

TECHNOLOGY UPDATE

DE AUTONOME FABRIEK

DONDERDAG 21 NOVEMBER | 15:00

BRAINPORT INDUSTRIES CAMPUS

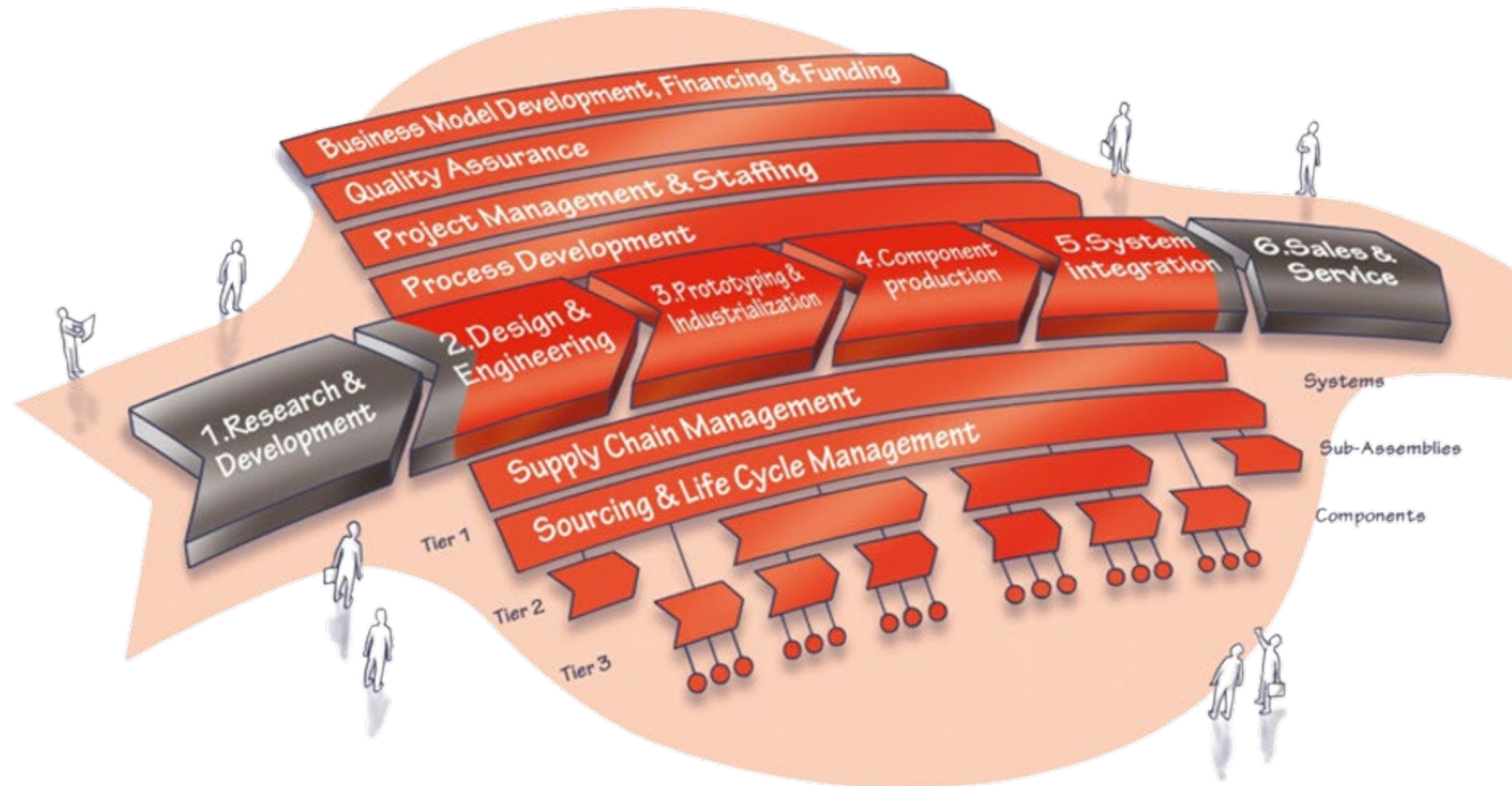
empowered by



Programma

- **15:00 Welkom en introductie - Frits Hoeve, Innovatiemanager Brainport Industries**
- 15:10 Update NXTGEN High Tech Autonomous Factory - Henry Neijhorst, Projectmanager
- 15:30 Operator support in de digitale en autonome fabriek - Jeroen van Oosterhout, TNO
- 15:50 De ontwikkeling van simulatieplatform ERS - Fred Jansma, InControl
- 16.10 Operator of the Future - Danny de Greef, Affix Engineering
- 16:30 Keynote: Robotisering is mensenwerk - Marijke Bergman, Fontys
- 17:00 Afsluiting en netwerkborrel
- 18:00 Einde

Brainport Industries Open Supply Network



125 Members – October 2024



Brainport Industries richt zich primair op 5 markten

High mix – low volume – high complexity

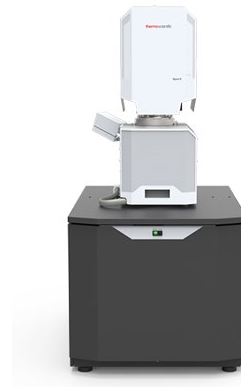
Semicon



Medical



Analytical



Printing



Energy systems



Krachten bundelen door slimme samenwerking





Strategische roadmap met 5 prioritaire thema's



Samenwerking in (internationale) productienetwerken



Maatschappelijke transitie en duurzaamheid



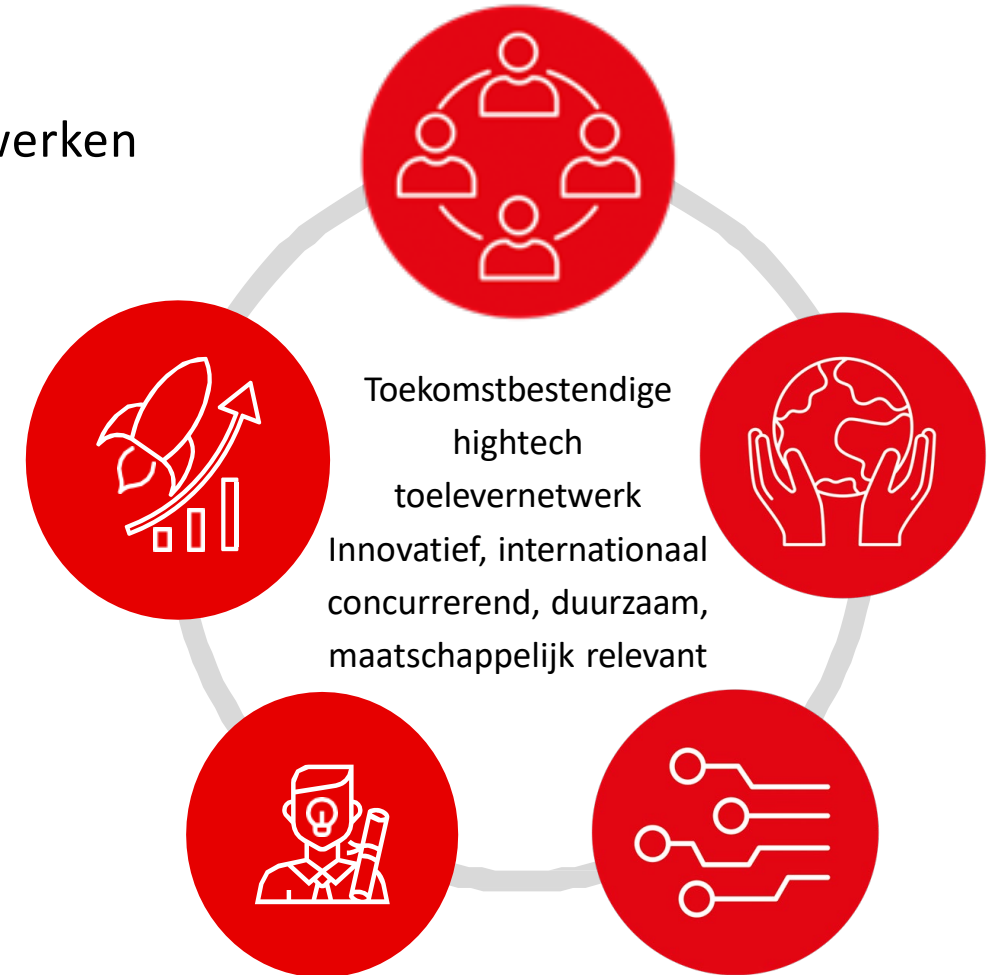
Digitalisering en productietechnologie



Human Capital



Toegankelijkheid van groei- en werkkapitaal



Digitalisering en productietechnologie

NXTGEN Hightech Autonomous Factory



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- Bouwstenen voor autonome productieprocessen in de high-mix low-volume omgeving
- Focus: Factory planning, autonome logistiek, robot-assisted manufacturing, bin picking en human-operated assembly



A close-up, blue-tinted photograph of a robotic arm's gripper, which is a black mechanical claw with two pincers. The arm is positioned in the upper left quadrant of the frame. The background is a blurred industrial setting with various mechanical components and pipes. A large, bright orange diagonal stripe runs from the top right towards the bottom left, separating the top right section from the bottom right section. The overall aesthetic is clean, modern, and high-tech.

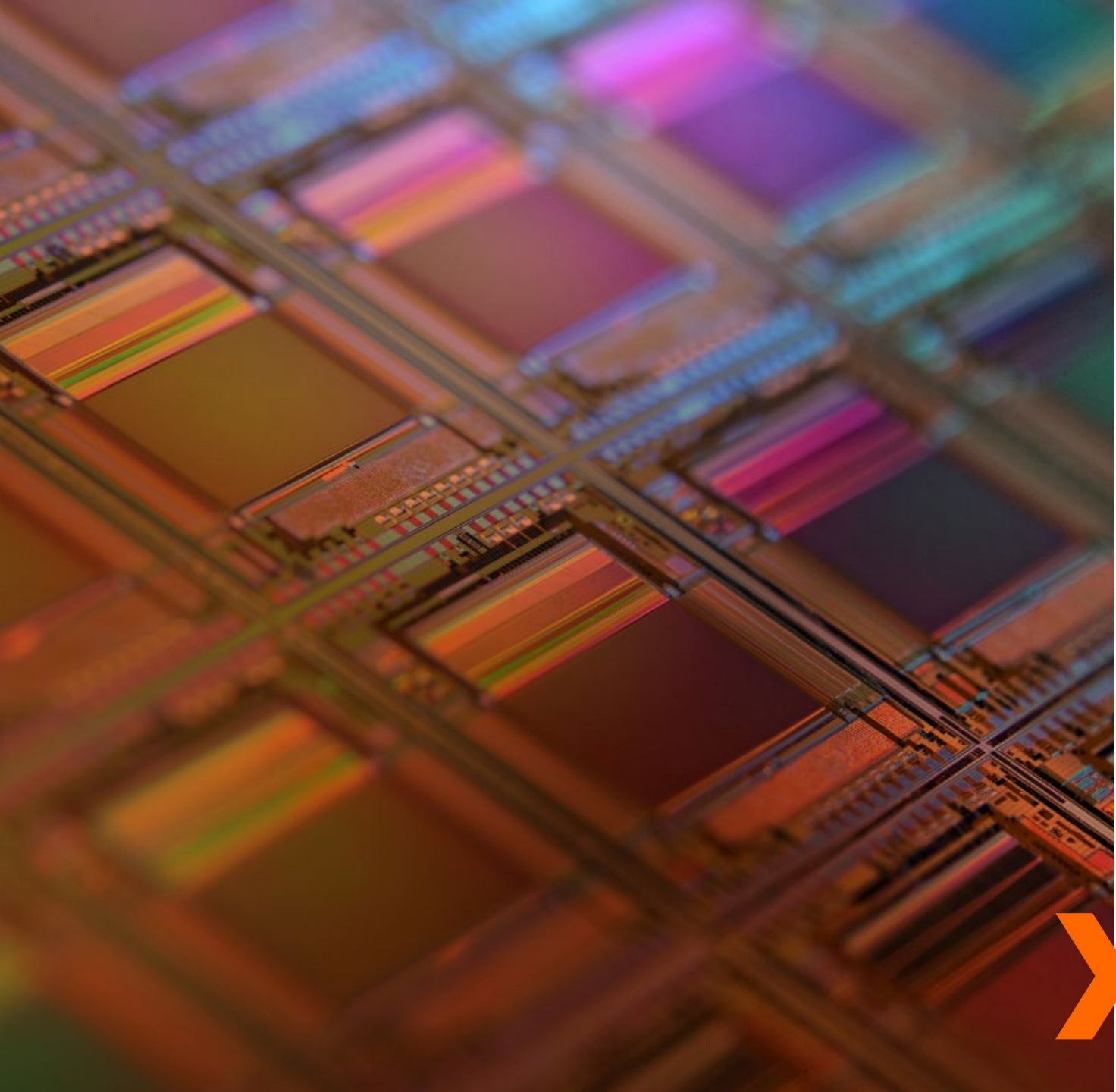
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Autonomous Factory

Building blocks for autonomous production in a high-mix low-volume environment

nxtgenhightech.nl



Agenda

By Henry Neijhorst, project manager
Autonomous Factory, Brainport Industries

1. Introduction NXTGEN Hightech
2. Technical realisation



Chapter 1

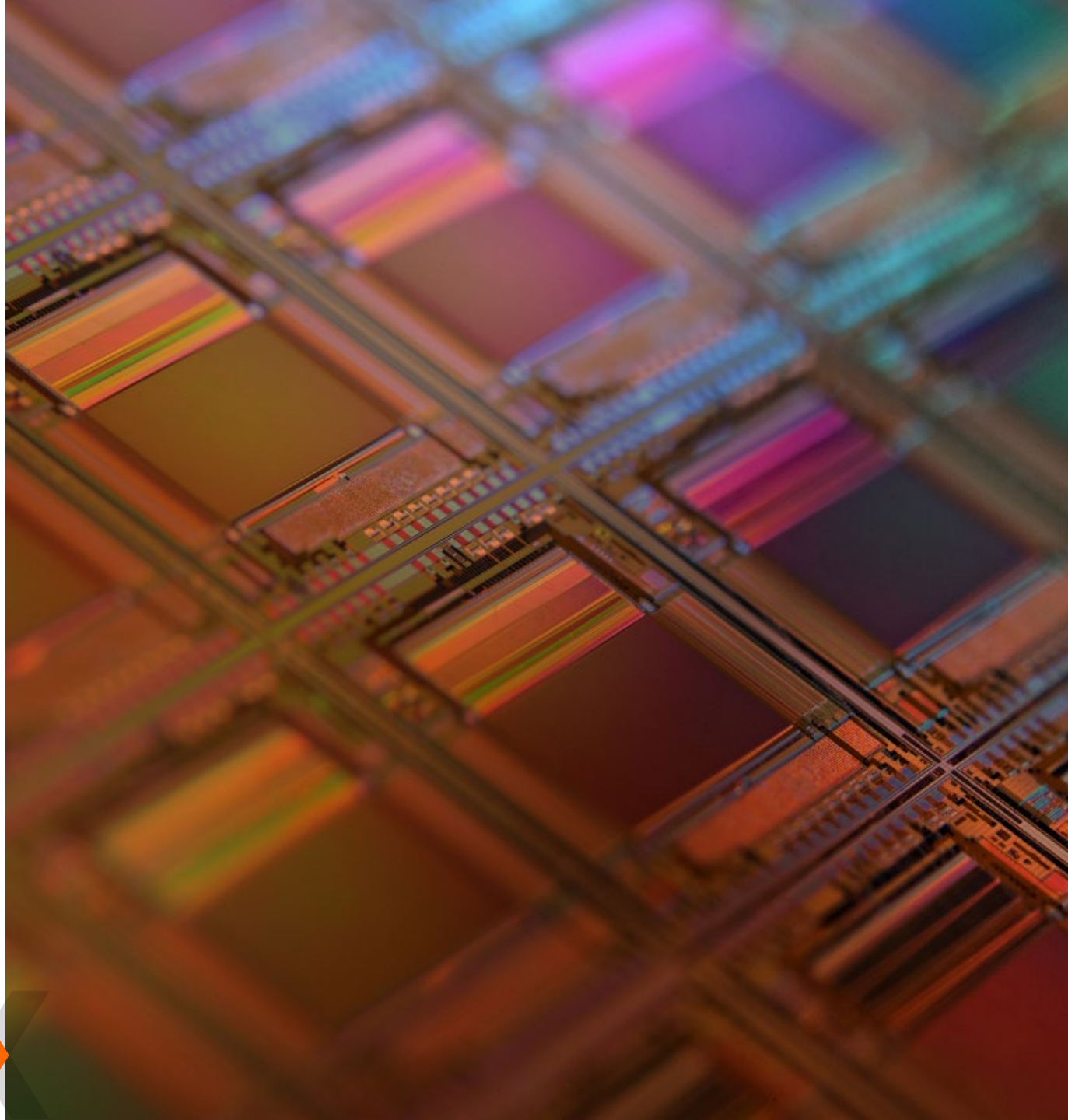
NXTGEN Hightech

Smart Industries

Smart Industry creates the machines of the future! Factories are becoming more autonomous, staff are becoming more productive, machines are becoming smarter, the production process is becoming more economical and we are working together on skills so that the whole of the Netherlands can take a step towards digitalization.

