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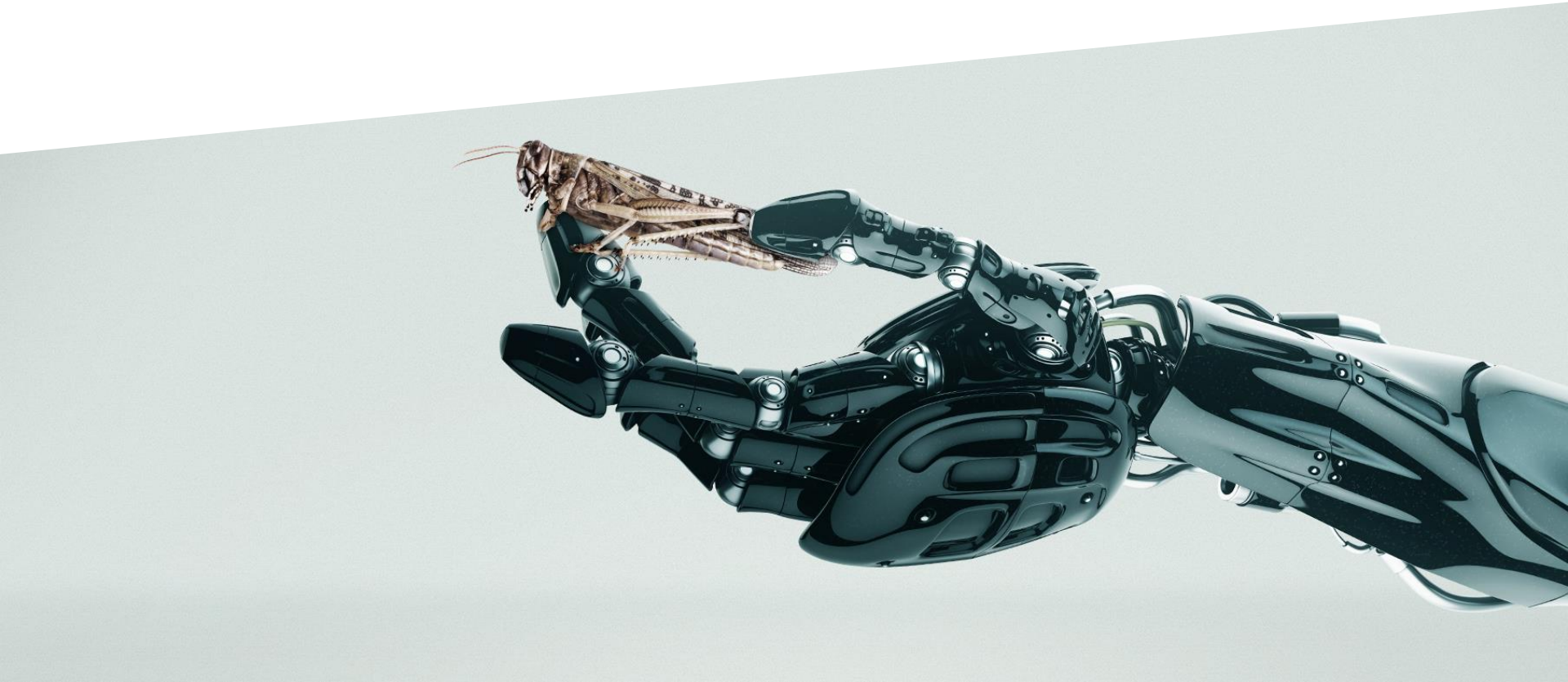
it's all about innovation



DANISH TECHNOLOGICAL INSTITUTE
- Robot Technology

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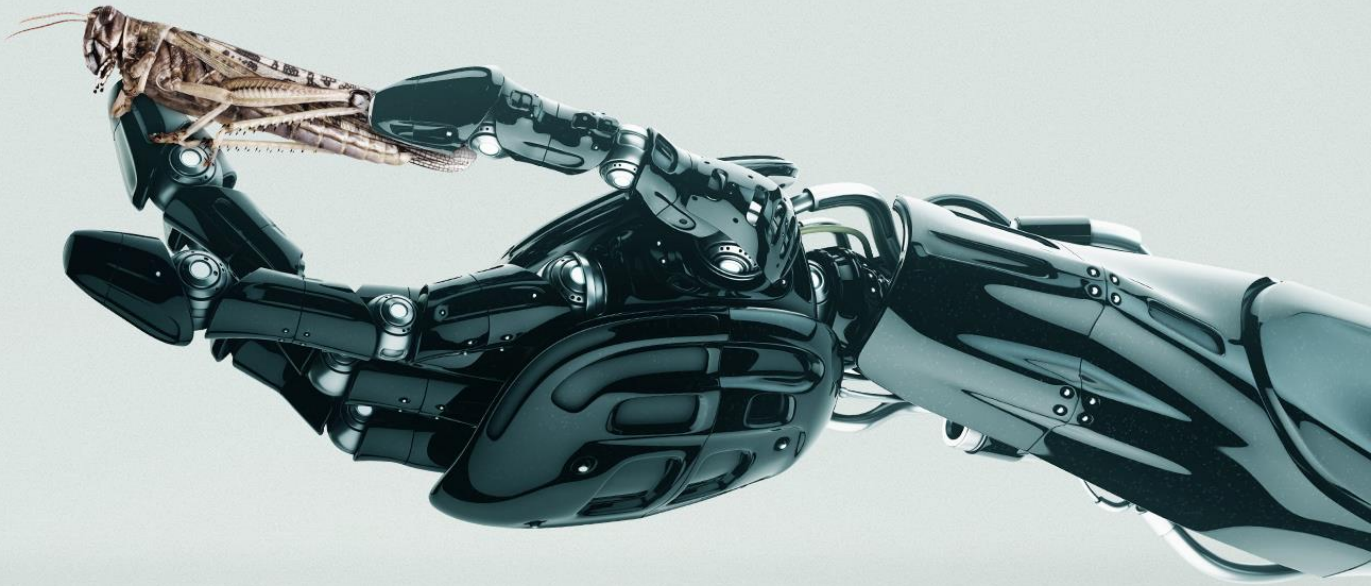
Jens Fynbo
Sektionsleder
jef@dti.dk



DTI HAS EXISTED SINCE 1906

To support Danish industry, mainly small enterprises, by providing technical assistance in the form of teaching, advice, testing and technological research

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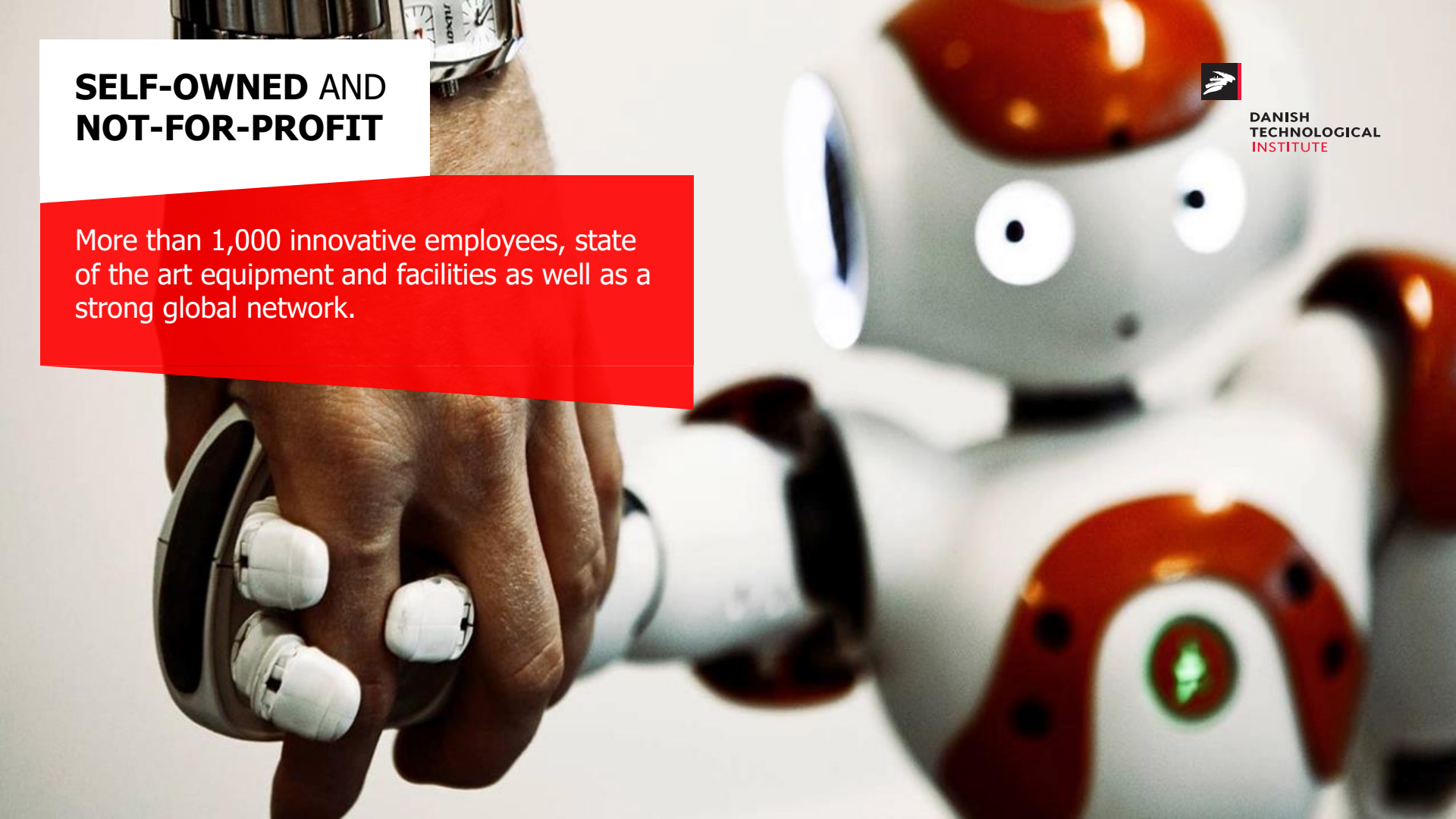

SELF-OWNED AND **NOT-FOR-PROFIT**

More than 1,000 innovative employees, state of the art equipment and facilities as well as a strong global network.

