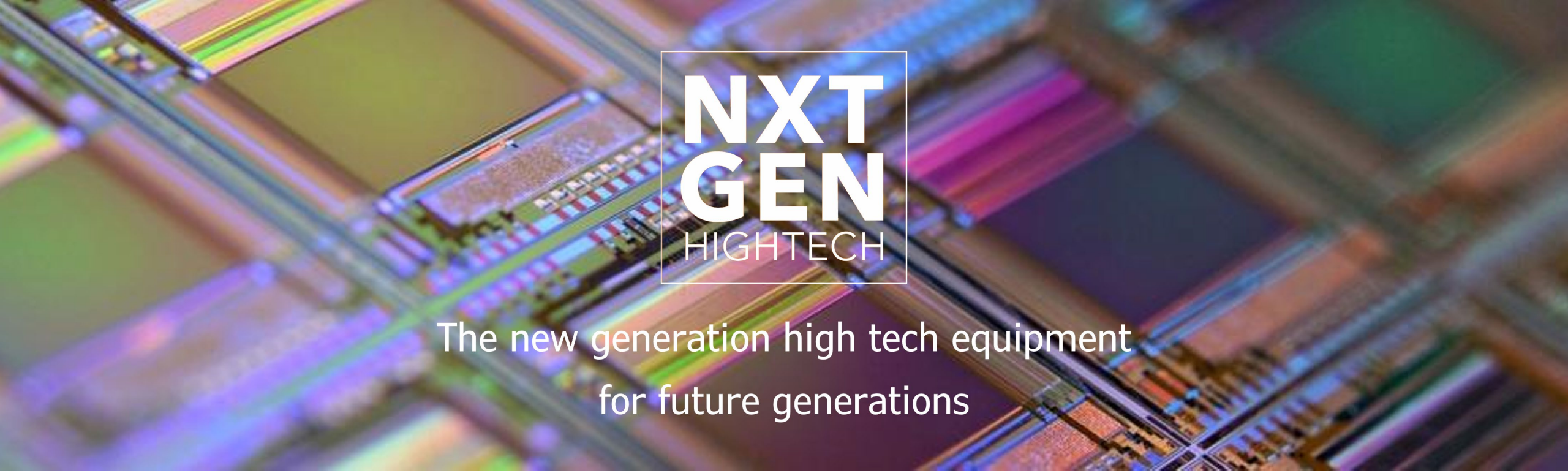

Welcome

Timo Meinders

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Programme

Timo Meinders	*Opening*
Mark Huijben	*Energy*
Andries van der Meer	*Biomedical Production Technology*
Gertjan Koster	*Semiconductor Equipment*
Sebastian Thiede	*Smart Industry*
Maarten Bonnema	*Systems Engineering*
Vinod Subramaniam	*Closure*

Followed by drinks & bites in Atrium

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NXT GEN HIGHTECH

NGF NXTGEN HIGHTECH

Versterken van het lange termijn verdienvermogen

Oplossingen bieden voor maatschappelijke uitdagingen

Groeifondsvoorstel NXTGEN HIGHTECH

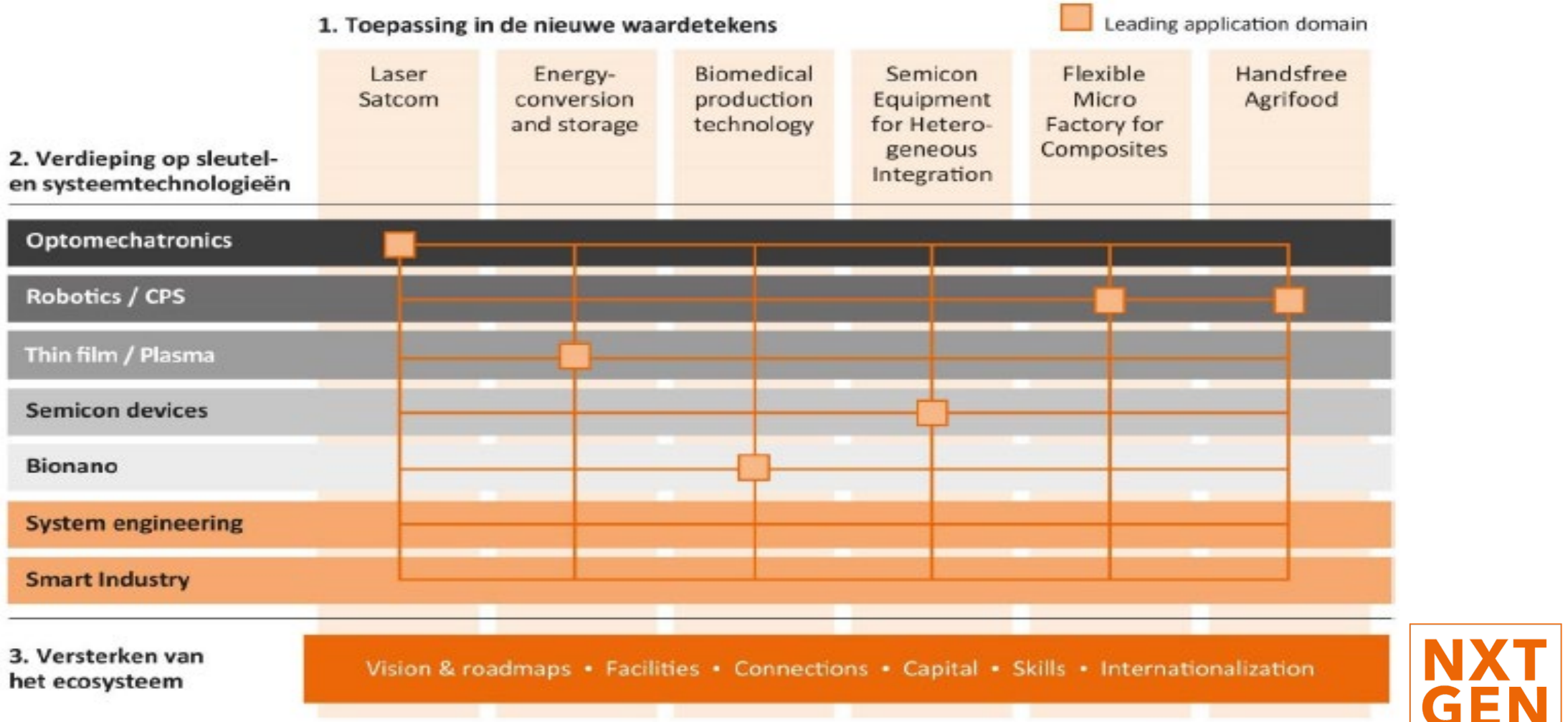
Een coherent, wendbaar en internationaal toonaangevend ecosysteem

Toepassingspijler	**Verdiepingspijler**
Realiseren nieuwe hightech toepassingen	Versterken technologiebasis

Ecosysteempijler
Gerichte interventies voor versterken gehele ecosysteem

NXT GEN HIGHTECH

NGF NXTGEN HIGHTECH



NXT GEN HIGHTECH

NGF NXTGEN HIGHTECH

Leading Dutch High Tech Equipment Ecosystem in 2030

- Application pillar
- Knowledge pillar
- Ecosystem Pillar

Subsidy total: 450M€

Domains (incl. involvement UT ~40M€):

- LaserSatcom
- Energy
- Biomedical Production
- Semicon
- Composites
- AgriFood
- Smart Industry

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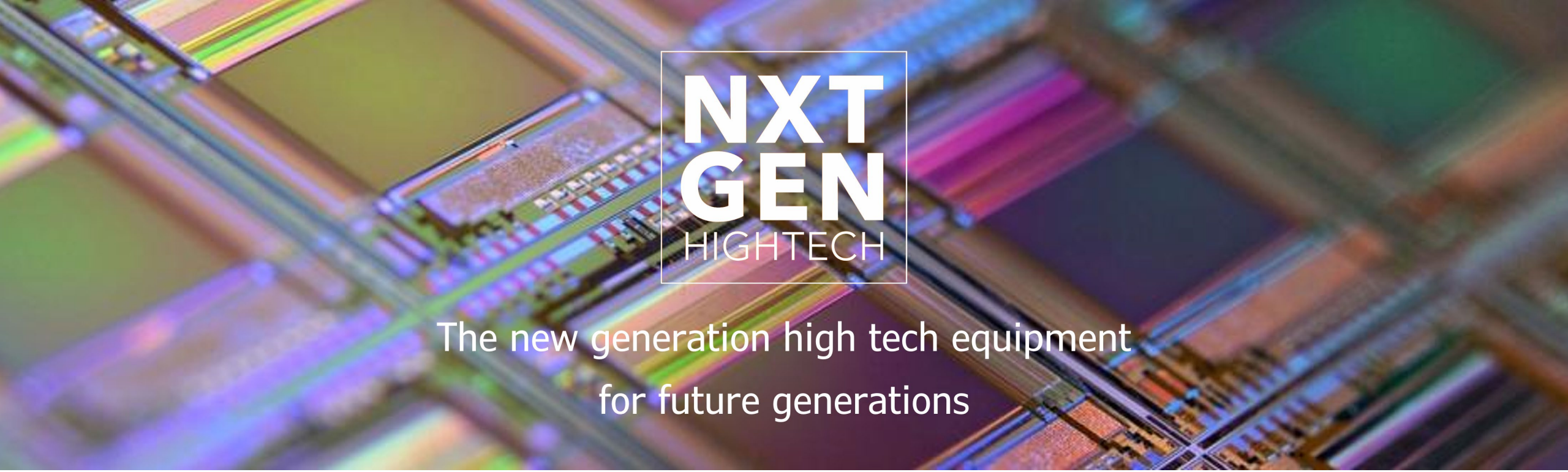

Energy domain

Prof. dr. ir. Mark Huijben

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Energy domain

This program focuses on the development of an integrated, scalable production chain for new generation **fuel cells and electrolysers**, **batteries**, and **plasma conversion** that enables a transition towards a more sustainable energy supply and the process industry.

