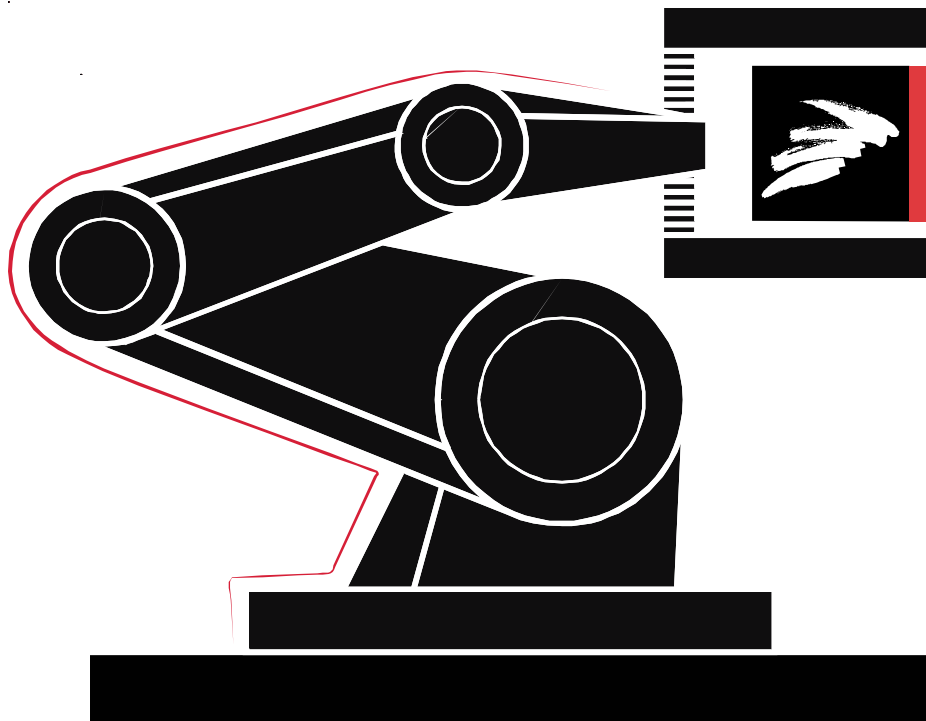
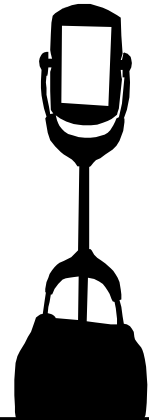
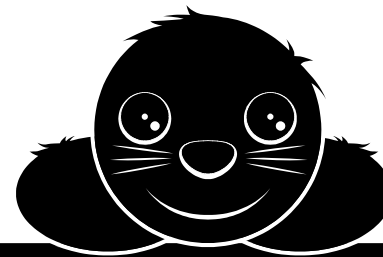


DTI, the Danish Technological Institute



# DANISH TECHNOLOGICAL INSTITUTE

CENTRE FOR ROBOT TECHNOLOGY



# Intro – DTI, the Danish Technological Institute <sup>1/6</sup>

Gunnar Gregersen, founder 1906 – DTI was born to be *the* innovation institute in Denmark!