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DTI ECONOMY

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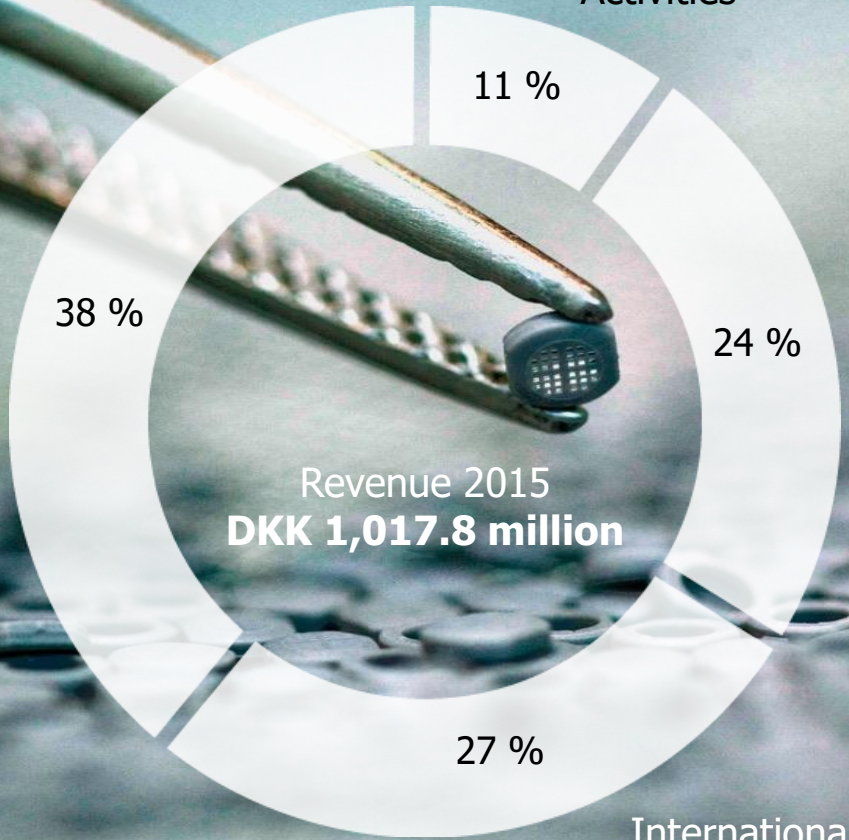


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Stockholm
Gothenburg
Hirtshals
Aarhus
Odense
Taastrup
Sønder Stenderup
Warsaw
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ORGANISATION

Board of Representatives

Board of Trustees

DANISH TECHNOLOGICAL INSTITUTE

Danish Technological Institute

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- Concrete
- Sustainable Building
- Indoor Climate and Building Inspection
- Masonry
- Textile
- Wood Technology

DMRI

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Lars Hinrichsen

- Business Development
- Automation
- Hygiene and Processing
- Meat Technology
- Measuring Systems and IT
- Slaughter Technologies

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Vice President
David Tveit

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- Biomass and Biorefining
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- Plastics Technology
- Product Development
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Vice President
Bo Frølund

- Life Science
- DTI Enhanced Oil Recovery
- DTI Oil & Gas
- Food Technology
- Chemistry and Biotechnology
- Laboratory for Chemistry and Microbiology

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Vice President
Jane Wickmann

- Business and Society
- Policy and Business Analysis
- Ideas and Innovation
- Training

Production

Vice President
Anne-Lise H. Lejre

- Metrology and Quality Assurance
- Microtechnology and Surface Analysis
- Robot Technology
- Welfare & Interaction Technology

Finance and Accounts

Group CFO
JørgenK. Pedersen

Subsidiaries

- Danfysik A/S
- Teknologisk Institut AB Sweden
- DTI Polska Sp. z o. o.
- Teknologisk Innovation A/S
- Dancert A/S
- DTI Spain SL

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DTI, ROBOT TECHNOLOGY

Odense, Denmark

We are a **leading European robotics innovator** with a staff of more than **40 robotic experts** within **industry and service**.

DTI, ROBOT TECHNOLOGY **IN NUMBERS**

DANISH TECHNOLOGICAL INSTITUTE

35.000.000 DKK revenue in 2015

12.000+ views per year on our YouTube-videos (www.youtube.com/dtirobot)

5.000+ guests per year

2.000 square metres innovation facilities

400 customers in 2015

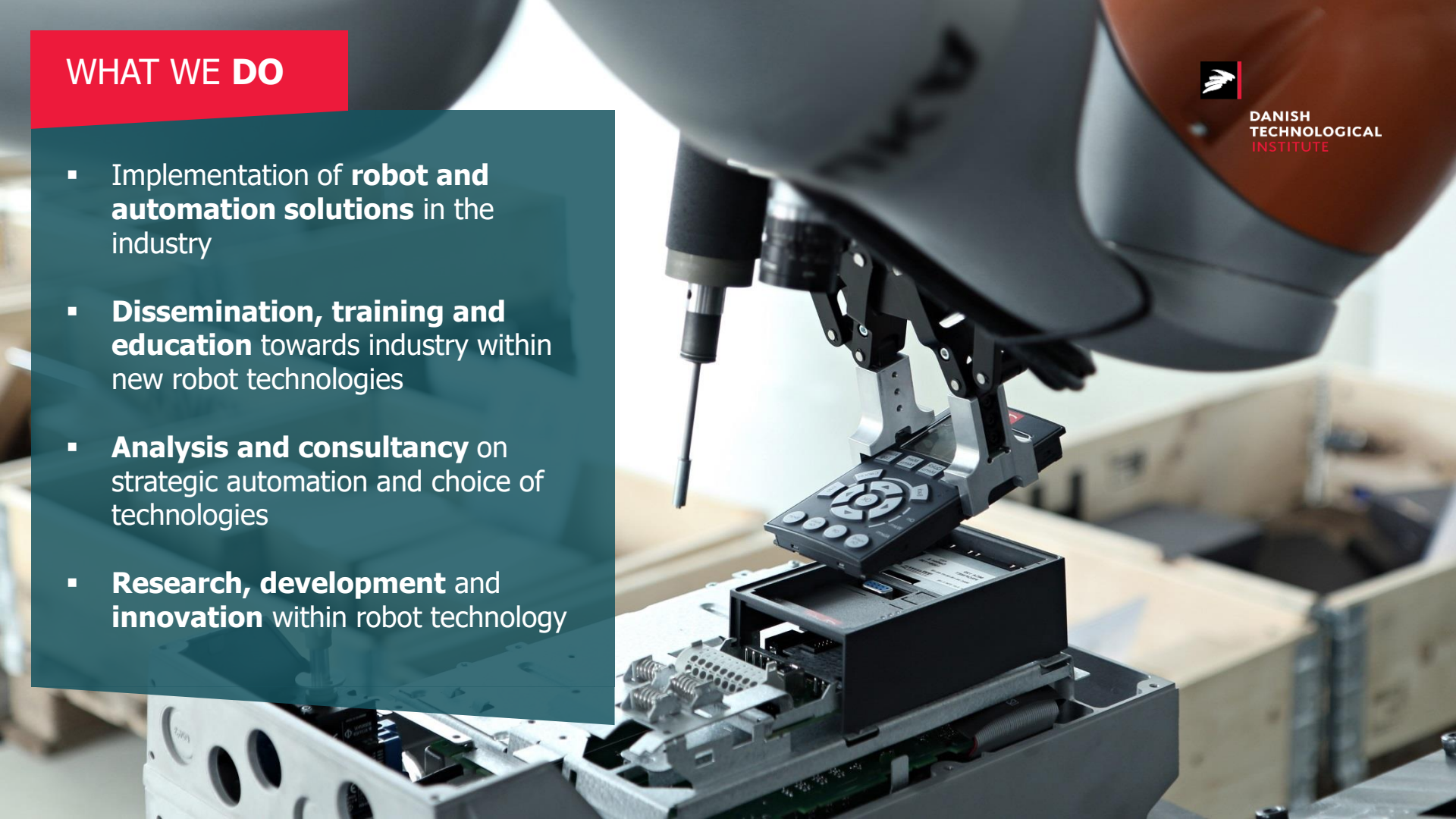
40+ robotics experts

15+ robots

5 robotics start-ups in the Odense Robotics StartUp Hub

WHAT WE **DO**

- Implementation of **robot and automation solutions** in the industry
- **Dissemination, training and education** towards industry within new robot technologies
- **Analysis and consultancy** on strategic automation and choice of technologies
- **Research, development** and **innovation** within robot technology



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DTI, Robot Technology

Head of Center
Kurt Nielsen

Industry	Flexible Industrial Robots	Sensors and Process	Service Robotics
Section Leader Jens Fynbo	Team Leader Anders Billesø Beck	Team Leader Jacob Kortbek	Team Leader Lars Dalgaard




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INDUSTRY

WHO ARE WE?

