

Welkom!



AI en Digital Twins in warehousing



We starten om 15.00 uur

In samenwerking met:

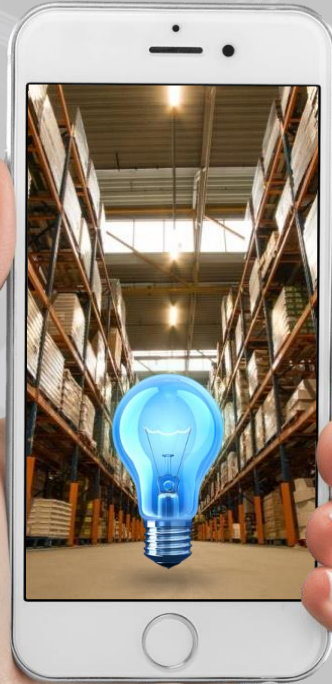


Welkom!

- Camera en microfoon zijn standaard uit
- Vragen stellen via chat
- Op aangeven Ben Gräve, mogelijkheid om vragen live te stellen - ontvangt verzoek om microfoon te *unmuten*

Programma

15:00	Opening door SLF en introductie BEMAS
15:05	Introductie Digital Twins door CQM
15:10	Presentatie case
15:30	Waarde van Digital Twins binnen service logistiek
15:50	Q&A
16:00	Einde webinar



Digital Twins and AI

In retail and e-commerce distribution centers

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Supplier



Warehouse



Retail



Store

E-commerce



Customer

🔗 Main processes in warehouses

- Receiving
- Putaway
- Replenishment
- Orderpicking
- Packing

Smart Warehousing

⇒ Challenges

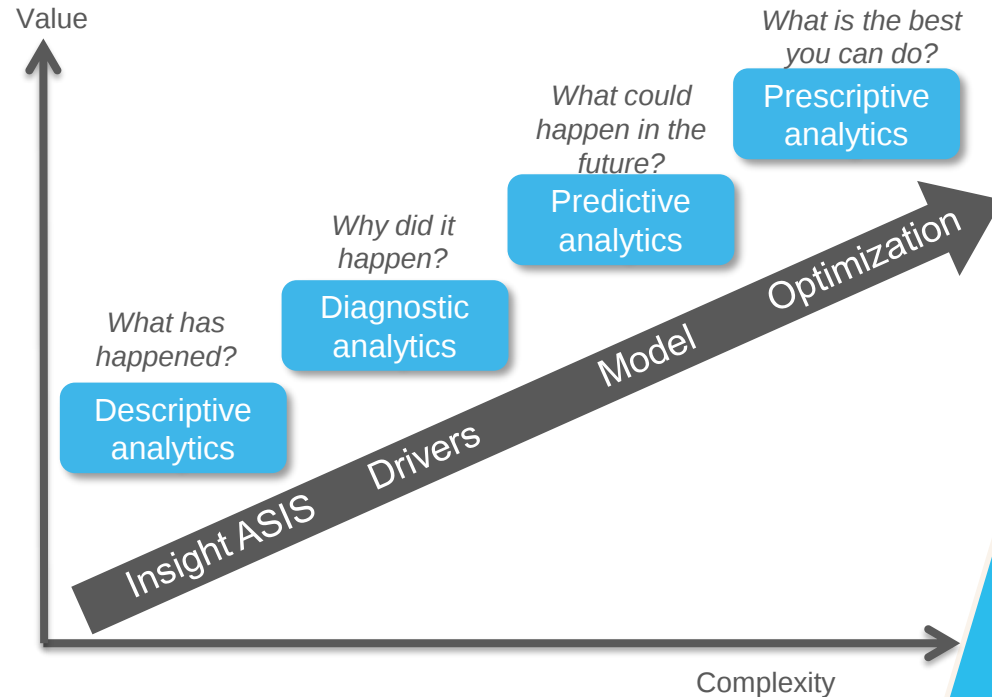
- Volatility increases
- Demanding leadtimes
- Shortage of personnel
- Partially automated solutions



⇒ Opportunities

- More data available
- Smart algorithms come available
- The use of robots is 'accepted'