Projects

- Autonomous factory - Industrial Cluster Noord
- Autonomous factory - Industrial Cluster Oost
- **NXTGEN Autonomous Factory**
- Autonomous factory - Industrial Cluster West
- Autonomous factory - Common
- **NXTGEN Smart Enabling Technologies**
- Enabling technologies for smart networks - RAMses
- Enabling technologies for smart networks - Aphrodite
- Enabling technologies for smart networks - Common
- NXTGEN Capability Booster



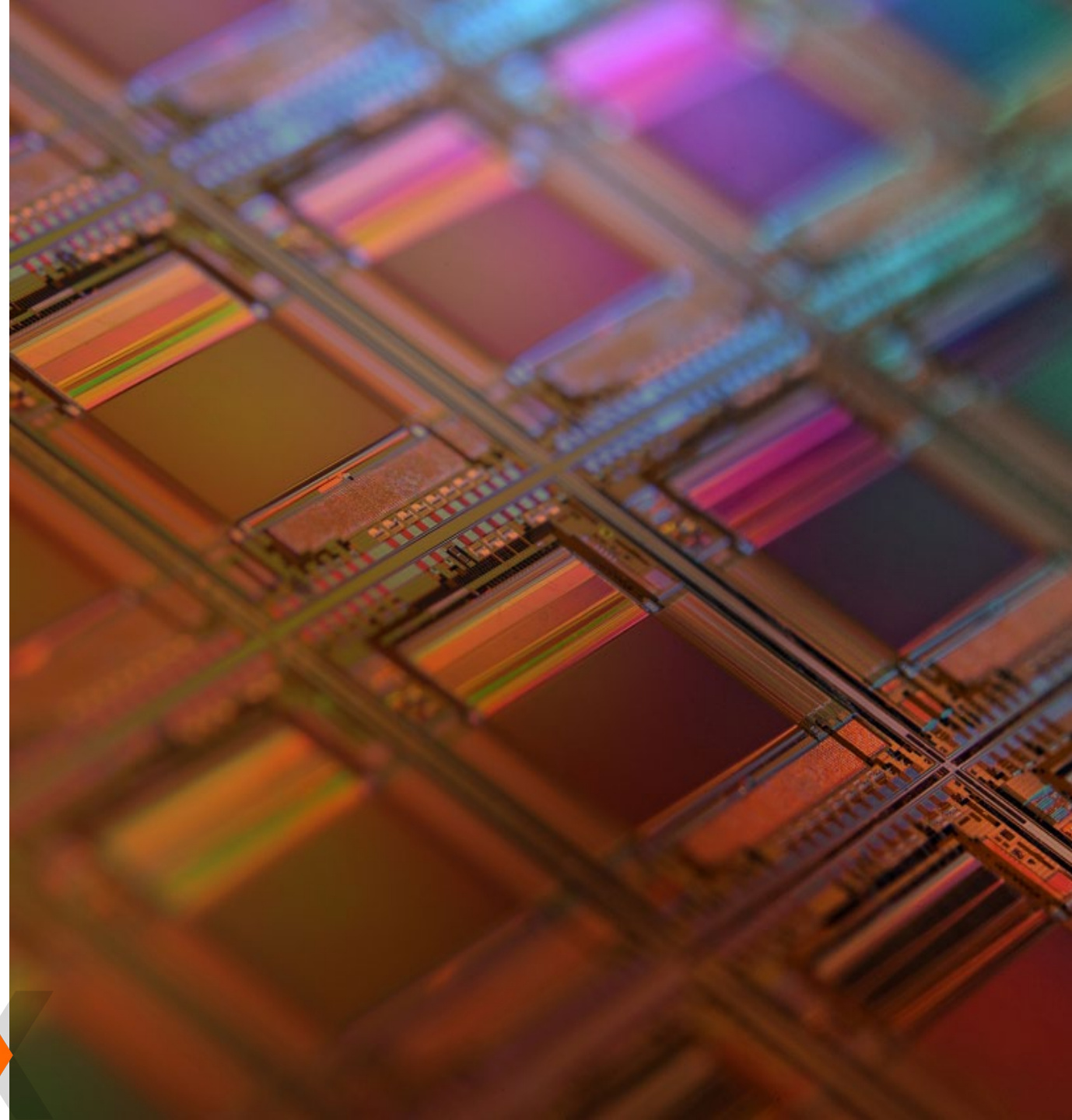
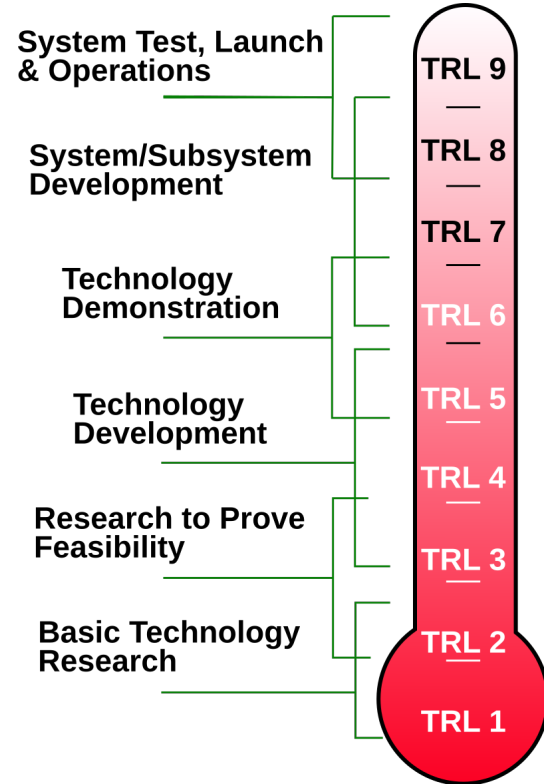


Goal, ambition

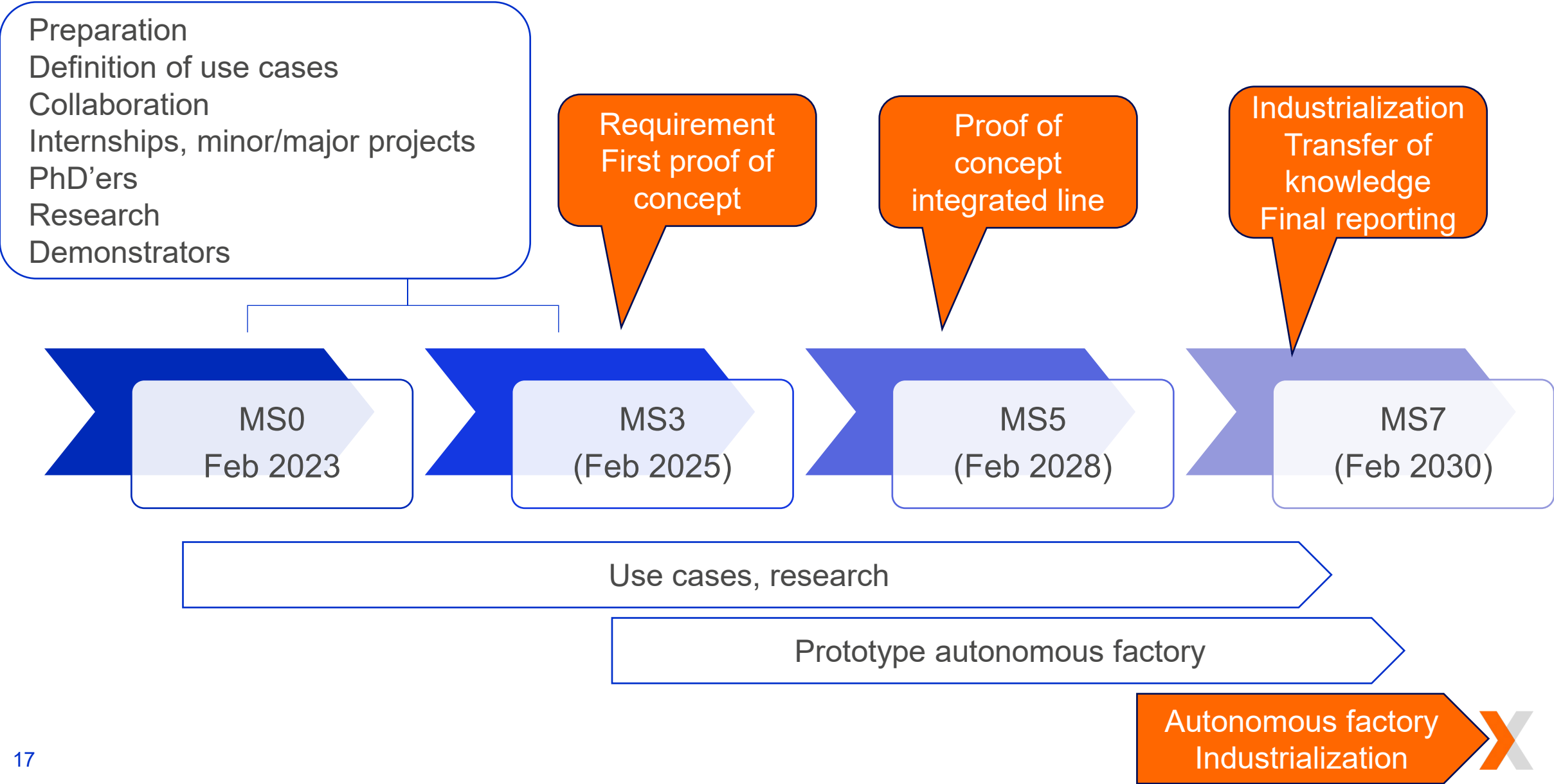
Explore multiple areas within relevant technology domains of autonomous factory in HMLV environment.

Solutions with high level of technology readiness level (TRL7 and higher), combination of research, demonstration and applications.

Realise (part of) autonomous factory.



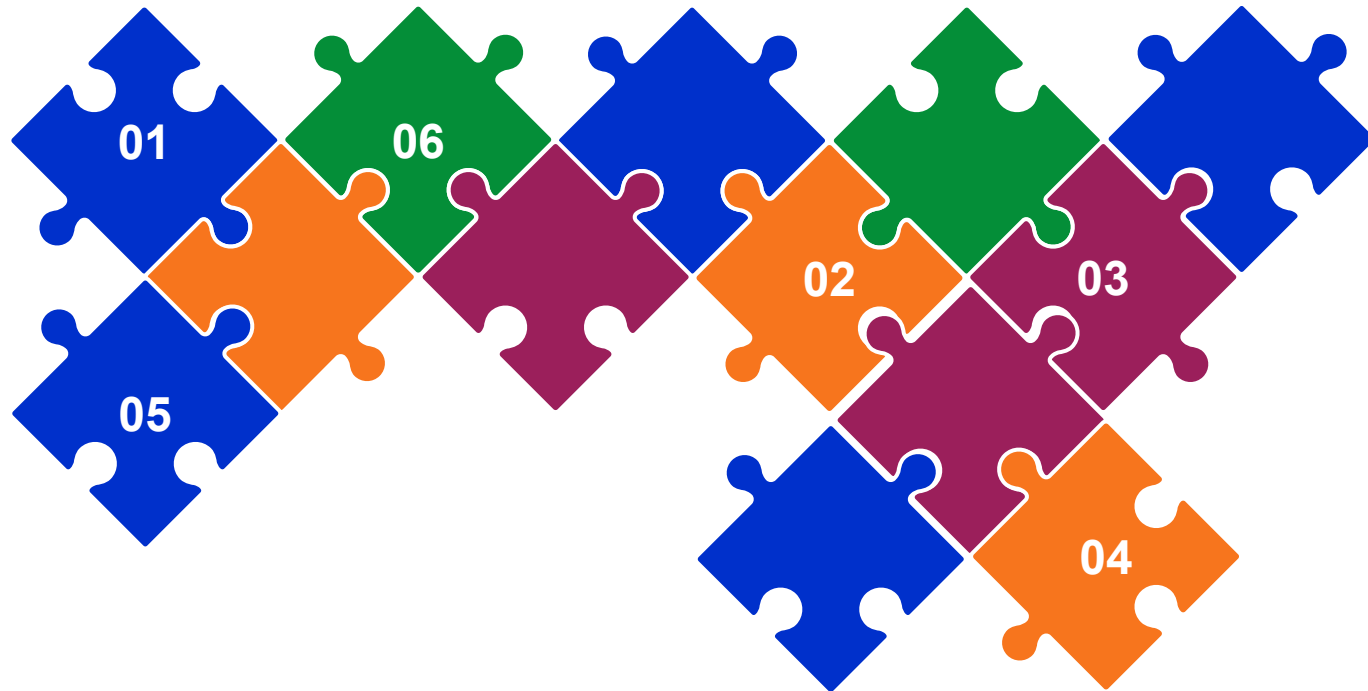
Roadmap: milestones and deliverables



Chapter 2

Technical realisation

Building blocks & puzzle pieces



Research and development topics

01: Zero programming Robot

02: Data collection using OPC UA

03: ORE Calculation

04: Blueprint for AAS

05: Flexible grippers

06: Operator independent manufacturing

07: Realtime AGV planning

08: Digital twin of autonomous logistics

09: Glaring object detection

10: Integrated quality control

11: Dynamic/flexible operator instructions

12: Integration of production cells

13: Factory planning for zero defect/zero downtime

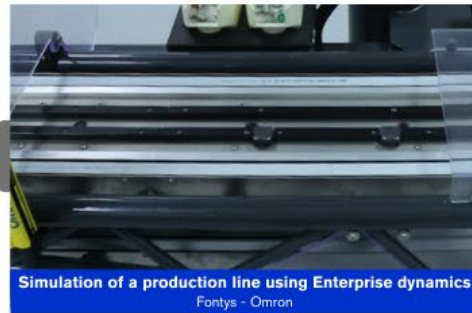
14: Vision integration robot manufacturing

