DigI-VET
Fostering Digitization and Industry 4.0 In Vocational Education and Training

MODULE 2
Teacher Module 2 : Terms and History of Industry 4.0

PROJECT NO: 2018-1-DE02-KA202-005145

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Coordinator: Partners:
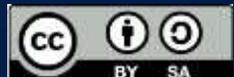
WHAT THIS MODULE WILL COVER

- **What is industry 4.0?** & Task

Terms

  - Cyber-physical systems (CPS) & Cloud computing & Task

  - The internet of things (IoT) & The Industrial internet of things (IIoT) & Task

  - Cognitive Computing & Artificial Intelligence (AI)

  - Smart manufacturing

- **History of Industry 4.0** & Task

  - Industry 4.0 - The Fourth Industrial Revolution (video/task)

- Contact

- References

SECTION A

- **What is industry 4.0?**
  & Task

Terms

- Cyber-physical systems (CPS) & Cloud computing
  & Task
- The internet of things (IoT) & The Industrial internet of things (IIoT)
  & Task
- Cognitive Computing & Artificial Intelligence (AI)
- Smart manufacturing

WHAT IS INDUSTRY 4.0?

- Industry 4.0 is essentially the Digital Networking of people, machines and products.

- It is also known as the 4th industrial revolution that concerns industry.

- Although the terms "industry 4.0" and "fourth industrial revolution" are often used interchangeably, "Industry 4.0" factories have machines which are intensified with wireless connectivity and sensors, connected to a system that can envision the entire production line and make decisions on its own.

- Essentially, industry 4.0 is the trend towards automation and data exchange in manufacturing technologies and processes which include cyber-physical systems (CPS), the internet of things (IoT), industrial internet of things (IIOT), cloud computing, cognitive computing and artificial intelligence (AI).

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TASK
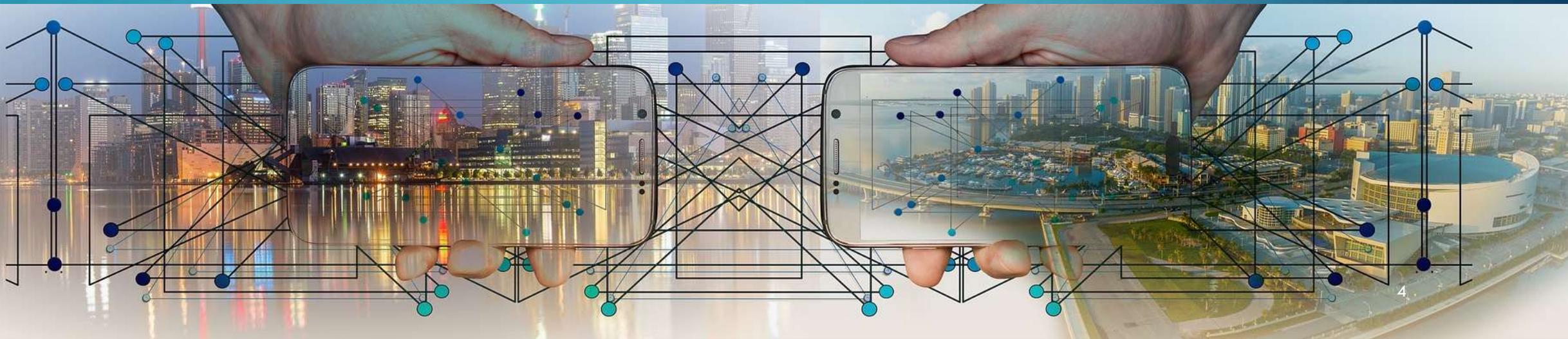
1. Concept of Industry 4.0

Submitted by DigiVET on Fri, 01/24/2020 - 11:30

Which of the following is NOT included in the Industry 4.0 concept?

○ Automated production using electronics and IT.

○ Lights out (manufacturing) also known as dark factories

○ Internet of Things (IoT)

○ Smart Manufacturing

✓ Check

Exercise can be found in the link https://h5p.org/node/705021

WHAT ARE ALL THESE TERMS?

