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DigI-VET

Fostering Digitization and Industry 4.0 In Vocational Education and Training

MODULE B

Learner Module B : Industry 4.0 and history

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

Coordinator:

Partners:

WHAT THIS MODULE WILL COVER

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

SECTION B

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

SECTION C

- **Agriculture 4.0 and Industry 4.0** & Task
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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).

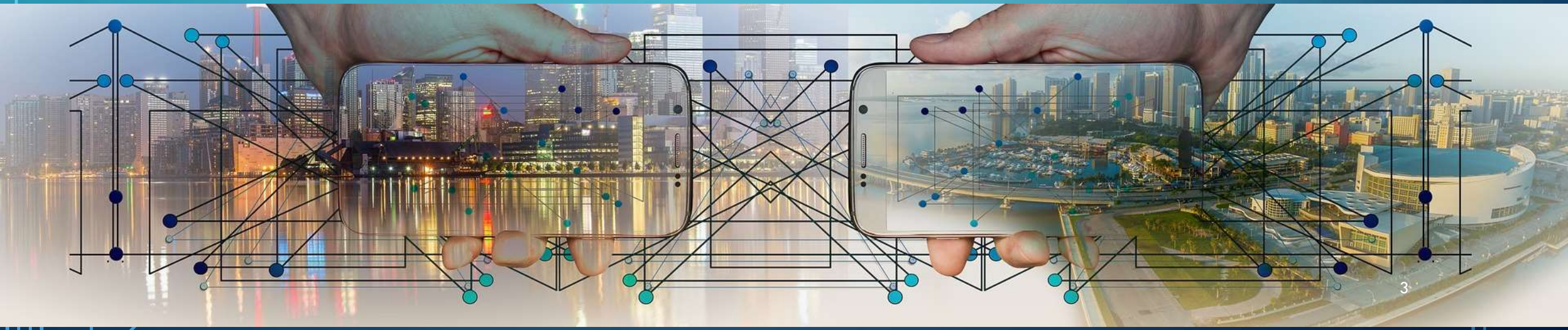


Image from Pixabay
https://pixabay.com/photos/city-panorama-smartphone-control-3213676/

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

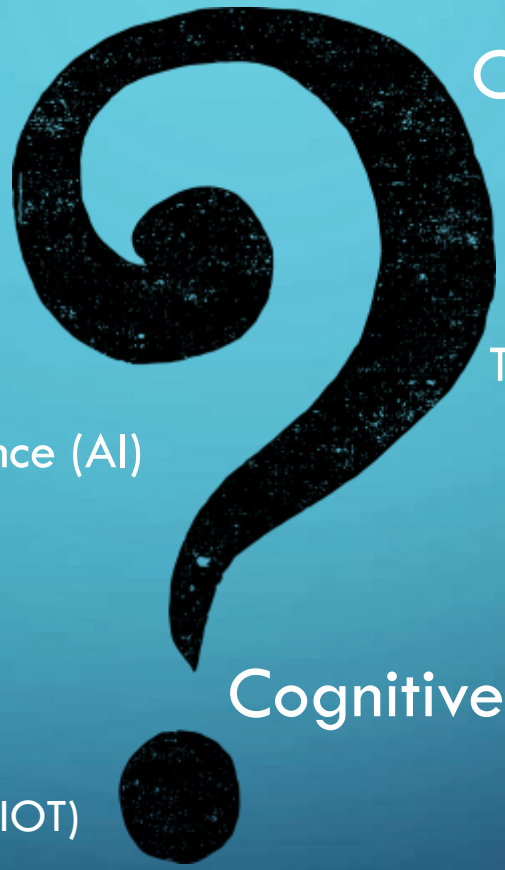
Check

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

WHAT ARE ALL THESE TERMS?

Cyber-physical systems (CPS)

Cloud computing



The internet of things (IoT)

Artificial intelligence (AI)

Cognitive computing

Industrial internet of things (IIOT)

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/

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

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.