15: Vision integration robot manufacturing

..... and many more



Simulation of a production line/master Thesis
Teun Jansen - Tue - Omron



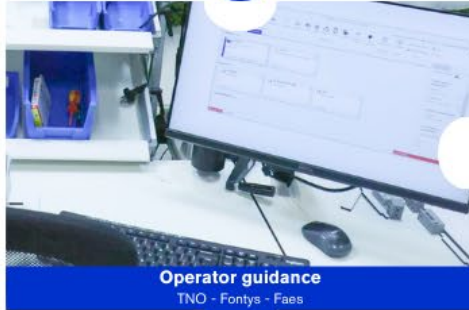
Simulation of a production line using Enterprise dynamics
Fontys - Omron



Data collection on a production line
Fontys - Omron



Agriculture, automated sorting
Teun Jansen - Tue - Omron



Operator guidance
TNO - Fontys - Faes



Connecting ERP with digital instruction systems
TNO - Fontys - Supply Drive - Faes



Advanced data collection on a production line
Fontys - Omron



Advanced simulation of a production line using Enterprise Dynamics
Fontys - Omron



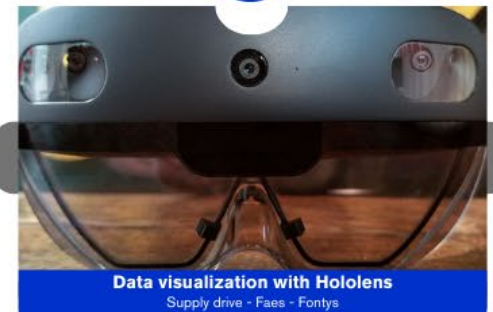
OEE Dashboard
Fontys - Omron



Collecting tacit knowledge
Fontys - TNO - KMWE - NTS - Faes



Projection technology
TNO - Avans



Data visualization with HoloLens
Supply drive - Faes - Fontys



Operator of the future
Affix



After pick
Affix



Cycle time
Affix



Contruction
Affix

Use cases and research activities

Ongoing or completed

Simulation of centralized packaging line

Data collection

Product data for image processing

Cycletime optimization

Appliance of robots in construction

Techniques for determining reflective objects

Optimizing placement of objects for picking

Operator Guidance

Connection ERP with instruction system

Advanced data collection using OPC UA/Pack ML

Task allocation

Ongoing or completed

Collecting tacit knowledge

Projection technology

Data visualization with Hololens

OEE algorithm based on PackML

ORE dashboard, action driven

Simulation of an assembly line using Enterprise Dynamics

Dynamic simulation using production data

Bridging the gap between companies and smart technologies

Optimizing machine processes at MSG

Intelligent programming and machine task allocation

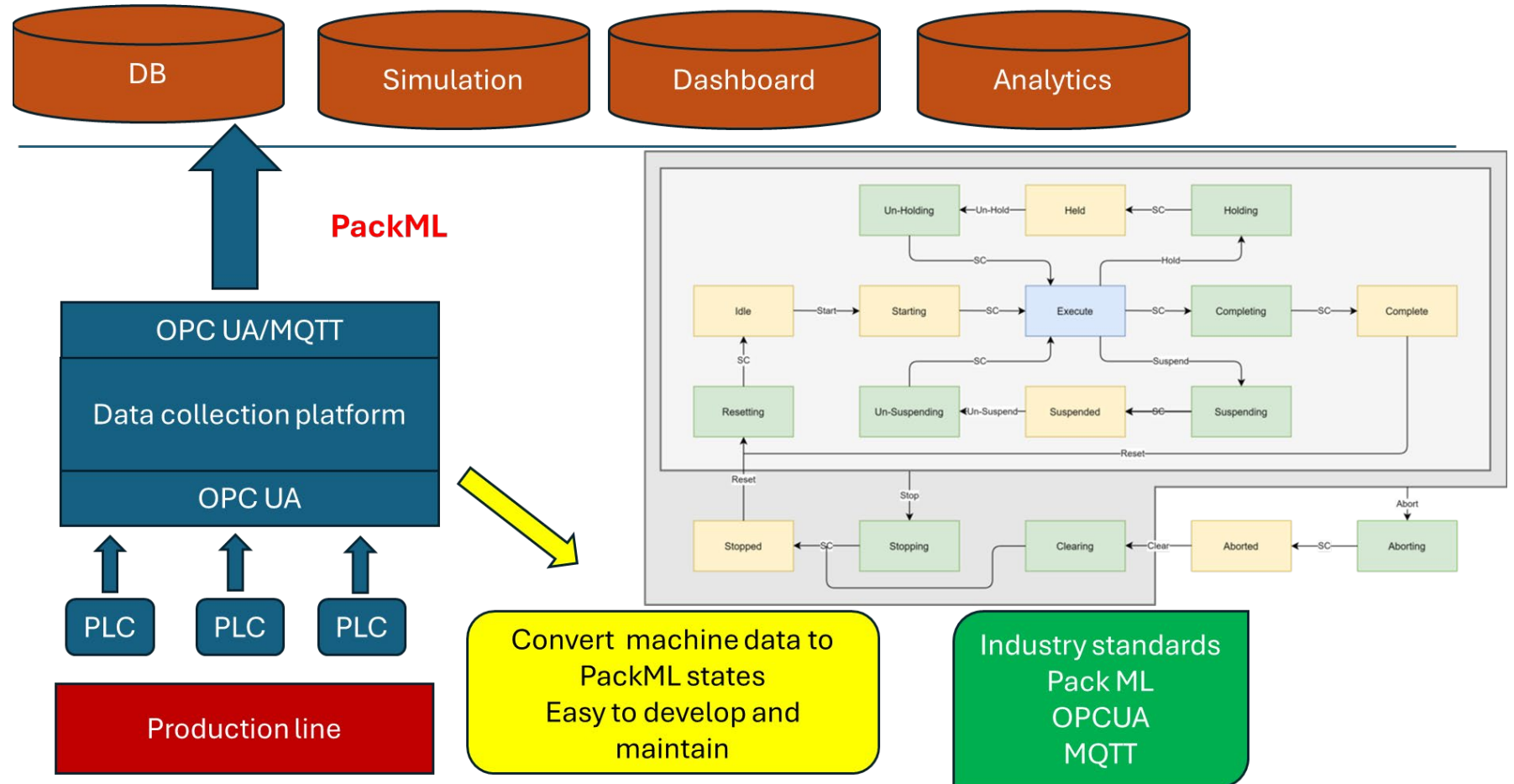


Data collection framework

Key building block
for AF

Lessons learned and
recommendations
from Factory of the
Future

Using existing
industrial standards



Prototype factory in Experience Center

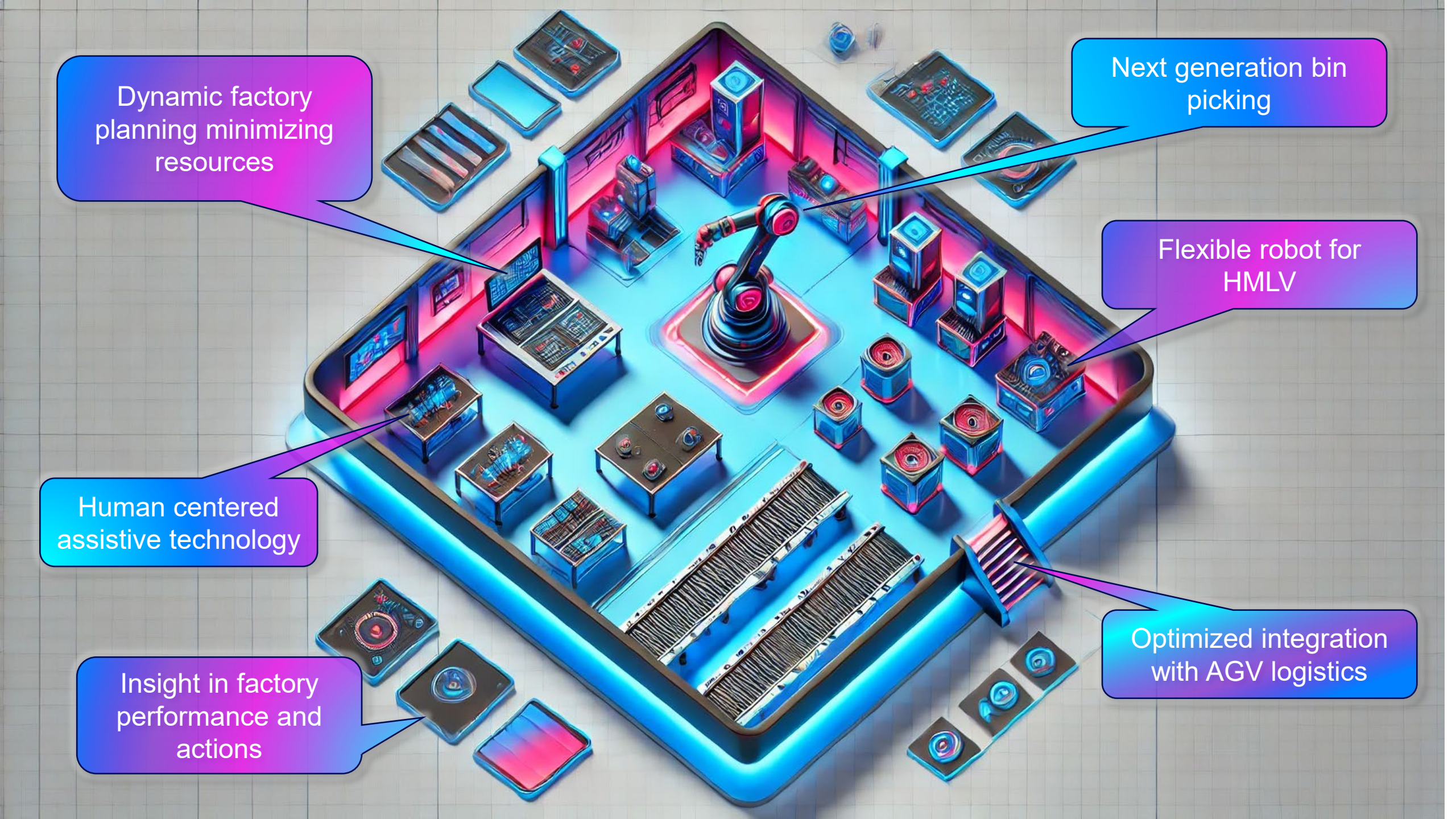
Use existing demonstrators to collaborate, interact and become part of prototype factory

Owners asked to "open" up their setup if feasible

Basis for research, development, student assignments, integration and demonstration

Demonstrators will stay "independent"





Dynamic factory
planning minimizing
resources

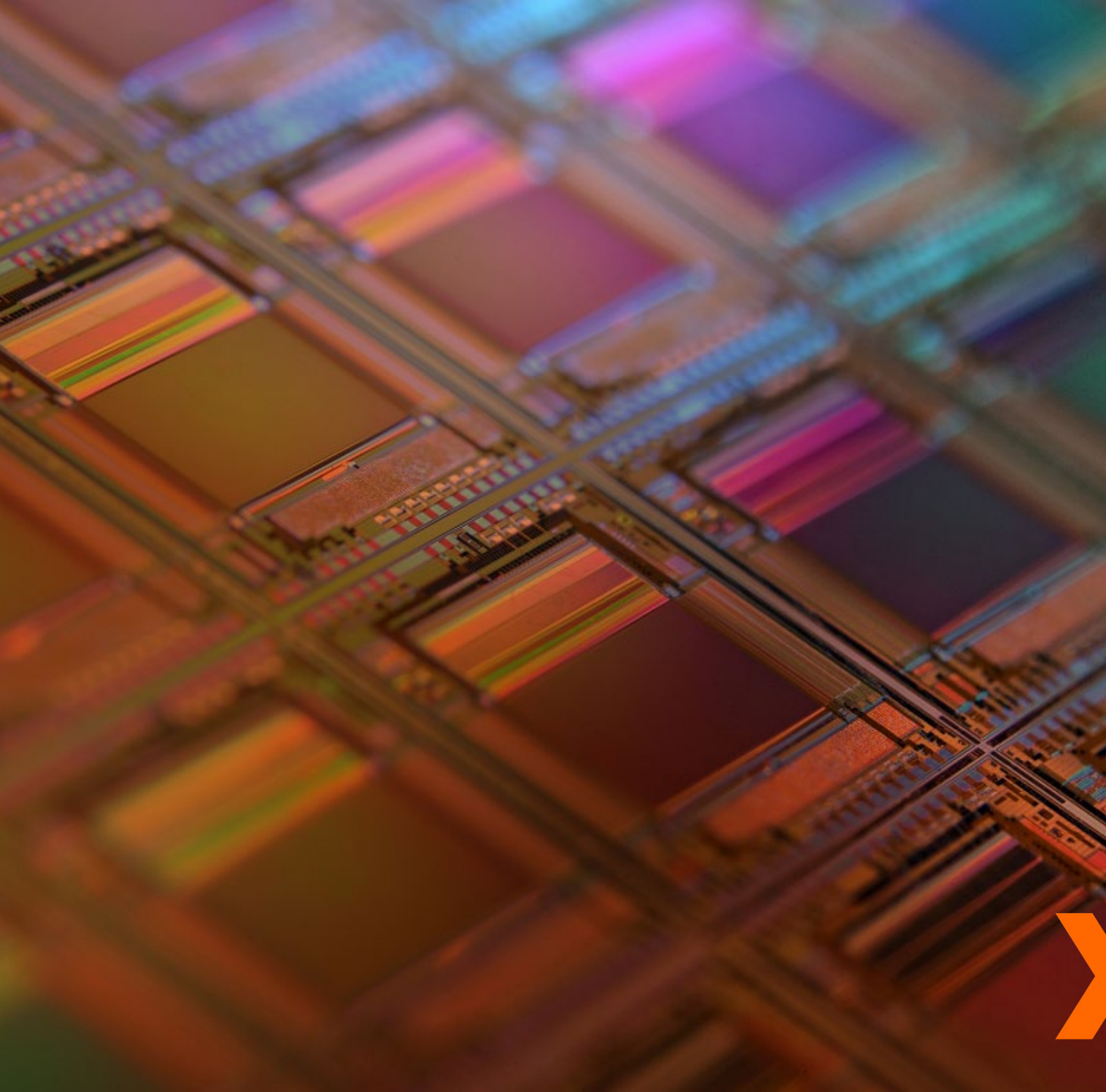
Next generation bin
picking

Flexible robot for
HMLV

Human centered
assistive technology

Insight in factory
performance and
actions

Optimized integration
with AGV logistics



How to contribute?

1. Potential use cases?
2. Articles, publications?
3. Events?
4. Feedback?

Reach out to us!