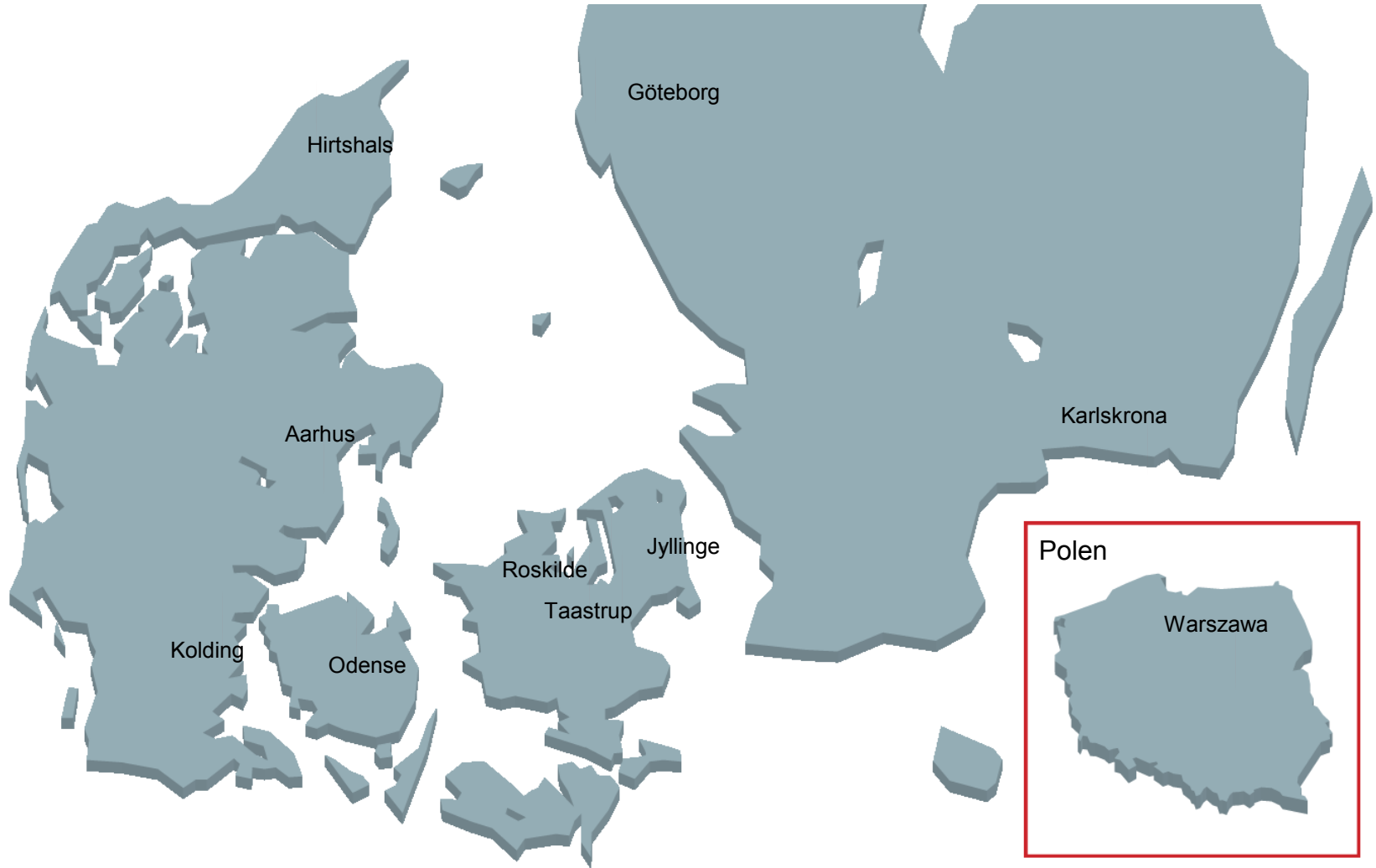
- “To support Danish industry, mainly SMEs, by providing technical assistance in the form of teaching, advice, testing and technological research”

- “Technological research - developed with the necessary scientific approach, but without the means of making science. The purpose is to develop new fields for manufacturing”

***Gunnar Gregersen***

# Intro – DTI, the Danish Technological Institute <sup>2/6</sup>

## Locations



### **BUILDING TECHNOLOGY**

Concrete  
Building Processes  
Indoor Climate and Building  
Examinations  
Masonry and Building  
Components  
New Industrialisation  
Swimming Pool Technology  
Textiles  
Wood Technology

### **BUSINESS DEVELOPMENT**

Policy and Business Analysis  
Human Resources  
Development  
Creativity and Growth  
Technology Partnership

### **PRODUCTIVITY AND LOGISTICS**

Automobile Technology  
Packaging and Logistics  
Production  
Robot Technology

### **DANISH MEAT RESEARCH INSTITUTE (DMRI)**

Hygiene and Conservation  
Measuring Systems and Data  
Integration  
Processing Quality  
Slaughtering Technology

### **LIFE SCIENCE**

DTI Oil & Gas  
Fisheries and Environmental  
Technology  
Food Technology  
Chemistry and Microbiology  
Laboratory for Microbiology