DANISH TECHNOLOGICAL INSTITUTE

Jens Fynbo
Section Leader
R&D&I
Product Development
Business Development
System Design
National Funds
Contract Negotiation

Bo Genefke
Development and Optimization of Automatic Facilities and Processes
Organizational Development in Automation Projects

Karsten Thornø Ahrentsen
Development and Implementation Consultancy
Software Development
Programming, Simulation and Visualization

Lars Ingvar Knudsen
Specialist in ABB Robots and RobotStudio
System Design and Configuration to Industrial Use
Industrial Process Facilities
Standard and ATEX Approved Facilities

Morten Nielsen
Network Developer
Network Facilitator
Idea Development

Steen Harder Ulrichsen
Network Developer
Network Facilitator
Sales and Project Generation
Idea Development

Michael Stæhr
Six Sigma, FMEA, audit, ISO 9001, Quality Management, Data Analysis, Digitalization

WHO ARE WE?

DANISH TECHNOLOGICAL INSTITUTE

Arne Kolze
Production Strategies
Production Concept Development
Lean and TPM
Material and Information Flow
Target Management

Asger Thomsen
High Mix Low Volume
TPM Equipment Maintenance
Manufacturing acc. to TS 16949
Lean Manufacturing Exellence

Claus Nielsen
Lean in Service Businesses, Administation and Production
Change Management

Freddie Agerskov
ISO9001
Quality Management
Information Security
Audit
Business Excellence
Six Sigma

Tanya Sørensen
Six Sigma, APQP, FMEA, PPAP, MSA, audit, ISO 9001, ISO 14001, Quality Management, Data Analysis, Digitalization

Kry Herholdt
Lean
Productivity
Logistics
Coaching
Teaching
Calculation
Data Handling

Paulius Stulga
Production Optimization, Industry 4.0, Digitalization

WHAT WE DO

- We create **higher quality**
- We create **higher productivity**
- We create a **better work environment**

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HOW WE DO

- **Product Optimization** (LEAN)
- **Automation** (Special Machines and Industrial Robots)

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FLEXIBLE
INDUSTRIAL ROBOTS

WHO ARE WE?

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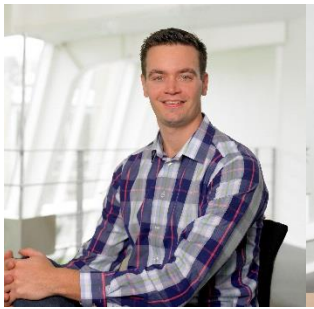

Anders Billesø Beck, PhD
Team Manager

Andreas Holmetoft Lyder, PhD

Andreas Rune Fugl, PhD

Mikkel Rath Pedersen, PhD

Martin Mølbach Olsen, PhD

Rasmus Hasle Andersen, PhD

Søren Peter Johansen
Technical Manager

Bjarke Kirkelykke Skjølstrup

WHAT WE **DO**

- Focus on development of **modern, flexible robot solutions**
  - **Generalized** and **reusable** solutions
  - **Cost-effective** solutions
  - Integration of **sensory science**
  - **Software/hardware combinations** that can be commercialized in cooperation with robot integrators

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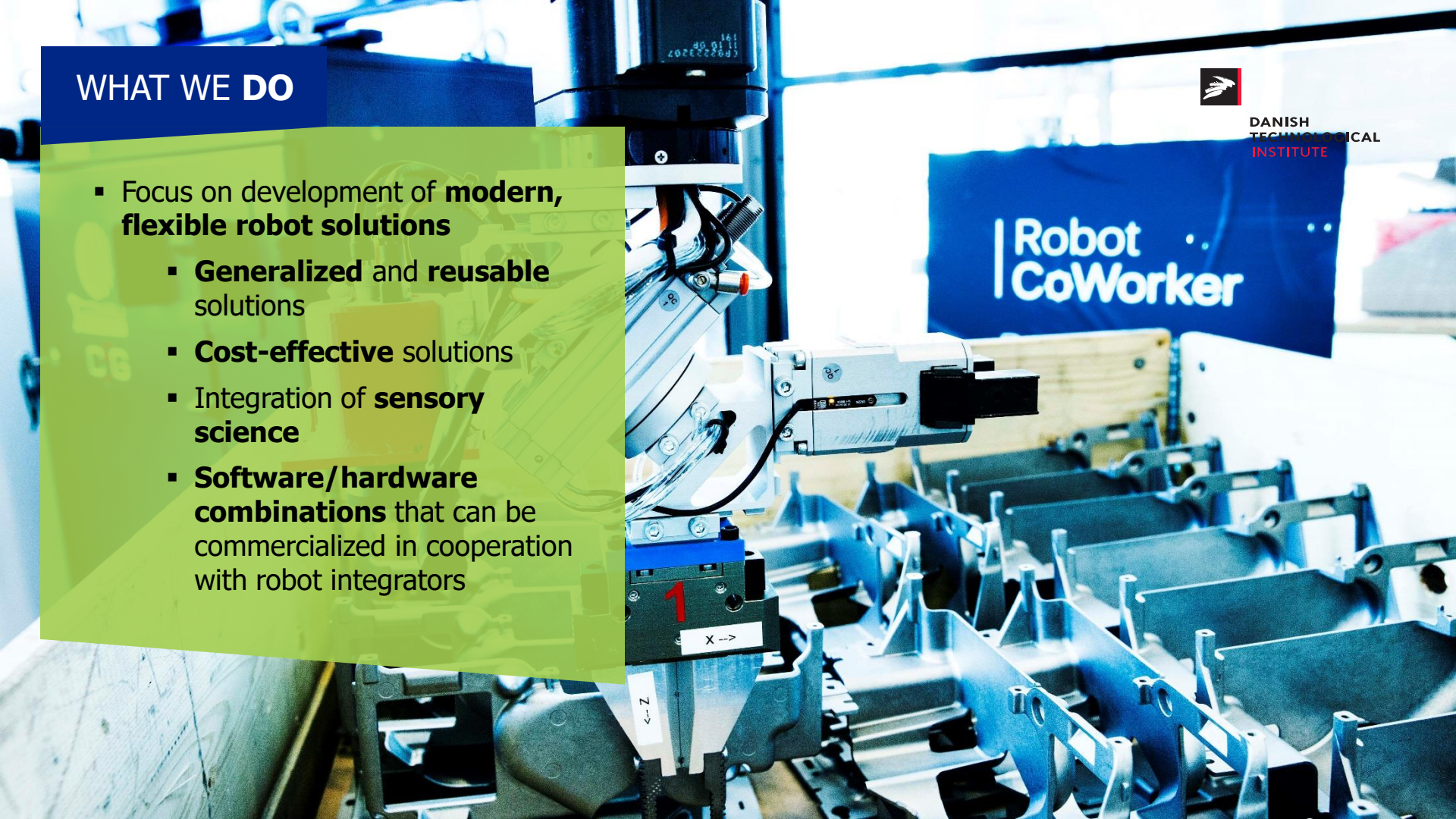

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SENSORS & PROCESS

WHO ARE WE?

DANISH TECHNOLOGICAL INSTITUTE

Jacob Kortbek, PhD
Team Manager
Project Management
R&D
Sensors
Signal Processing
Medical Ultrasound

Carsten Panch Isaksen
Development & Integration Vision for Quality Inspection
Robot Vision
Software Development
GUI development

Francois Picard
R&D
Computer Vision
Vision Sensors
Real-time Scene Analysis
Human-Computer-Interaction

Mikkel Viager
R&D
Project Management
Integration & POC
2D & 3D Sensor Systems
Robotics & Programming

Michael Nielsen
R&D
2D-3D Machine Vision
Agricultural Engineering
Human Computer Interaction
Industrial Quality Inspection

Thomas Sølund
R&D
Computer vision
3D sensors & Perception
Grasp planning
Pose estimation
Bin-picking
3D part scanning

Thomas Mosgaard Giselsson, PhD
Machine Vision
Vision for Agriculture Machines
Blood Sample Sorting Technology

WHAT WE **DO**

- Expert knowledge on vision solutions, which often are gatekeepers in the development of innovative products
- Vision for robot control and industrial quality inspection
- 3D Vision and Bin-Picking
- HRI systems for capture and recognition of user body language
- Application domains: Manufacturing industry, agricultulture, waste sorting
- We push the boundaries for application to secure an even better utilization of the technologies in the future