**(Even if you are not a member of
NXTGEN Hightech)**



empowered by



Dit project wordt mede mogelijk gemaakt door een uit het
Nationaal Groeifonds programma NXTGEN Hightech

nxtgenhightech.nl

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Operator support in de digitale en autonome fabriek

Jeroen van Oosterhout, Gu van Rhijn, Aijse de
Vries, Maurits van der Veen, Sharon Engbers

jeroen.vanoosterhout@tno.nl



Toenemende behoefte digitale support medewerkers

Markt ontwikkelingen

grotere variatie aan producten

korte levenscyclus van producten

complexere producten en taken

schaarste arbeidsmarkt

toenemende diversiteit werknemers

minder (technisch) gekwalificeerd personeel



Uitdagingen voor bedrijven

foutkans verkleinen / kwaliteit borgen

Versiebeheer

flexibel inzetten medewerkers

sneller inleren nieuwe medewerkers

afhankelijkheid van specialisten verkleinen

begeleidingstijd reduceren

inclusiviteit: werk toegankelijk maken

digitaal vastleggen data proces door operator

traceerbaarheid

Welke support technologieën zijn er?

- 1 Digitale instructies via scherm of tablet



- 3 2D info via smart glass



- 2 Projectie technologie



- 4 3D info mbv augmented reality



- 5 Remote assistance



In de praktijk zien we vaak nog papieren werkinstructies in plaats van digitaal (DWI)

Drie van de oorzaken van beperkte adaptatie:

Voordelen van DWI zijn niet goed bekend

- Test bij VDL Nedcar in samenwerking instituut GAK
- Kunnen nieuwe medewerkers met lager opleidingsniveau sneller zelfstandig aan het werk met DWI?

Aanmaken van werkinstructies is complex

- Met behulp van AI, DWI (semi) automatisch genereren op basis van
 - 3DCAD data
 - video en spraak (Instant Instructions)

Koppelen van digitale tools is complex

- Werken aan een standaard digitale connector

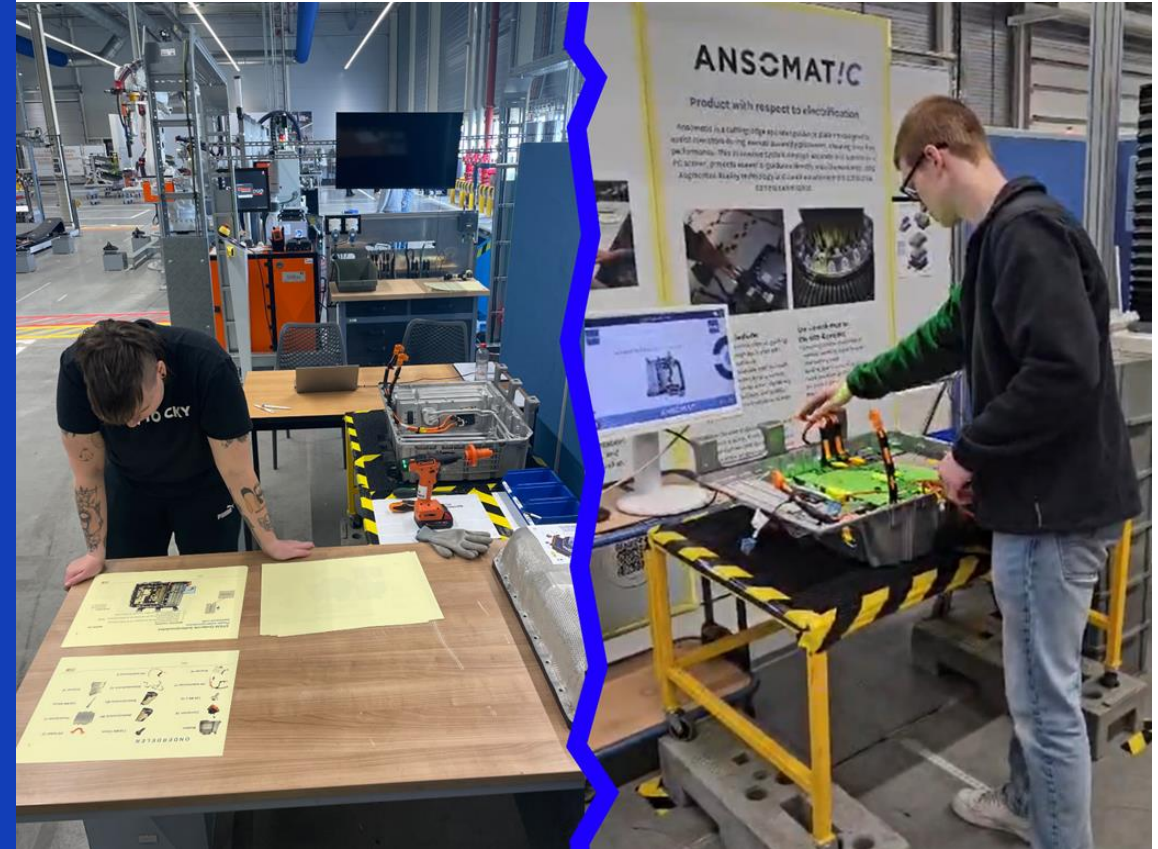


Voordelen van DWI



Werk toegankelijk maken met DWI

- Onderzoeksvragen:
 1. Kunnen werknemers met behulp van DWI werk uitvoeren dat normaal gesproken op een hoger niveau gekwalificeerd is? (MBO2 – MBO4)
 2. Wat is het effect (en meerwaarde) van operator support oplossingen in batterij assemblage?
- Opzet
 - 80 MBO studenten van VISTA college
 - assemblage taak bij VDL
- Tijdens de taak monitoren van fouten, hulpvragen en doorlooptijd



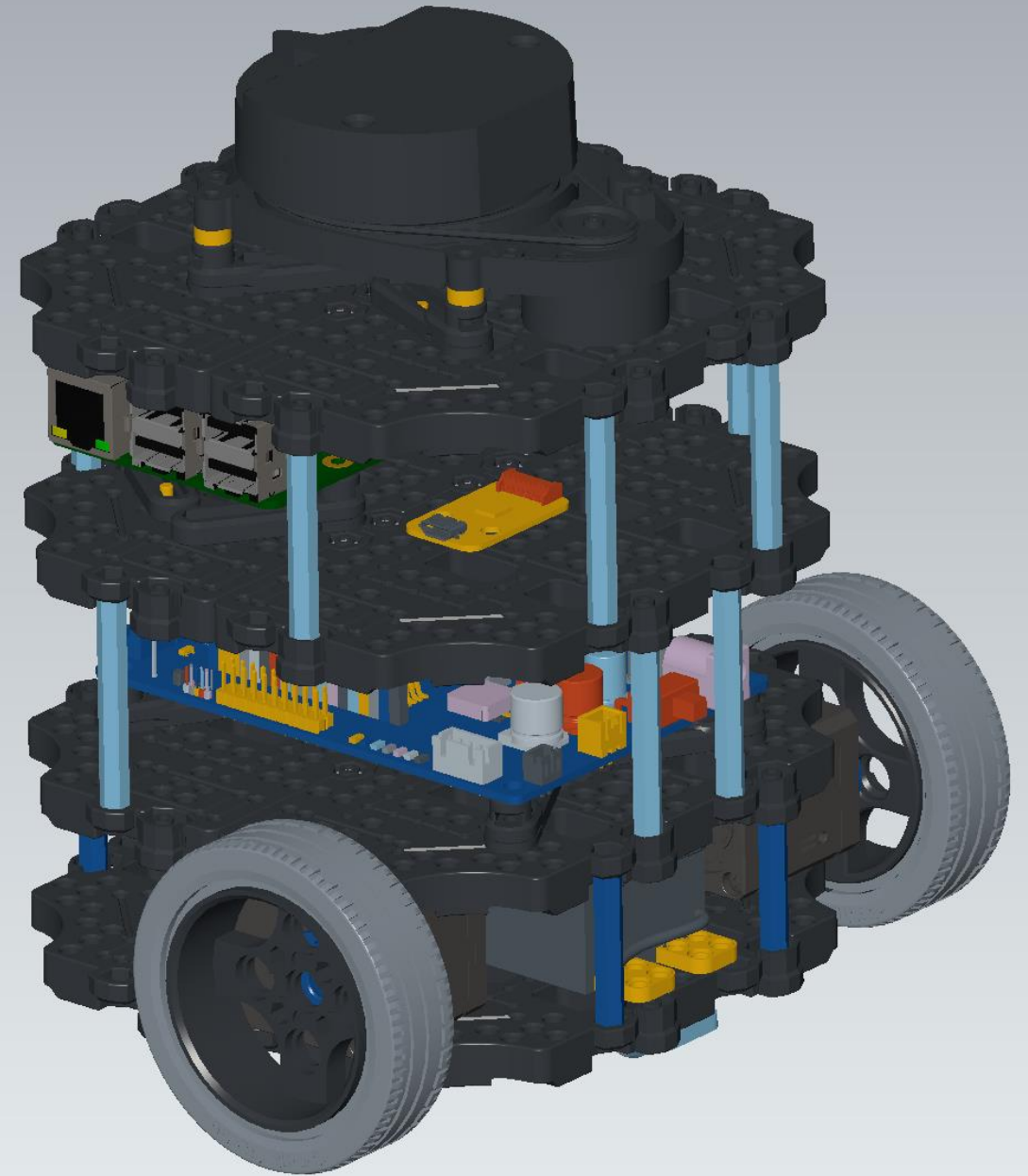
VISTA
college

VDL

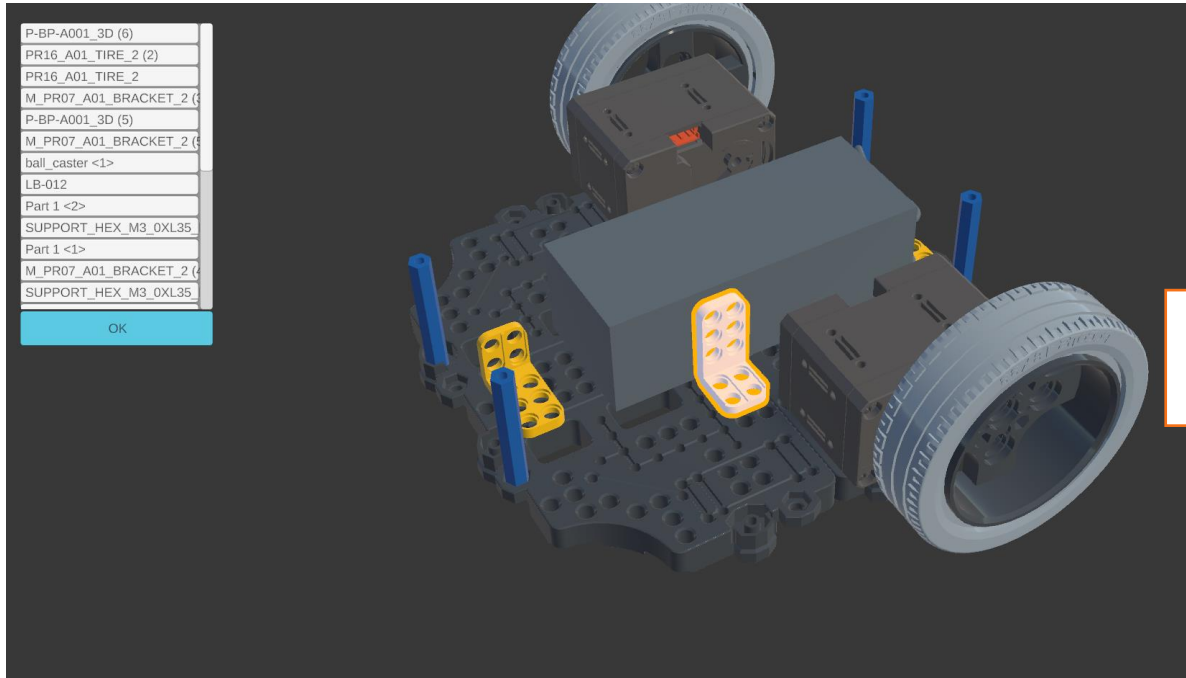
instituut gak

& Green Transport Delta – Electrification (GTD-E)

(Semi) Automatisch aanmaken werkinstructies



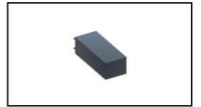
Van CAD data naar bouw instructies



15

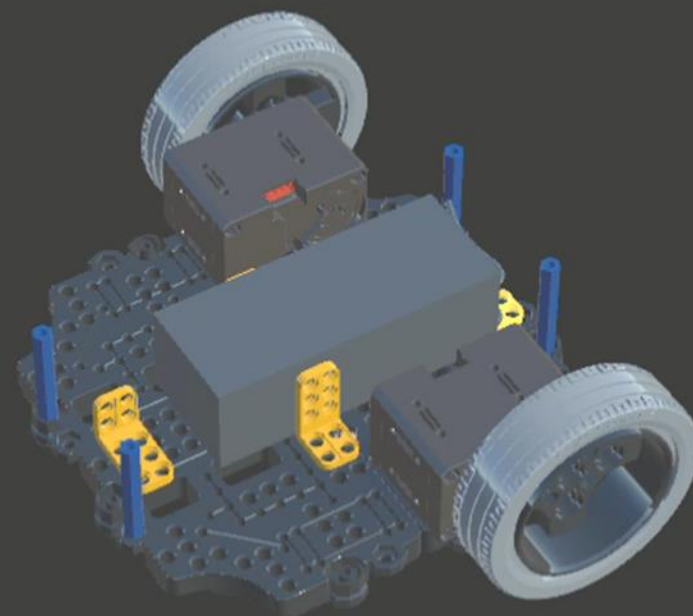


16



M_PR07_A01_BRACKET_2
NUT2_M3 (3)
P-BP-A001_3D
PHS_M3X6 (4)
PHS_M3X6 (3)
PHS_M3X6 (2)
NUT2_M3 (2)
PHS_M3X6
NUT2_M3
M_PR07_A01_BRACKET_2 (5)
M_PR07_A01_BRACKET_2 (4)
Part 3 (2)
PR16_A01_TIRE_2

OK



Instant Instructions



Instant Instructions

Een platform dat **elke medewerker** kan gebruiken om **werkinstructies** aan te maken voor zijn collega's, om zo bij te dragen aan het leren van **nieuwe skills**, **minimaliseren van leercurves** en het stroomlijnen van het **onboarding process** van **nieuwe medewerkers**



Aanmaken van werkinstructies

Instant Instructions in actie



Stap 2

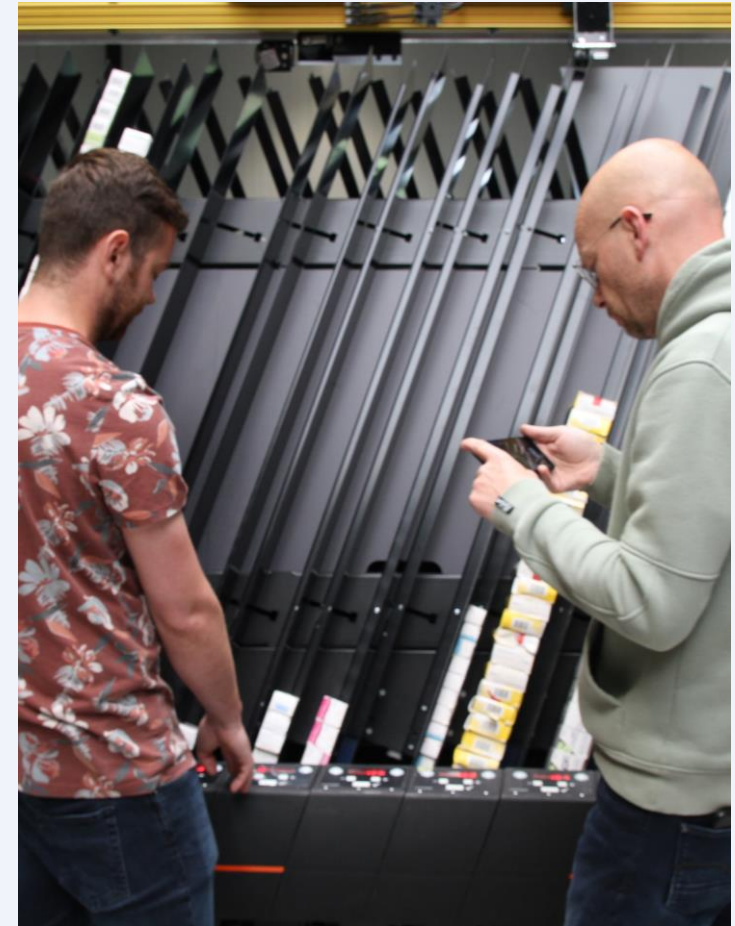
Klik op de knop "Start" in het HMI. Controleer of de lopende banden leeg zijn en of het filling station leeg is.
Controleer het filling station door de klep los te draaien en binnenin te kijken.