Data science and CQM way of working



Think big, start small, scale fast
Iterative and agile way of working

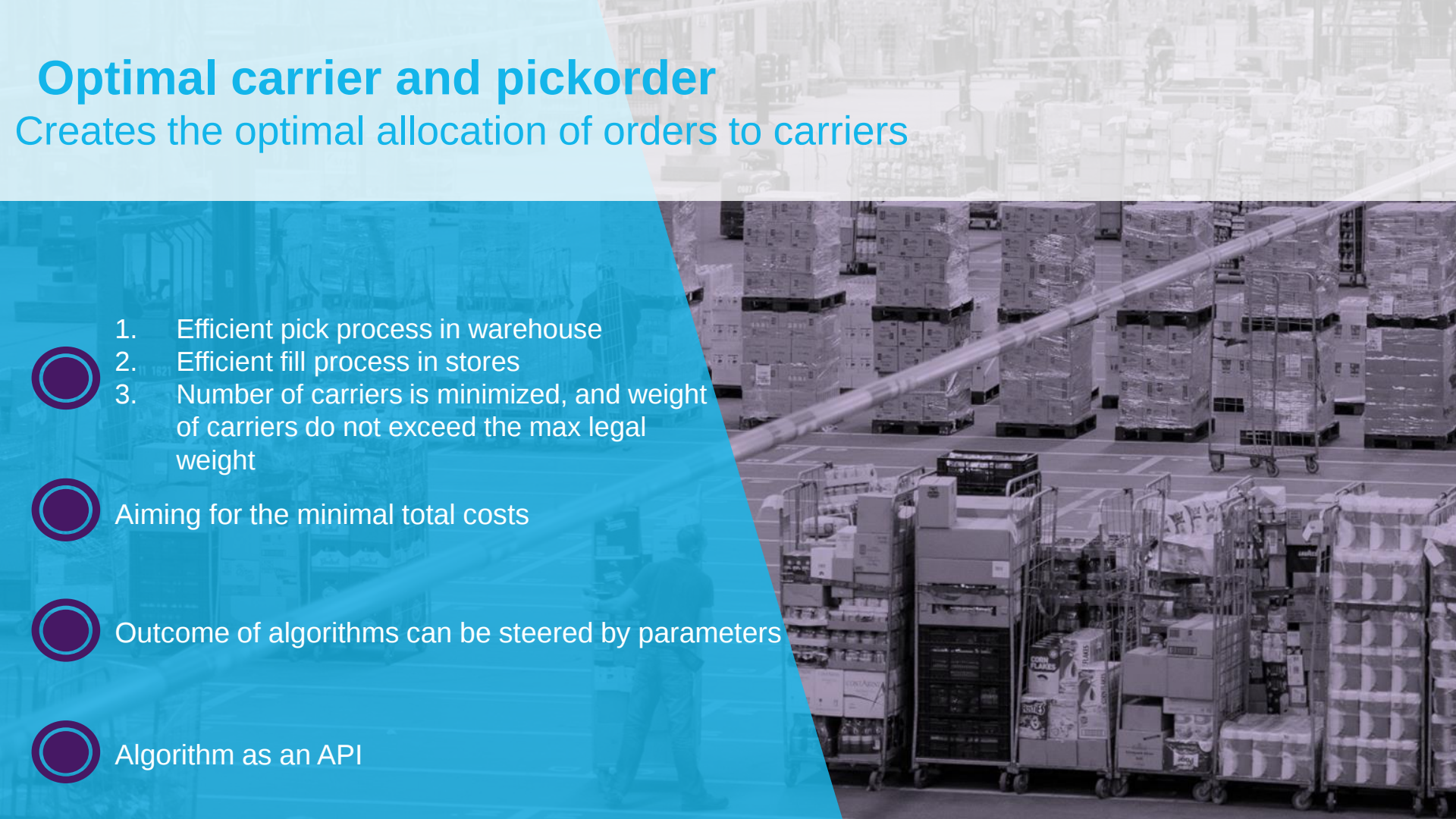
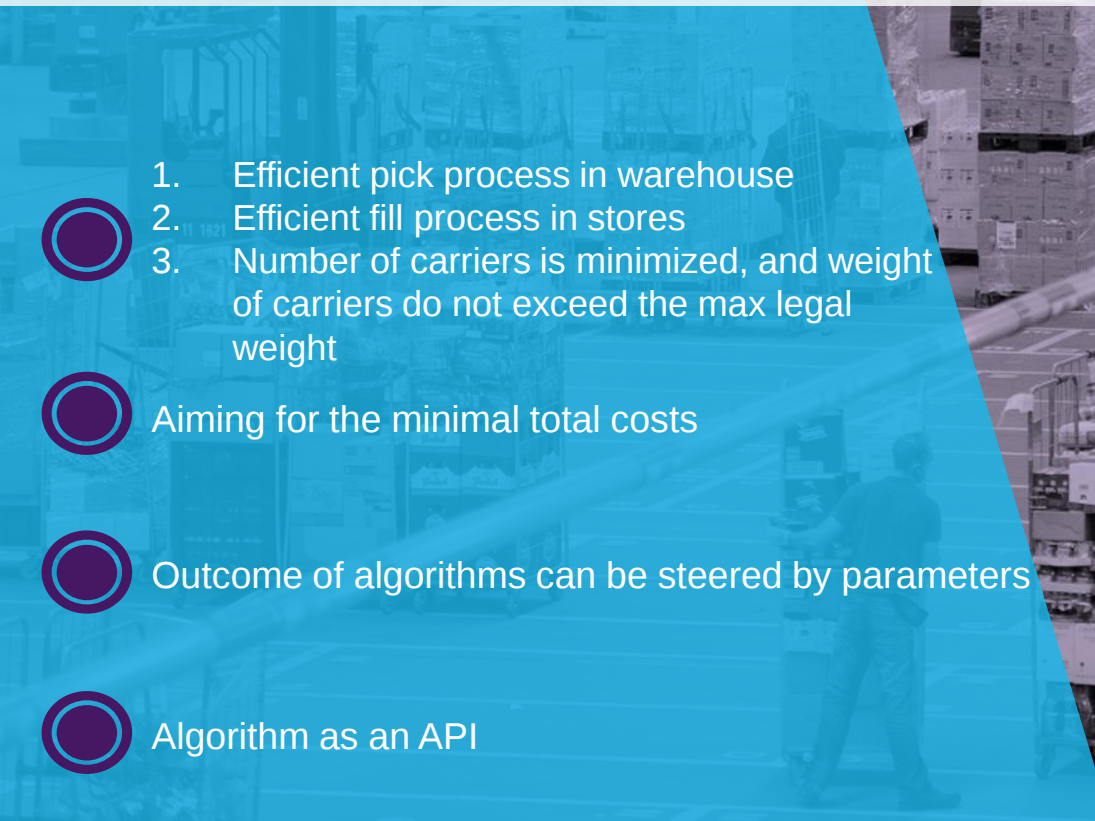
Add value
Focus on what is really needed and stop when the added value is not high enough

