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A visual approach to the UCN Industrial Playground

11th Conference on Learning Factories, CLF2021

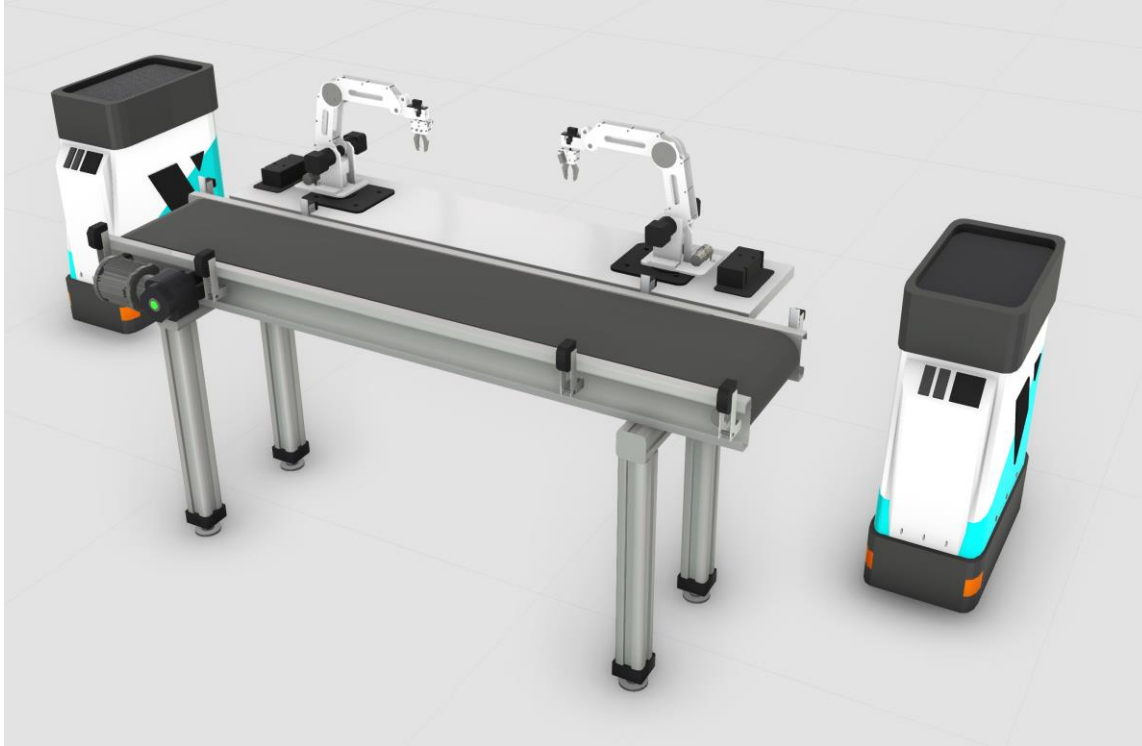
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Introduction

11th of Marts 2020 – Denmark and all access to labs at the Danish Universities were lock down. This meant all access to the physical learning factory setup - UCN Industrial Playground (UCN IP) – were denied to both researchers, companies and students.

How to continue – Let's aim towards a digital/visual learning factory ...