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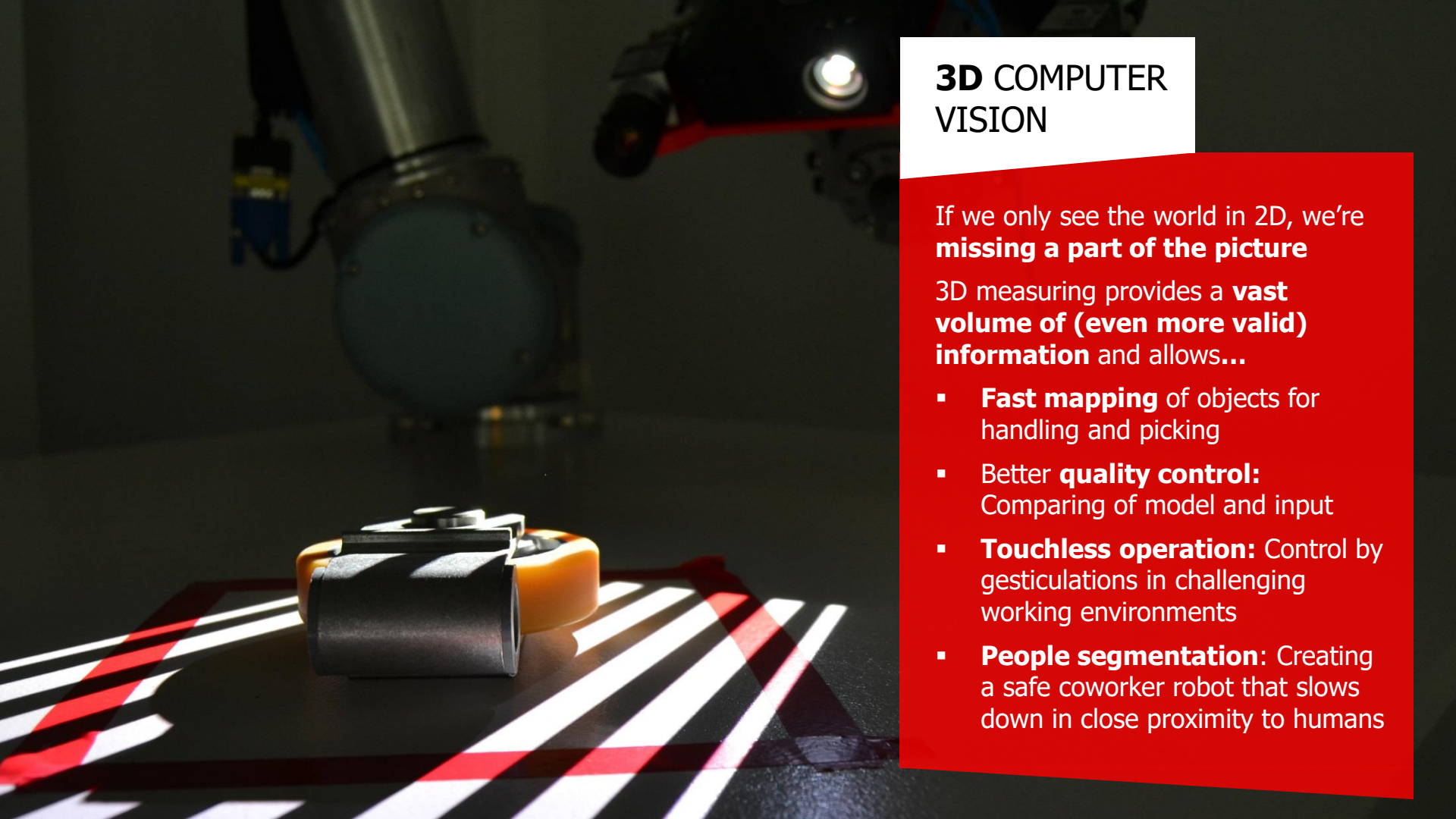

3D COMPUTER VISION

If we only see the world in 2D, we're **missing a part of the picture**

3D measuring provides a **vast volume of (even more valid) information** and allows**...**

- **Fast mapping** of objects for handling and picking
- Better **quality control:** Comparing of model and input
- **Touchless operation:** Control by gesticulations in challenging working environments
- **People segmentation**: Creating a safe coworker robot that slows down in close proximity to humans

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SERVICE ROBOTICS

WHO ARE WE?

DANISH TECHNOLOGICAL INSTITUTE

Lars Dalgaard, PhD
Team Manager
R&D&I
System Design
Mobile Robots
Decision Support

Malene Tofveson Nibe
R&D&I
User Centered Design
Industrial Design
Product Development
Innovation Processes

Thomas Madsen Almdal
R&D&I
ROS/ROS-I
UAV and AUV
System Design
Sensors and Actuators

Kasper Camillus Jeppesen
R&D&I
Control, Navigation and Localization
System Design
Modelling
Interface Construction
Simulation of Robot and Sensor Solutions

WHAT WE **DO**

DANISH TECHNOLOGICAL INSTITUTE

PURPOSE
We contribute to the spreading and application of **professional service robots** in the industry, the service sector and the health sector

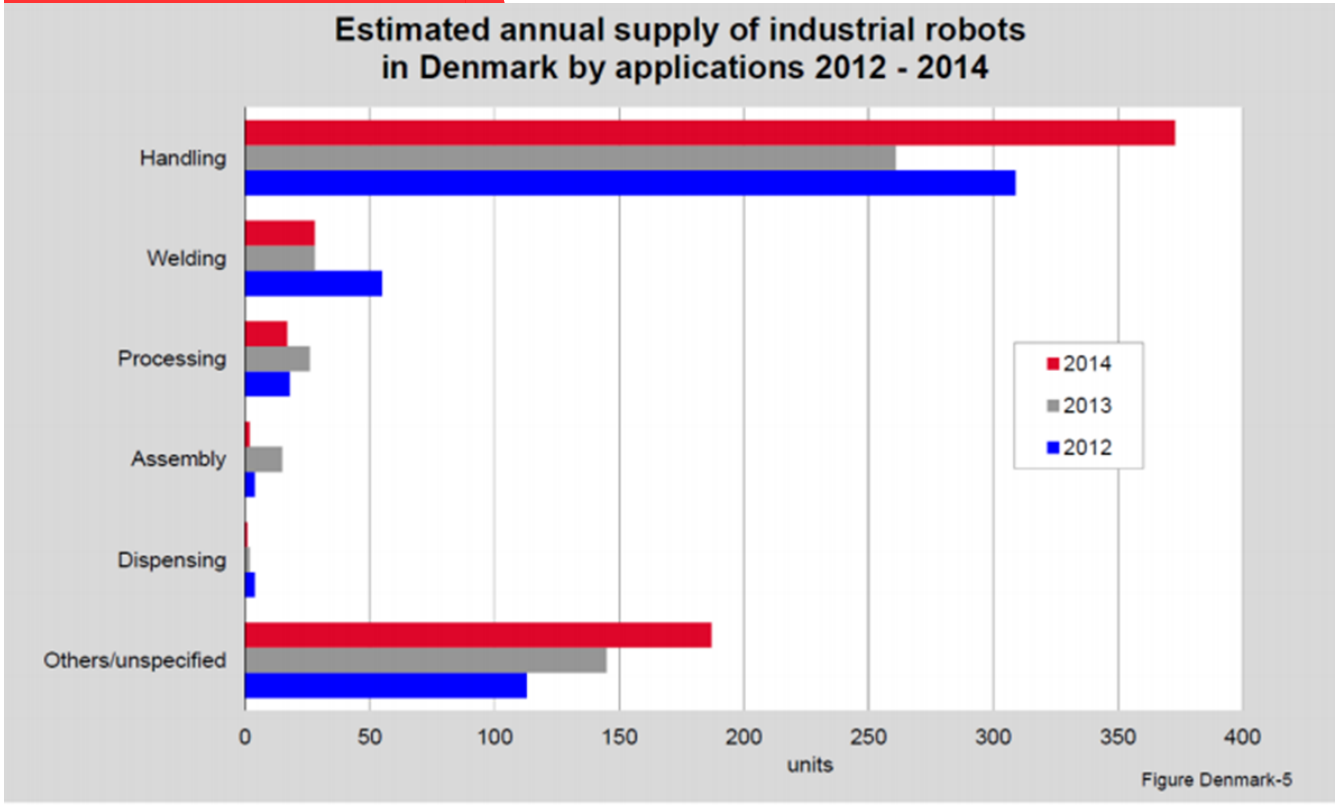
FOCUS
System Design & Integration – ***to create solutions***