Trust in model
Transparency and validation are important elements of the model

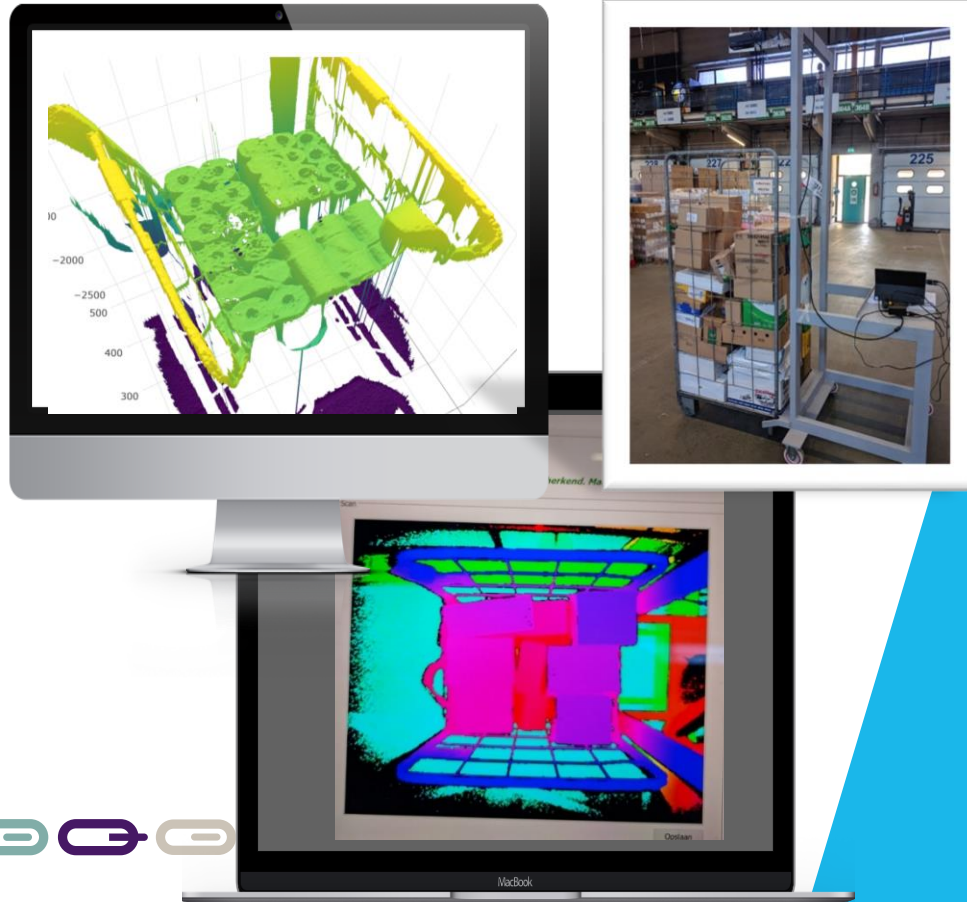
Cooperation
Involve business experts, data scientists and stakeholders