< VORIGE STAP

VOLGENDE STAP >

Take home message

- Digitale werkinstructie systemen bieden voordelen voor kwaliteit, inleertijd, traceerbaarheid, flexibele inzet personeel
- Digitale werkinstructies helpen werk toegankelijker te maken, bijvoorbeeld ook voor mensen met minder technische skills, door informatie slim te doseren
- AI kan ingezet worden om makkelijk instructies aan te maken, maar ook om kennis over te dragen
- Instant instructions is via het Fast track programma van TNO nu beschikbaar
- Binnen NXTGEN Autonome Fabriek Zuid wordt deze systemen ingezet en verder ontwikkeld





Contact:

jeroen.vanoosterhout@tno.nl

gu.vanrhijn@tno.nl

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ERS

De ontwikkeling van een nieuw simulatieplatform

Fred Jansma – Fred.Jansma@IncontrolSim.com

Nienke Valkhoff - Nienke.Valkhoff@IncontrolSim.com

Technology update NxtGen 21-11-2024

Agenda

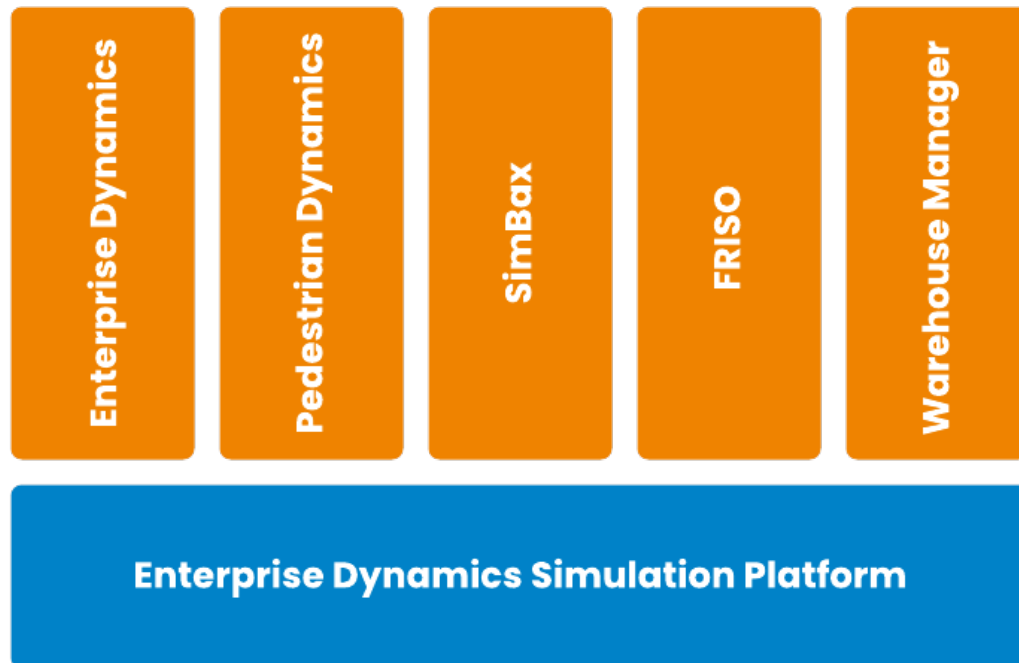
1. Introductie InControl
2. Probleem
3. Oplossing
4. ERS



InControl Enterprise Dynamics

InControl is a worldwide leading manufacturer of simulation and emulation software for the safety and sustainability of critical infrastructures.

Our products



Samenwerking: Digital Factory of the Future

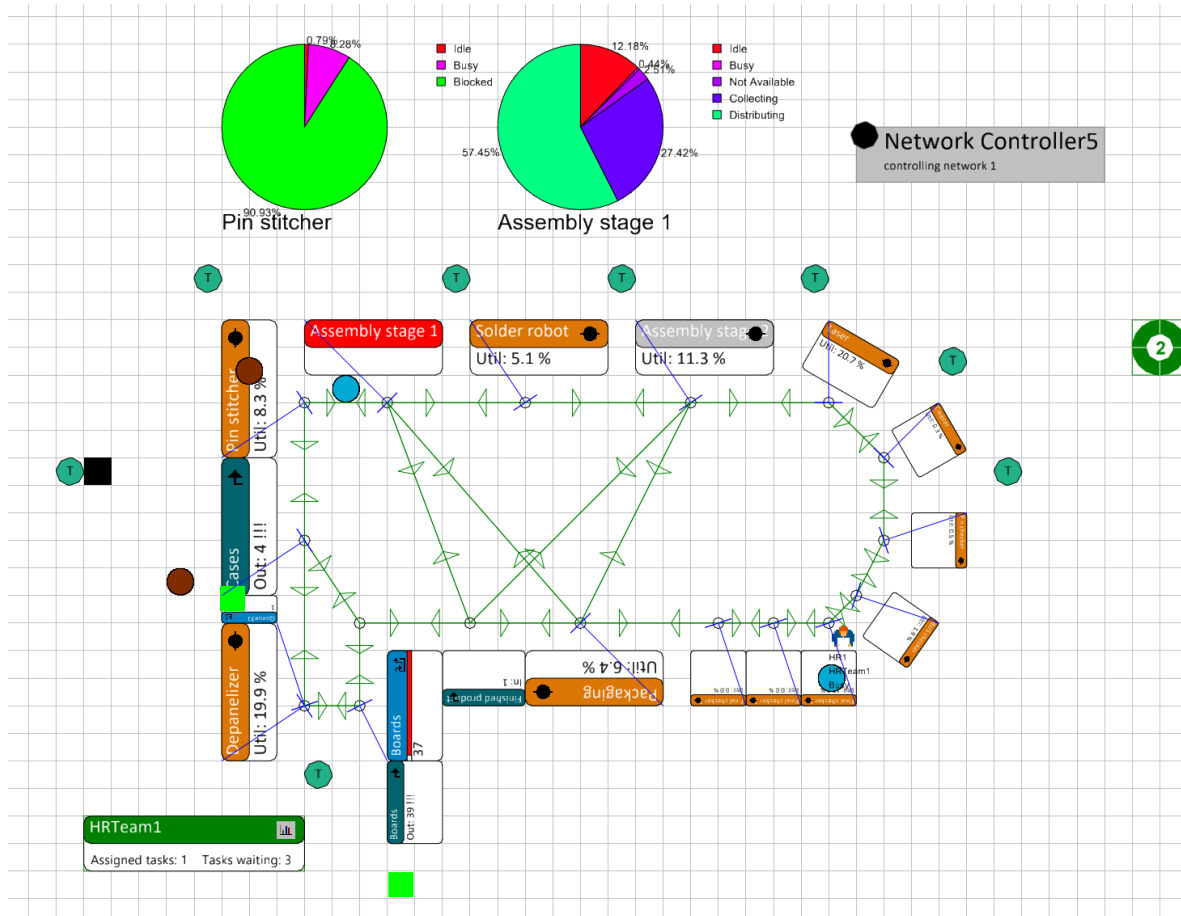


Decentralized learning multi-agent system for online machine shop scheduling problem

Jeroen B.H.C. Didden*, Quang-Vinh Dang, Ivo J.B.F. Adan



NxtGen Autonomous Factory



Eindhoven University of Technology
Department of Industrial Engineering & Innovation Sciences
Operations, Planning, Accounting, and Control

Centralized versus decentralized packaging
in a high-mix environment

T.C.M.(Teun) Jansen
1224945

Probleem

- Discrete-Event simulatie & Multi-Core hardware
- Windows niet langer het “enige” OS
- Enterprise Dynamics beperkt integreerbaar

Oplossing

Ontwikkel een nieuw simulatie platform:

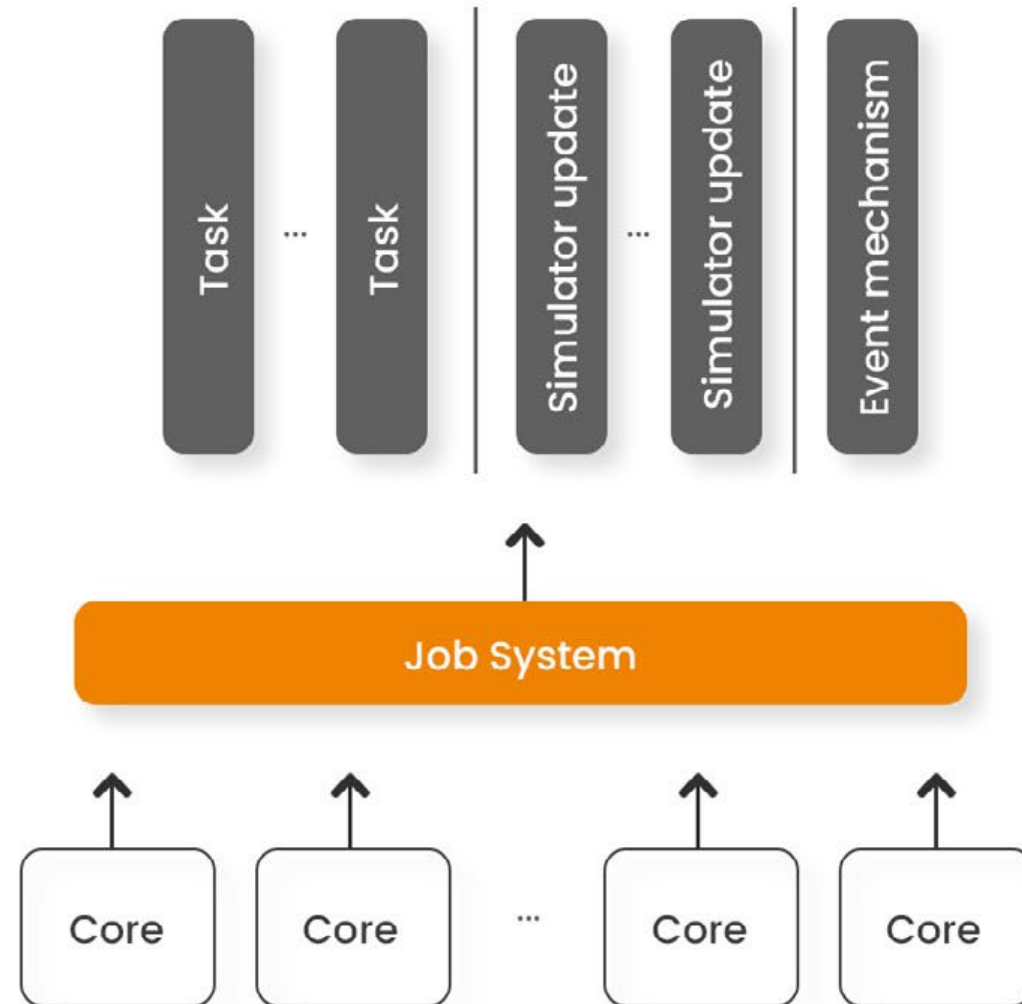
- Cross platform
- Maak gebruik van multi-core hardware
- Combineer simulatie formalismen
- Visualisatie op ieder device
- Object-oriented
- Real-time interactie
- Emulatie

Oplossing

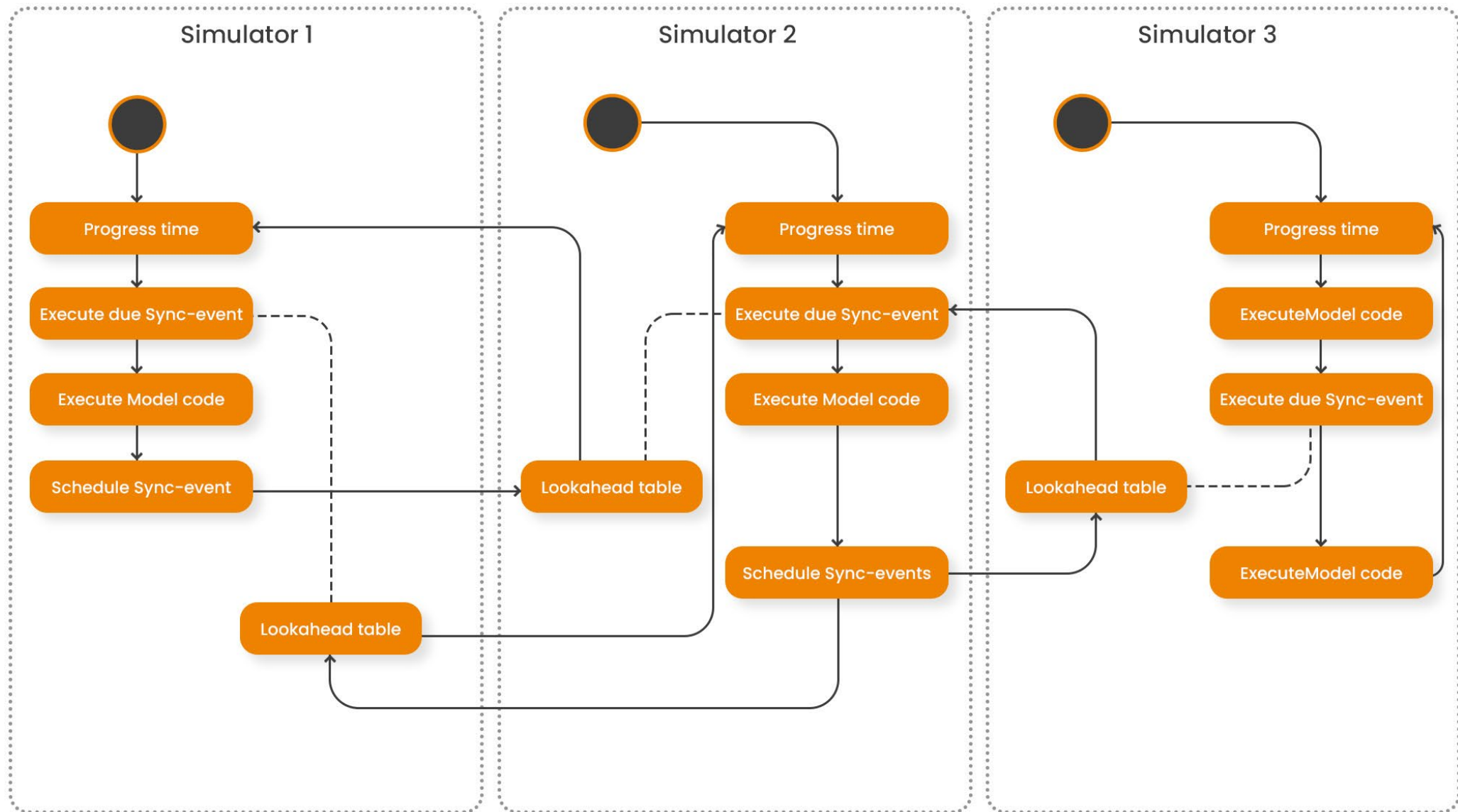
- Literatuurstudies
- Academische prototypen
- Eigen prototypen