### **TRAINING**

IT Training  
Conferences  
Management

### **ENERGY AND CLIMATE**

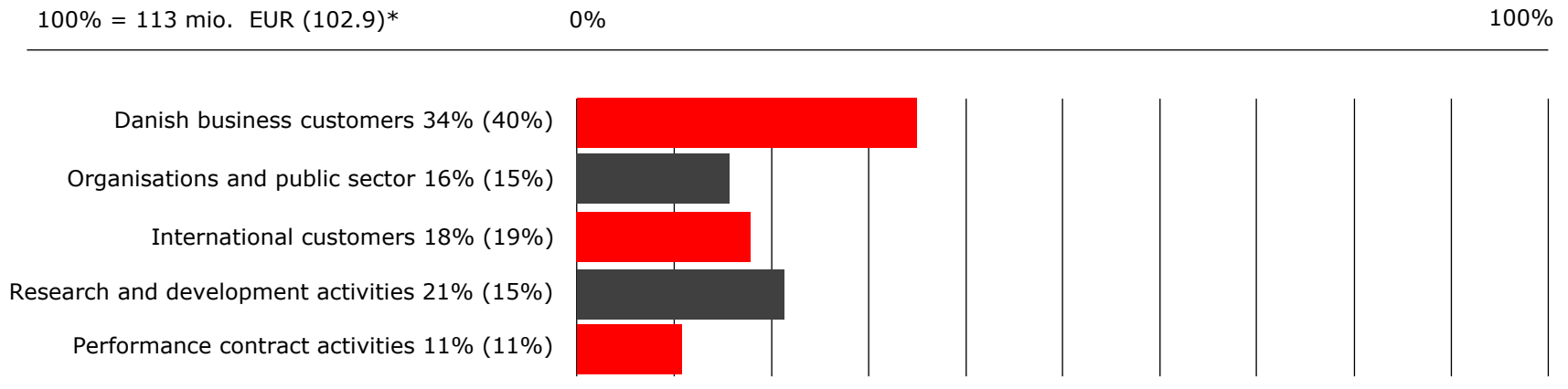
Energy Efficiency and  
Ventilation  
FEM-Secretariat  
Installation and Calibration  
Refrigeration and Heat  
Pump Technology  
Pipe Centre  
Renewable Energy and  
Transport

### **MATERIALS AND PRODUCTION**

Materials Testing  
Microtechnology and  
Surface Analysis  
Metrology and Quality  
Plastics Technology  
Product Development  
Tribology