- Energy01 3D battery pilot line production
- Energy02 Next-gen equipment for batteries and battery-materials
- Energy03 Plasma conversion methane
- Energy07 PHOENIX-Alkalina
- Energy08 Third-generation electrolysis
- Energy10 Massa production of ZEF micro-plants for affordable solar fuel

- Total budget: ~ 100M€, of which ~ 60M€ GF contribution

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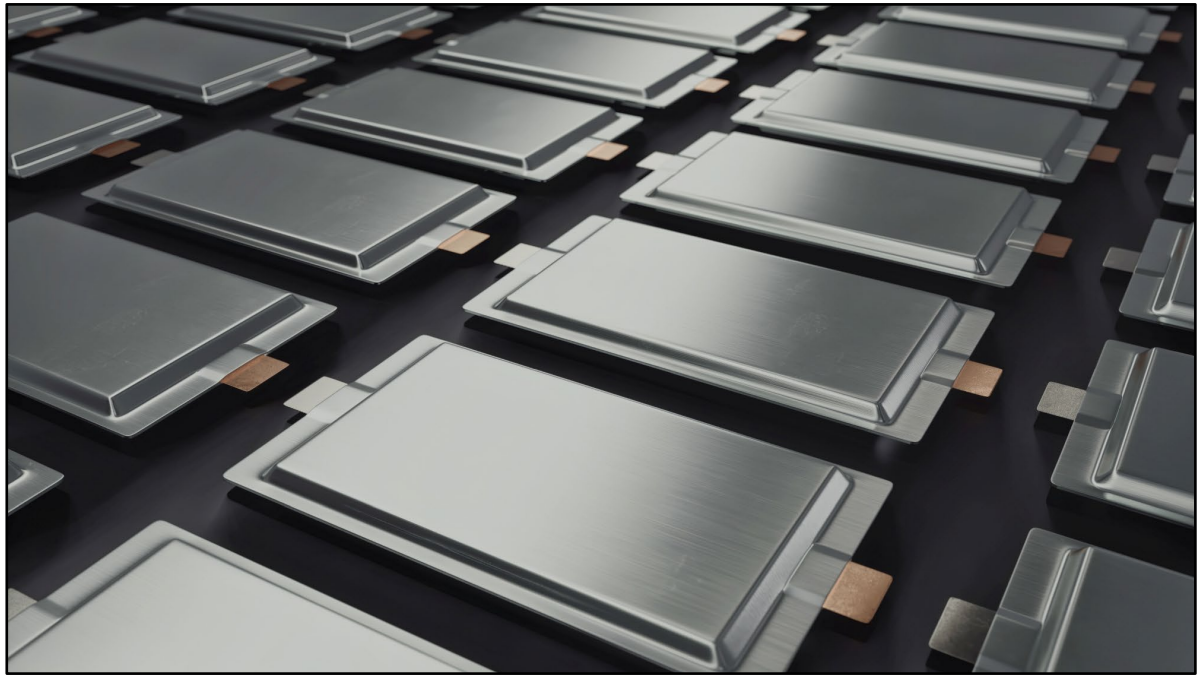
Energy01 3D battery pilot line production

S&T faculty (Mark Huijben)

Scope : **Battery material optimization** as well as **battery cell design**, by detailed post-mortem analysis of the solid-state battery to relate the energy storage performance to the present **degradation processes**.



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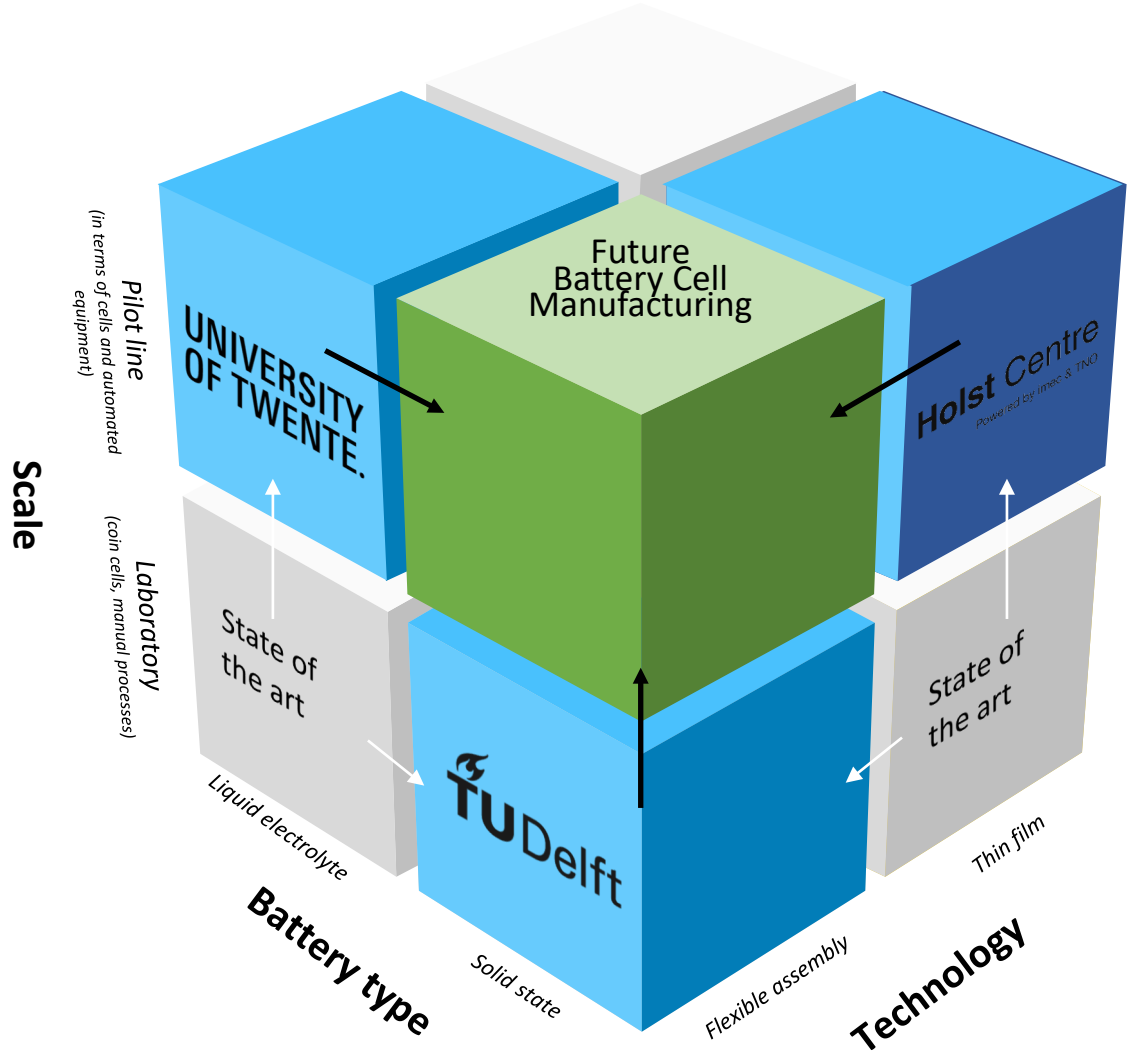
Energy02

Next-gen equipment for batteries and battery-materials



Goal : to expand the Dutch battery R&D infrastructure for innovative battery cell manufacturing and to generate integral battery material and processing knowledge to be valorised by the ecosystem partners – current and future.

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Energy02 Next-gen equipment for batteries and battery-materials

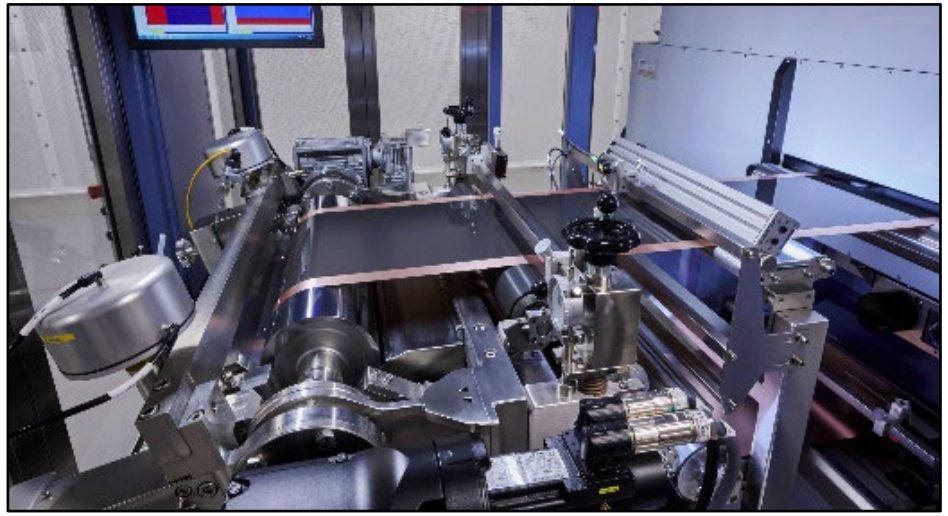
Joint ET faculty (Sebastian Thiede) and S&T faculty (Mark Huijben)

Scope : - Flexible pilot line infrastructure for Battery R&D
- Material development and characterization

Open facility for testing new materials, processes and technologies. Typical batch sizes of around 100 battery pouch cells (around 5 Ah and more).

The platform is technology open and allows the implementation of new technologies/materials in a flexible, modular way and testing against a defined reference.

Strong links are given to smart industry topics, e.g. a full digital backbone including a digital twin of the process chain will be established.



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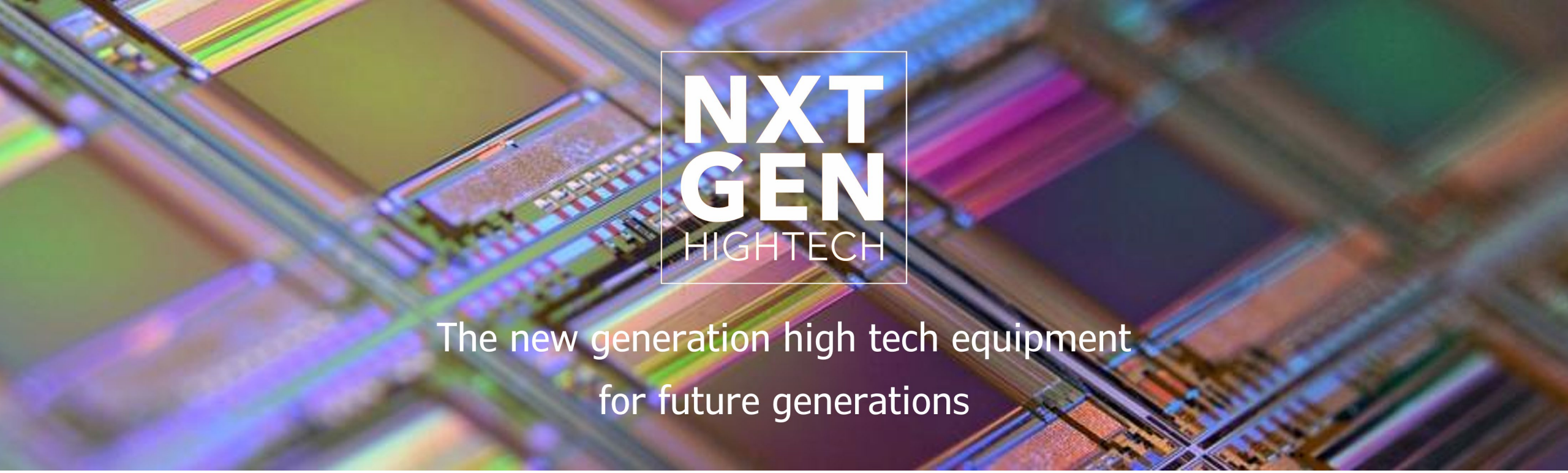