Optimal carrier and pickorder

Creates the optimal allocation of orders to carriers

- 
- 
- 1. Efficient pick process in warehouse
 - 2. Efficient fill process in stores
 - 3. Number of carriers is minimized, and weight of carriers do not exceed the max legal weight
- 
- Aiming for the minimal total costs
- 
- Outcome of algorithms can be steered by parameters
- 
- Algorithm as an API

Stacking of products



Model that predicts the amount of unusable volume on a carrier because of imperfect stackability



Based on the products on the carrier and their characteristics



Model created based on 3D images



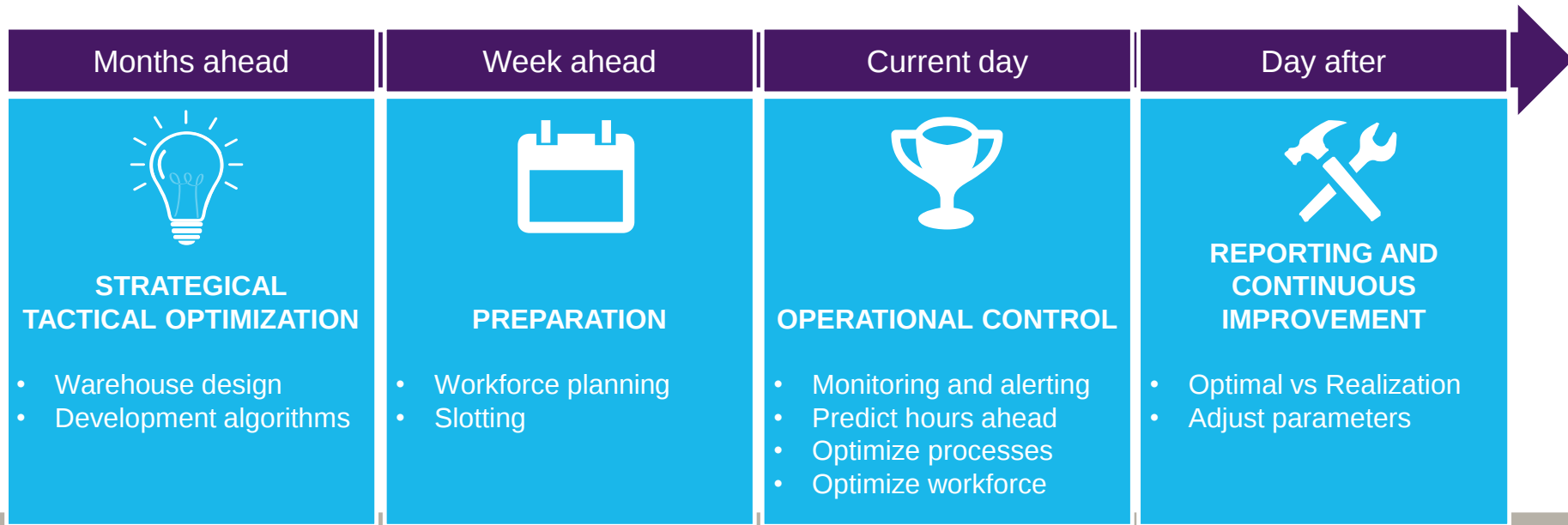
Choice for regression model – transparent, explainable, understandable



