands at about 33 billion dollars.

EXAMPLE OF 4th INDUSTRIAL REVOLUTION

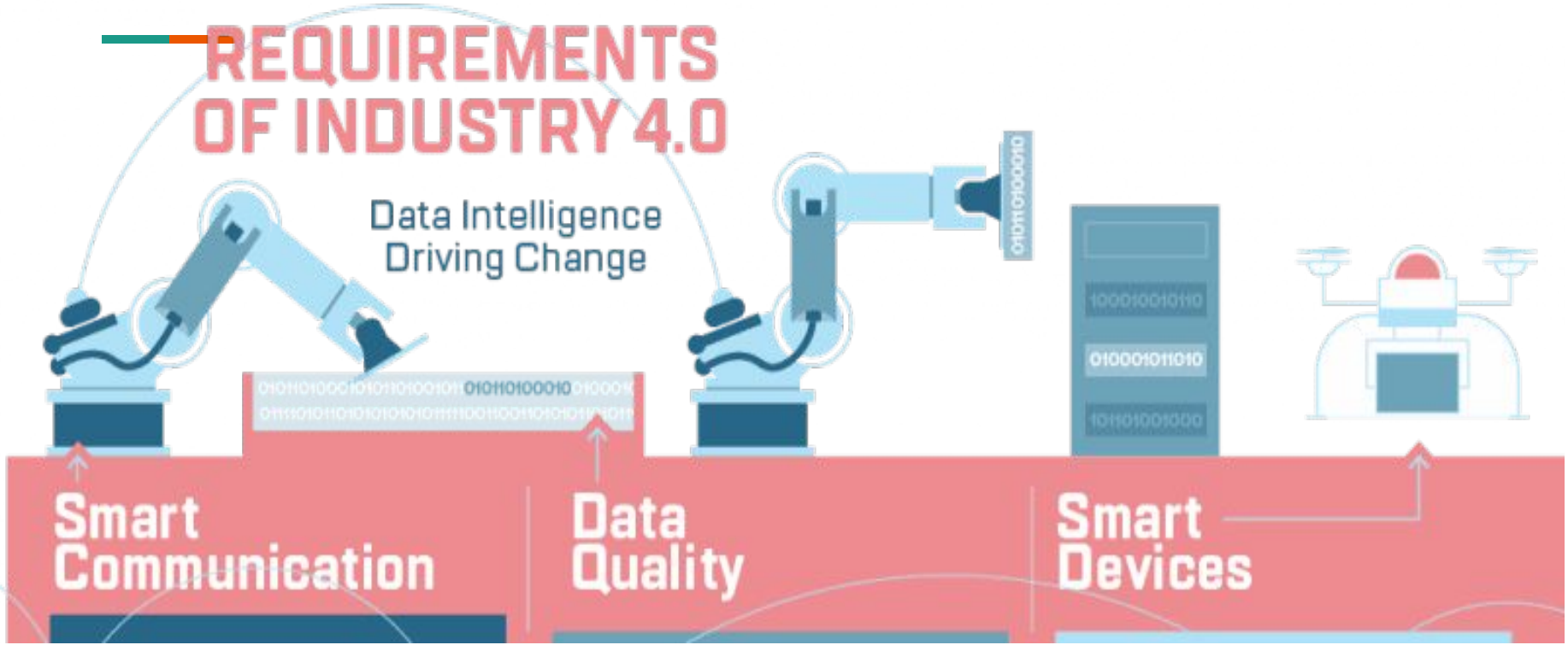
- Another example of failure is LG Electronics' late entry into the smartphone market.
- Despite the transition to the mobile era when Apple Inc. of the United States launched the iPhone around the world in 2007, LG Electronics was focusing on high-end traditional mobile phones rather than focusing on the development and marketing of smartphones.
- At that time, LG Electronics possessed the technology and capabilities to transform its core business model to a mobile-based one quickly. However, by not executing a transition to smart mobile devices, its current market share in the global smartphone market is meager compared to other business divisions of LG Electronics.
- It failed to predict the arrival of the smartphone era when the structural changes in the business environment took place. As a result, LG Electronics' mobile division has been recording losses for 22 consecutive quarters.