### **INTERNATIONAL CENTRE**

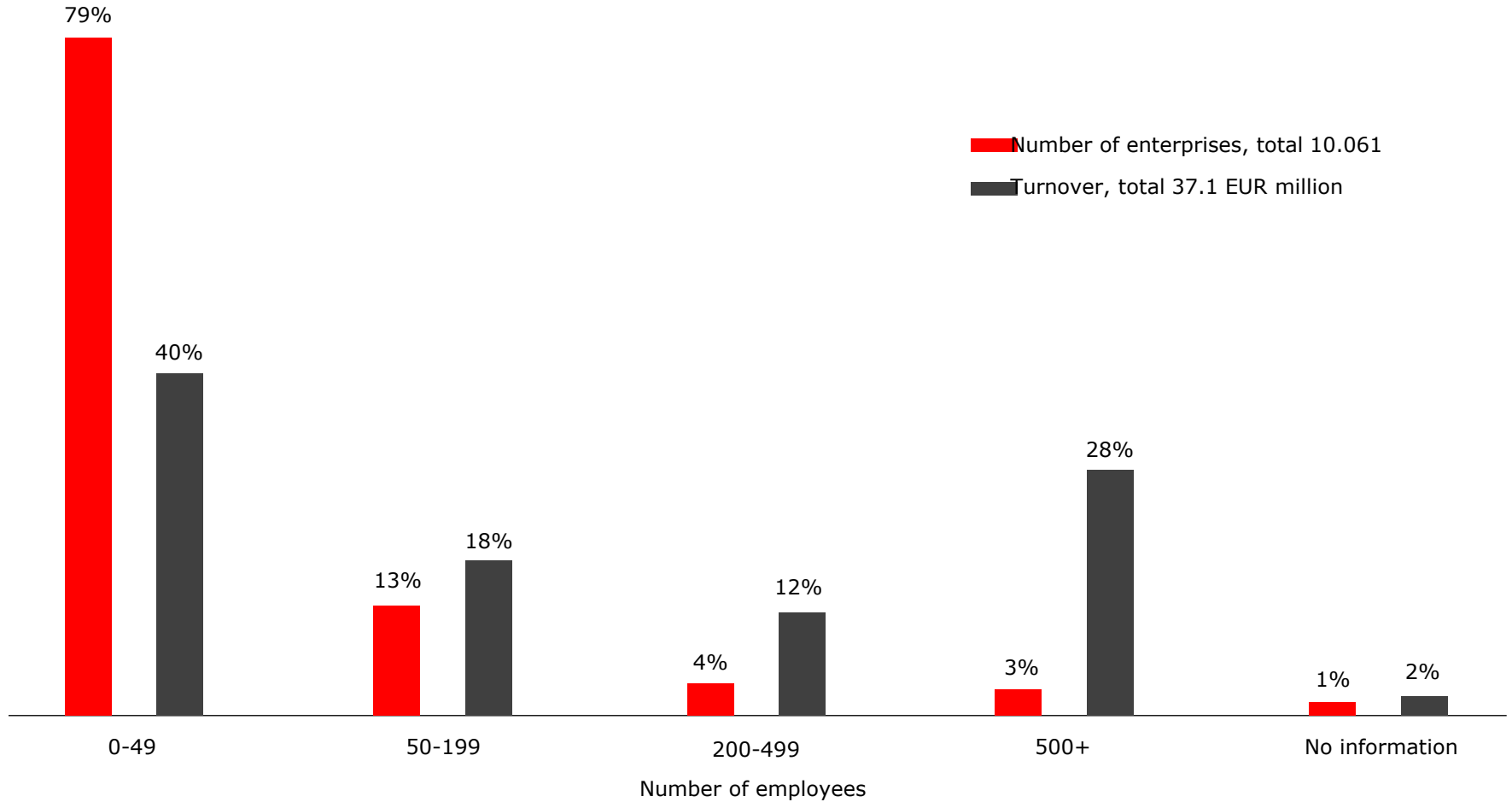
## Turnover



\*The figures in parentheses refer to 2008

# Intro – DTI, the Danish Technological Institute <sup>5/6</sup>

Focus on Small- and Medium sized Enterprises (SME)



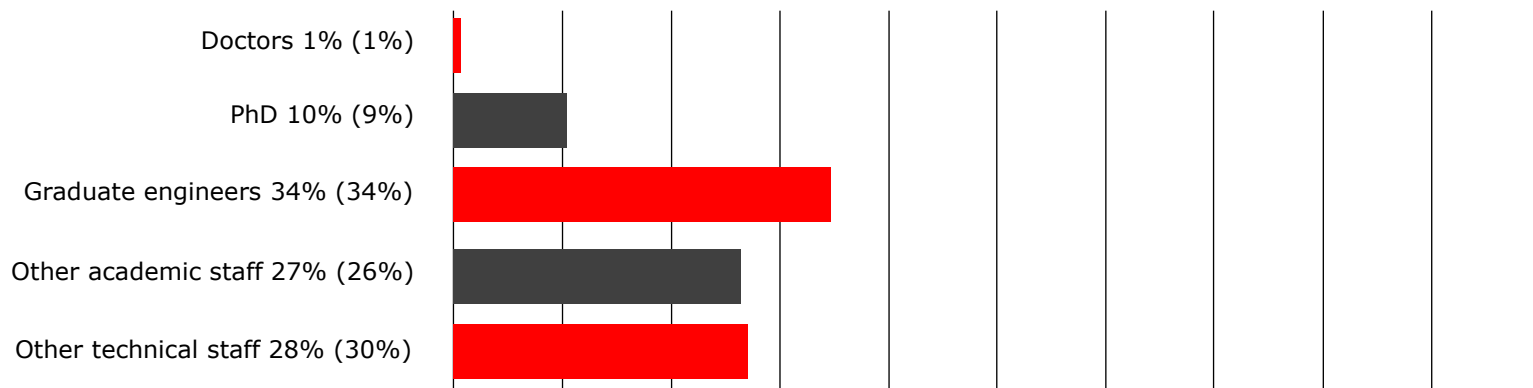
# Intro – DTI, the Danish Technological Institute <sup>6/6</sup>