Platform for the Digital/Visual Learning Factory

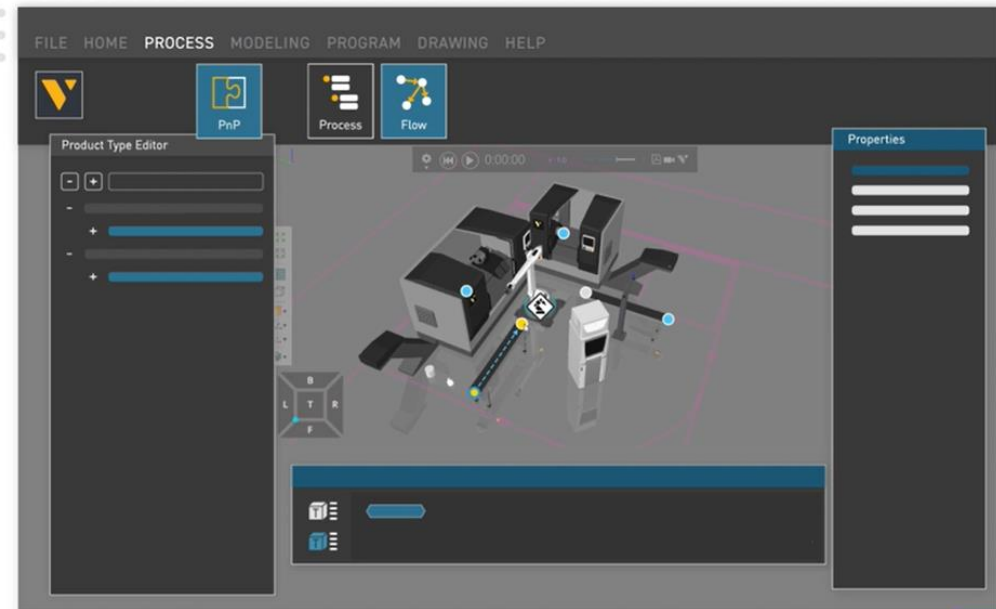


Software demands:

- Working without physical access to Campus net
- Possibility to work with “real” machines
 - clones or model of machines used in production
- Standalone production simulation
- Communication with external Hardware using industrial standard communication
 - Robot controllers, PLC, SCADA, MES, ERP etc.
- Software provider Getting started platform

The digital twin/visualization software:

V VISUAL COMPONENTS



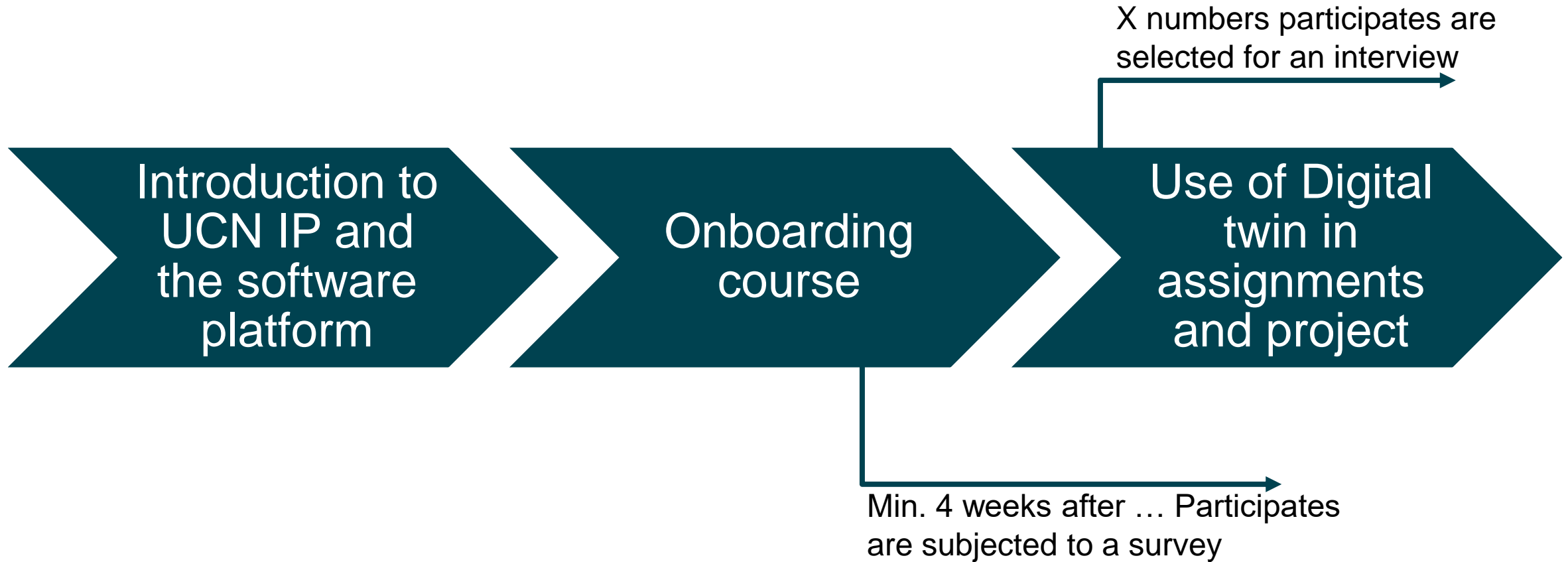
Research questions:

- Is there a balance between invested time in training a digital platform and the skills a participant will think they possess for use?
- Is it possible to use a digital twin as the centre of various technical educations to create a synergy for understanding industry 4.0?