IS INDUSTRY 4.0 A REVOLUTION

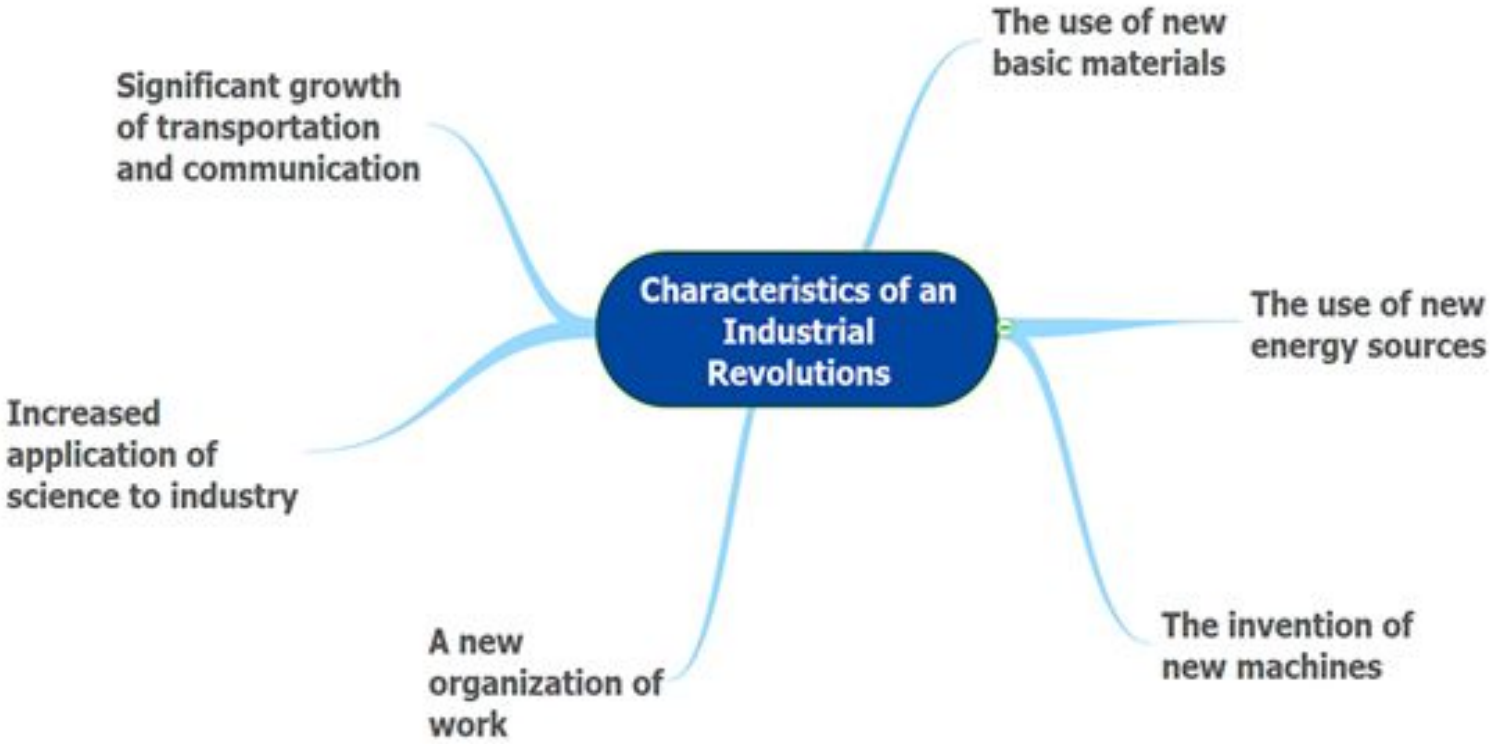


- A movement is called revolution when it impacts multiple dimensions of the society