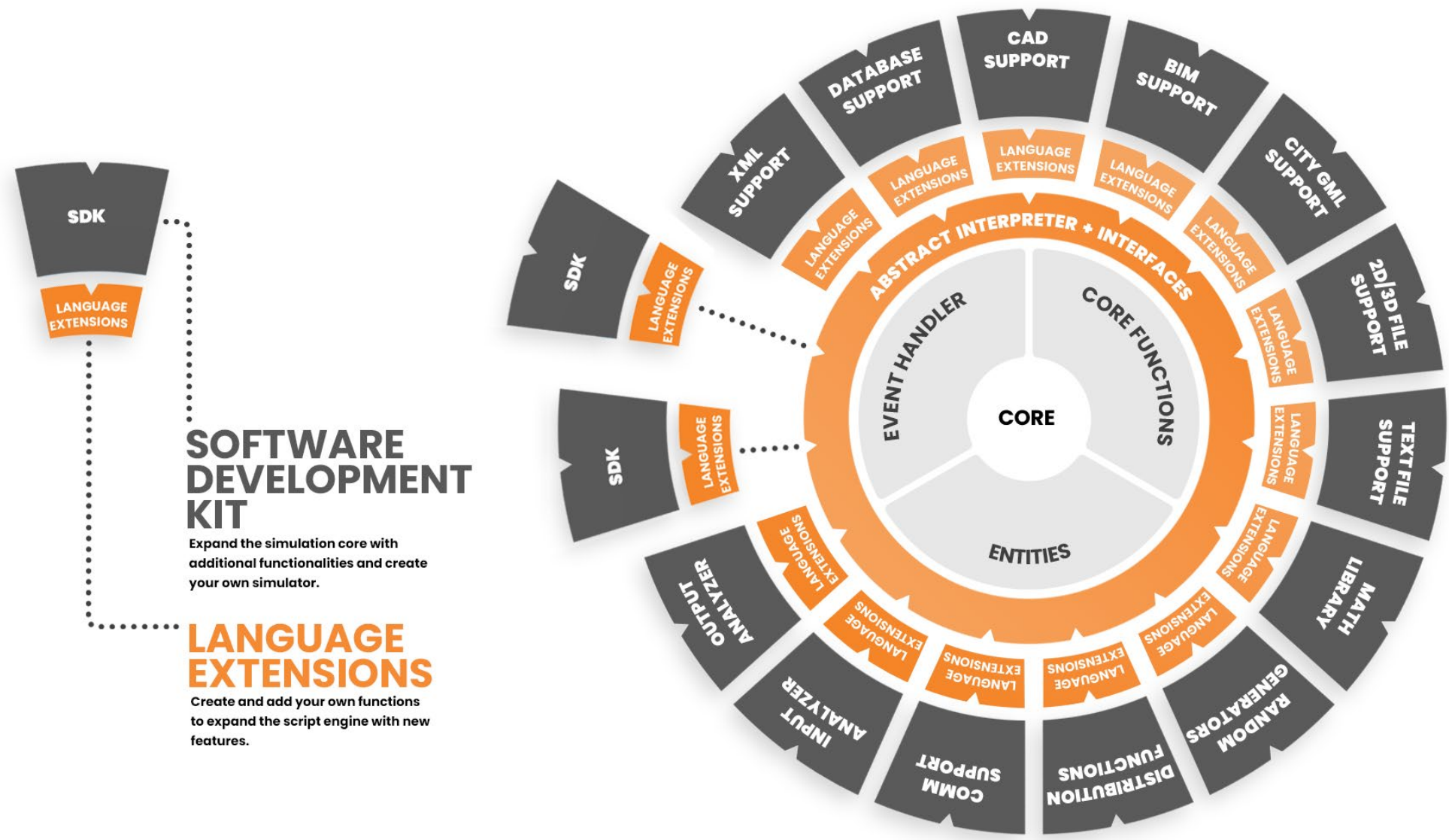
ERS



ERS



ERS



ERS

Een nieuw simulatieplatform:

- 13 jaar in ontwikkeling
 - Vallen en opstaan
 - Geen end-user applicatie
-
- Uitnodiging voor samenwerking en onderzoek:



Questions?



Programma

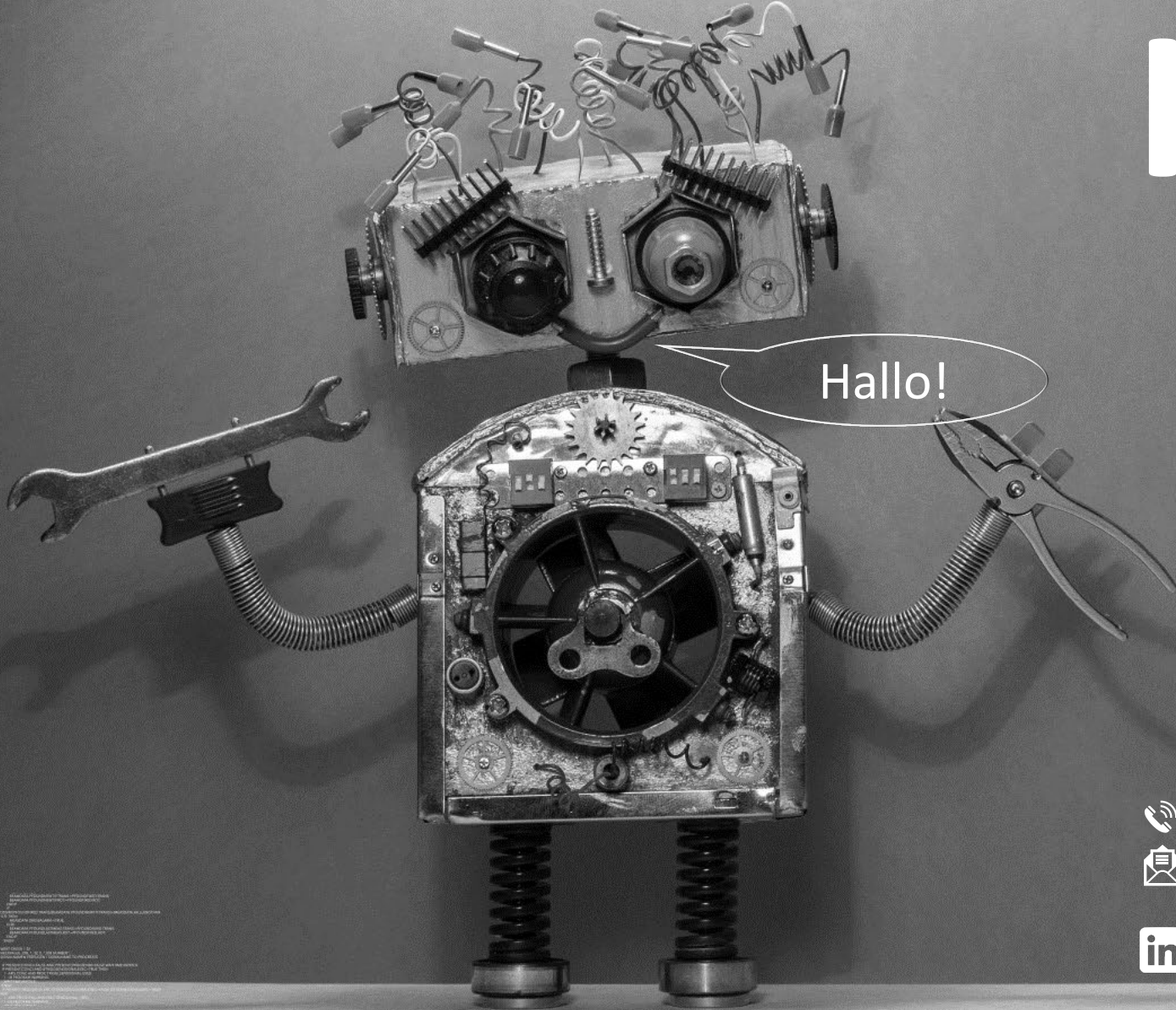
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IO_CTRL
010 0010

GripLock



BRING CREATIVE PROJECTS TO LIFE

[illegible]

Hallo!

Atix Engineering, V



1. **RESEARCH AND ANALYSIS** - This is the first and most critical step in the process. It involves gathering information about the problem, identifying the stakeholders, and understanding the context. This step is essential for developing a clear and concise problem statement.

2. **PROBLEM STATEMENT** - This is a clear and concise statement of the problem that needs to be solved. It should be written in a way that is easy to understand and that clearly defines the scope of the problem.

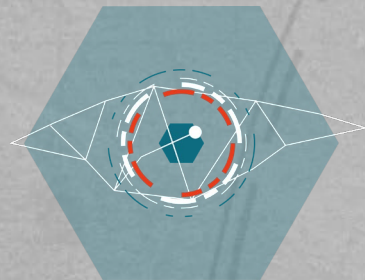
3. **ANALYSIS** - This is the process of breaking down the problem into smaller, more manageable parts. It involves identifying the key components of the problem and understanding how they are related to each other.

4. **SOLUTION DEVELOPMENT** - This is the process of developing a solution to the problem. It involves brainstorming ideas, evaluating the pros and cons of each idea, and selecting the best solution.

5. **IMPLEMENTATION** - This is the process of putting the solution into practice. It involves developing a plan, allocating resources, and monitoring progress.

6. **EVALUATION** - This is the process of evaluating the effectiveness of the solution. It involves comparing the results of the solution to the original problem statement and identifying areas for improvement.

7. **CONCLUSION** - This is the final step in the process, where the results of the evaluation are summarized and the overall findings are presented.



Robot Programming | Machine Vision | | Process Optimisation | Project Management

Harmonize

Your investment



[illegible]

Dynamisch



Practical
Innovative
Logical approach
thinking out of the box

Makkelijk

(1)

High-Mix, Low-Volume

(2)

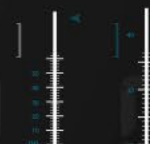
Dynamisch



Small text block in the bottom left corner, likely a footer or disclaimer.



The most dangerous phrase in the language is
"We've always done it this way."
-Grace Hopper



INDUSTRIAL REVOLUTION



The logo for Affix Engineering, featuring the word "Affix" in a stylized orange font with a geometric, angular design, and the word "ENGINEERING" in a white, sans-serif font below it. The background is a teal hexagon with a white geometric pattern.

AFFIX
ENGINEERING

BRING
CREATIVE
PROJECTS
TO **LIFE**



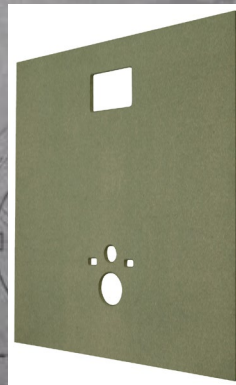
OPERATOR of the
FUTURE

The logo for the Factory of the Future Experience Center, featuring the text "FACTORY of the FUTURE" in a bold, sans-serif font, with "of the" in a smaller font. Below it is the text "experience center" in a red, sans-serif font. To the right is a colorful dot matrix graphic.

FACTORY of the
FUTURE
experience center

Combining modern technologies with the flexibility of a robot

Kimberly



Linda



1

Scharnierinkrozingen

Toevoegen

Inkrozingen (minimaal 4)

Afstand van boven (in mm)	Breedte (in mm)	Dikte achterhout (in mm)
200	89	10
300	89	10
1700	89	10
1800	89	10

+ Scharnierinkrozing toevoegen

03 / 05

Uitsparingen

9 Raamuitsparingen

10 Brievenbus opening

11 Spionooog

Toevoegen

Afstand van boven (in mm)

705

2

Kader omfrezing

Toevoegen

3 zijdig

4 zijdig

7

Cilindergat/kruggat

Kruggat toevoegen

Kruggathoogte (in mm)

1050

Afstand van slotzijde (in mm)

55

Cilindergat toevoegen

Cilindergathoogte (in mm)

1000

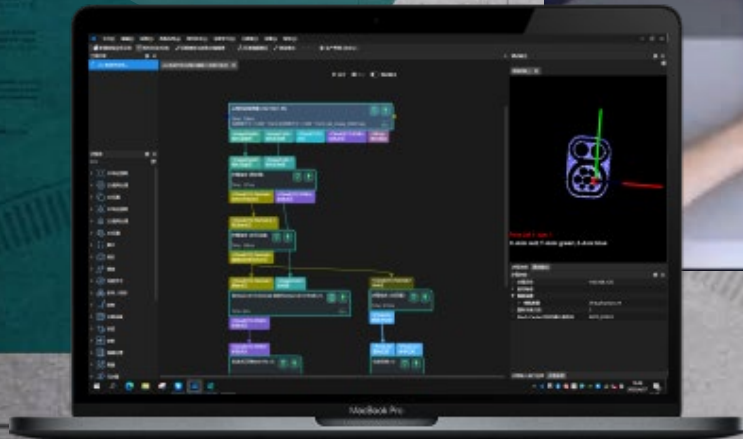
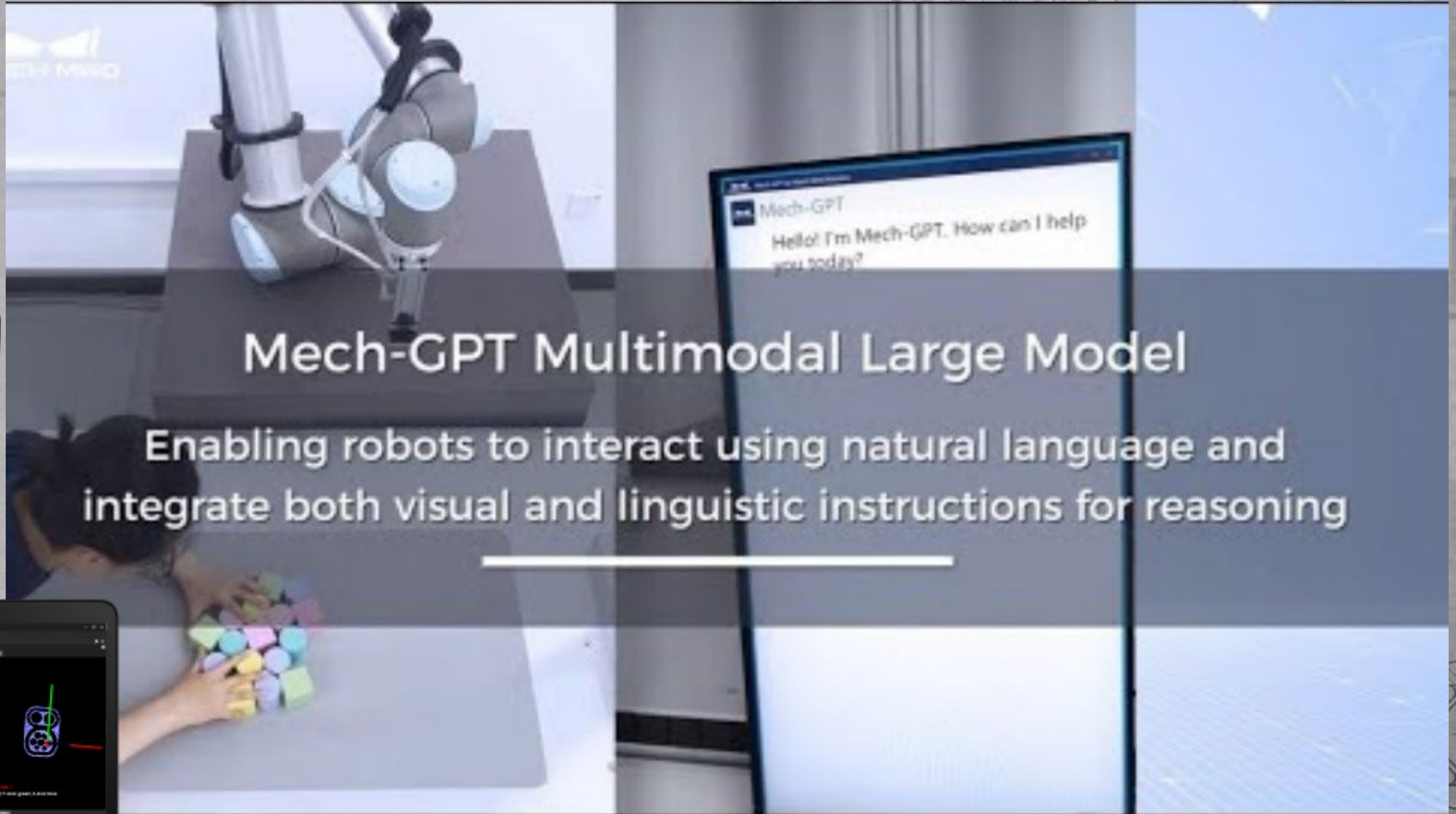
Afstand van slotzijde (in mm)

