

Digital tvilling (DT)

Hva menes (egentlig) med DT?

«I-en i BIM-en» og «I-en om bygget»

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Eilif Hjelseth

Professor i digitalisering av byggeprosesser – NTNU
Leder av Arena for digitalisering - PN

eilif.hjelseth@ntnu.no
<https://www.linkedin.com/in/hjelseth/>

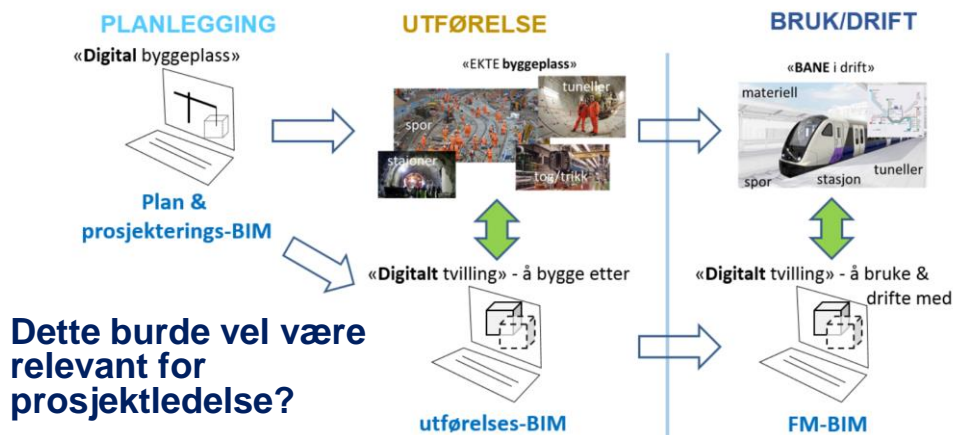
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1

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<https://www.bnl.no/dokumenter/digitalt-veikart/>



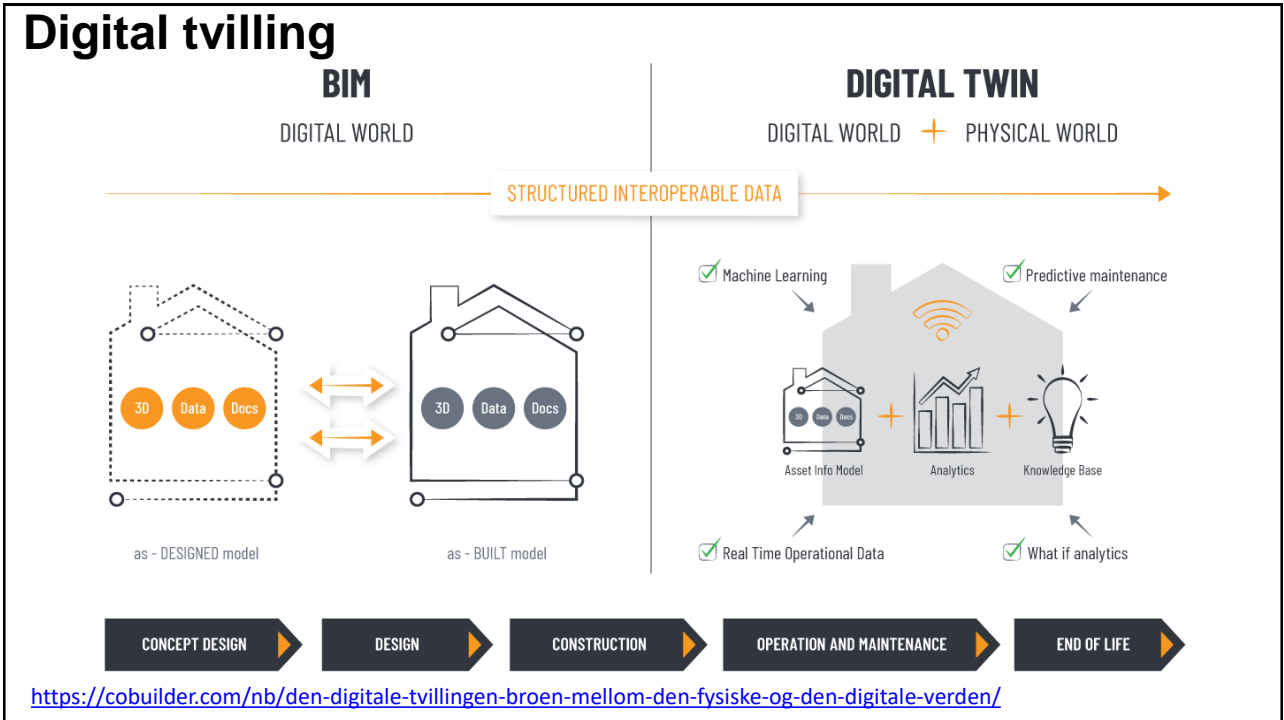
Figur 10 Den digitale byggeplass og den digitale tvilling i verdikjeden

- Viktig del av **Digital veikart** fra 2017
 - så det burde være godt kjent for hele bygg, anlegg og eiendomsnæringen

2



2



3

DT: Bygg digital før du bygger reelt

DT: Drift bygget digitalt etter at det er bygget

- Smaragdbygget
- NTNU campus Gjøvik
- Bygget av Statsbygg

Bra BYGG?!