Use of a Digital Twin

Digital representation of the warehouse





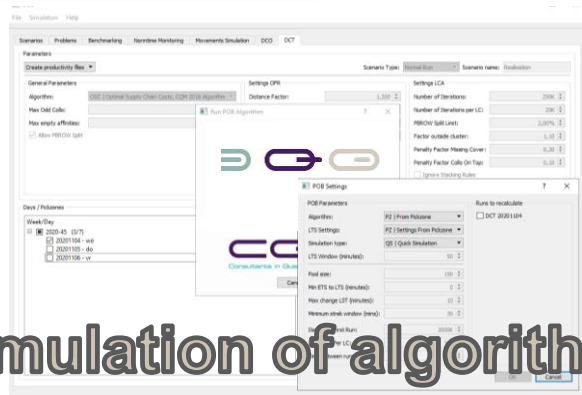
DIGITAL TWIN

Strategic tool to calculate the impact of new warehouse design, new algorithms and new processes

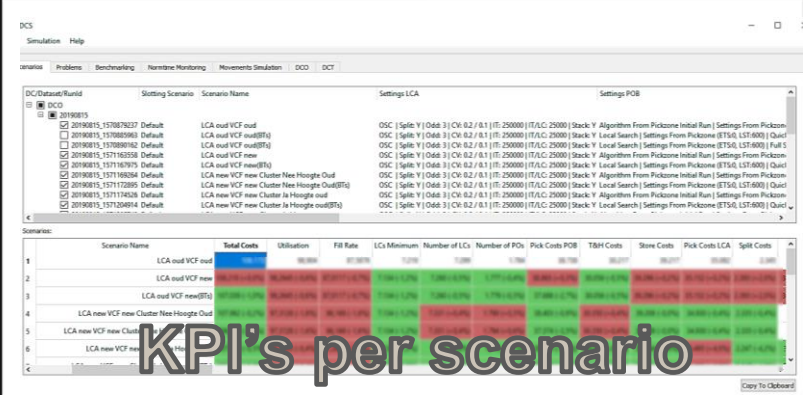
Tactical tool with demand forecast of the week ahead to optimize workforce planning and warehouse slotting/layout

Operational tool to calculate realtime scenarios, compare those scenarios, optimize those scenarios and take best decision

Retrospective tool to compare realization with optimal scenario to learn and improve



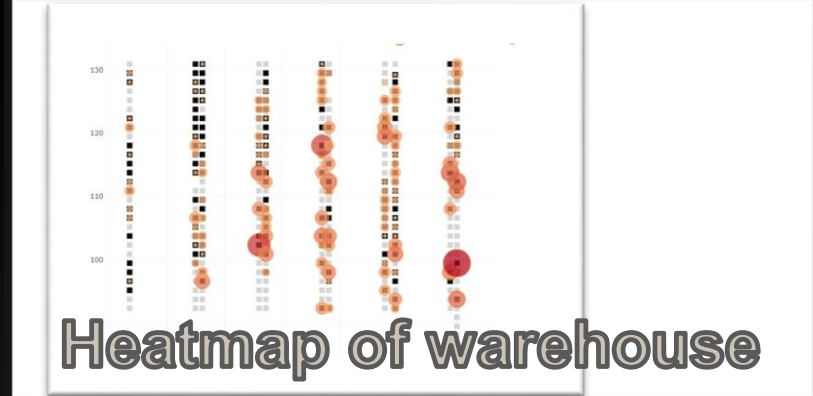
Simulation of algorithms



KPI's per scenario



Productivitymodel



Heatmap of warehouse



Take aways

The use of AI and Digital Twin to improve the warehouse process

- ⇒ Smart warehousing is not only relevant in mechanised warehouses but also in manual warehouses
- ⇒ Start with a descriptive and diagnostic phase so you know what's the best to optimize
- ⇒ Smart Warehousing is relevant throughout the whole warehouse process, from warehouse design, planning to operations
- ⇒ A Digital Twin supports you on that and gives you the opportunity to simulate and optimize processes, also realtime