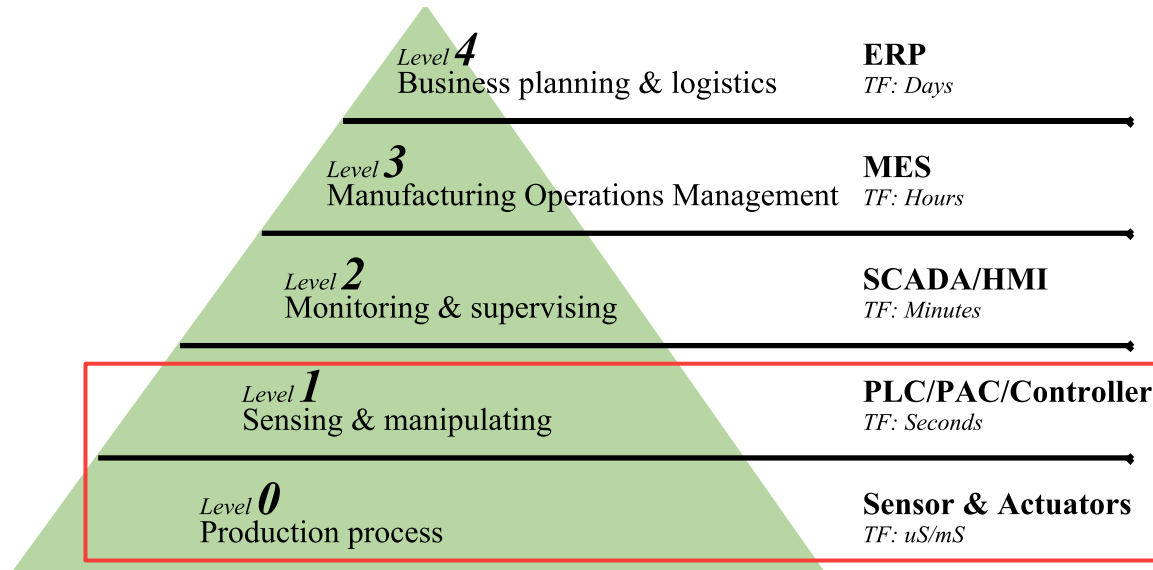
Participates:

- 84 students (AP & Bachelor level)
- 19 staff members

The process



Hardware-In-Loop with a Digital Twin

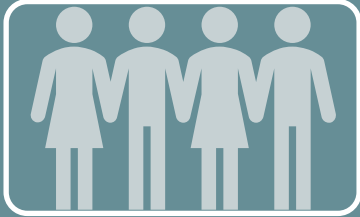


Digital twin were tested towards Hardware-in-loop

- Robot programming (OLP)
- PLC/PAC programming (both simulated and real PLCs)

Main change:

- Avg. tag update in digital twin ~50-70 milliseconds depending on case
- Problem started when updates exceeded 100 milliseconds