Biomedical Production Technologies

Andries van der Meer

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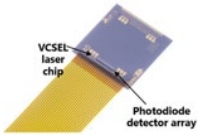
Biomedical Production Technologies

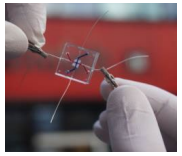
Lack of sufficiently fast and Point-of-Care diagnostic tests
(for healthcare (Covid), food/environmental safety)

Lab-on-Chip



Lack of validated human test systems
(drug failure, no personalized medicine, animal use)

Organ-on-Chip

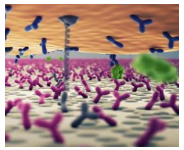


Lack of donors and high burden on patient
(hemodialysis, kidney failure)

Artificial organs

Lack of highly qualified standardized cells/cell products for therapy
(viral particles for oncolyticaltherapy, induced pluripotent stem cells)

Cell Production Technologies



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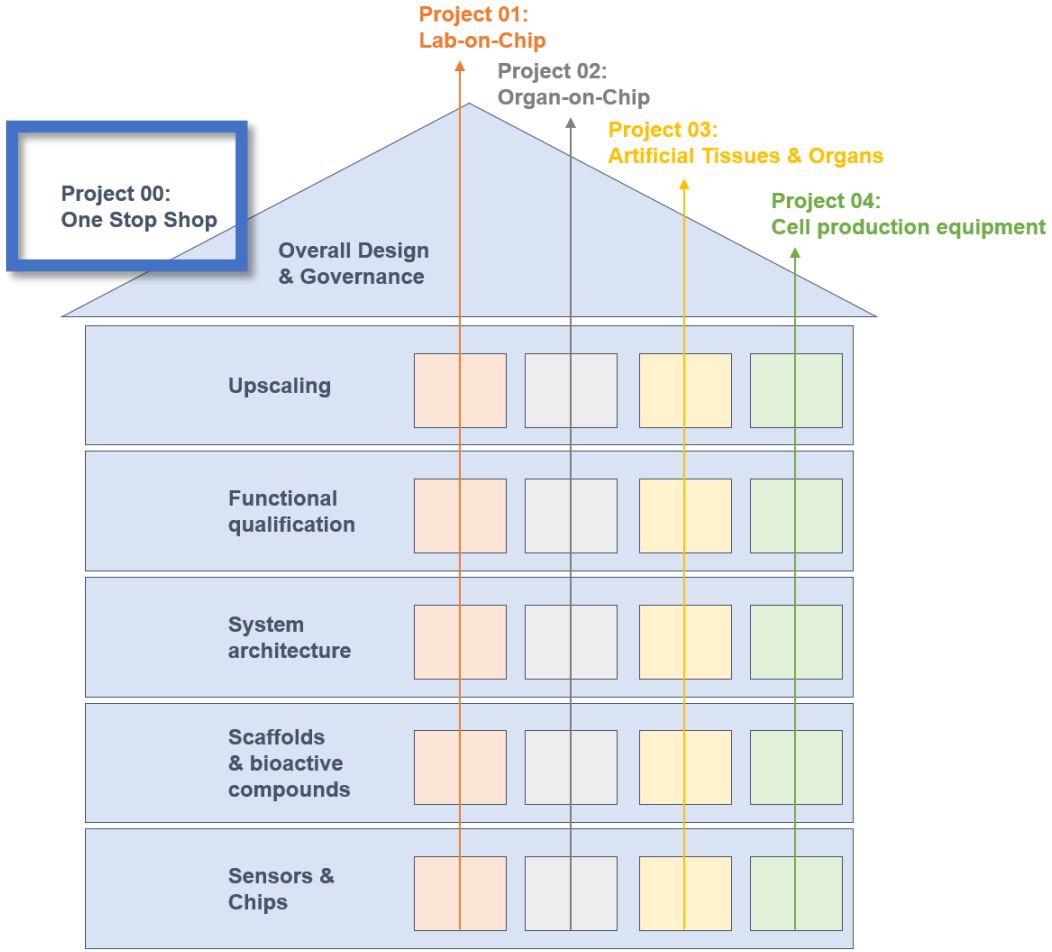
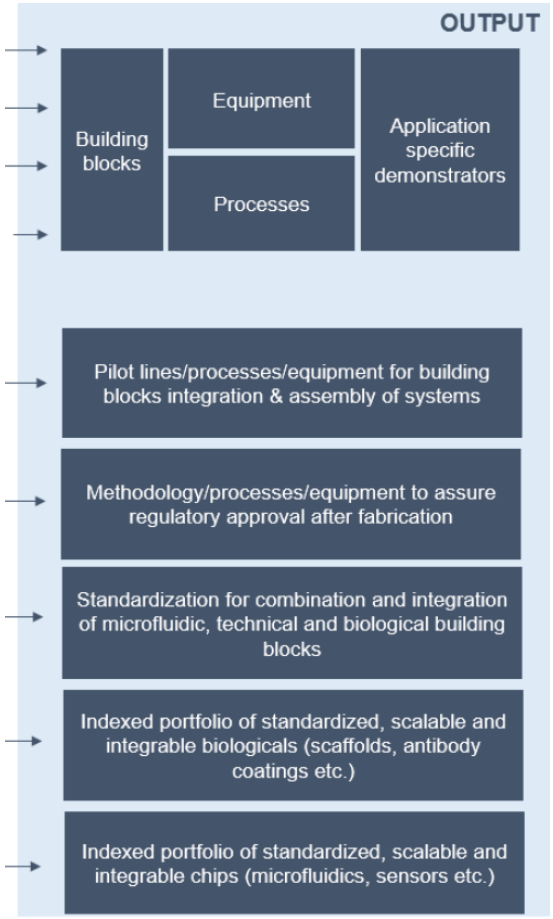
Organization of the Domain BMPT





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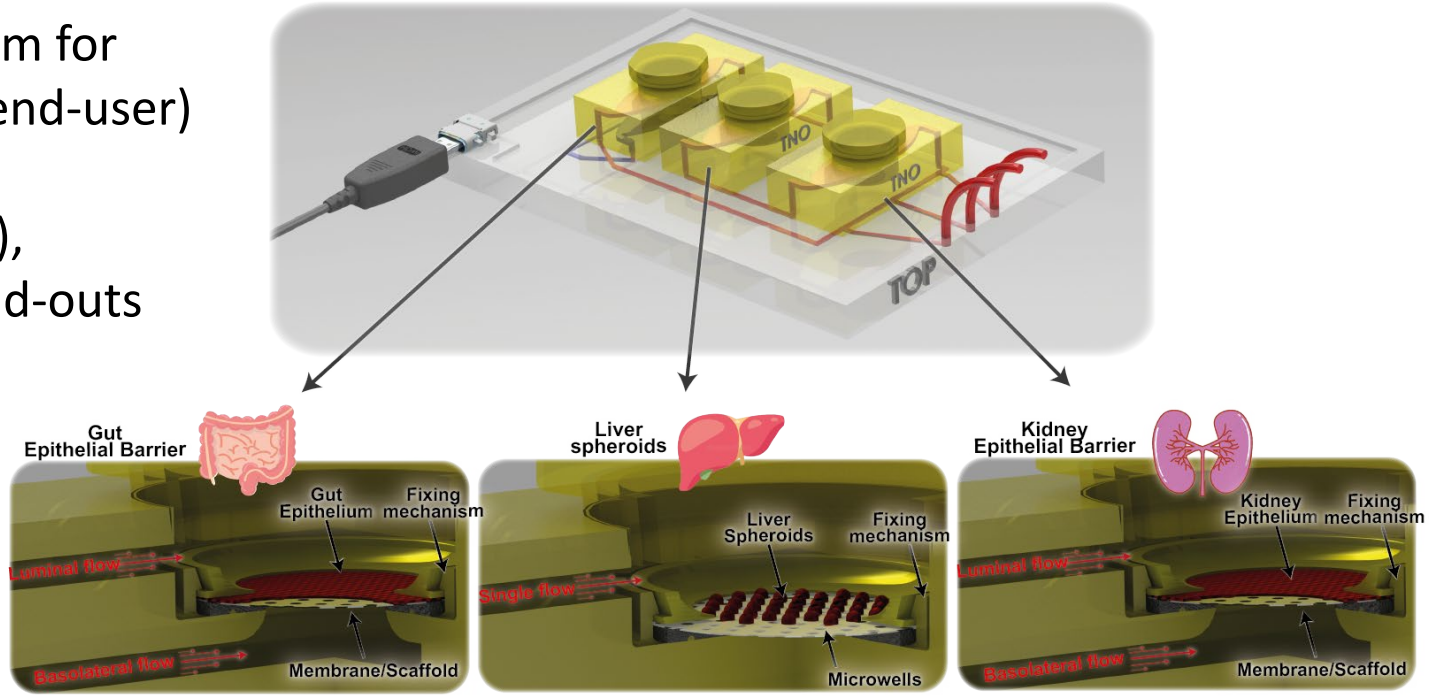
Example: Organ-on-a-Chip

Multi-organ cell culture platform for ADME studies (TNO HL&W as end-user)

Living cell culture units (‘chips’), microfluidic routing, online read-outs and non-invasive imaging



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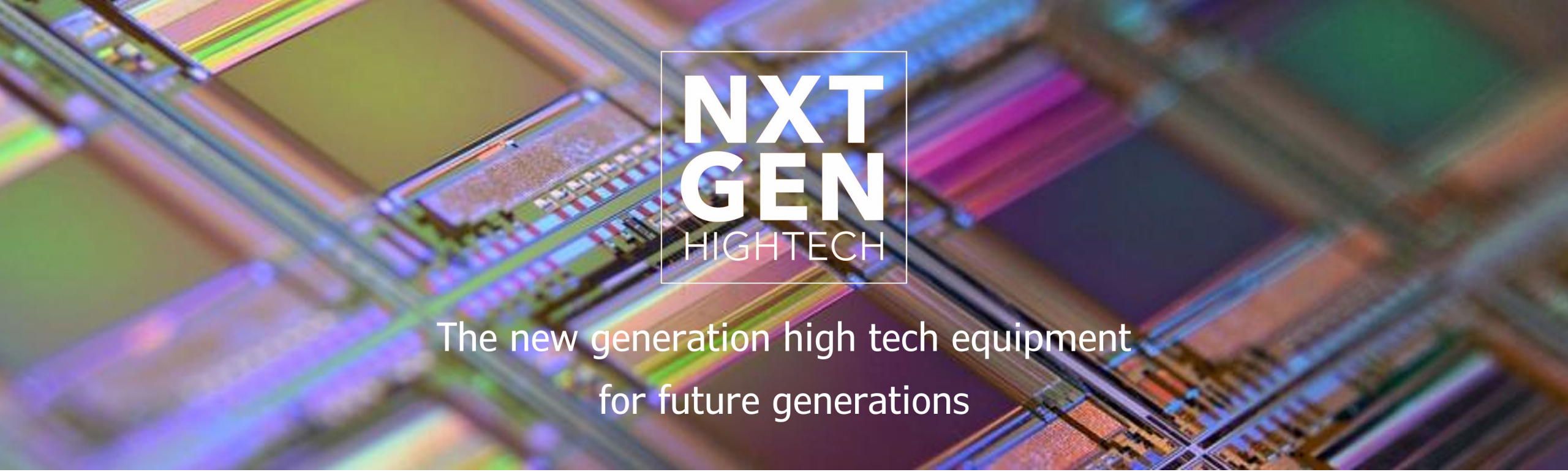

High TRL PLD in Semicon

Gertjan Koster

UNIVERSITY OF TWENTE.