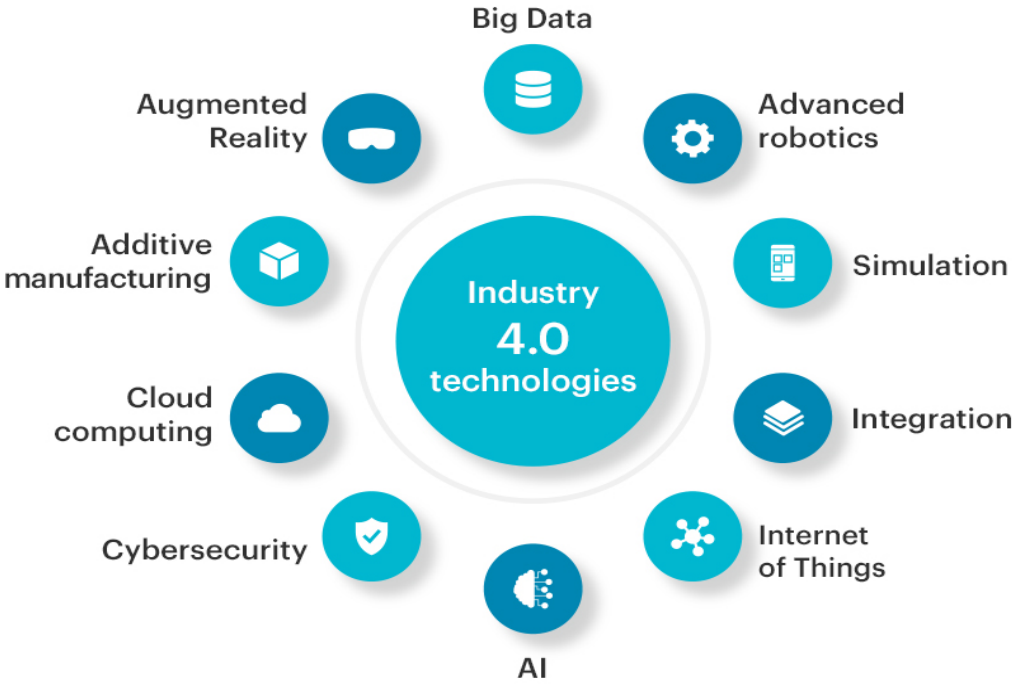
REQUIREMENTS OF I4.0



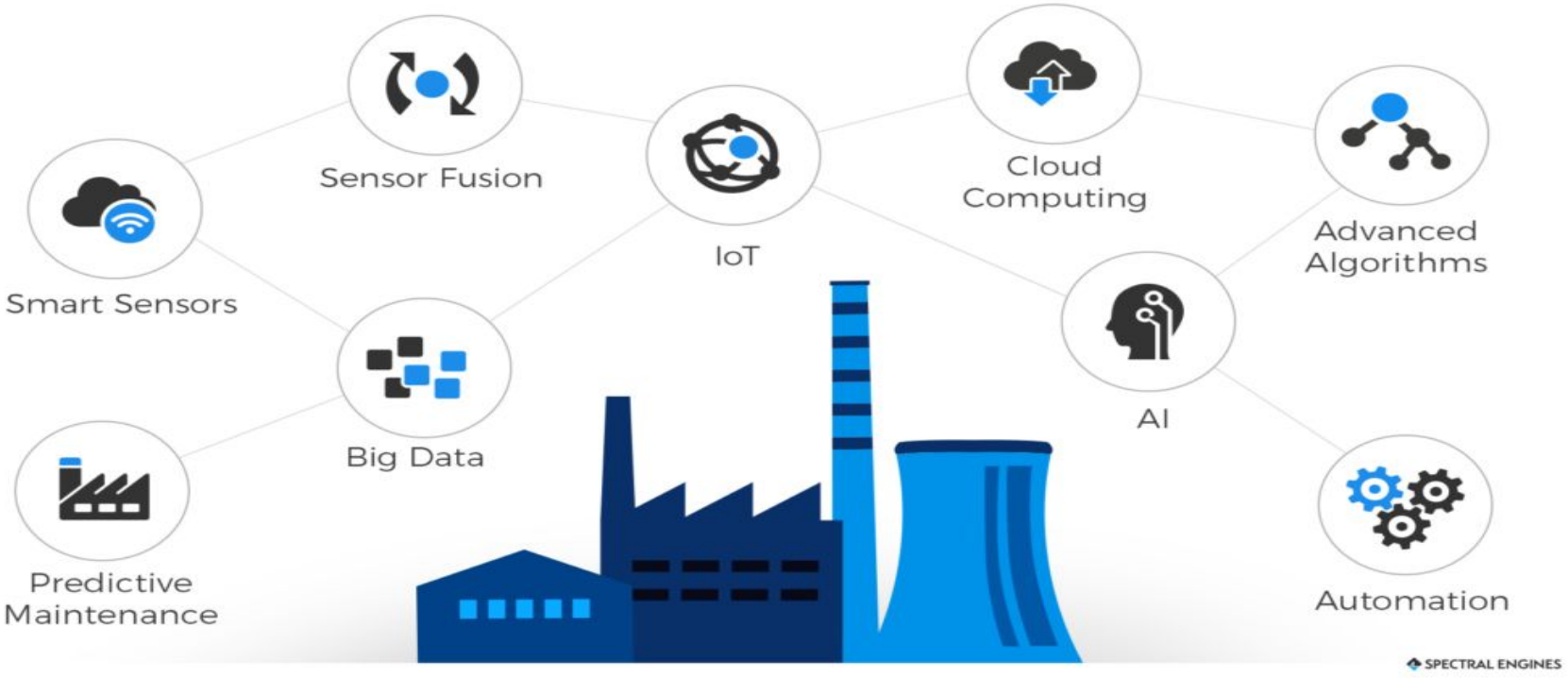
CHARACTERISTICS OF INDUSTRIAL REVOLUTION



KEY TECHNOLOGY OF INDUSTRY 4.0