Participants in the onboarding course: **103**

- 84 students (AP & Bachelor level), 19 staff members



Responded on survey after >4 weeks: **36**



Interviewed participants : **6**

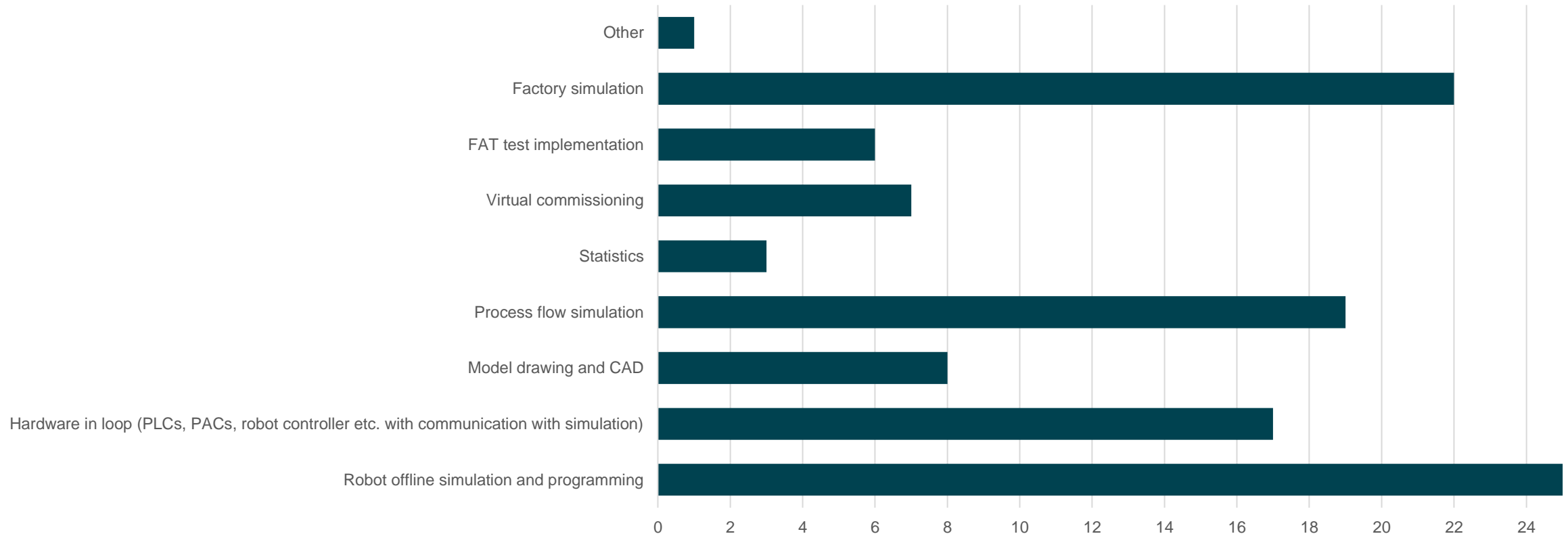


SMEs involved : **0**

- Because of the Lockdown

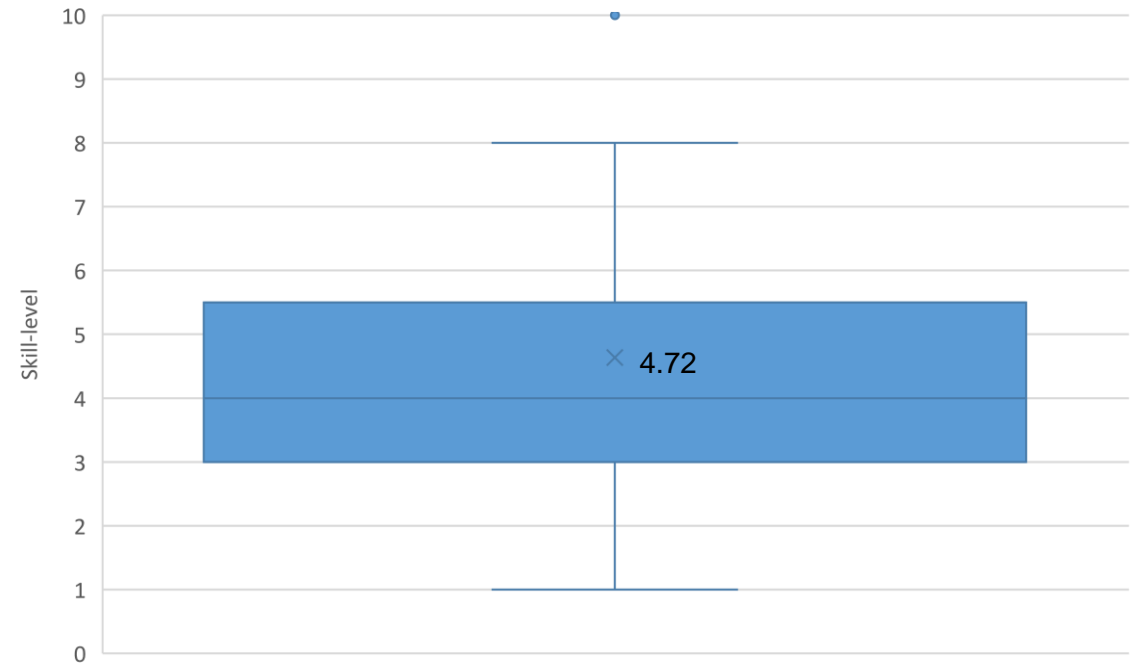
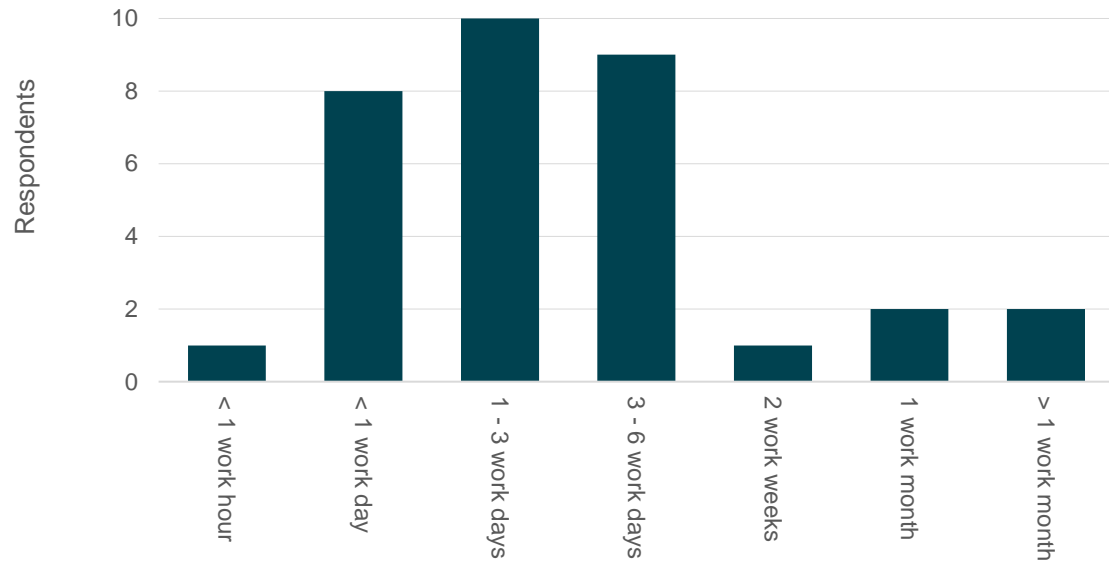
Results

Is it possible to use a digital twin as the centre of various technical educations to create a synergy for understanding industry 4.0?



Results

is there a balance between invested time in training a digital platform and the skills a participant will think they possess for use?



Invested time working with Visual Components.

Evaluation of skill-level between 0-10 after invested time.

Digital twin as a tool for future work in a SMEs

”50% could see that simulation and digital twin software could be the value creator and would recommend their future employer“

“10% would put it as a requirement for their upcoming employment that this technology was available“

Conclusion

Participants are able to:

Read

Define, Describe

Hear, View

List, Explain

Images, Video

Demonstrate

Watch a demonstration

Apply, Practice

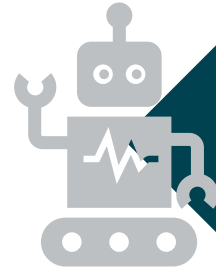
Participate in hands-on workshop

Analyze, Design

Simulation or model a real experience .
Perform a presentation – Do the real thing.

Create

Focus of the developed learning environment



Hardware-in-loop gives timing challenges with “real” controllers and digital twin