High TRL PLD

Semicon-01: Process optimization for high TRL & high MRL PLD

UT participants:
Prof. dr. Ir. Gertjan Koster
Prof. dr. ing. Guus Rijnders
Dr. Minh Nguyen
Tobias Nickel, MSc

REDEN

UNIVERSITY OF TWENTE.

MASÉVON GROUP

SOLMATES
THIN FILM EQUIPMENT
A Lam Research Company

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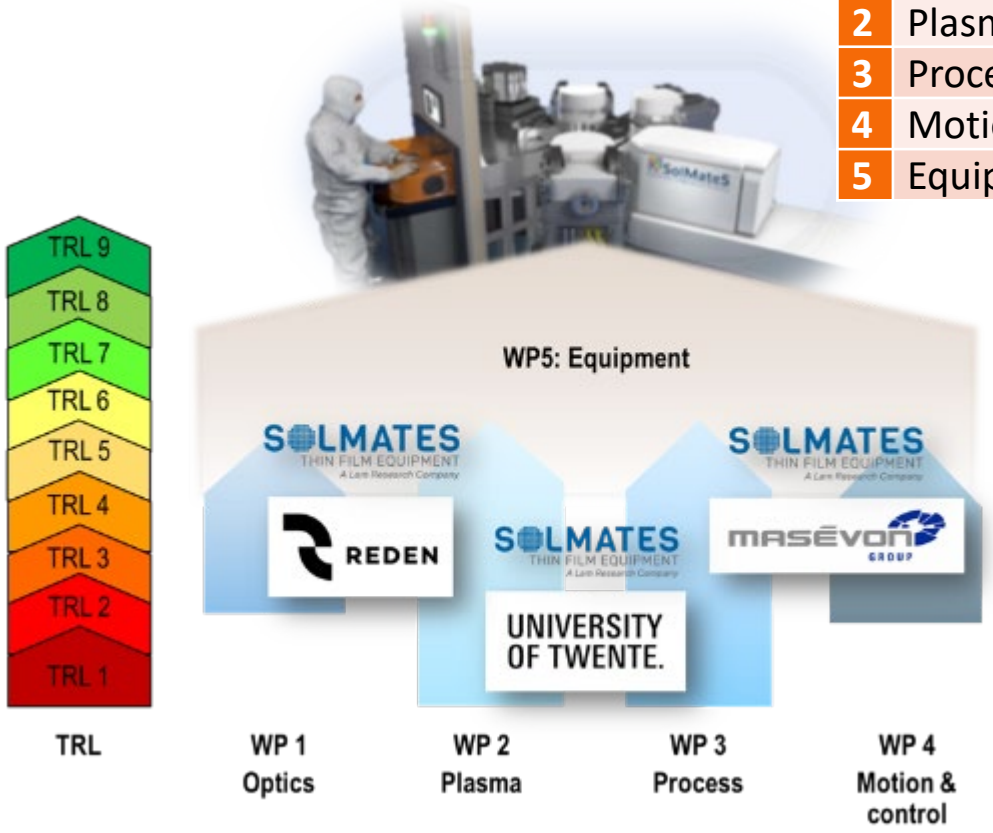
High TRL PLD

Workpackages:

#	Name work package	WP responsibility	Start	End
1	Optics	Reden	Q1 2023	Q4 2028
2	Plasma	Solmates	Q1 2023	Q2 2029
3	Process	University of Twente	Q1 2023	Q4 2028
4	Motion and control	Solmates	Q1 2023	Q2 2029
5	Equipment	Solmates	Q3 2023	Q4 2029



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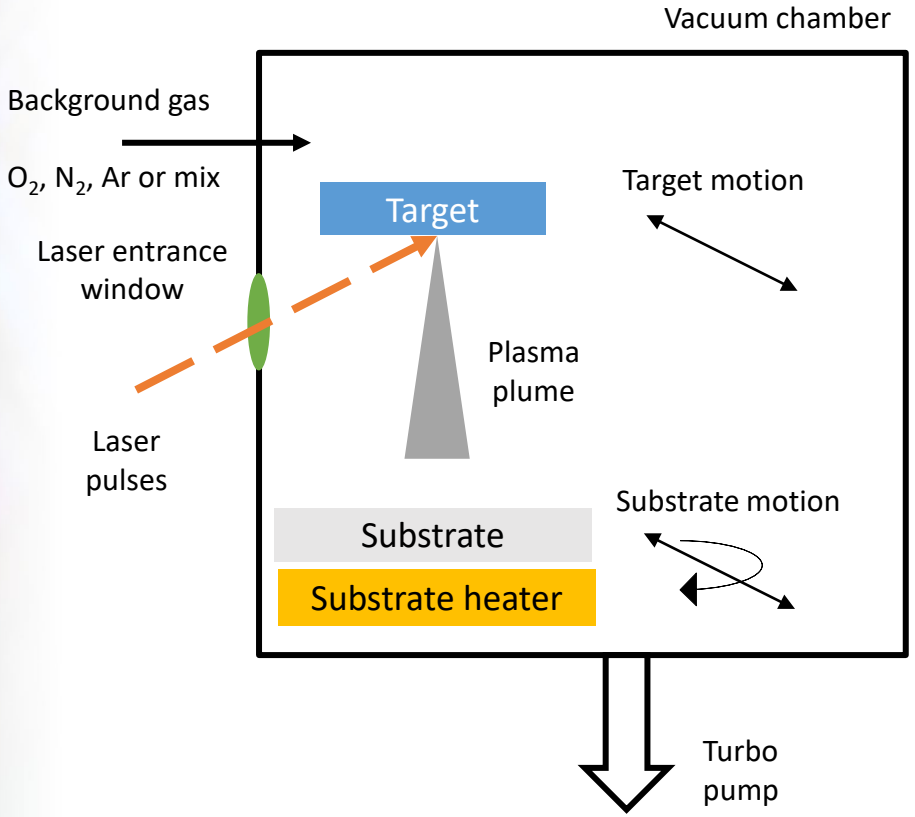
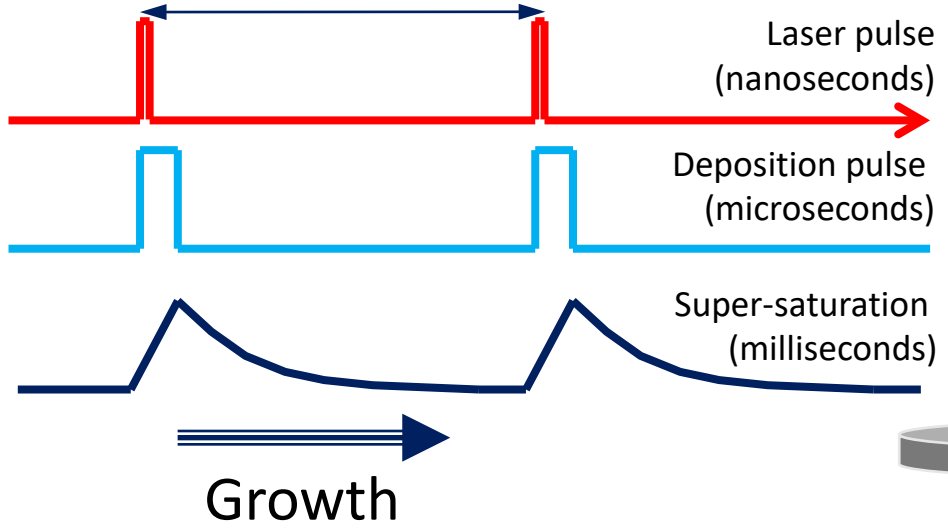
High TRL PLD

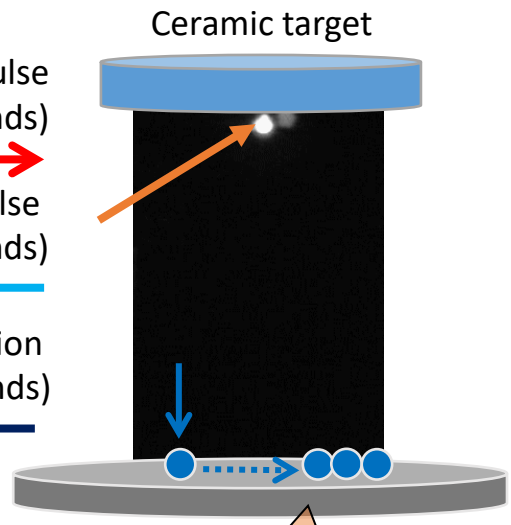
Pulsed Laser Technology

Non-continuous nature of PLD plasma promotes crystal quality of deposited films

Localized plasma plume (few centimetres in diameter) requires scanning of plasma over wafer to obtain continuous film







Local deposition:
~ 0.1 mono-layer per pulse
~ 1 square inch with Gaussian profile

High TRL PLD

UT: support in process development
- ScAlN process parameter dependencies
- Understanding plasma behavior

Reden: support in simulations
- Simulations on particle behavior
- Beam and plasma stability predictions