INDUSTRY 4.0 FRAMEWORK

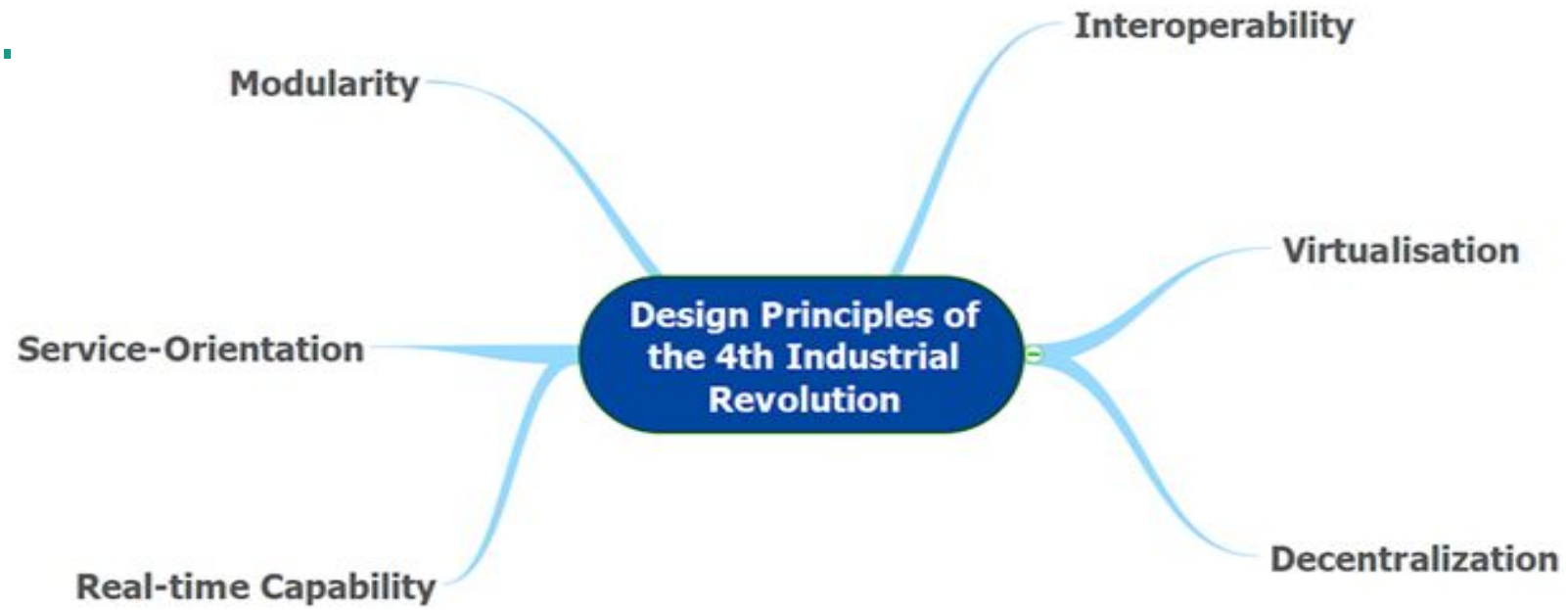


INDUSTRY 4.0 ENVIRONMENT

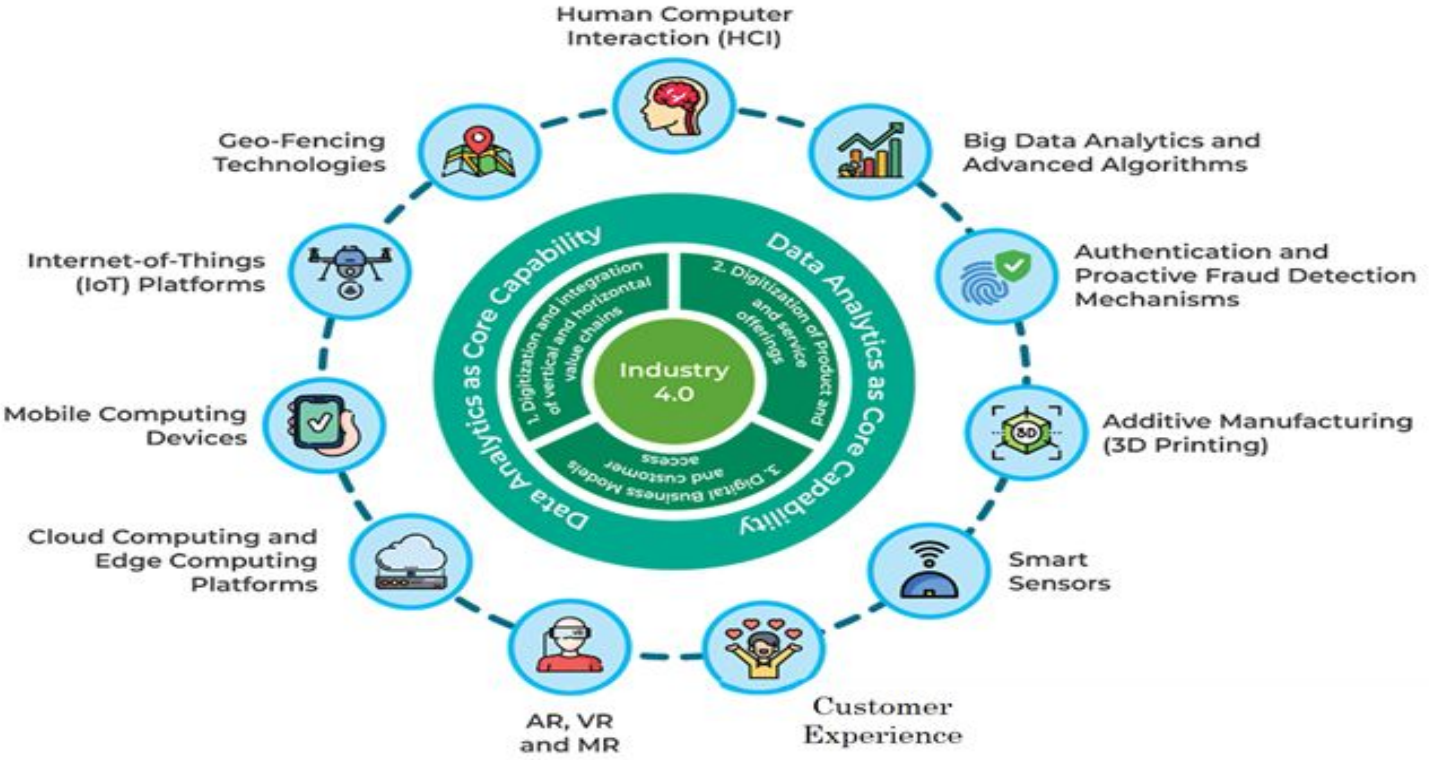
- Internet of Things
- Internet of Industrial Things
- Internet of Medical Things
- Internet of Services(service oriented architecture)
- Internet of Everything (people-data-thing-processes)
- Internet of payments

