

A?

Aalto University

Digital Twins – Replacing engineering witchcraft?

*Kari Tammi, Associate Professor
School of Engineering
Responsible leader (PI) of DigiTwin project*



IEEE Computer Society Predicts: Top 10 Technology Trends for 2019

11. **Digital twins.** These are software representations of assets and processes to understand, predict, and optimize performance for improved business outcomes. A digital twin can be a digital representation of any characteristic of a real entity, including humans. The choice of which characteristics are digitized is determined by the intended use of the twin. Digital twins are already being used by many companies: according to analysts, 48% of companies in the IoT space have already started adopting them. This includes digital twins for very complex entities, such as an entire smart city (for example, Digital Singapore). Digital twins are also expected to play a transformational role in healthcare over the next three years.

<https://www.computer.org/web/pressroom/ieee-cs-top-technology-trends-2019>

Digitaalinen kaksonen pelastaa suomalaisyritykset



Digitaalinen kaksonen tarkoittaa tuotteen tai järjestelmän virtuaalista mallia, joka pitää sisällään kaiken fyysisestä sisarestaan saatavilla olevan tiedon.

Digikaksonen lupaa mullistaa tuotekehityksen ja ylläpidon. Perjantaina Aalto-yliopistolla järjestetään DigiTwin-demopäivä, jossa projektista ja yritysten

osallistumismahdollisuuksista kerrotaan enemmän.

<http://etn.fi/index.php/13-news/8933-digitaalinen-kaksonen-pelastaa-suomalaisyritykset>

160 persons subscribed in this event!

Why digital twins?

For fun?

Future business potential

Safety

Performance

Capacity

Usual reasons: “Citius, altius, fortius”

Q: Why witchcraft? A: as long as we don't have good crystal ball, we better develop digital twins

What? – Merging the physical and virtual worlds

Virtual or cyber physical capabilities in modern machines

Digital twins benefit/use measurements, big data, IoT, ...

“Digital Twin is the cyber part of a Cyber Physical System.” (Autiosalo, 2018)

Connection to data from physical world is to make a distinction to traditional physical/mathematical model

How?

No standard realisation exist

Typical realisation: hardware, sensors, software with models of hardware

Today's opportunities: big data, AI, industrial internet, wireless communication, cloud computing



Challenges – Development targets – Research

How to realise?

Data quality? Big data is often bad data

How to update?

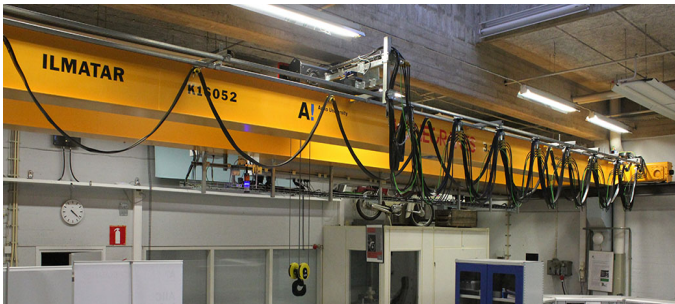
How to manage complexity?

How to scale up?

Make e.g. digital twin of a car, about 90 million cars produced annually → 90 million digital twins?

Let's make max out of demos and networking!

Physical Twin



Knowledge

Data

Digital Twin