## Highly educated employees

100% = 849 academically  
qualified staff members (724)\*

0%

100%



\*The figures in parentheses refer to 2008

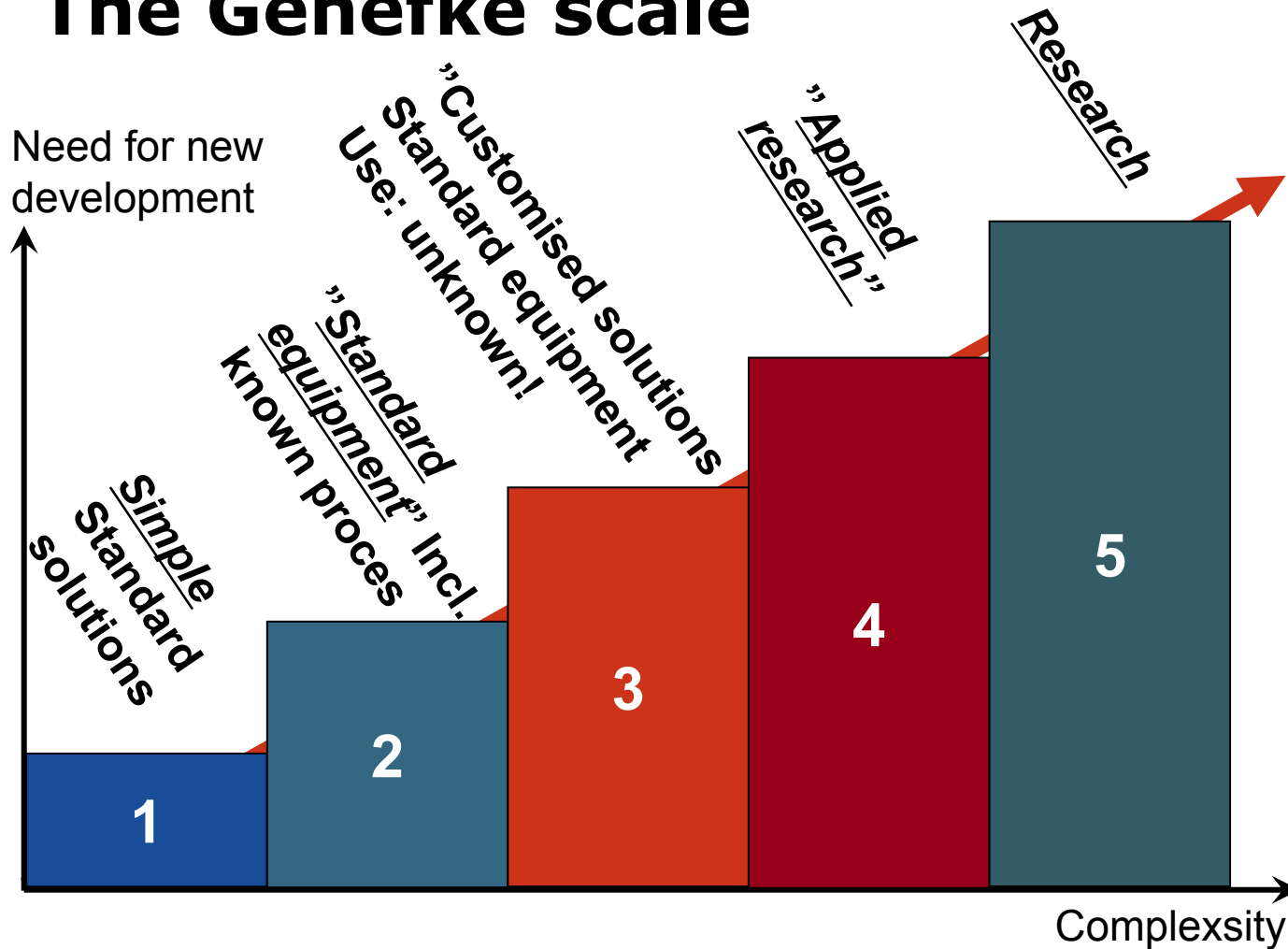
# Intro – DTI's Centre for Robot Technological Institute

Facilities, Staff, Labs, Segments

- 50+ robot experts
- Focus on innovation – new solutions
  
- 25+ innovation projects
- 50+ service-delivery projects
  
- 1.100 m<sup>2</sup> labs (new in 2010)
- 15.000 users per year
  
- Manufacturing & Food Industry
- Health Care & Welfare
- Education, Entertainment & Events
- Energy & Climate
- Buildings & Urban Spaces
- Agriculture, Horticulture & Green Houses



## The Genefke scale



# How do we aim at level 4 and higher?

- Seeking new borders in new projects
- Having focus on thinking out of the box
- Testing equipment on and on their way into the market
- Trying to bundle technologies in new combinations
- Close corporation with University
- Creating the link – University to Companies