- Internet of Skills
- Internet of Data
- Internet of Behaviour
- Internet of DNA
- Internet of Energy
- Internet of Military Things
- Internet of Body (Body signals to Network)
- Internet of Nature

DESIGN PRINCIPLES

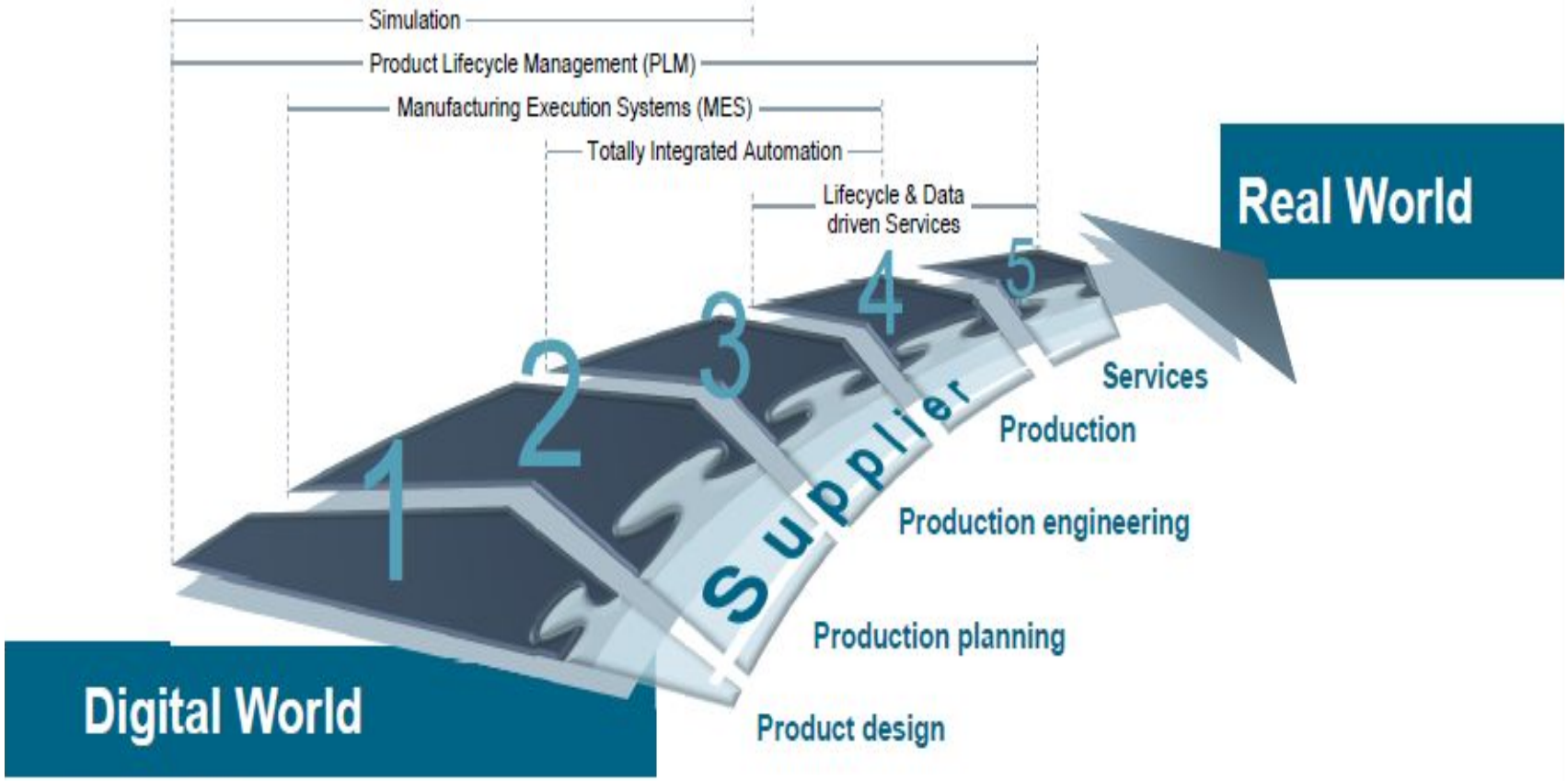