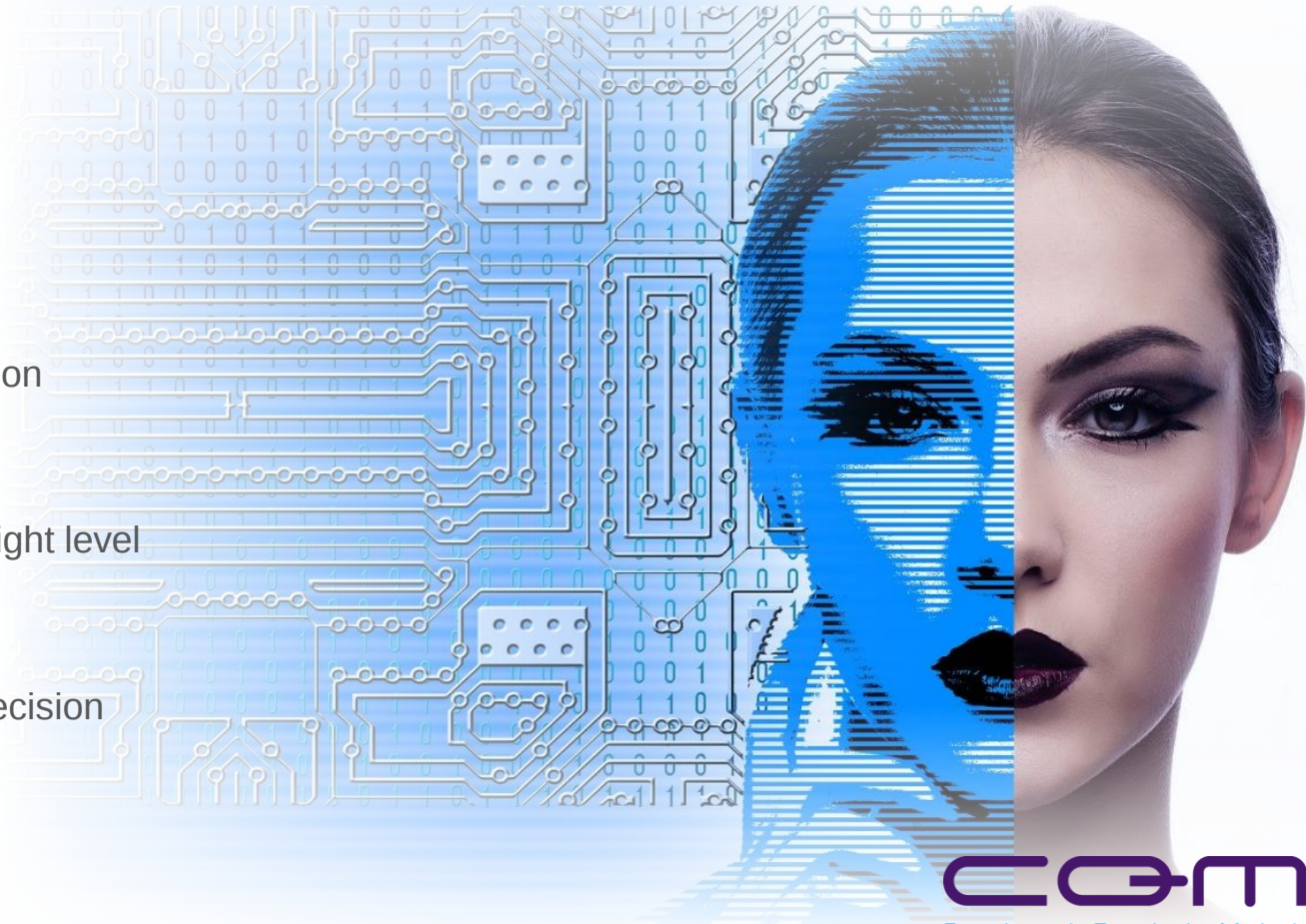




Thank you
Are there any questions?

Benefits of working with a digital twin

- + Better decisions based on quantitative results
- + Evaluate scenarios before implementation in practice
- + Extensive process description
- + Transparent model
- + Enable discussions at the right level
- + Encourage creativity
- + First step towards expert decision support





Strategic network design



Tactical staff planning



Operational dispatching

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Where do you see added value?



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Wij maken complexe beslissingen eenvoudig

Factbased, kwantitatief, persoonlijk en met ongekende passie.

OVER CQM

Hartelijk dank voor uw aanwezigheid!

Volgend webinar SLF op 9 november a.s.

**“Preventive maintenance for new systems
using multi-objective optimization”**

Dit webinar werd mede mogelijk gemaakt door: **THALES**  **PEACHGROUP** **ASML**