Cloud computing

Cyber-physical systems (CPS)

The internet of things (IoT)

Artificial intelligence (AI)

Cognitive computing

Industrial internet of things (IIOT)

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CYBER-PHYSICAL SYSTEMS (CPS)

CPS are objects which have embedded software and electronics connected to each other in a system, for example, robots, drones and other movable machines. This way physical and mechanical objects and processes are connected with software-controlled objects and processes – with the real and virtual worlds converging. CPS can be used for traffic control or for managing intelligent electricity networks.

Image from Pixabay
https://pixabay.com/illustrations/industry-4-0-web-network-points-2741774/
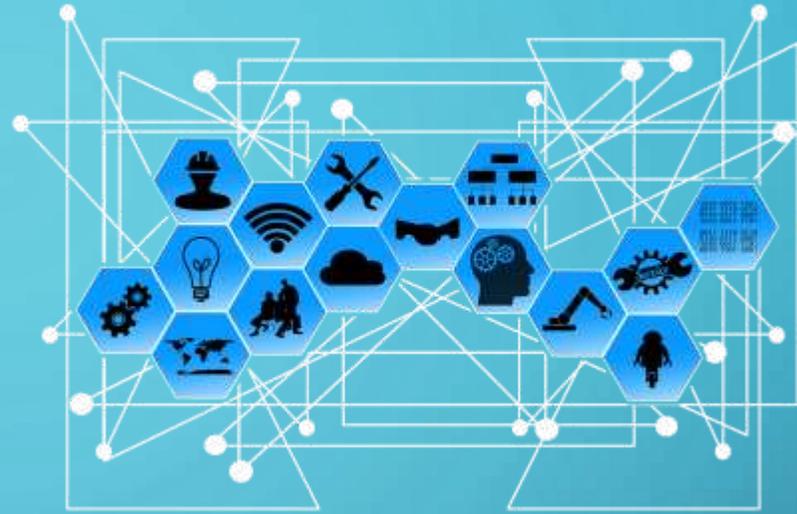
CLOUD COMPUTING

Cloud computing covers all activities taking place on an online service (For example: sending e-mails, processing documents via an online platform and saving them there, playing videos or analysing data). It makes an IT infrastructure which makes it possible for data to be saved on decentralised computer systems via the internet and to be available at any time at any place as long as there is an internet connection. Thus, a cloud provider offers a complete working place in a virtual form (such as computer, memory, platforms and software applications) creating great flexibility for the user.

Image from Pixabay
https://pixabay.com/illustrations/cloud-computing-network-internet-2001090/

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TASK

cyber-physical systems (CPS)

Submitted by DigIVET on Tue, 03/24/2020 - 16:20

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Drag the words into the correct boxes

CPS are objects which have embedded [   ] and electronics [   ] to each other in a system, for example, [   ], drones and other movable machines. This way physical and mechanical objects and processes are connected with software-controlled [   ] and processes – with the real and [   ] worlds converging. CPS can be used for [   ] control or for managing intelligent [   ] networks.

| electricity |
| software |
| virtual |
| objects |
| connected |
| traffic |
| robots |

Check

↻ Reuse   ‹› Embed

Exercise can be found in the link https://h5p.org/node/760844

Cloud Computing

Submitted by DigIVET on Tue, 03/24/2020 - 16:25

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Drag the words into the correct boxes

Cloud computing covers all [   ] taking place on an [   ] service (For example: sending e-mails; processing documents via an online platform and saving them there, playing videos or analysing data). ☐It makes an IT [   ] which makes it possible for data to be saved on [   ] computer systems via the internet and to be available at any time at any place as long as there is an internet [   ]. Thus, a cloud provider offers a complete working place in a virtual form (such as computer, memory, platforms and software applications) creating great [   ] for the user.

| decentralised |
| infrastructure |
| online |
| connection |
| activities |
| flexibility |

Check

↻ Reuse   ‹› Embed

Exercise can be found in the link https://h5p.org/node/760853

THE INTERNET OF THINGS (IOT)

The IoT is a network of connected devices that can communicate with each other and provide data to users through the Internet. IoT devices can connect to the Internet and often have sensors that enable them to collect data. An IoT device can be useful on its own, but when you use numerous devices together, they become even more valuable.

IoT technology enables the user to collect data automatically from many different functions. IoT technology can also be used to automate equipment and parts of industrial operations.