3 - Layered Framework

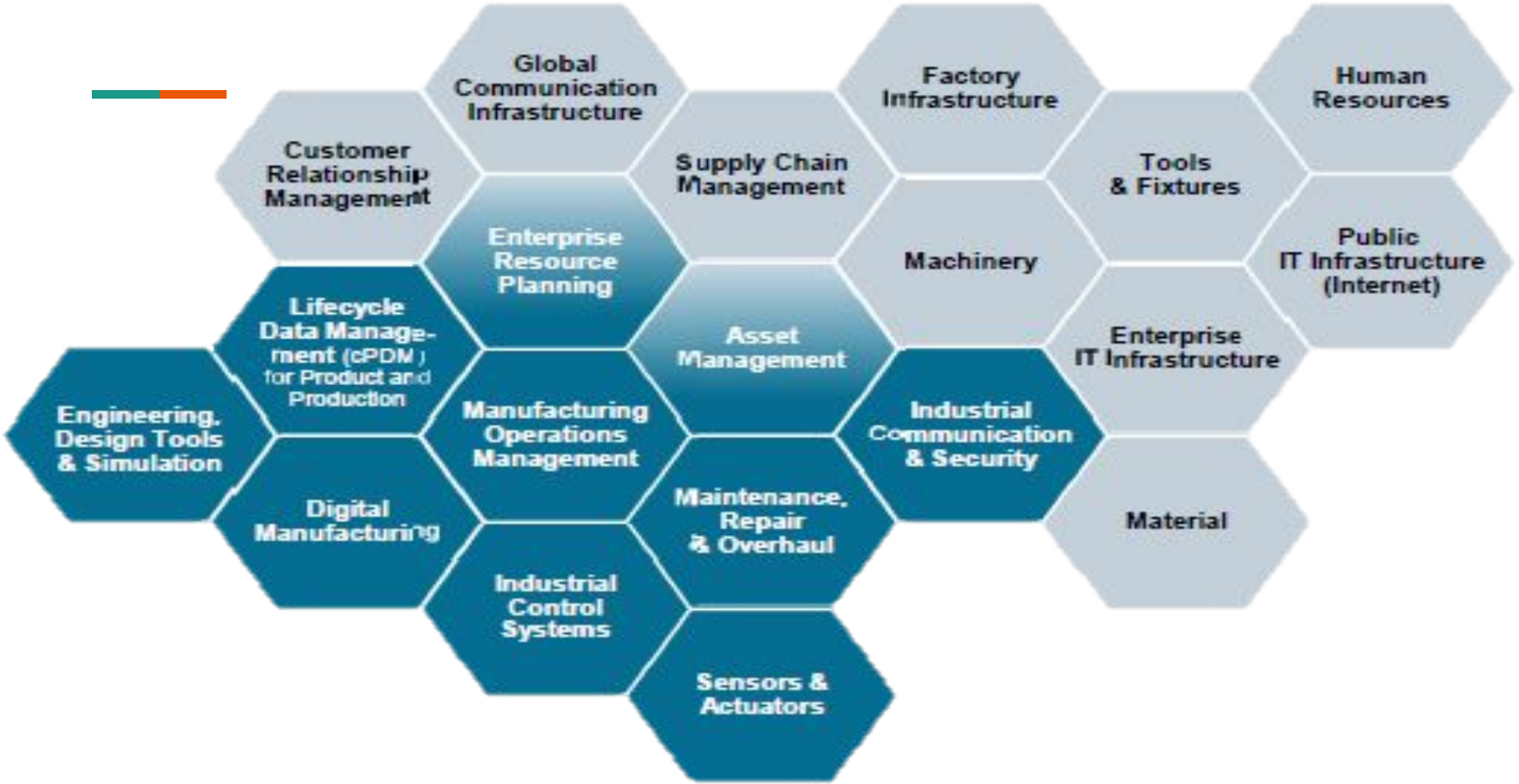


DIGITAL ENTERPRISE

ENTIRE VALUE CHAIN IS DIGITIZED AND INTEGRATED



IMPACTING ALL ASPECT OF VALUE CHAIN



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