Hvordan vurdere dette før bygget er bygget

Bra BIM?!

Digital «ferdigbefaring – gode løsninger?

4

- DT er en av trendene
 - Denne er fra 2017
 - Fly er eksemplet
- Kan vi bytte ut med bygg i 2023

<https://www.gartner.com/smarterwithgartner/gartners-top-10-technology-trends-2017/>

Gartner.

Top 10 Strategic Technology Trends 2017

Intelligent



Digital



Mesh



gartner.com/SmarterWithGartner

Gartner.



Presenteres lynkjapt ;-)

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5

The National Digital Twin Programme

data infrastructure
to unleash the information economy

<https://www.youtube.com/watch?v=Gw2dOtJAoew>










6

6
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6



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What we do

National Digital Twin Programme

- > Explaining the Information Management Framework (IMF)
- > Digital Twin Hub
- > Resources: The Gemini Principles
- > Resources: The Roadmap
- > Resources: Pathway Towards an IMF
- > Resources: Top-Level Ontologies and Industry Data Models
- > Resources: Approach to Delivering an NDT

Case Studies, Tools and Guidance

The Construction Innovation Hub

Promoting digital construction Internationally

NATIONAL DIGITAL TWIN PROGRAMME

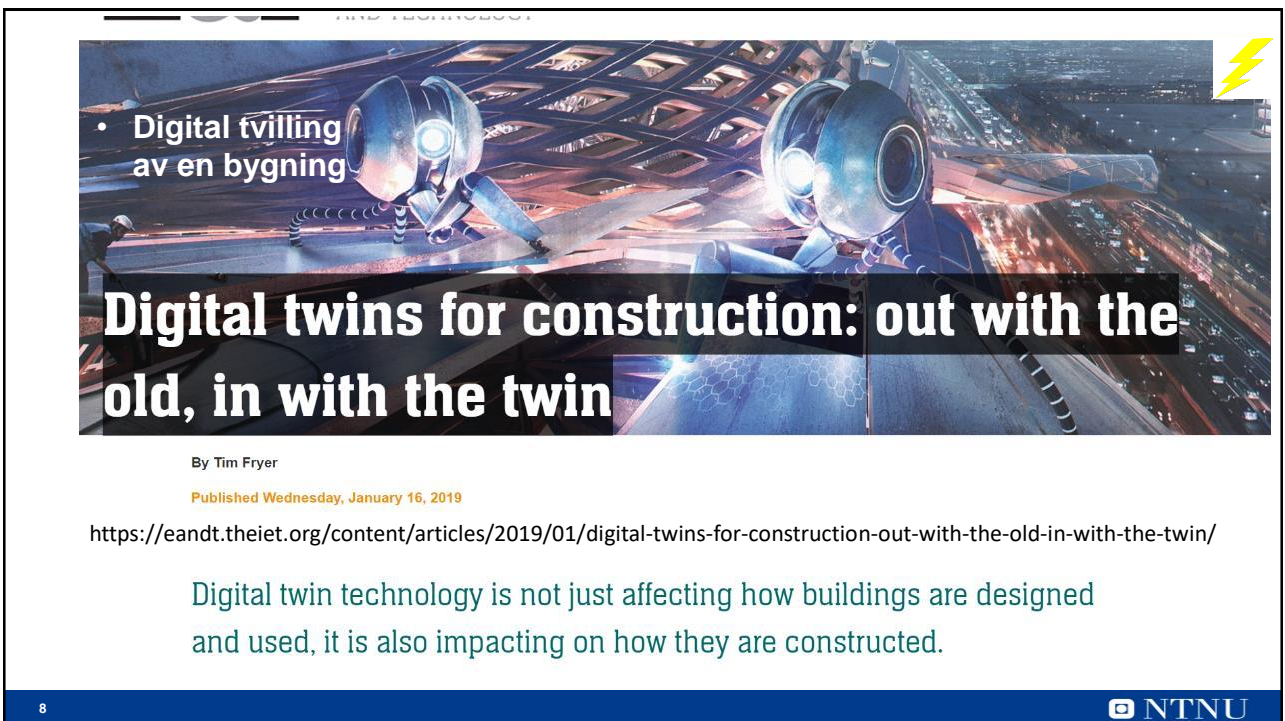
cdbb
Centre for Digital Built Britain

<https://www.cdbb.cam.ac.uk/what-we-do/national-digital-twin-programme>

The National Digital Twin programme (NDT_p) is run by the Centre for Digital Built Britain, a partnership between the University of Cambridge and the Department for Business, Energy and Industrial Strategy. Launched by HM Treasury in July 2018, the NDT_p was set up to deliver key recommendations of the National Infrastructure Commission's 2017 'Data for the Public Good Report'.