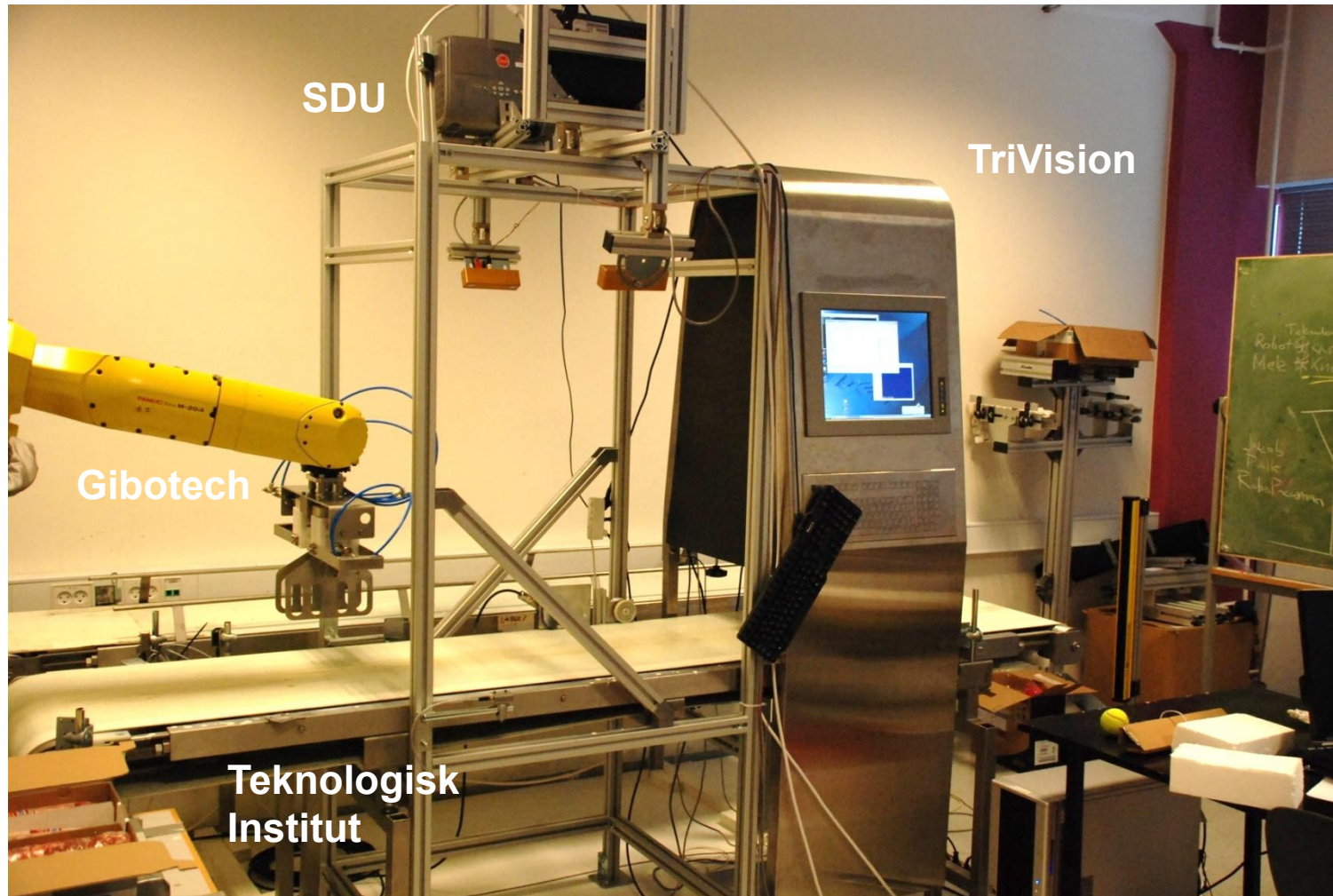
# What triggered the project: Intelligent Robot for Handling of Flexible Objects

- An ongoing project Robo-Packmann
- Partners: Giben Scandinavia, TriVision, Danish Crown, University of Southern Denmark & Danish Technology Institute
- Fund Financing made by Danish Directorate for Food
- Focus were to archieve a simple robotics platform which could solve some of the packaging problems handling meat in a slaughterhouse
- Professor Henrik Gordon Pedersen/SDU-MMMI and Claus Risager/DTI saw the need for handling of flexible objects to

# Example – Project Robo-Packman 2008-2010

- We started low – level 2 – to get everything to “play”
- Very simple gripper technology
- 2 types of vision – to compare results and learn
- A standard robot “from the shelf”
- Design of the cell connected to reallife

# Robot cell for testing



**Projekt  
Robo-Packman  
Februar 2010**

# Intelligent Robots for Handling of Flexible Objects - IRFO

European Union  
European Regional  
Development Fund  
Investing in your future



*The project that runs across the Danish-German border is sponsored by the INTERREG 4A programme Syddanmark-Schleswig-K.E.R.N and The European Union's "The European Regional Development Fund".*