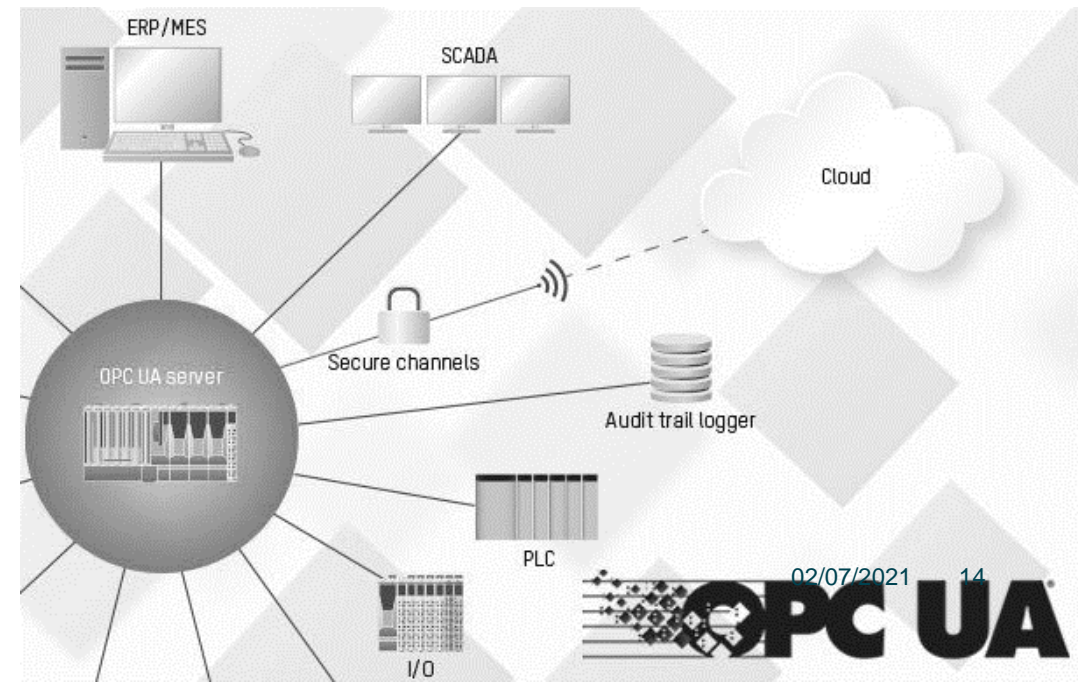
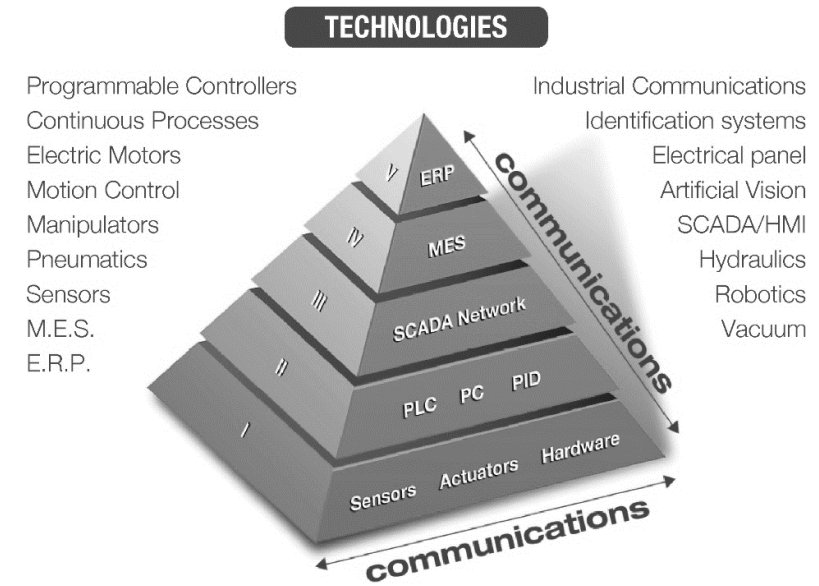
A digital Learning Factory is an opportunity under a pandemic – and is a great addition with a physical Learning factory for future work



A factory simulator like VC, with multiple discipline supports a T-profiled student – When knowing the mechanics of a Digital twin an interdisciplinary skillset can be further explored

Future goals and work

- **The focus** will be to:
 - Merge of UCN Industrial Playground (physical) & UCN Industrial Playground (Digital)
 - Defuse and add more digital technologies, including investigating cloud-based software platform for ERP and MES
 - Investigating the use of PowerApps for data handling and visualization, with a special focus towards use in SMEs in Northern Jutland, Denmark
 - Continuing the work with Industrial-Hardware-in-loop



Question or just want to hear more

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