55

Robot works the same as an Operator

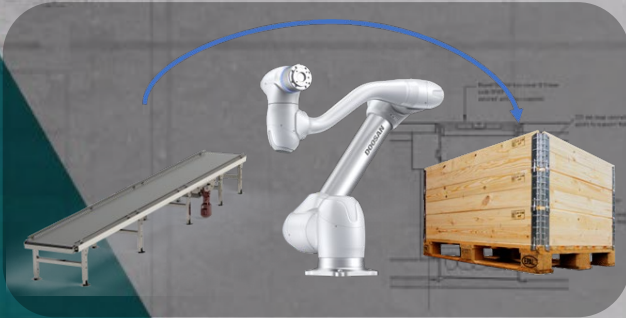


Mech-GPT Multi Agent System



USE-CASES

Conveyor to Pallet



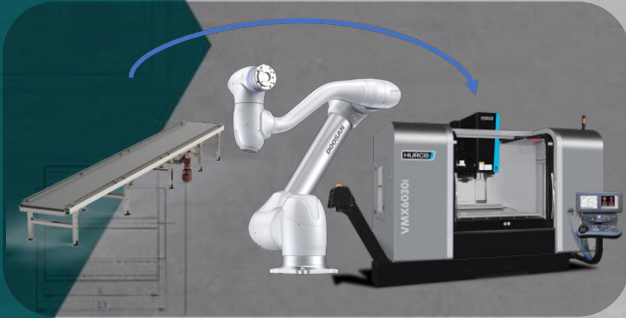
Pallet to Machine



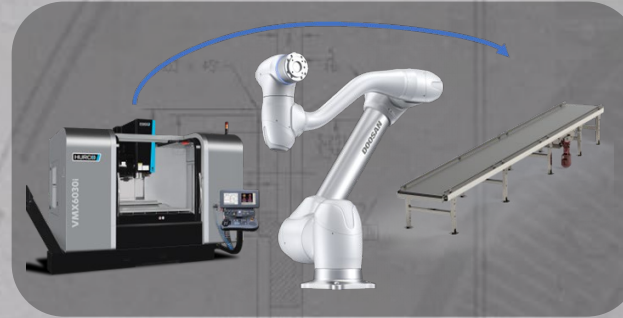
Pallet to Conveyor



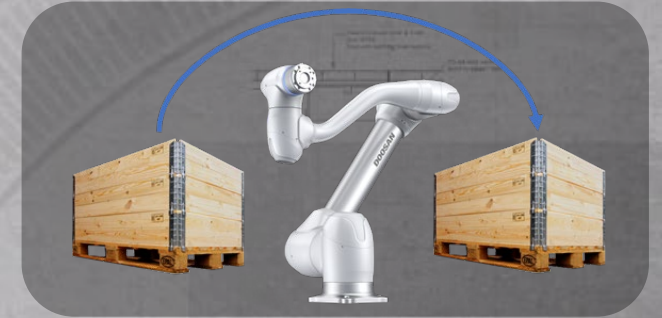
Conveyor to Machine



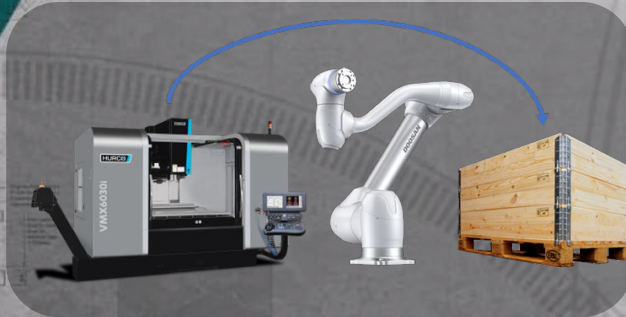
Machine to Conveyor



Pallet to Pallet



Machine to Pallet



- ✓ Scanning pick positions and place positions
- ✓ Maximum flexibility
- ✓ Change product inside the user-interface
- ✓ Multiple stations with one robot

Example of a team with experts (Affix & Yaskawa) and students from Fontys





AFFIX

ENGINEERING



Affix Engineering BV
Bedrijfsweg 13
5683 CM Best

20011,35228



11884,676351

Danny de Greef:
+31 644801111

d.degreeef@affixengineering.nl

The logo for Affix Engineering, featuring the word "Affix" in a stylized orange font and "ENGINEERING" in a white sans-serif font, set against a dark teal background with a faint geometric pattern.

AFFIX
ENGINEERING

BRING
CREATIVE
PROJECTS
TO **LIFE**



OPERATOR of the
FUTURE

The logo for the Factory of the Future Experience Center, featuring the text "FACTORY of the FUTURE" in a bold sans-serif font, with "experience center" in a smaller red font below it. To the right is a colorful dot matrix graphic.

FACTORY of the
FUTURE
experience center

Combining modern technologies with the flexibility of a robot

Programma

- 15:00 Welkom en introductie - Frits Hoeve, Innovatiemanager Brainport Industries
- 15:10 Update NXTGEN High Tech Autonomous Factory - Henry Neijhorst, Projectmanager
- 15:30 Operator support in de digitale en autonome fabriek - Jeroen van Oosterhout, TNO
- 15:50 De ontwikkeling van simulatieplatform ERS - Fred Jansma, InControl
- 16.10 Operator of the Future - Danny de Greef, Affix Engineering
- **16:30 Keynote: Robotisering is mensenwerk - Marijke Bergman, Fontys**
- 17:00 Afsluiting en netwerkborrel
- 18:00 Einde