Masevon: support in hardware development
- Motions in vacuum

SOLMATES
THIN FILM EQUIPMENT
A Lam Research Company

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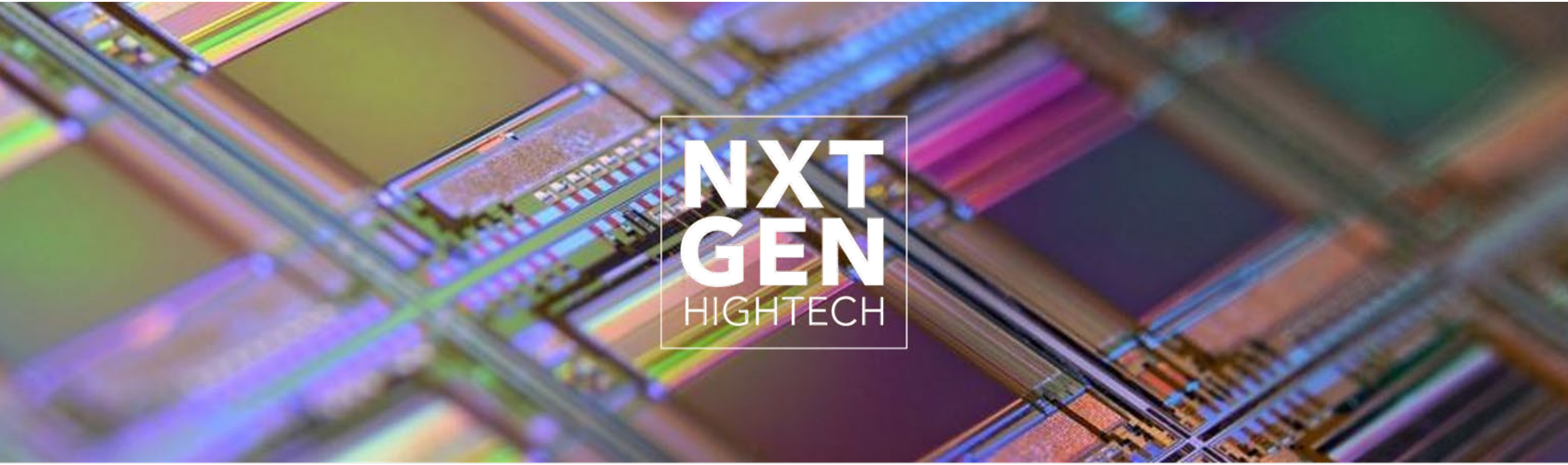

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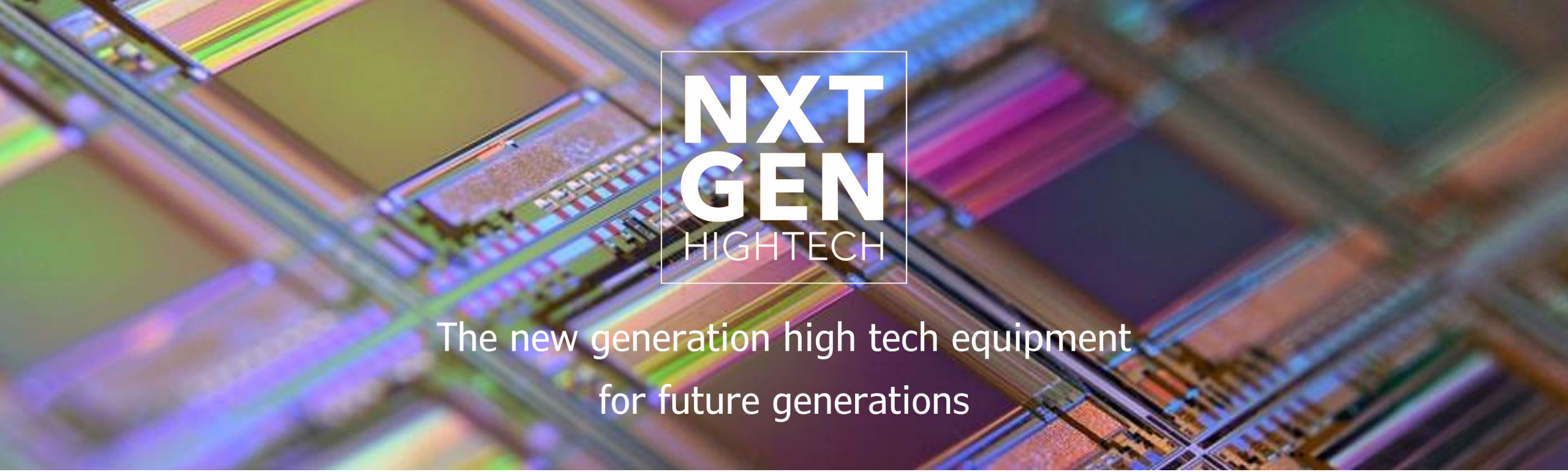


NXTGEN Hightech Smart Industry

Factory 2030

(East NL Industrial Cluster)

Sebastian Thiede

UNIVERSITY OF TWENTE.

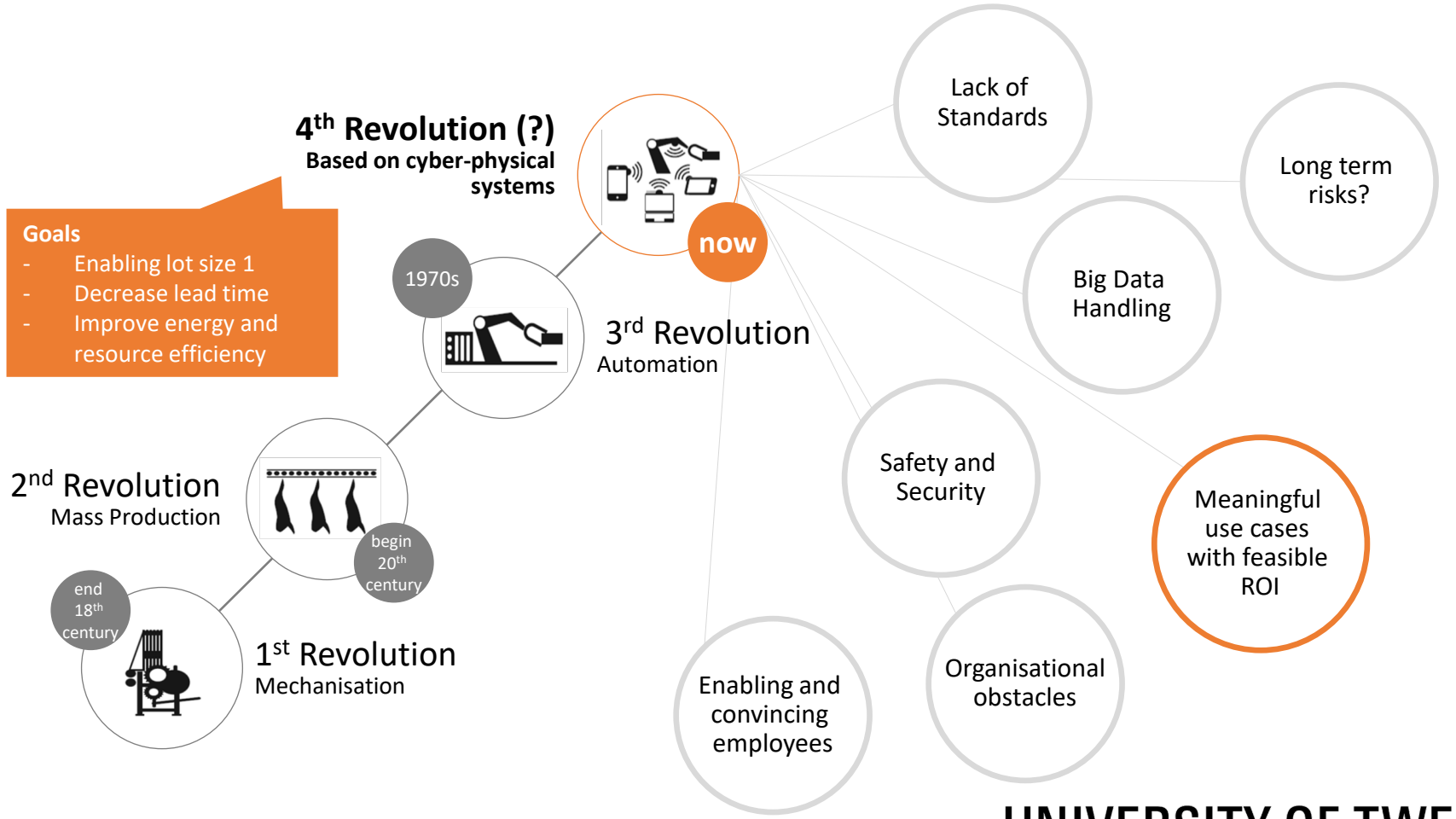
SMART INDUSTRY

SIGNIFICANT PROGRESS IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT), ASSOCIATED WITH TERMS LIKE INDUSTRY 4.0 / SMART MANUFACTURING

POTENTIAL BENEFITS BUT ALSO CHALLENGES

Photo: Siemens AG
https://www.thefuturefactory.com/blog/32
https://www.plm.automation.siemens.com/

NXTGEN Smart Industry Projects



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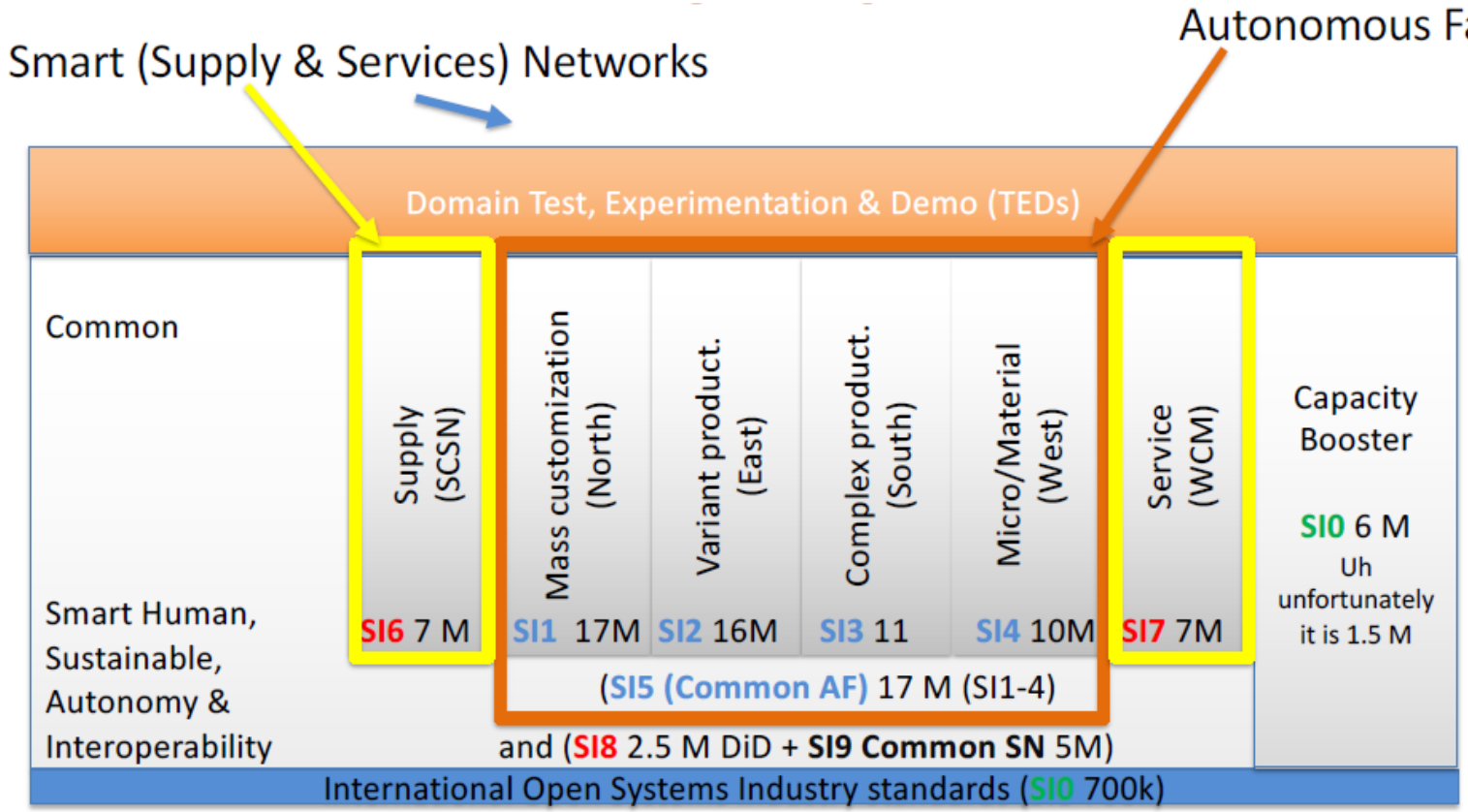
DFKI 2011, Smart Factory KL

Kagermann, H., Helbig, J., Hellinger, A., Wahlster, W. (2013). Recommendations for implementing the strategic initiative Industrie 4.0: Securing the future of German manufacturing industry; final report of the Industrie 4.0 Working Group, 2013.