**INTERREG4A**  
SYDDANMARK-SCHLESWIG-K.E.R.N.





Leadpartner:

- **Danish Teknological Institute**, Center for Robottechnology

Danish partner:

- **University of Southern Denmark**  
Maersk Mc-Kinney Moller Institute



Danish partner:

- **University of Southern Denmark**  
The Mads Clausen Institute



German partner:

- **Christian-Albrechts-Universität zu Kiel**  
Institut für Informatik



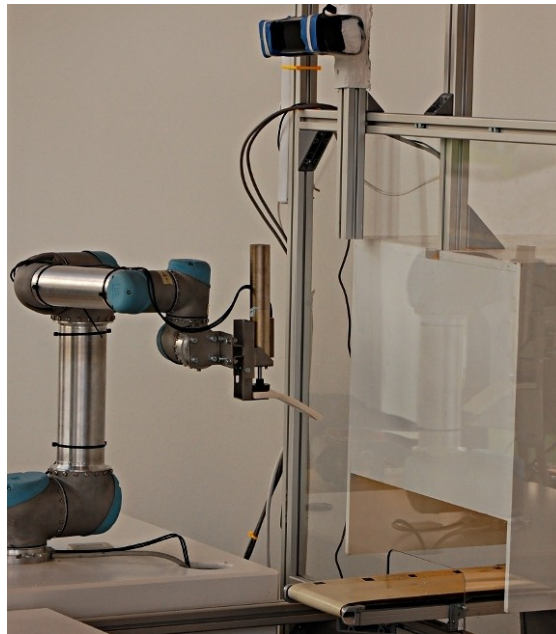
European Union  
European Regional  
Development Fund  
Investing in your future



# Tasks in overview



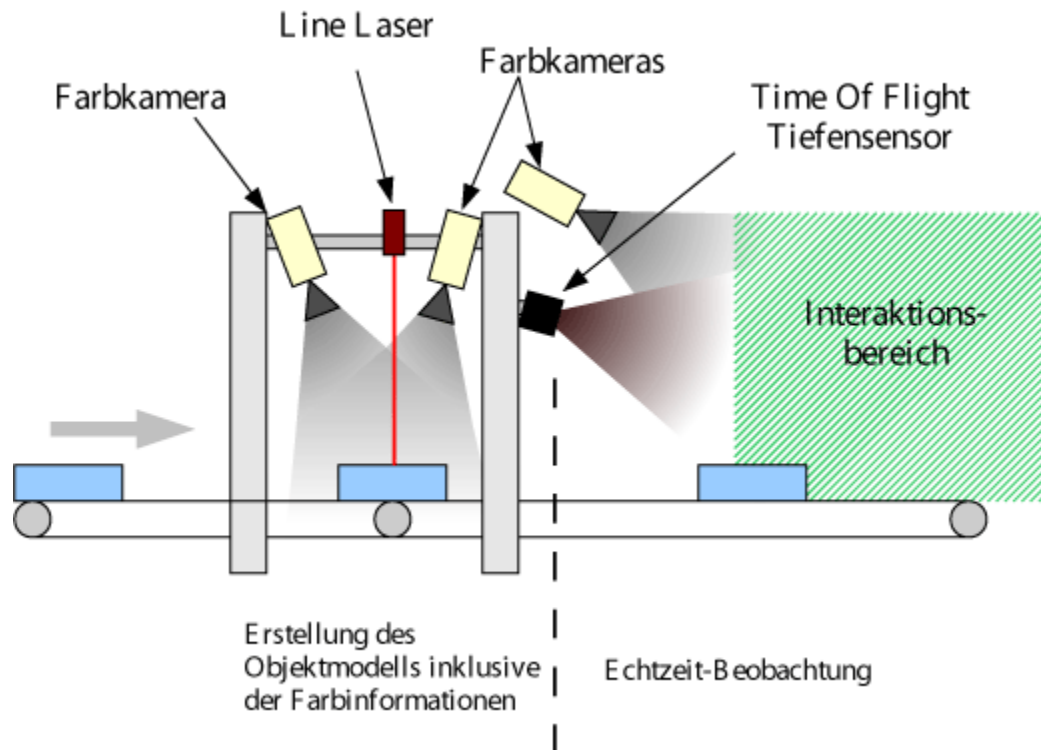
- Extracting the information of the object using visual sensing
- Mathematically calculate the deformation and deflection of the object – make a prediction for grasping
- Use tactile sensing to help the robot to grasp
- Adapt learning to the robot by both practising and simulation