Fontys

› FOR SOCIETY

ROBOTISERING IS MENSENWERK

Marijke Bergman

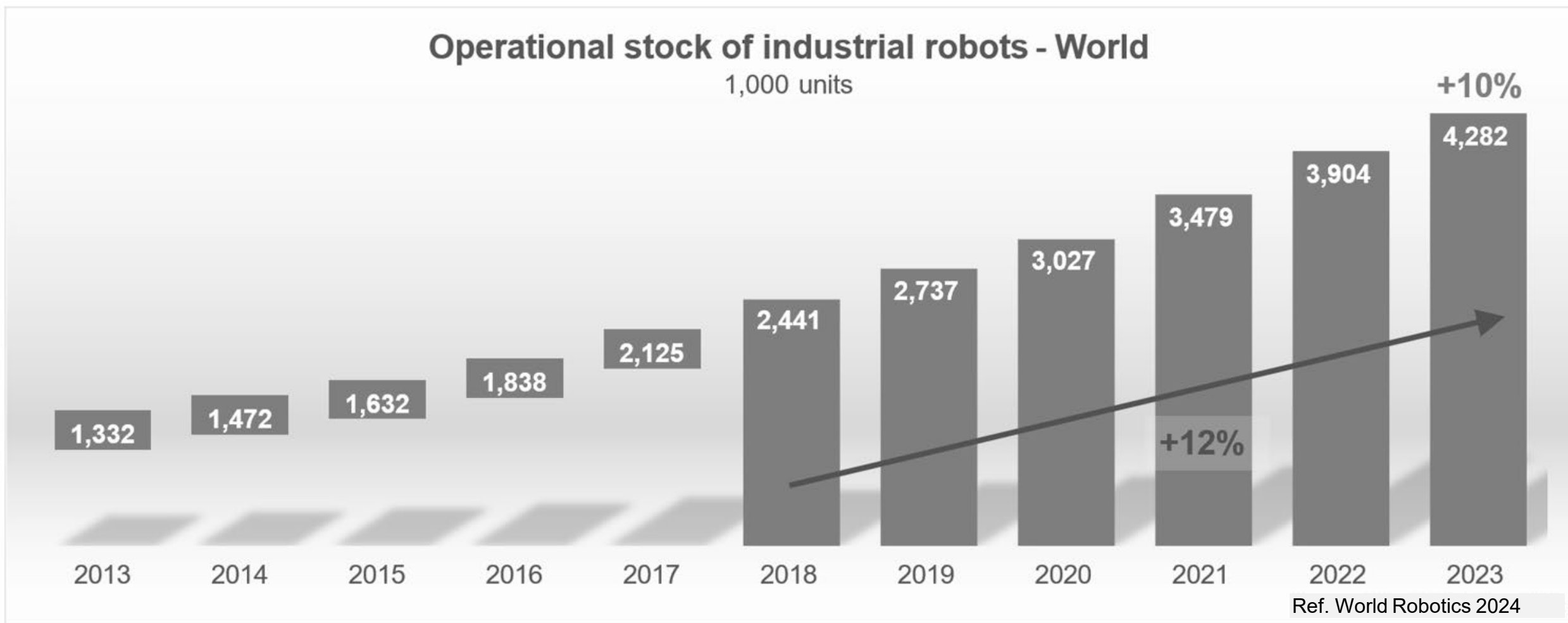
Fontys Lectoraat Mens en Technologie

Presentatie Technolgy Update, Brainport Industries , 21 november 2024

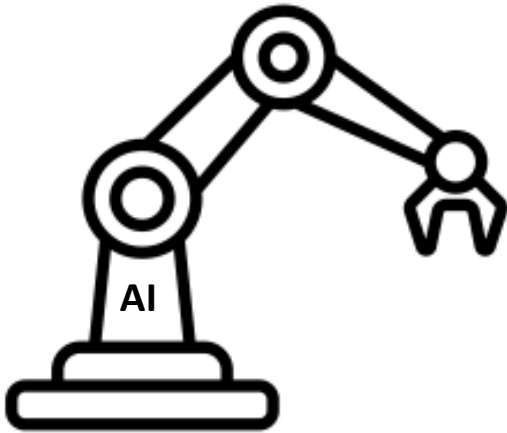
Mensenwerk



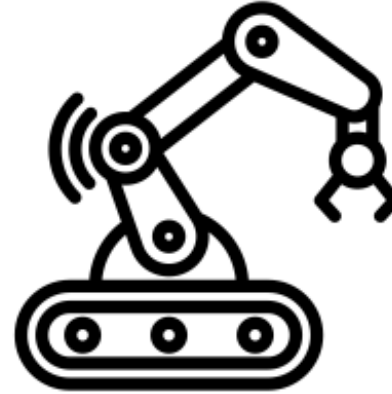
Industriële robots wereldwijd



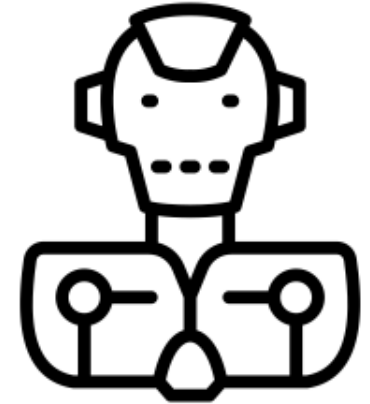
Robottrends



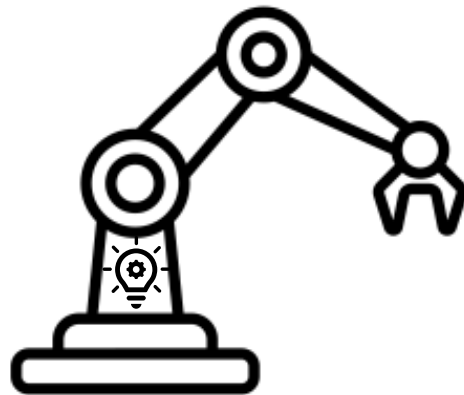
AI &
Machine Learning



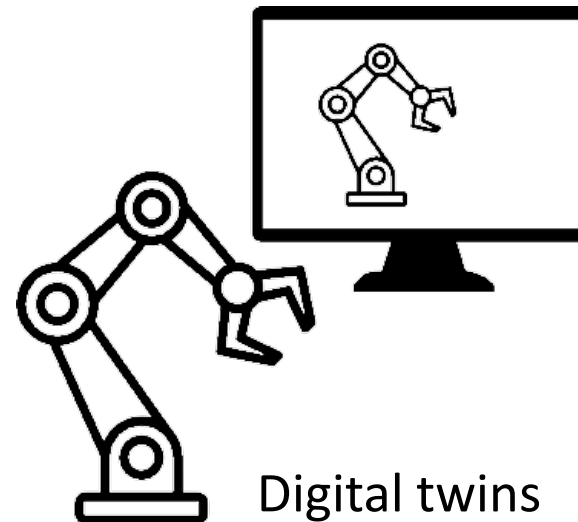
Mobiele manipulatoren



Humanoïde robots

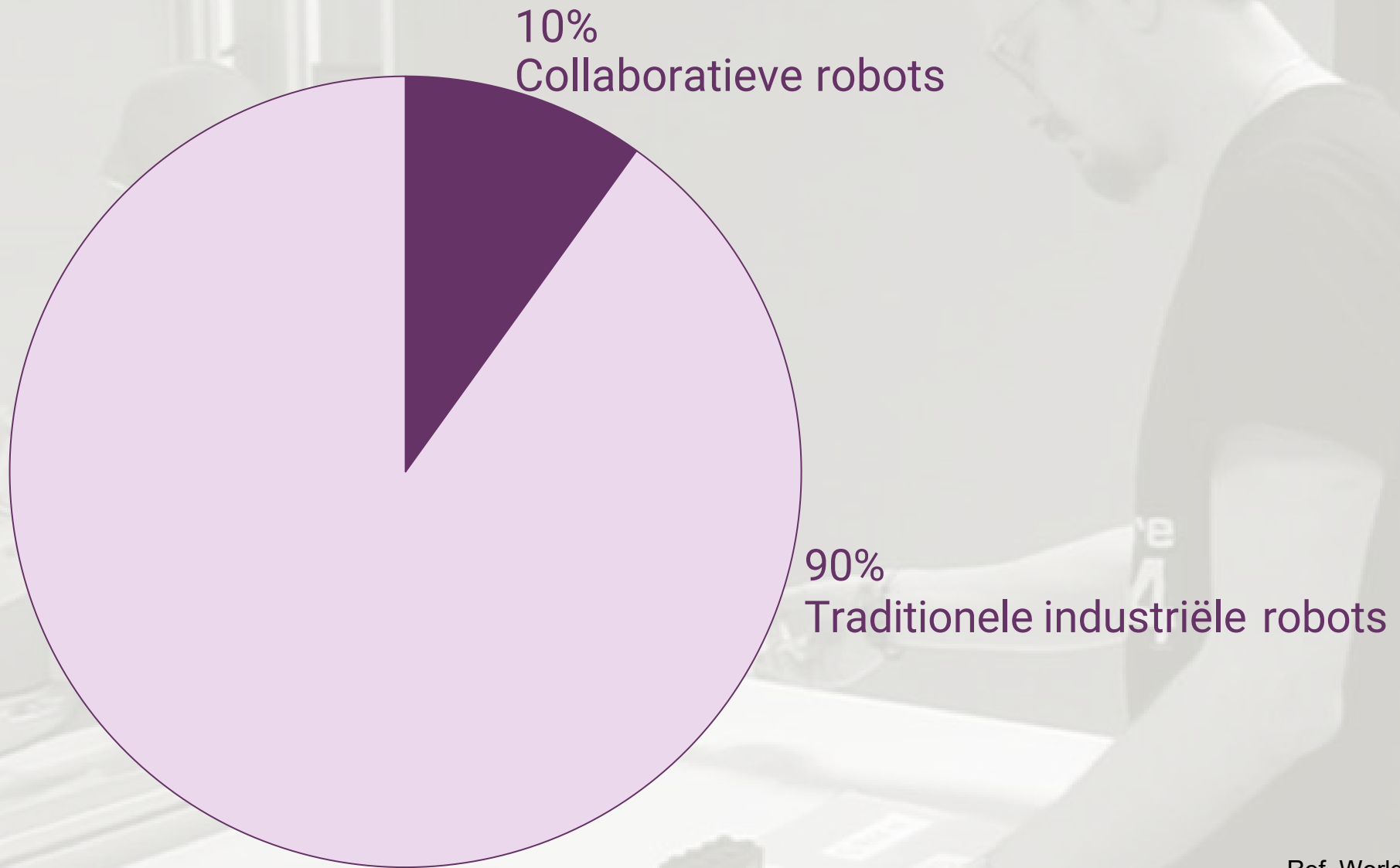


Co-bots in
nieuwe toepassingen



Digital twins

Aandeel co-bots

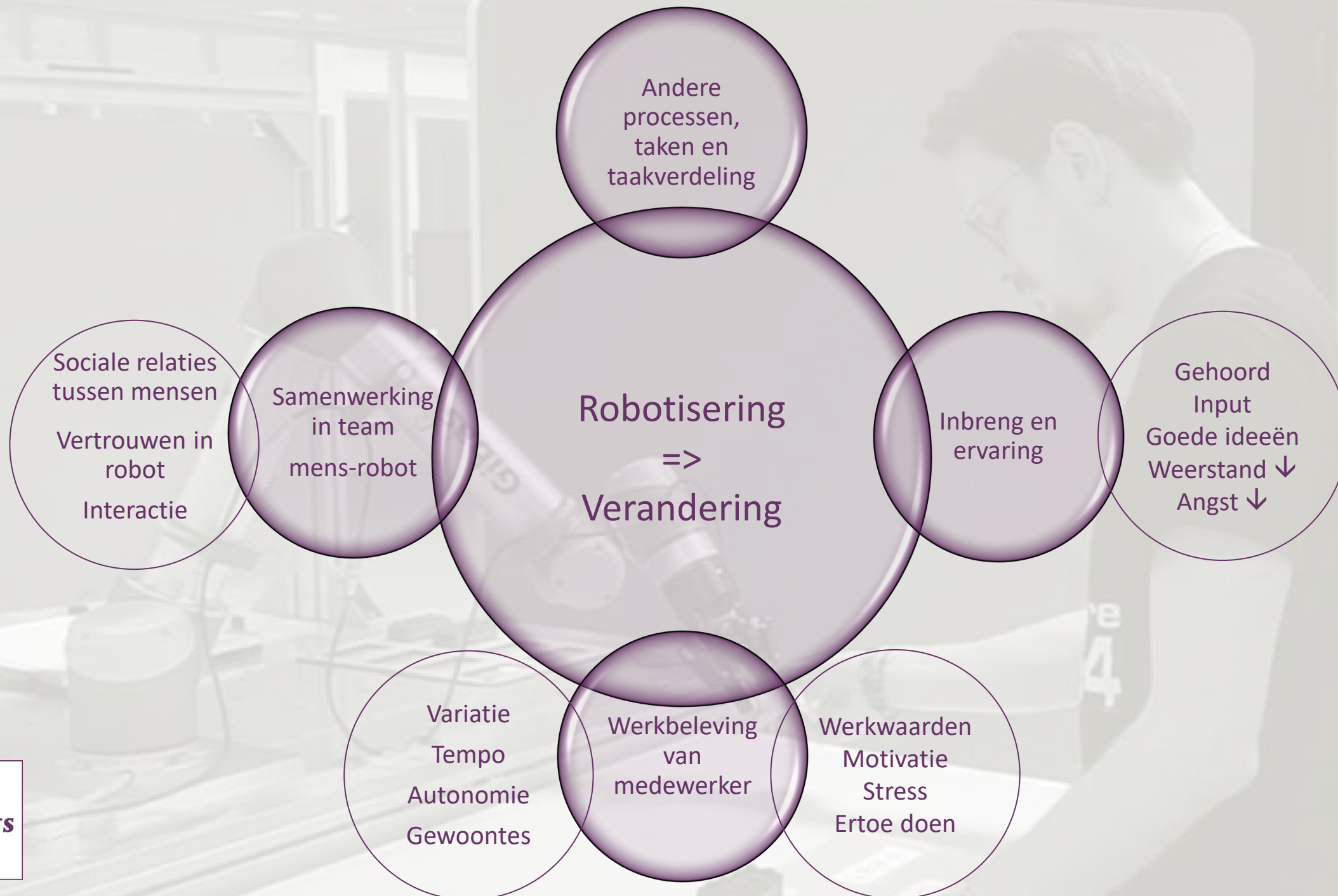


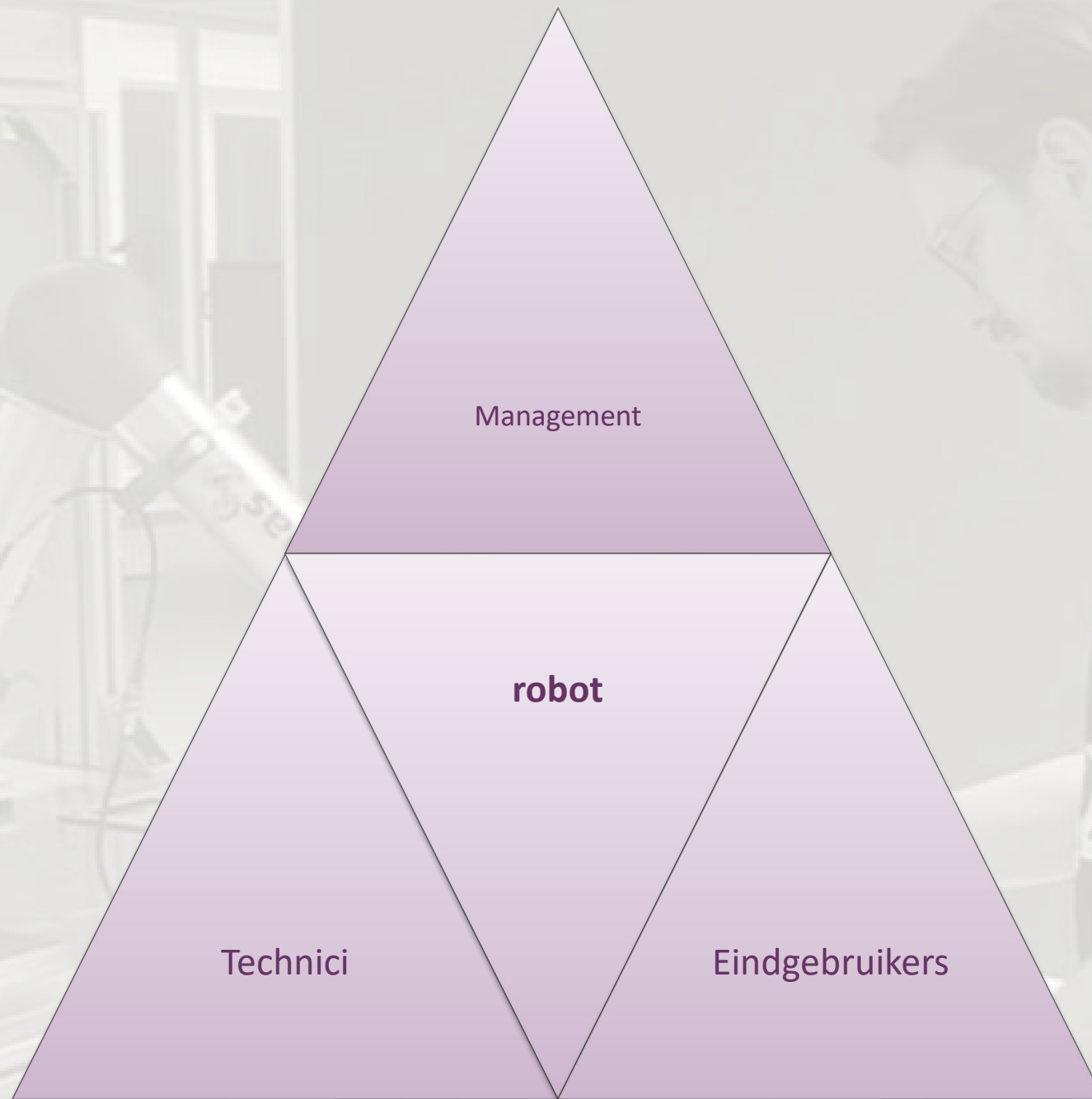
Robotisering

Robots	Mensen
Toename Vervanging van of aanvulling op mens	Afname vergrijzing et cetera
Meer verschillende taken door technologische ontwikkelingen	Minder taken per medewerker door technologische ontwikkelingen
Efficiëntie en snelheid Deductief redeneren.	Flexibiliteit en creativiteit Inductief redeneren en

A grayscale photograph of a man with glasses and a beard, wearing a dark t-shirt, working in a laboratory. He is standing and looking down at a robotic arm that is positioned over a workbench. The arm is holding a small object. The background shows laboratory equipment and shelves. The text is overlaid in the center of the image.

Wie is er verantwoordelijk om te zorgen dat er met een robot wordt (samen) gewerkt?





Management, leidinggevenden

... in veel organisaties wordt nieuwe technologie er gewoon doorgedrukt. De medewerker is dan het eindstation dat vergeten wordt.

Paul Preenen, lector Human Capital, Saxion



Geïnformeerde keuze van robot



Actief luisteren naar medewerkers



Beleid b.v. rond processen, personeel, scholing



Facilitering van scholing, trainingen



Inzicht in (werk-)waarden, kwaliteit van arbeid

Technici

Vorm van robot

Bewegingen van robot

Natuurlijke en intuïtieve interactie

“Emotional” engineers

Inleven in en kennis over eindgebruikers

*Verbeteren van mens-robot interactie
kan er mede voor zorgen dat robots
fijne “collega’s” worden*





Medewerker

*Nieuwsgierigheid is de drijvende
kracht achter leren.*

Meedenken

Aanpassingsvermogen

Willen bijleren

Robot eigen maken

Loopbaan-fase

Sociale invloed

Robotisering is mensenwerk

Kansrijke
implementatie

Zicht houden op
sociale en
organisatorische
gevolgen

En op het belang
van goed
ontworpen robot
en interactie

Bottom up, Inbreng
en behoeften van
medewerkers

Efficiënte werk- en
productieprocessen

Beter werk

De mens versterkt
de technologie

Technologie
versterkt de mens

*Alleen kan je niks,
je moet het samen doen.*

Johan Cruijff

Marijke Bergman

✉ m.bergman@fontys.nl

Fontys Hogeschool HRM en Toegepaste Psychologie

[Lectoraat Mens en Technologie](#)



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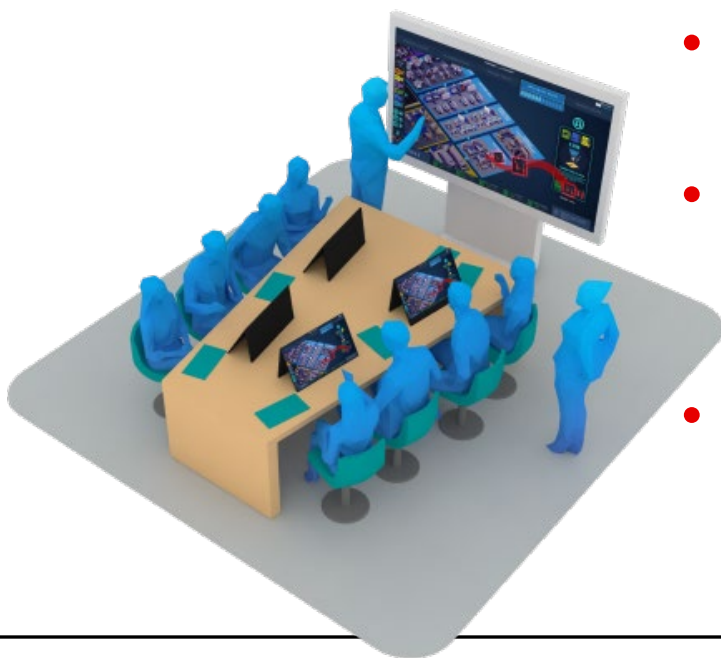
Digitalisering en productietechnologie

Ga naar de Brainport Industries w
voor meer informatie

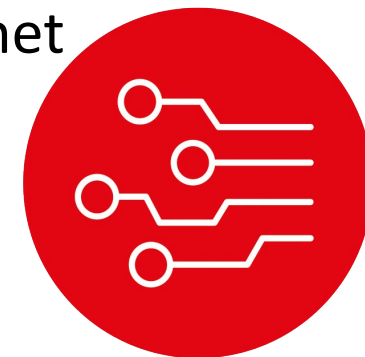


Factory of the Future Serious Game

Ervaar de uitdagingen en dilemma's van digitale transformatie van de maakindustrie in een serious game workshop format.



- Beleef het transformatieproces op weg naar Industry 4.0 en ervaar de complexiteit van het onderwerp
- Doe ervaring op te doen bij het navigeren door de vele mogelijkheden en krijg energie om met het onderwerp aan de slag te gaan
- Start met de vertaalslag naar het eigen bedrijf!



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