NXTGEN Smart Industry Projects



- regional cluster differ in terms of focused application domains, consortium and type of production
- build up on common activities, e.g. for establishing the digital architecture
- transfer into education and training

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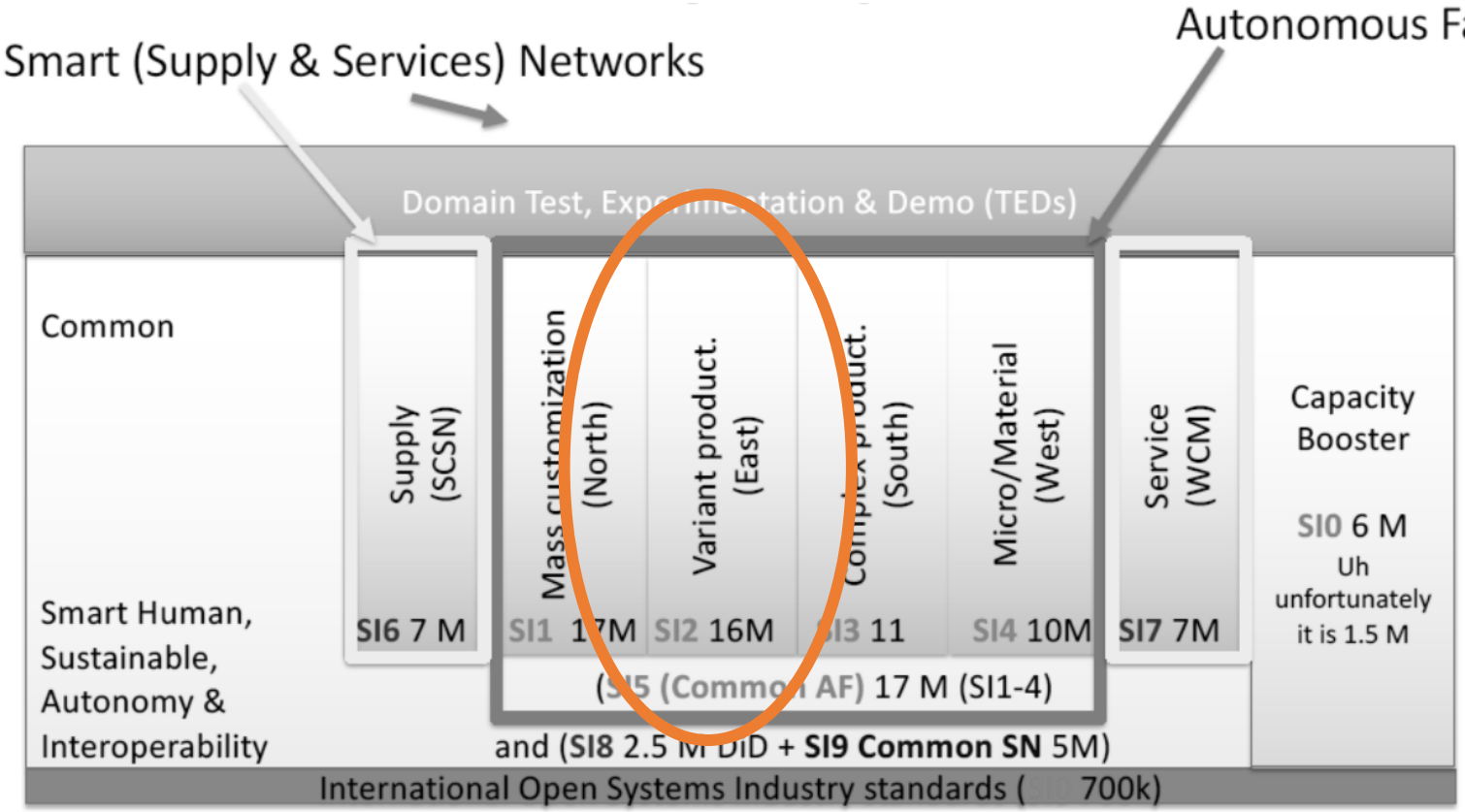
NXTGEN Smart Industry Projects



- regional cluster differ in terms of focused application domains, consortium and type of production
- build up on common activities, e.g. for establishing the digital architecture
- transfer into education and training

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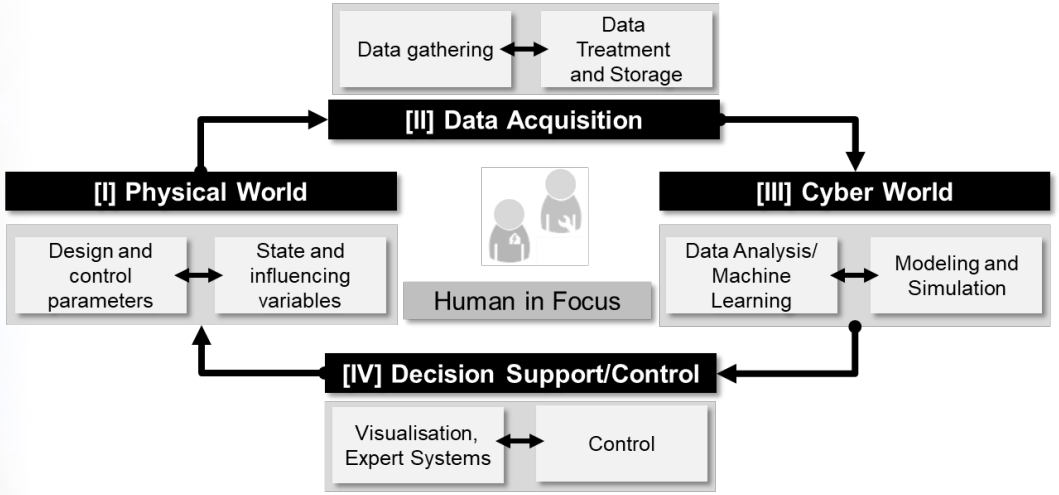
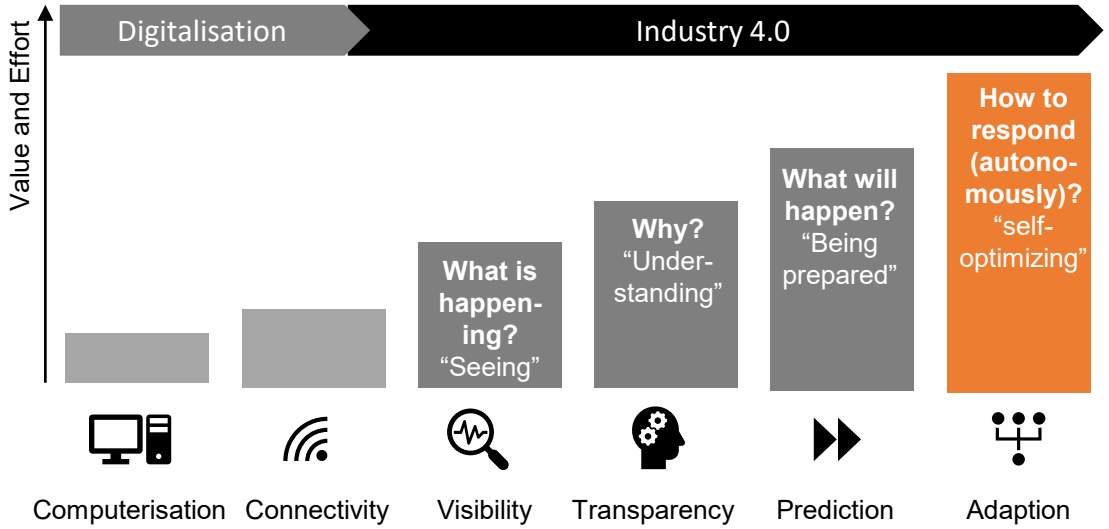
NXTGEN SMART INDUSTRY SOLUTIONS
CPPS FOR AUTONOMOUS FACTORIES

Cyber physical (production) systems ⟷ **Capabilities and maturity levels**





- smart manufacturing asks for system approaches
- combination of (ICT) technologies and related methods/tools for use case on different levels (from process to whole factory or beyond), connected to Digital Twin concept

- autonomous factories ask for advanced capabilities that include understanding and prediction but also decision making and execution, variety of use case possible

Thiede, S. (2018): Environmental sustainability of cyber physical production systems, Procedia CIRP, 69, 644-649, Elsevier
Schuh et al. (2017): Industrie 4.0 Maturity Index. Managing the Digital Transformation of Companies (acatech STUDY)

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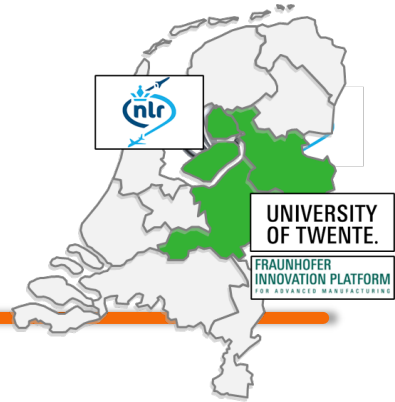
FACTORY 2030 (EAST NL CLUSTER)
INNOVATIVE USE CASES IN FOUR CLUSTERS



Energy
(focus on batteries)