TASK

cyber-physical systems (CPS)

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

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

Cloud Computing

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

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/

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

Thank you for trying out H5P. To get started with H5P read our getting started guide

IoT technology enables the user to collect data :

- manually
- automatically
- electronically
- by using a network

Check

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

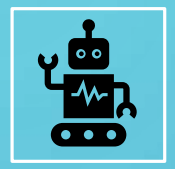
HISTORY OF INDUSTRY 4.0

Industry 1.0

- Mechanical production equipment powered by steam

Industry 2.0

- Mass production



Industry 3.0

- Autmated production

Industry 4.0

- Intelligent production

Source: Followed - Image from Techutzpah
https://techutzpah.com/evolution-of-industrial-revolution-4-0/

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/

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

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.

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/

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

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.

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

Screenshot from YouTube
Follow the Link: https://www.youtube.com/watch?v=HPRURtORnis

AGRICULTURE 4.0 AND INDUSTRY 4.0

The Industry 4.0 trend is transforming the production capabilities of all industries, including the agricultural sector. Connectivity is the basis of this transformation and IoT is the key for enabling this technology which is a huge part of the agricultural equipment.

According to the European Parliament definition, Agriculture 4.0 is "*a farming management model based upon observing, measuring and responding to inter and intra-field variability in crops*". The goals are mainly increasing the productivity of the crops while ensuring a higher environmental sustainability.

Basically, to produce quantity and quality with less. And for that there are several tools, techniques and technologies.

Image from Pixabay
https://pixabay.com/photos/farmer-tractor-agriculture-farm-880567/

TASK

8. Agriculture and Industry 4.0

Submitted by DigiVET on Mon, 02/17/2020 - 16:20

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Fill in the missing words.

Industry 4.0 is transforming the production capabilities of all industries, including the _____ sector. _____ is a vital element of this transformation and _____ a key enabling this technology that is increasingly taking part of the agricultural equipment.

The digitalisation of agriculture is based on the development and introduction of new _____ and _____ in production.

Check

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Exercise can be found in the link https://h5p.org/node/726119

DRONES

The use of drones is starting to be developed in the Agriculture 4.0 sector in several ways.

1. Soil and field analysis: Drones can be helpful at the start of the crop cycle. They are able to produce precise 3-D maps for the early soil analysis, which is useful in planning seed planting patterns. After planting, drone-driven soil analysis provides data for irrigation and nitrogen-level management.

2. Planting: Startups have created drone-planting systems that achieve an uptake rate of 75% and decrease planting costs by 85%. These systems shoot pods with seeds and plant nutrients into the soil, providing the plant all the nutrients necessary to sustain life.

3. Crop spraying: Distance-measuring equipment, meaning ultrasonic echoing and lasers, enables a drone to adjust altitude as the topography and geography vary, and thus avoid collisions. Consequently, drones can scan the ground and spray the correct amount of liquid, modulating distance from the ground and spraying in real time for even coverage. The result: increased efficiency with a reduction of in the amount of chemicals penetrating into groundwater.

**Experts estimate that aerial spraying can be completed up to five times faster with drones than with traditional machinery.*

Image from Pixabay
https://pixabay.com/el/photos/%CE%B3%CE%B5%CF%89%CF%81%CE%B3%CE%AF%CE%B1-%CF%84%CE%BF%CF%80%CE%AF%CE%BF-%CE%B1%CE%B3%CF%81%CF%8C%CE%BA%CF%84%CE%B7%CE%BC%CE%B1-3182252/