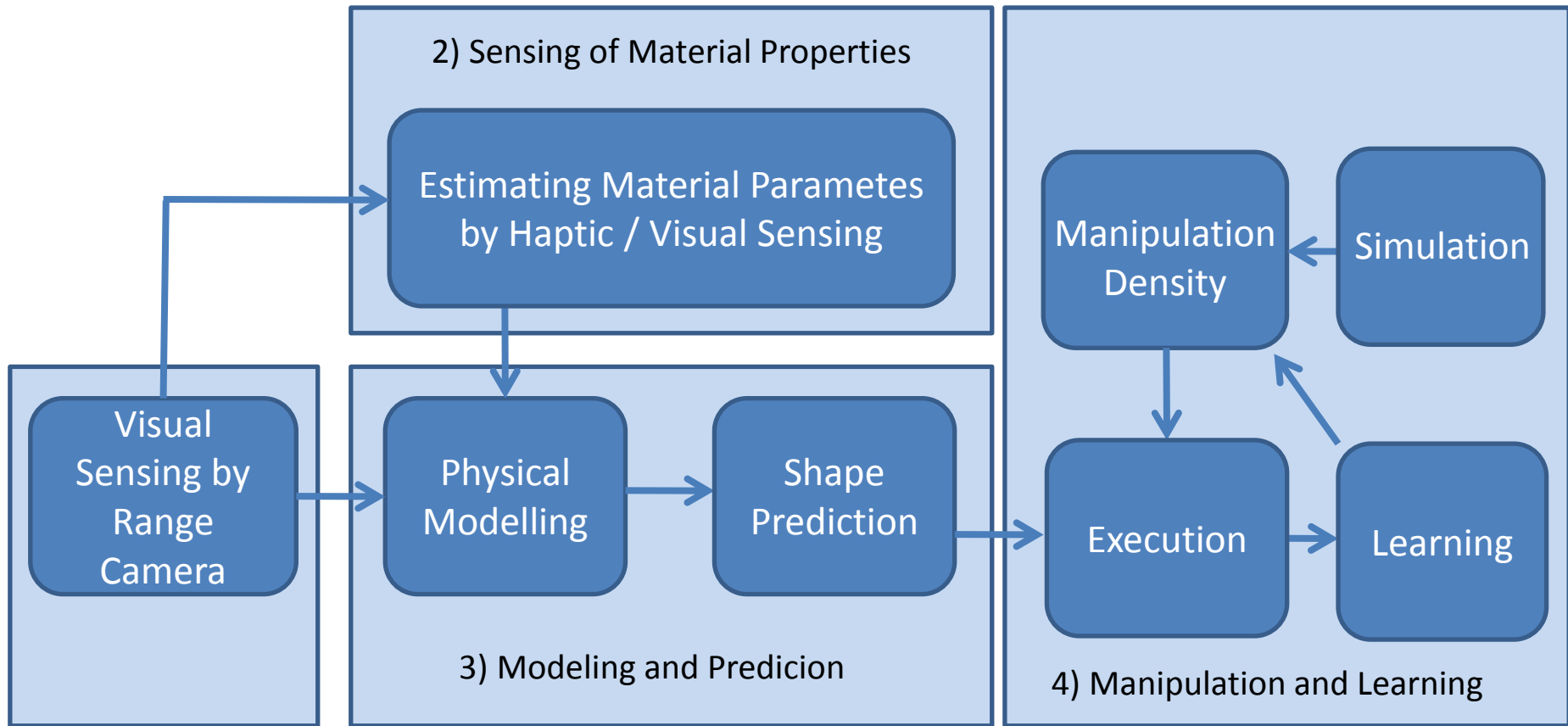
# Setup Overview as planned 2009

**Christian-Albrechts-Universität zu Kiel**

Institut für Informatik 



# Diagram of proces for extraction and manipulation of objects



Where can this technology be applied in the future?

- Slaughterhouses for handling of cut meat
- Productionlines for fish
- Productionlines for poultry
- Handling and packaging of vegetables
- Convenience food packaging where costumer demands are high
- All homogenous and flexible objects - handling and packaging
- Plus? New areas will arrise.



Thank you for Your patience.

Project: Intelligent Robots for Handling of Flexible Objects

Next in the program will be:

Vision system for 3D object capture (Informatik, CAU Kiel)

European Union  
European Regional  
Development Fund  
Investing in your future