Customer- market- and supplier knowledge

Flexibility through modularity

USE OF **INDUSTRIAL ROBOTS**

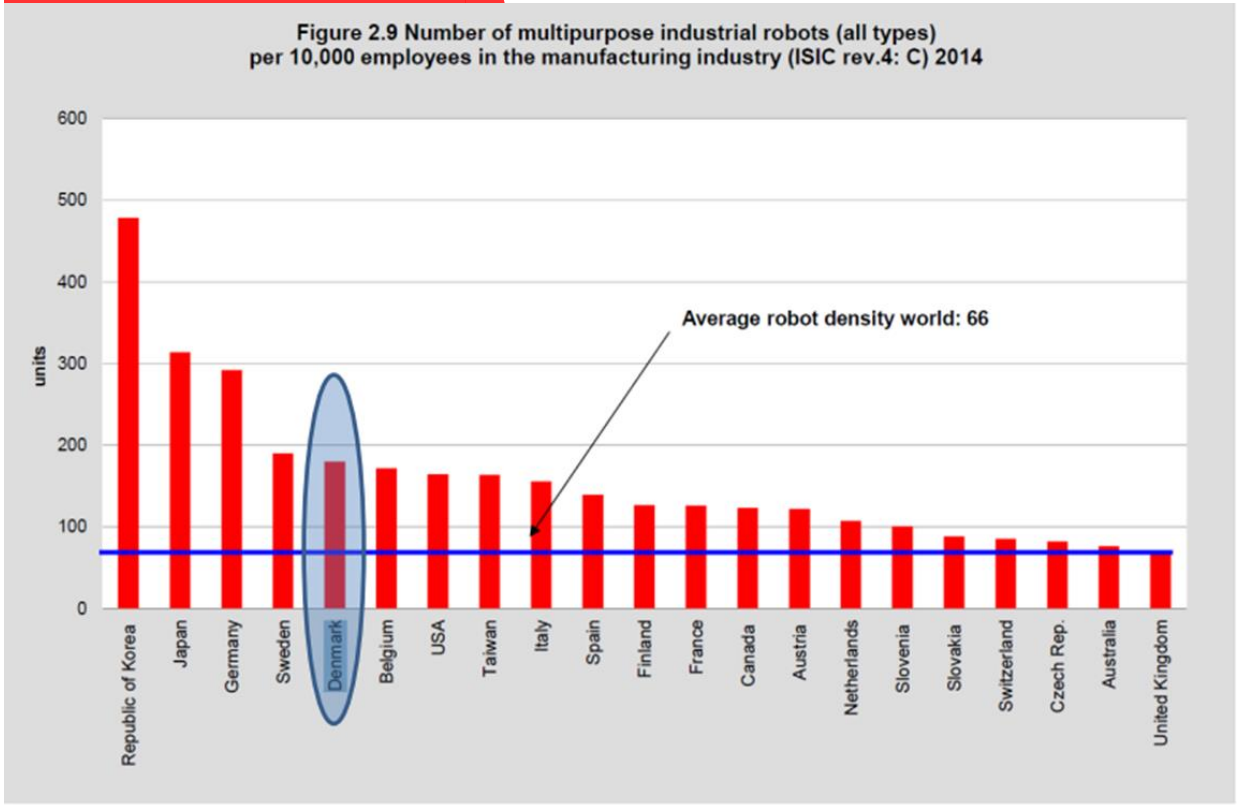
DANISH TECHNOLOGICAL INSTITUTE



Source: International Federation of Robotics (www.ifr.org), 2015

DANISH
AUTOMATION LEVEL

DANISH TECHNOLOGICAL INSTITUTE



Source: International Federation of Robotics (www.ifr.org), 2015

USE OF **INDUSTRIAL ROBOTS**

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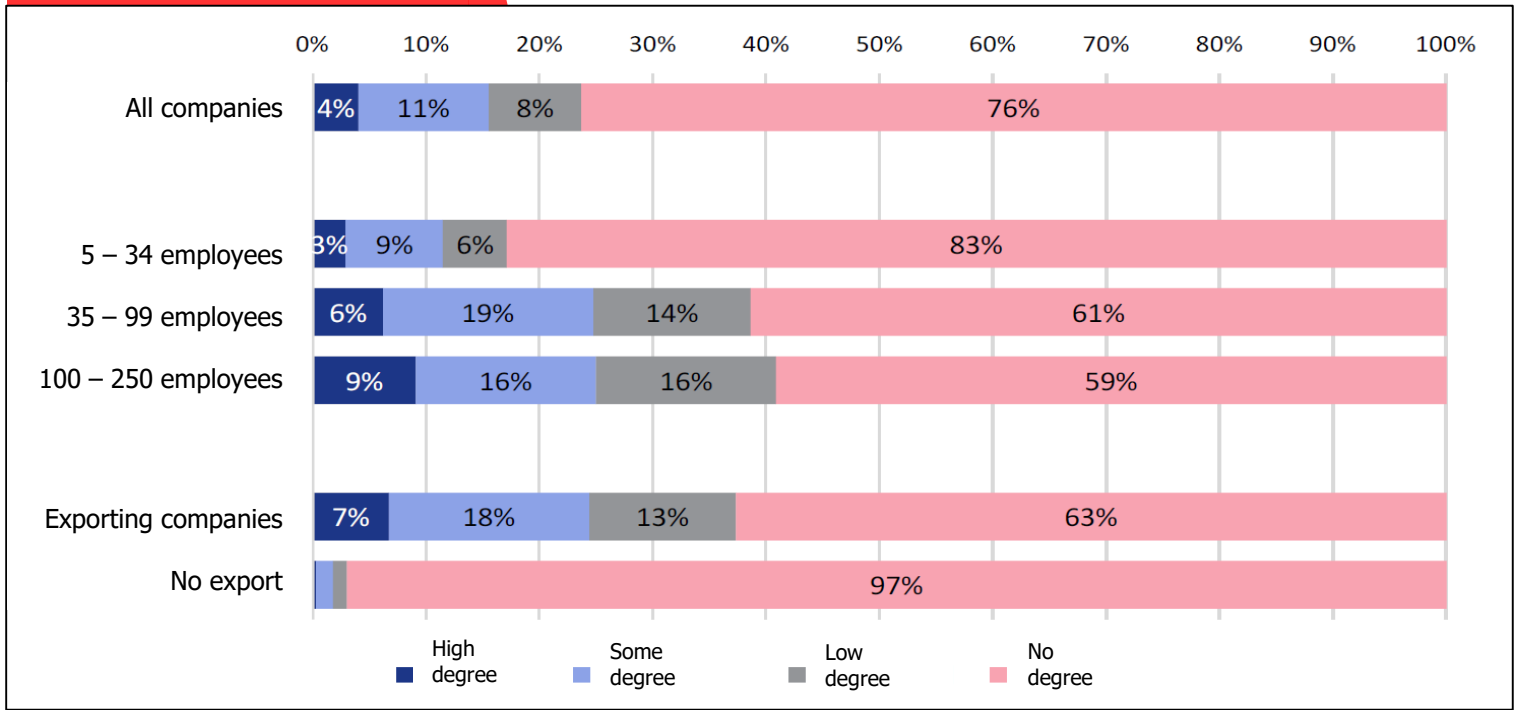

Source: "Robotter i global kamp", DTI, august 2015

"To which extend do your company use **robots in the manufacturing process**?"

WHY NOT INDUSTRIAL ROBOTS?

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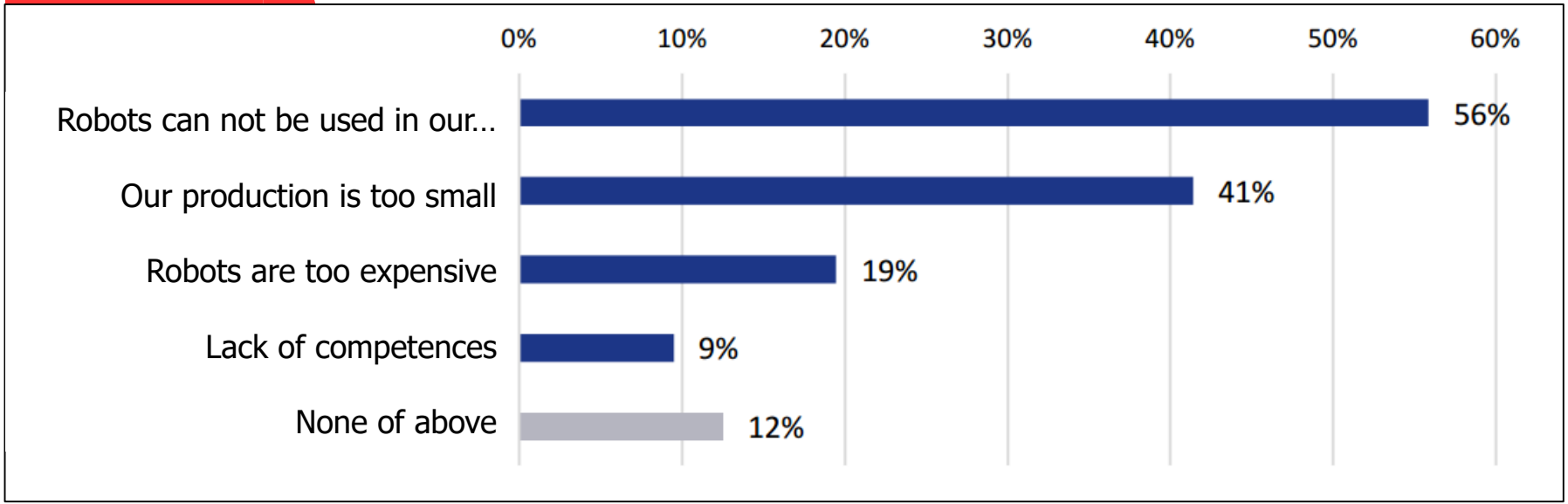