Smart production modules on battery manufacturing

DEMCON

Digital twins for battery manufacturing systems

LeydenJar ENERGISING TECHNOLOGIES

BioMed

Scale-up micro-needle production for vaccines & other products

Needle

Autonomous production for high volume medical disposables

DEMCON

Semicon

Digitally supported assembly of complex high-tech products

VDL ETG

Smart sensors for condition monitoring of complex machines

LEVITECH

Cross-sector digital transformation

AI-based toolbox for **Self-Organizing Manuf. and Intralogistics**

Distribute

Smart and scalable **assembly systems** for energy components

COOLL

Digital pipeline for product creation from Design to Manufacturing

oddbot

Quality Control for high-tech/high-spec products through Digital Twins

SPECTO AEROSPACE

Factory 2030 - Integration, dissemination and project management

SI Capability Booster – educational/training program

SI Common Autonomous Factory – development of generalizable technologies, e.g. the necessary digital stack

SI Programme Management – coordination, communication

- R&D support from University of Twente and NLR
- some F2030 internal cross-cutting activities to ensure coherence/ synergies
- additional strong link to overarching Smart industry projects – e.g. building up on digital stack/architectures
- links to pilot lines in energy (battery) and biomed domain

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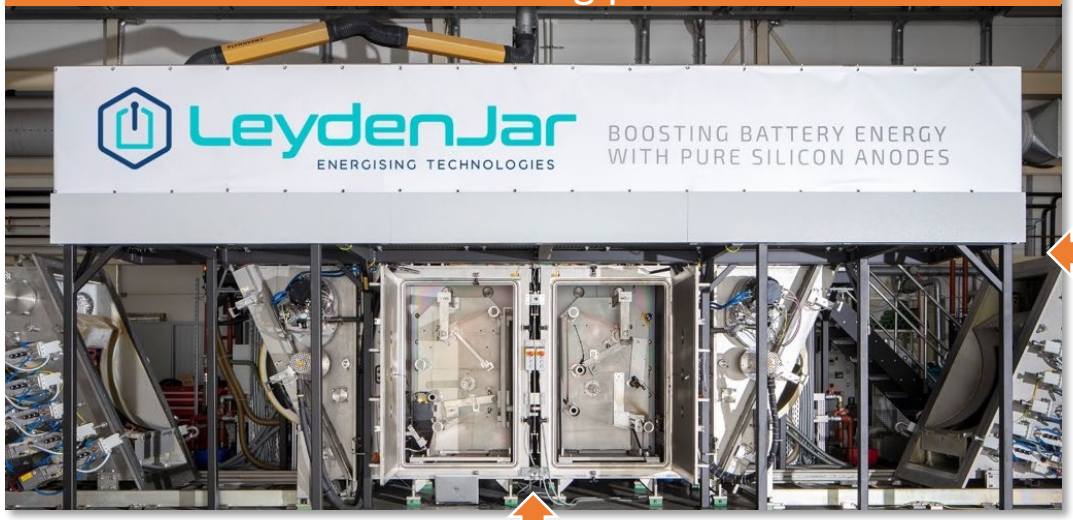
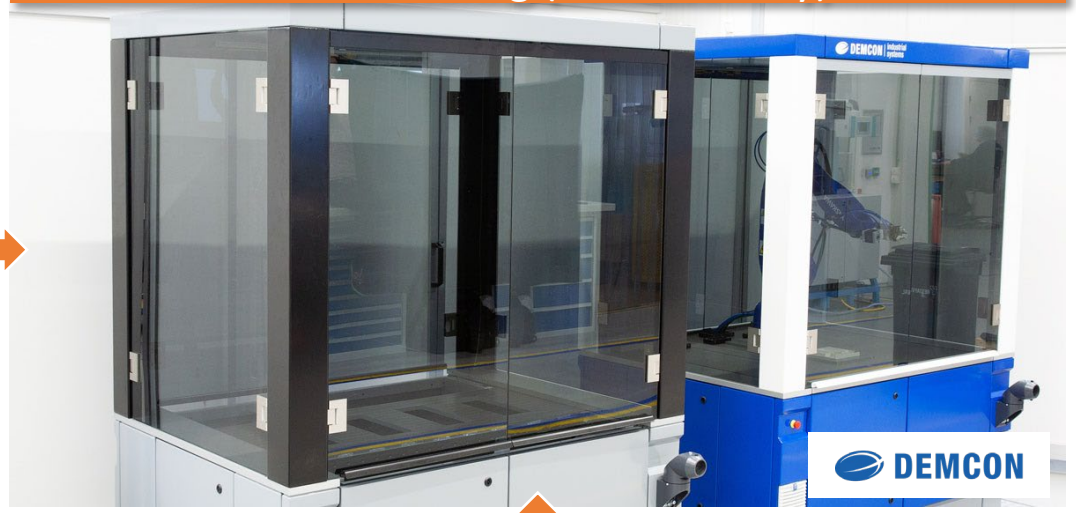
FACTORY 2030 (EAST NL CLUSTER)
EXAMPLE ENERGY/BATTERY DOMAIN

Digital twin of electrode (anode) manufacturing process



Smart production modules for battery manufacturing (cell assembly)



Embedment into digital battery manufacturing simulation platform

Connection to pilot line activities

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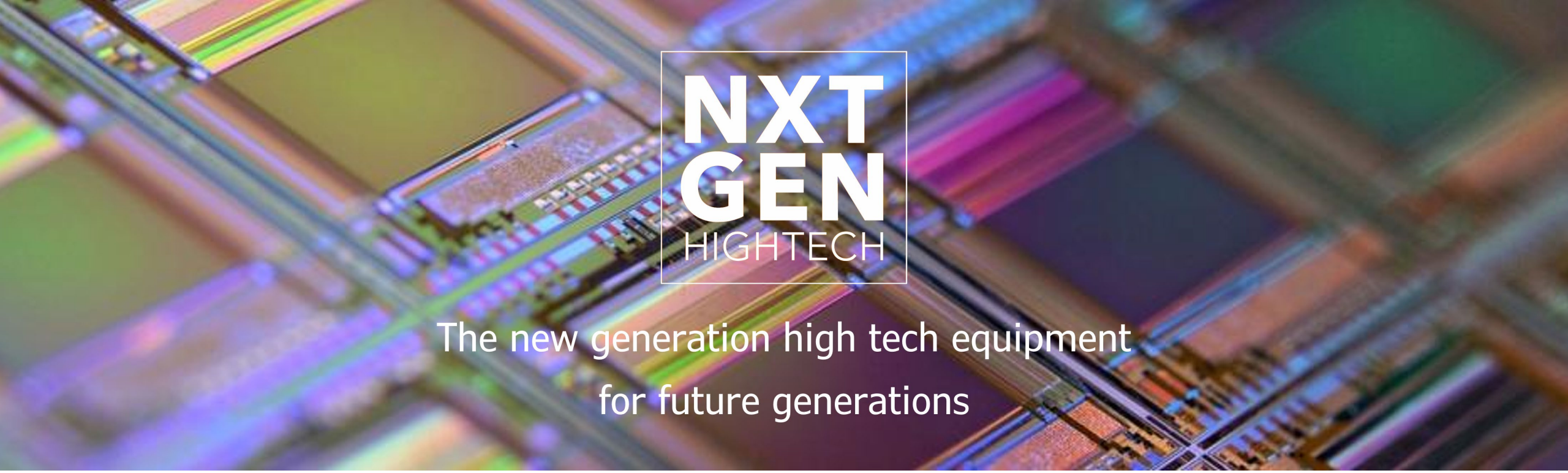

Comprehensive Systems Engineering

Maarten Bonnema

UNIVERSITY OF TWENTE.

NXTGEN Key Technology: Systems Engineering

Systems engineering is an interdisciplinary field of engineering and engineering management that focuses on how to design, integrate, and manage complex systems over their life cycles. At its core, systems engineering utilizes systems thinking principles to organize this body of knowledge.

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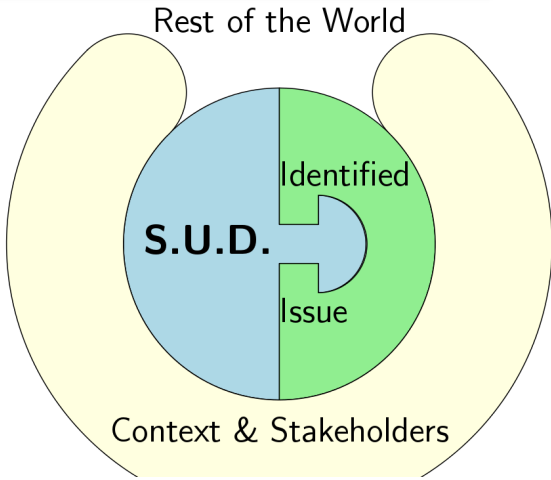
Systems Engineering

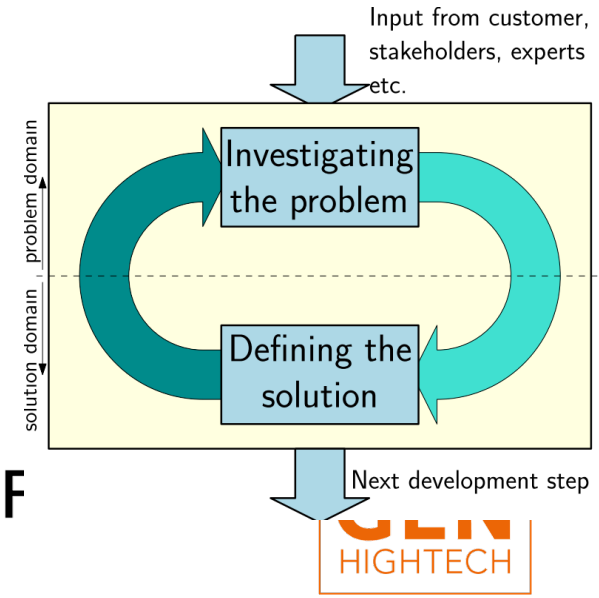
Netherlands is quite good at SE:

- ASML
- Canon PP
- Thales
- Vanderlande
- Rijkswaterstaat
- and more…

However:

- Room for improvement
- Share
- Strengthen&consolidate
- Promote





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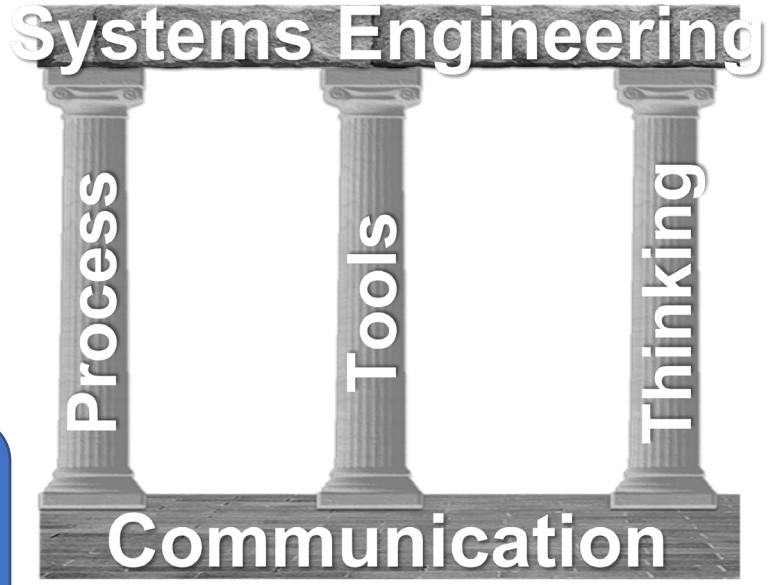
Challenges