Image from Pixabay
https://pixabay.com/photos/turn-on-turn-off-industry-energy-2923046/

Image from Freepoint Technology Inc.
https://getfreepoint.com/iiot-role-play-manufacturing/

Industrial internet of things (IIOT)

IIoT is a subcategory of IoT. The term refers to IoT technology used in Industrial settings, namely in manufacturing facilities. IIoT is a key technology in Industry 4.0, the next phase of the industrial revolution. Industry 4.0 emphasises smart technology, data, automation, interconnectivity, artificial intelligence and other technologies and capabilities.

These technologies are revolutionising the way factories and industrial organizations are run.

TASK

The Internet of Things

Submitted by DigiVET on Tue, 03/24/2020 - 16:30

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IoT technology enables the user to collect data :

○ manually

○ automatically

○ electronically

○ by using a network

✓ Check

↻ Reuse   <> Embed   H-P

Exercise can be found in the link https://h5p.org/node/760859

COGNITIVE COMPUTING

The use of computerised models to simulate the human thought process in complex situations where the answers may be ambiguous and uncertain. The phrase is closely associated with IBM's (International Business Machine) cognitive computer system, Watson. Cognitive computing overlaps with AI and involves many of the same underlying technologies to power cognitive applications, including expert systems, neural networks, robotics and virtual reality (VR).

ARTIFICIAL INTELLIGENCE (AI)

The ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings.

Image from Pixabay
https://pixabay.com/illustrations/web-network-programming-3706562/

SMART MANUFACTURING

Related terms: smart factory, smart production, smart data

Smart manufacturing is used to describe an environment in which computers are in charge of decision-making.

In a smart manufacturing environment, physical and digital are connected and communicate with one another to improve production.

The broad definition of smart manufacturing covers many different technologies. Some of the key technologies in the smart manufacturing movement include big data processing capabilities, industrial connectivity devices and services, and advanced robotics.

Image from Pexels
https://www.pexels.com/photo/high-angle-view-of-a-man-256381/

SECTION 2

- **History of Industry 4.0 & Task**
  - The four Industrial Revolutions
  - Industry 4.0 - The Fourth Industrial Revolution (video/task)

HISTORY OF INDUSTRY 4.0

Industry 1.0
- Mechanical production equipment powered by steam

Industry 2.0
- Mass production
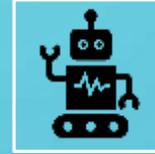
Industry 3.0
- Autmated production

Industry 4.0
- Intelligent production

HISTORY OF INDUSTRY 4.0

The **First industrial revolution** began with the mechanization and mechanical power generation in 1800s. It brought the transition from manual work to the first manufacturing processes (mainly in the textile industry). An improved quality of life was a main driver of the change.

Image from Pixabay
https://www.pexels.com/photo/high-angle-view-of-a-man-256381/

The **Second industrial revolution** was triggered by electrification that enabled industrialization and mass production. It was a period when advances in steel production, electricity and petroleum caused a series of innovations that changed society. With the production of cost effective steel, railroads were expanded and more industrial machines were built.

Image from Pixabay
https://pixabay.com/vectors/factory-car-engine-assembling-35104/

The **Third industrial revolution** is characterized by the digitalisation with introduction of microelectronics and automation. In manufacturing this facilitates flexible production, where a variety of products is manufactured on flexible production lines with programmable machines. Such production systems however still do not have flexibility concerning production quantity.

Image from Pixabay
https://pixabay.com/photos/company-factory-production-186980/

Today we are in the **Fourth industrial revolution** that was triggered by the development of Information and Communications Technologies (ICT). Its technological basis is smart automation of cyber-physical systems with decentralized control and advanced connectivity (IoT functionalities). The consequence of this new technology for industrial production systems is reorganization of the automation systems to a self-organising cyber physical production system, that allows flexible mass custom production and flexibility in production quantity.

Image from Pixabay
https://pixabay.com/photos/industrial-4-0-information-2470457/

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Exercise: https://h5p.org/node/705116

TASK

Exercise can be found in the link https://h5p.org/node/705116

INDUSTRY 4.0 - THE FOURTH INDUSTRIAL REVOLUTION

Check out this video, produced by the Siemens company regarding Industry 4.0 and the vision of tomorrow's manufacturing…
What are your thoughts on this?

TASK

https://www.youtube.com/watch?v=HPRURtORnis

REFERENCES

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Thank you for your attention!