Source: "Robotter i global kamp", DTI, august 2015

THE **GENEFKE SCALE©**
THE FIVE CATEGORIES

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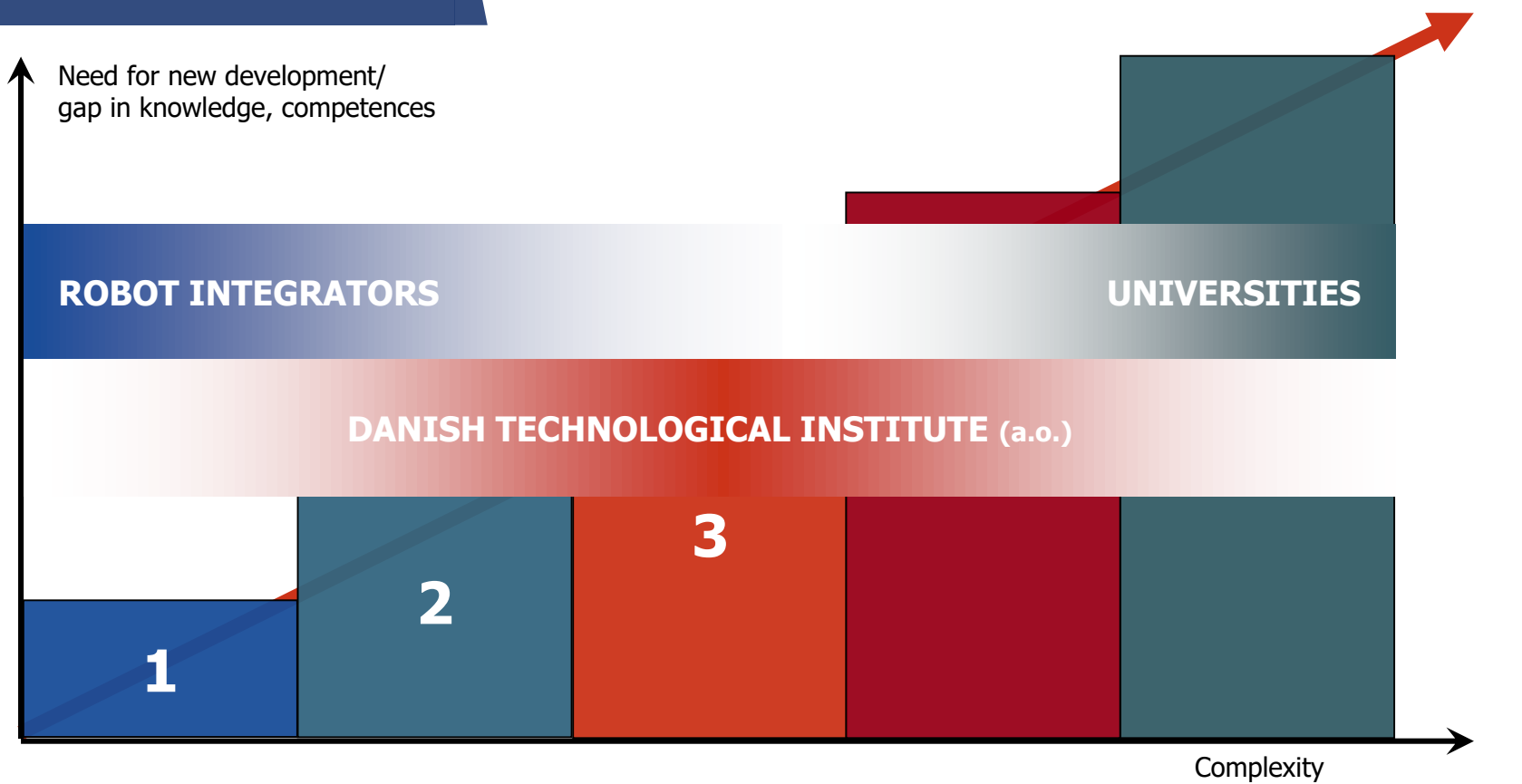
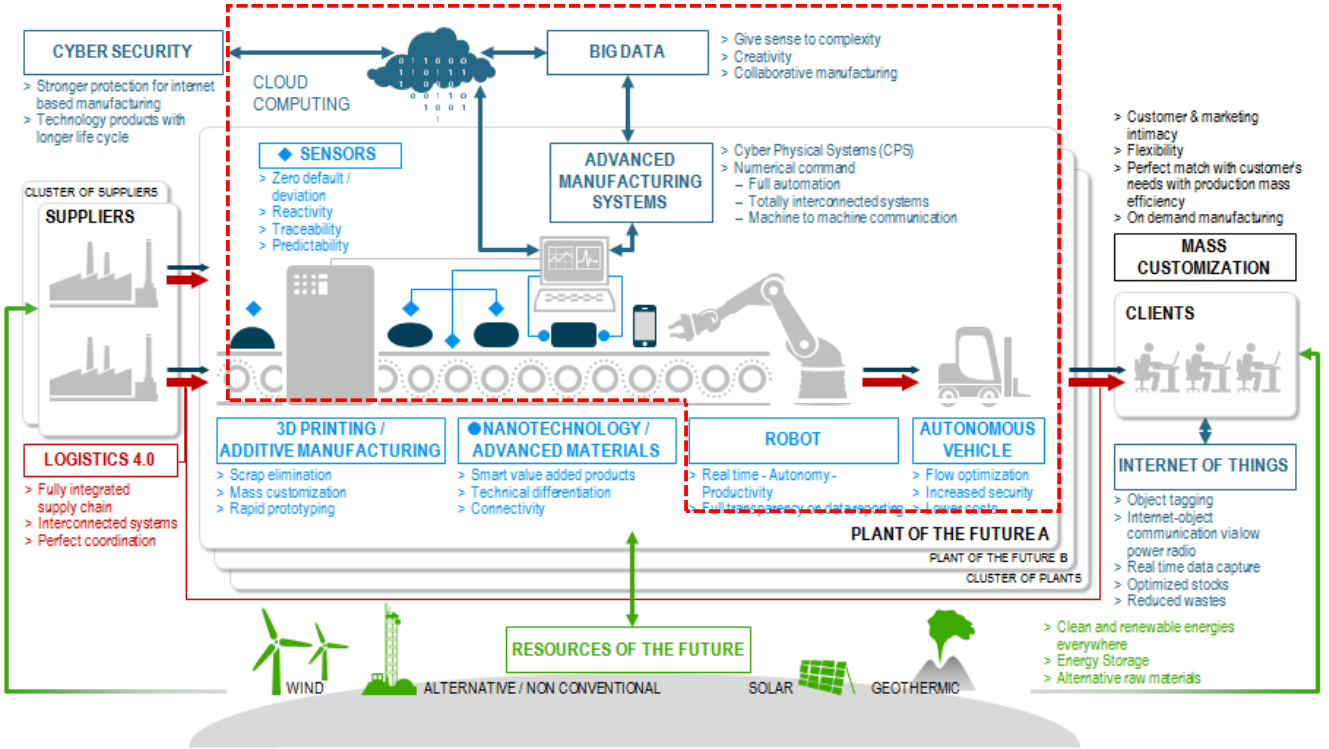


THE **INDUSTRY 4.0** ECOSYSTEM

DTI,
Centre for Robot Technology

DANISH TECHNOLOGICAL INSTITUTE



Source:
Roland Berger

Hvad er Big Data?

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- "*High **volume**, high **velocity**, and/or high **variety** information assets that require new forms of processing to enable enhanced decision making, insight discovery and process optimization"* (Laney, 2013).

- **Every single minute**, the world is said to generate 1.7 million billion bytes of data, equal to **360,000 DVDs** or over 6 megabytes for each man, woman and child on this planet every day.(1)

- I en undersøgelse gennemført af The Economist Intelligence Unit sammen med Capgemini, svarer 2/3 af godt 600 virksomheder, at de mener deres virksomhed og deres strategi er data-drevet, og **90% mener, at de burde udnytte data bedr**e for at træffe bedre beslutninger.

(1) https://ec.europa.eu/digital-agenda/en/news/helping-smes-fish-big-data-ocean

Hvad er Big Data?

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- **Volume** (mængde): Mængden af data vokser eksponentielt. Big data involverer ofte store datasæt med størrelser ud over, hvad normal software kan håndtere, indfange, organisere, styre og behandle. Der er ofte tale om datasæt i størrelsesordenen terabyte og petabyte, og mængden af lagret data og information vokser fire gange så hurtigt som verdensøkonomien.

- **Velocity** (hastighed): Hastigheden, hvormed data kan behandles, vokser eksponentielt med, at computerkraften fordobles hver 18. måned (Moores Lov) – eller ni gange så hurtigt som verdensøkonomien. Stigende datahastigheder er hjulpet godt på vej af forbedringen af databaseteknologi og nye databaseformer og platformtyper, som kan håndtere større og større datasæt.

- **Variety** (mangfoldighed): Rækkevidden af datatyper og datakilder forøges, og nye datakilder opstår konstant. Datatyper og datakilder kan være sensordata indbygget i produkter, ustruktureret patent- og publikationsdata, diskussioner på sociale medier, audiovisuelt materiale eller virksomheder og organisationers egne interne data.

Hvad kan man opnå?

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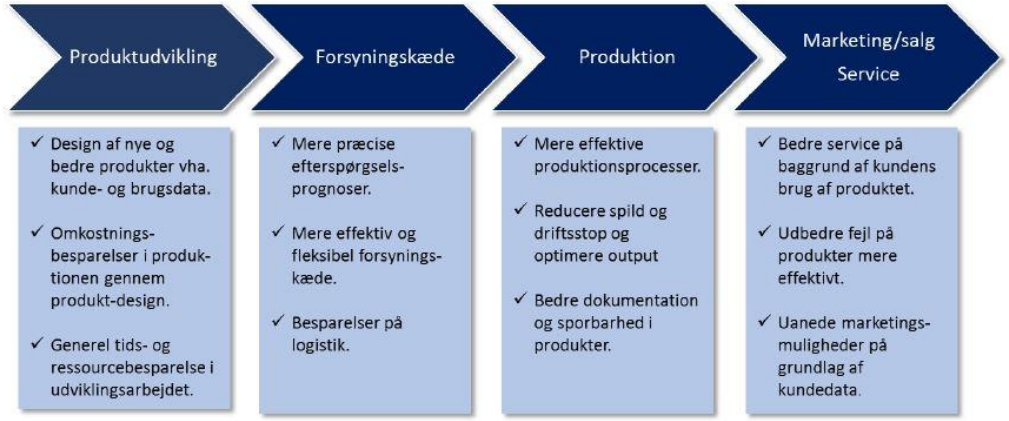
- Datadrevne virksomheder er i gennemsnit 5% **mere produktive**
- Og 6 pct. **mere profitable** end virksomheder, der slet ikke anvender "Big data analytics"
- Største potentialer i brugen af Big Data ligger i at sikre produktkvaliteten og i at spore produktdefekter samt inden for produktionsplanlægning (TATA Consultancy Services, 2013).



Kilde: Egen tilvirkning på baggrund af McKinsey Global Institute, 2011.

Øget Produktivitet i 4 trin!