- Products ➔ Systems
- Sustainability
- Increasing complexity
- Increasing multidisciplinarity (beyond engineering)

SE seen as promising approach



Increasing demand for Systems Engineering Systems Engineers

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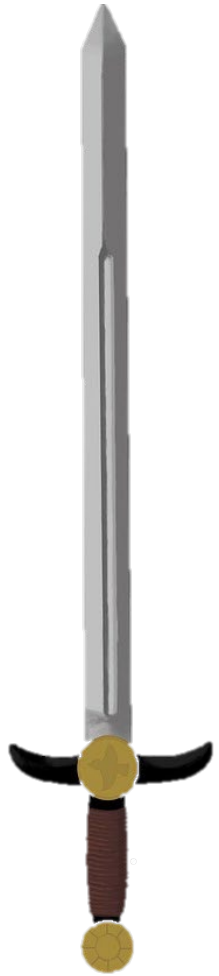
NXTGEN and SE

Use SE in all projects



Create “Dutch School of SE”

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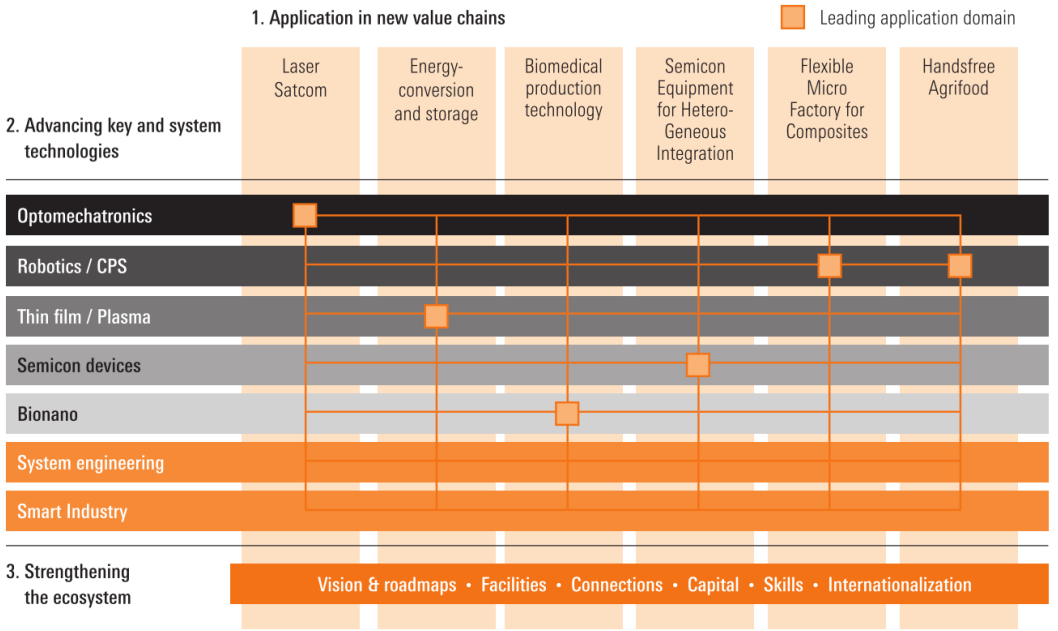
Use SE in all projects

- Representatives of all projects to be trained in SE (masterclasses)
- Milestones with SE deliverables



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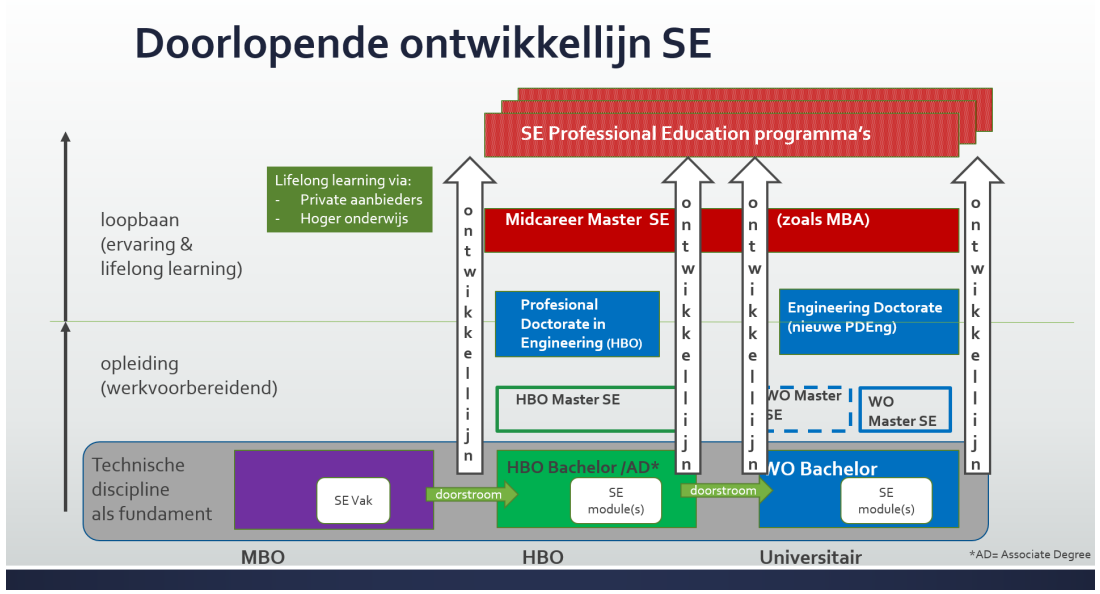
Comprehensive SE Education

- TU/e, TUD, UT, Fontys
- Holland Innovative
- ASML, Thales



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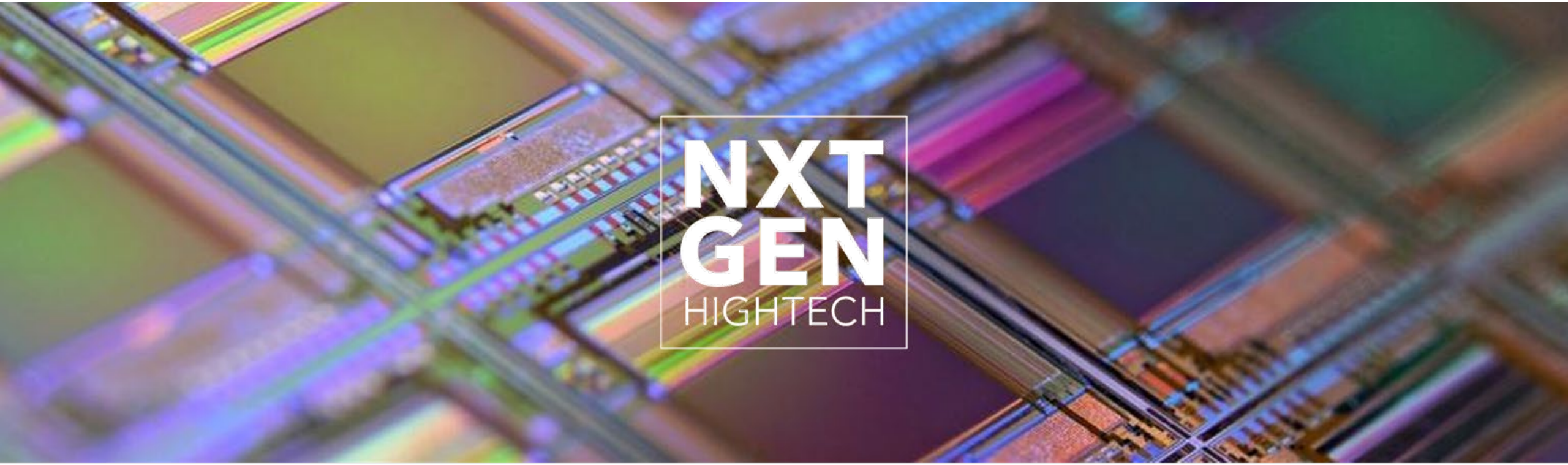

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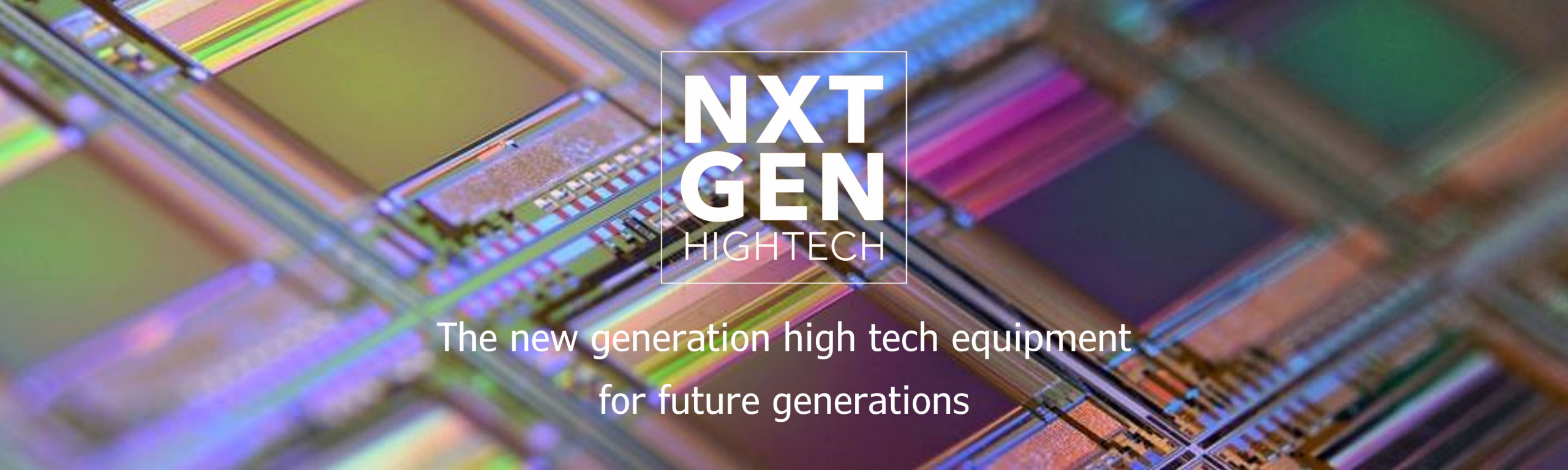

“We will rock you”

Vinod Subramaniam

UNIVERSITY OF TWENTE.