DRONES

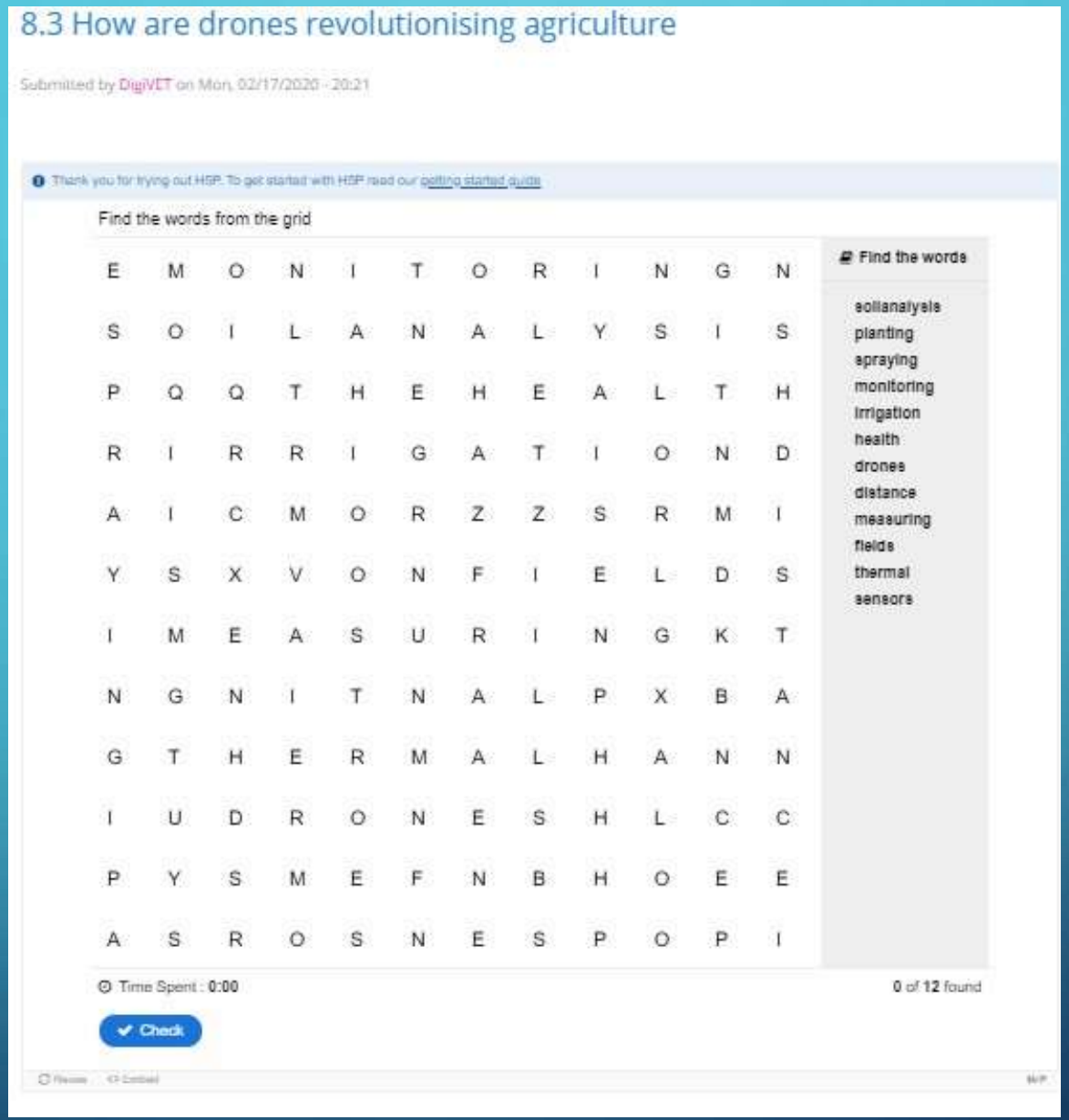
Image from Pixabay
https://pixabay.com/photos/dji-dji-agriculture-agriculture-4208863/

4. Crop monitoring: Vast fields and low efficiency in crop monitoring together create the largest obstacle in farming. Unpredictable weather conditions make the process even more challenging which increase risk and field maintenance costs. Previously, satellite imagery offered the most advanced form of monitoring. But there were drawbacks. Images had to be ordered in advance, could be taken only once a day, and were imprecise. Furthermore, these services were extremely costly and the images' quality was low especially on days where the weather was poor. Today, time-series animations can show the precise development of a crop and reveal production inefficiencies, enabling better crop management.

5. Irrigation: Drones with hyperspectral, multispectral, or thermal sensors can identify which parts of a field are dry or need improvements. Additionally, once the crop starts growing, drones allow the calculation of the vegetation table, which describes the relative density and health of the crop.

6. Health assessment: It's essential to assess crop health and spot bacterial or fungal infections on trees. Drone-carried devices can identify which plants reflect different amounts of green light and NIR light, by scanning a crop using both visible and near-infrared light. This information can produce multispectral images that track changes in plants and indicate their health. A speedy response can save an entire crop. In addition, as soon as a sickness is discovered, farmers can apply and monitor remedies more precisely. These two possibilities increase a plant's ability to overcome disease. And in the case of crop failure, the farmer will be able to document losses more efficiently for insurance claims.

TASK



Exercise can be found in the link https://h5p.org/node/726348

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Thank you for your attention!