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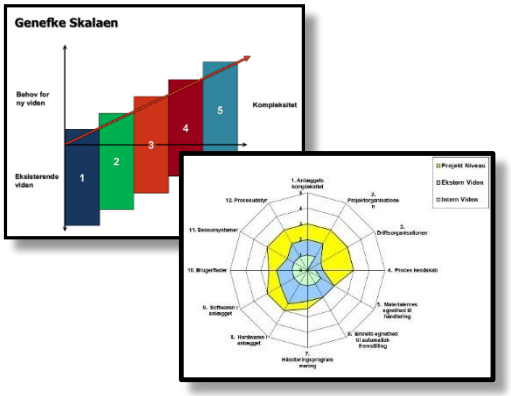
1. Administrationsoptimer (lean din administration)
2. Produktoptimer (færre varianter – vent med variantskabelsen)
3. Produktionsoptimer (lean din produktion – skab flow)
4. Automatiser - dine flaskehalse (gap analyse - Genefke)

Simplimize Academy



Baser dine beslutninger på data (kravspecifikation), ikke på mavefornemmelser eller tilfældigheder (leverandørvalg)

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DTI INITIATIVES TO **TRAIN** AND **EDUCATE** INDUSTRY

AUTOMATION **NAVIGATOR**

DANISH TECHNOLOGICAL INSTITUTE

PURPOSE

Understanding **the connection between human and technical factors in production processes**. Become a navigator in the complex aspects of automation.

FOCUS

- Balance between **literacy** and **practical hands-on**
- **Knowledge and applicable skills** in direct relation to the participants company


Production Manager: **Education in Automation** is Important
DANISH TECHNOLOGICAL INSTITUTE
»**The automation navigator education** will give an input from the start of the process, that we had to learn the hard way,« Christian Hallberg Jensen, Production Manager at C.C.JENSEN.


TEKNOLOGISK INSTITUT

LEAN **NAVIGATOR**

PURPOSE

Learn to **optimize flow**, **reduce waste** of time and create **more value** for you and your customers

FOCUS

- Understand the difference between **Lean Thinking** and **Lean Tools**
- **Implement relevant Lean principles** in participants own company
- Ability to map out **untapped potentials** and optimize them

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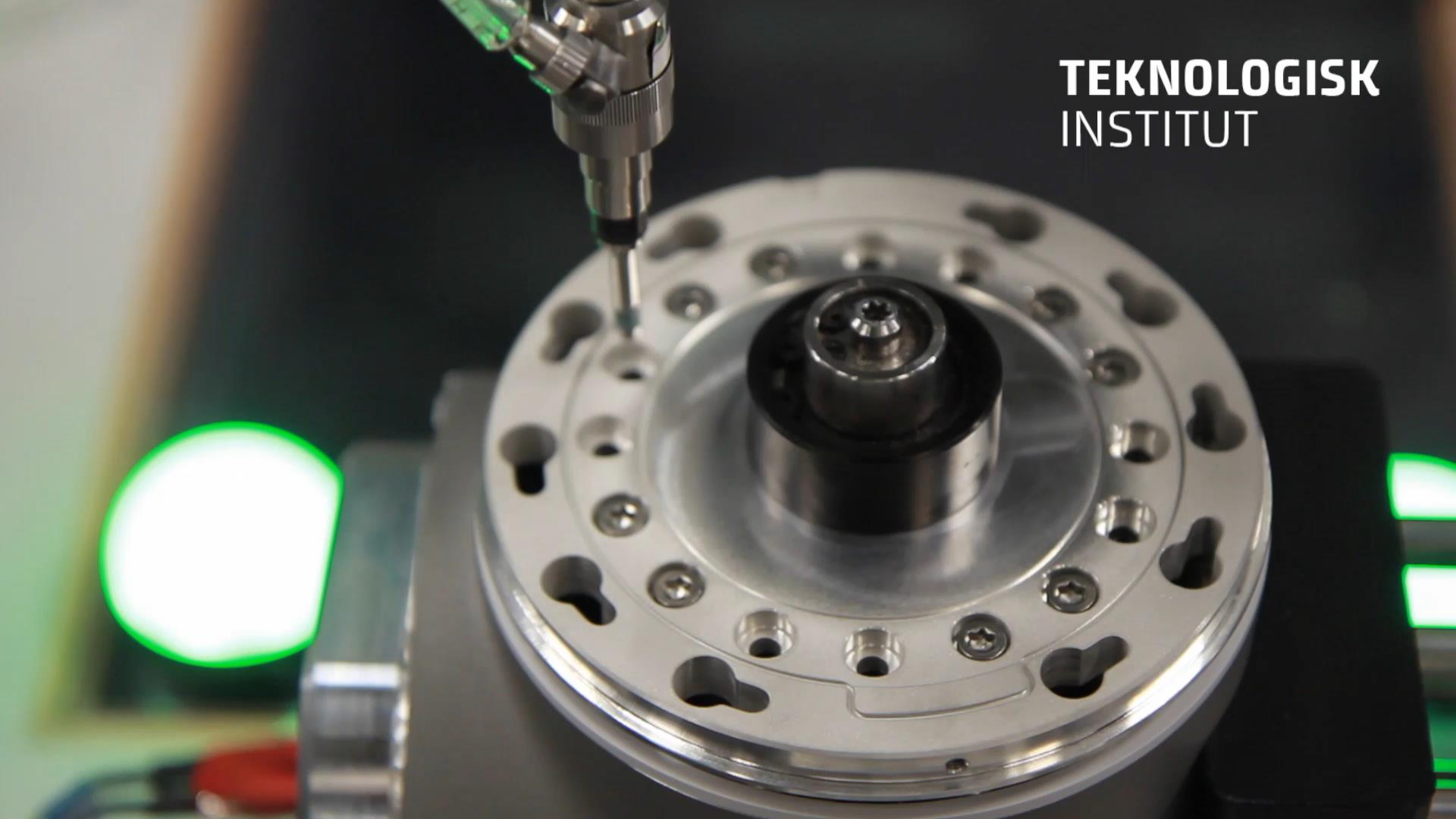
SELECTED CASES
FROM DTI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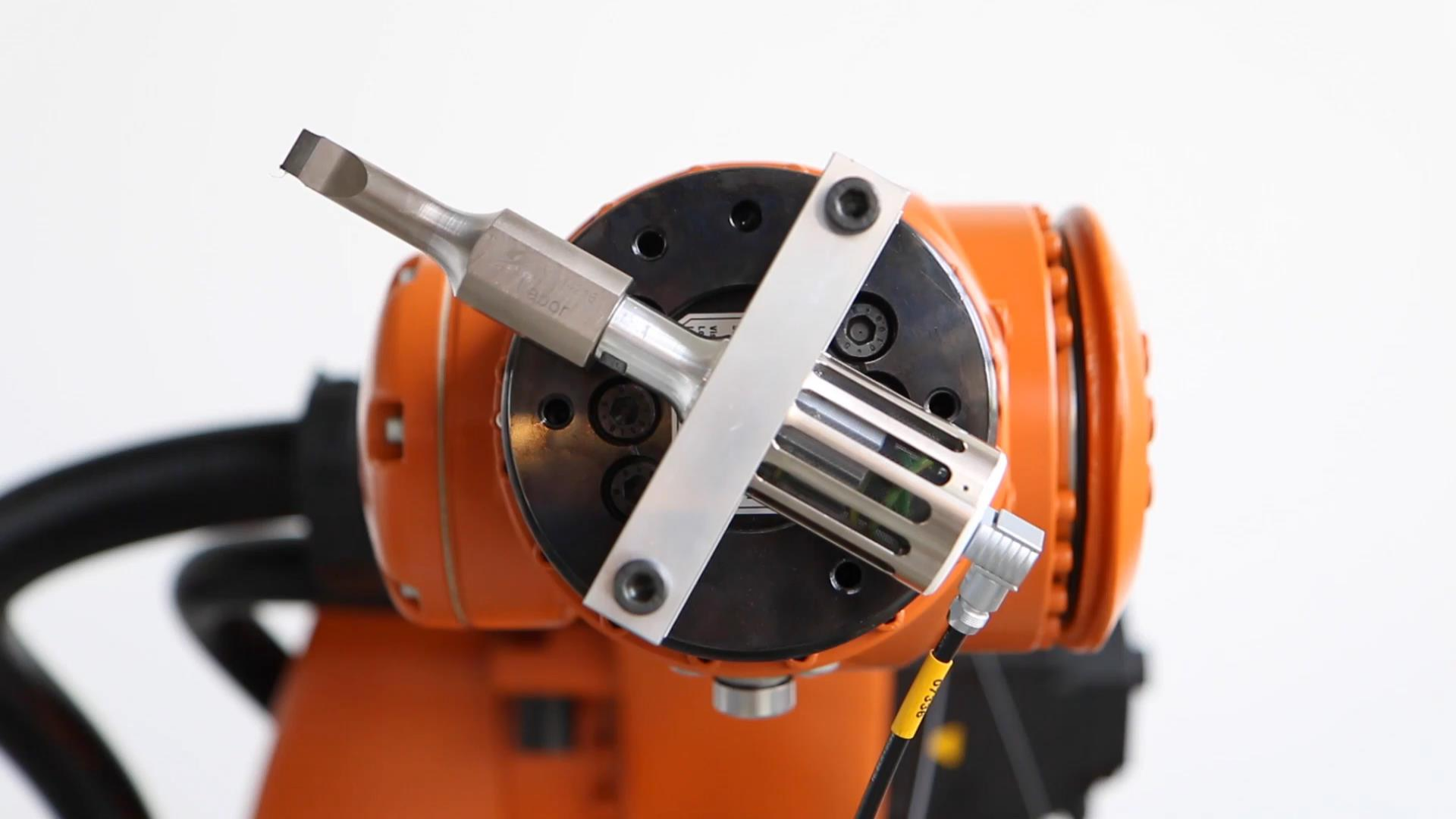