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7



• Digital twilling av en bygning

Digital twins for construction: out with the old, in with the twin

By Tim Fryer

Published Wednesday, January 16, 2019

<https://eandt.theiet.org/content/articles/2019/01/digital-twins-for-construction-out-with-the-old-in-with-the-twin/>

Digital twin technology is not just affecting how buildings are designed and used, it is also impacting on how they are constructed.

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8

- Digital tvilling av en dumper

<https://www.digitalengineering247.com/article/two-of-a-kind>



9

9

Digital Twins Form Building Blocks for Smart Cities

The combination of 3D models, simulations and real-time IoT data means smart city digital twins are being tapped to optimize everything from traffic patterns to energy efficiency.

By Beth Stackpole
© January 4, 2021

Digital twins, a concept rapidly gaining traction as a way to improve product design, create proactive maintenance services and optimize performance of industrial assets, are starting to take shape on an entirely different scale as they become the building blocks for futuristic smart cities.

In a smart city design context, digital twins function as a virtual replica of a city's assets; think buildings, roads, traffic patterns, lighting systems, mobility solutions, energy and grid capabilities. But it's not enough to create a 3D representation of these resources.



<https://www.digitalengineering247.com/article/digital-twins-form-building-blocks-for-smart-cities>

10

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10



Master's thesis

Tord Martin Bere Fjeld

Digital Twin - Towards a joint understanding within the AEC/FM sector

Master's thesis in Civil and Environmental Engineering

Supervisor: Eilif Hjelseth

June 2020

11

11

DT handler om kommunikasjon mellom modell og byggverk

- Her med litt ulike navn
- og ulik grad av
- kommunikasjon

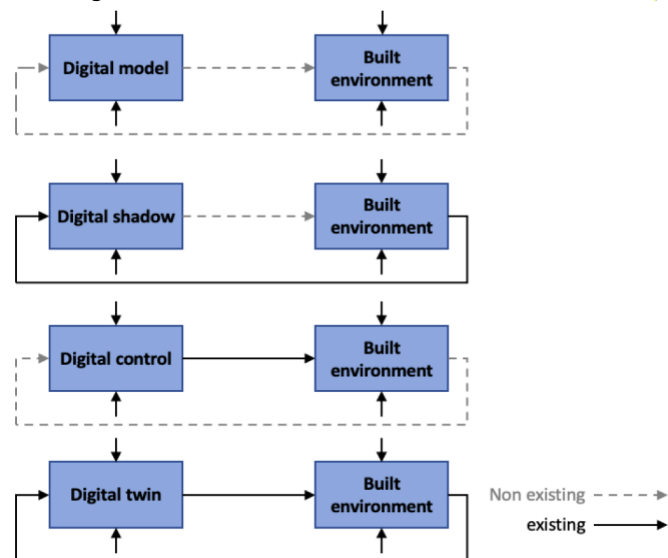


Figure 11: Classification of integration in DT

12

12

Digital Twin Maturity Index (DTMI)

- DTMI-indeksen er modellert etter den eksisterende Model Maturity Index (MMI), da dette allerede er et kjent system innenfor norsk AEC/FM-sektor (MMI, 2018, MMI, 2020).
- Indeksen er laget som et akkumulert system, noe som betyr at høyere nivåer av modenhet har egenskapene til lavere modenhetsnivåer.

Kilde:
Tord Fjeld (2020). Digital Twin - Towards a joint understanding within the AEC/FM sector, Master thesis, NTNU
<https://ntnuopen.ntnu.no/ntnu-xmliui/handle/11250/2779306>

	Level 100	Level 200	Level 300	Level 350	Level 400	Level 500
Twin term	Static Twin	Detailed Twin	As built Twin	Responsive Twin	Adaptive Twin	Intelligent Twin
Indicators from interviews	BIM	Detailed as built BIM.	Sensors, Digital thread	Actuation	Simulation	Autonomy
Example of data processing	Machine readable data; IFC, XML	Linked Data	Machine interpretable data	Rule based	Artificial intelligence	Machine learning
Degree of integration between the model and the built environment	No integration	Semi uni-directional integration from the physical to the virtual	Uni-directional integration from the physical to the virtual.	Limited bi-directional integration	Semi bi-directional integration	Fully bi-directional integration
Degree of Automated processes between the model and the built environment	No automated data flow	Limited automated data flow	Limited automated data flow.	Partially automated data flow	High degree of automated data flow	Fully autonomous data flow.

Figure 14: Framework for Digital Twin Maturity Index (DTMI)



Incremental Digital Twin



<https://www.mdpi.com/2075-5309/11/11/554>