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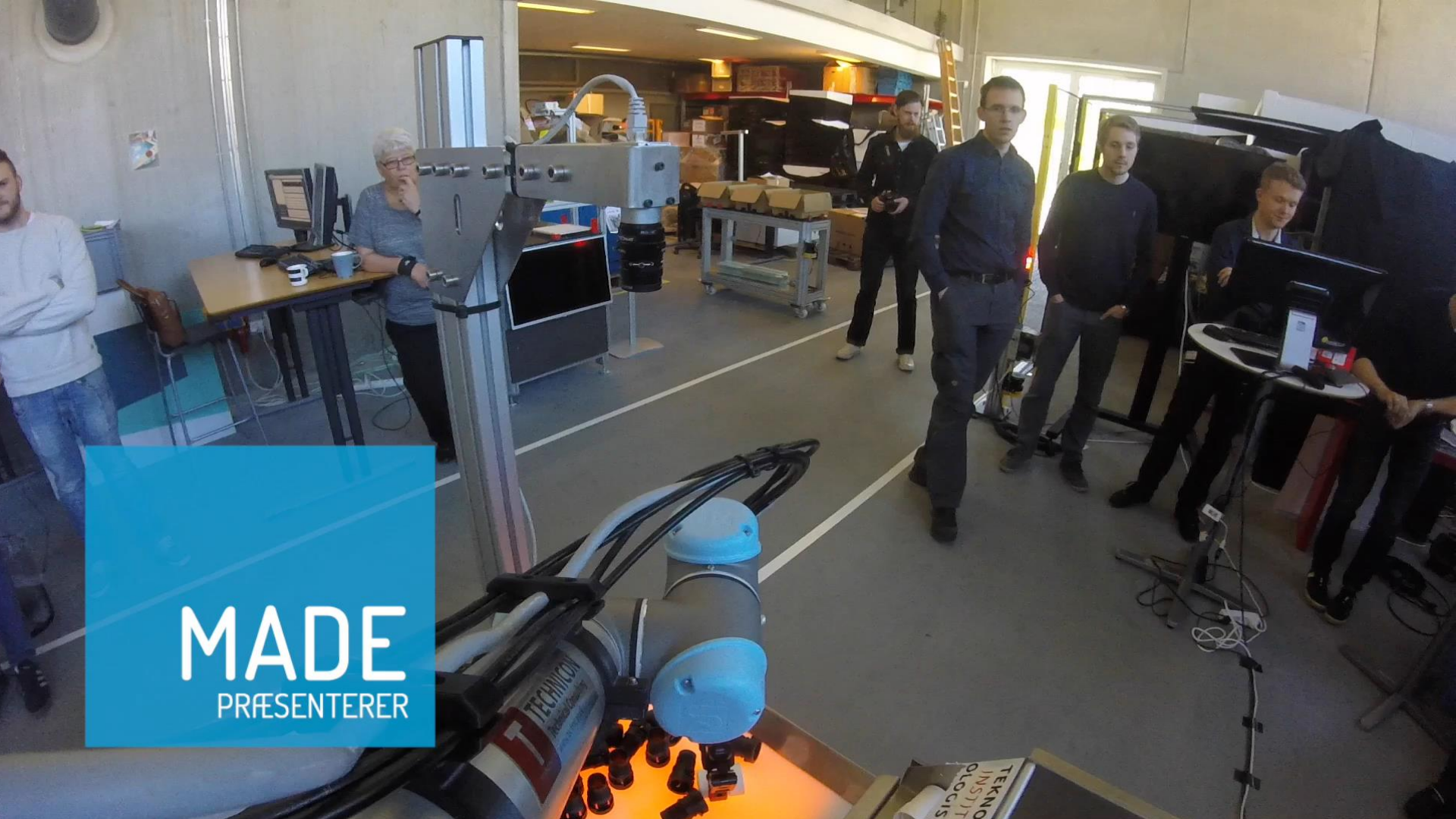
THE DANISH TECHNOLOGICAL INSTITUTE


MADE
PRÆSENTERER

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TECHNOLOGICAL
INSTITUTE

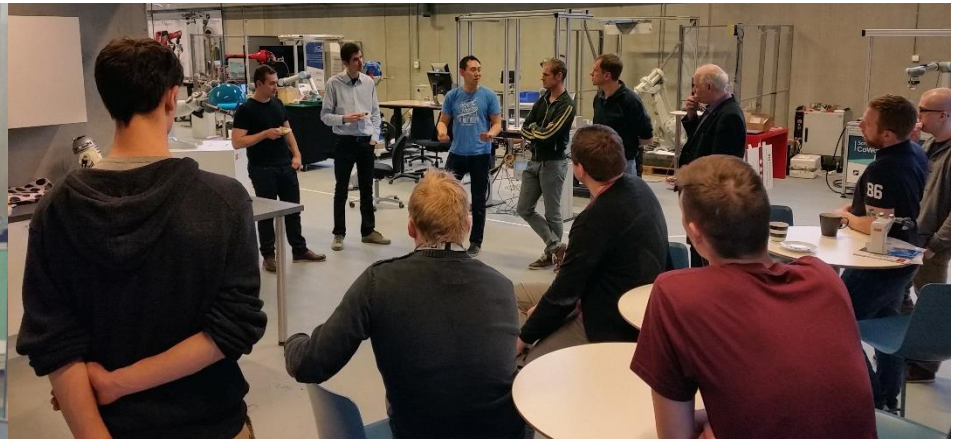
SELECTED ACTIVITIES
AT DTI

STARTUP HUB

DANISH TECHNOLOGICAL INSTITUTE

ODENSE ROBOTICS

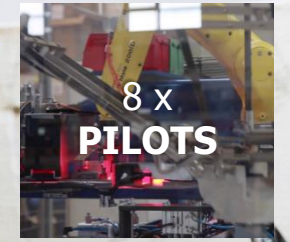
- Free office facilities in an inspiring environment
- Access to sparring and advice from the Danish Technological Institute
- Access to testing facilities
- Handpicked Advisory Board with the best people from the industry
- Sparring on your business plan and strategy
- Access to Odense Robotics network of companies and potential partners
- Access to investor capital



ROBOTT-NET
Robot Technology
Transfer Network

A shared infrastructure to sustainably optimise **technology transfer** throughout Europe: ROBO**TT-NET** exists to help make the best ideas in industrial robotics a reality; for the benefit of **technology developers** and **European manufacturing**.

ROBO TT NET
robot
technology
transfer
network



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tecnalia
mtc Manufacturing Technology Centre
Fraunhofer IPA

DIRA
Dansk Robot Netværk

FACTS

- DTI drives the secretariat for DIRA
- 150 company members (system integrators, suppliers, end-users)

ACTIVITIES

- 12+ inspiration tours at end-users, knowledge travels, DIRA Roadshow
- DIRA Automation Award – an annual award for best use of robots
- Member of IFR (Int. Federation of Robotics).

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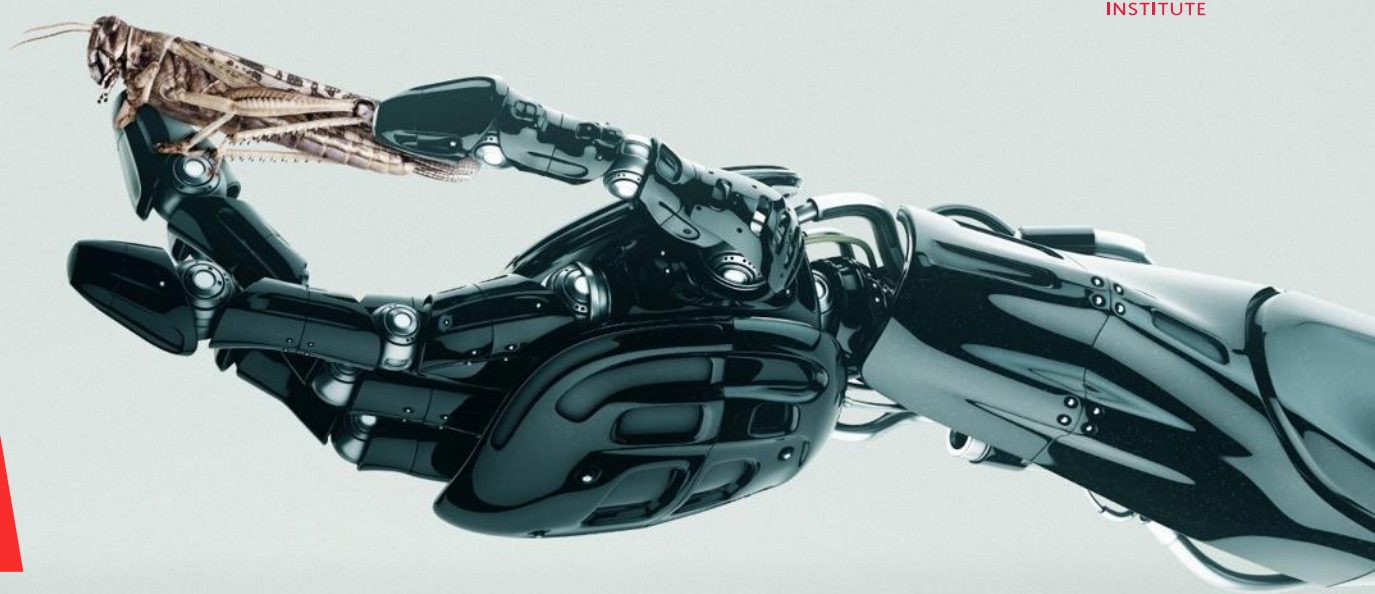

THANK YOU!

Jens Fynbo
Sektionsleder
jef@dti.dk

SIGN UP FOR OUR
ROBOTICS **NEWSLETTER!**

www.teknologisk.dk/robotnyhedsbrev

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