

Digital technologies and assistance systems in the workplace of the future

Simon Schumacher, 4th of July 2018



Agenda

- 1 **Future of work challenge**
- 2 **Innovation lab for work, people and technology**
- 3 **Highlights and milestones**
- 4 **Use cases from applied research**
- 5 **Outlook**

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Driver of the transformation of work

The focal points of work have changed

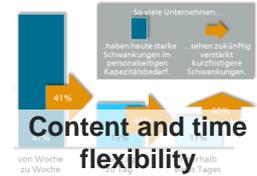
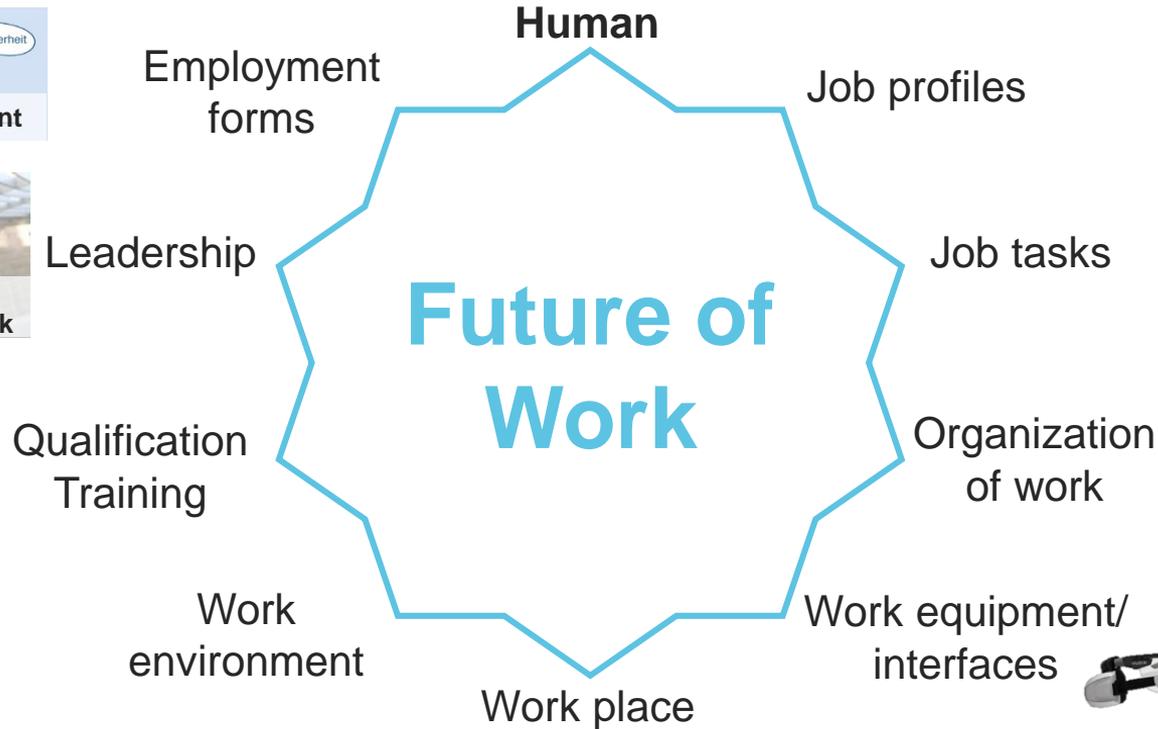


Technology and digital systems

Organizations and business models

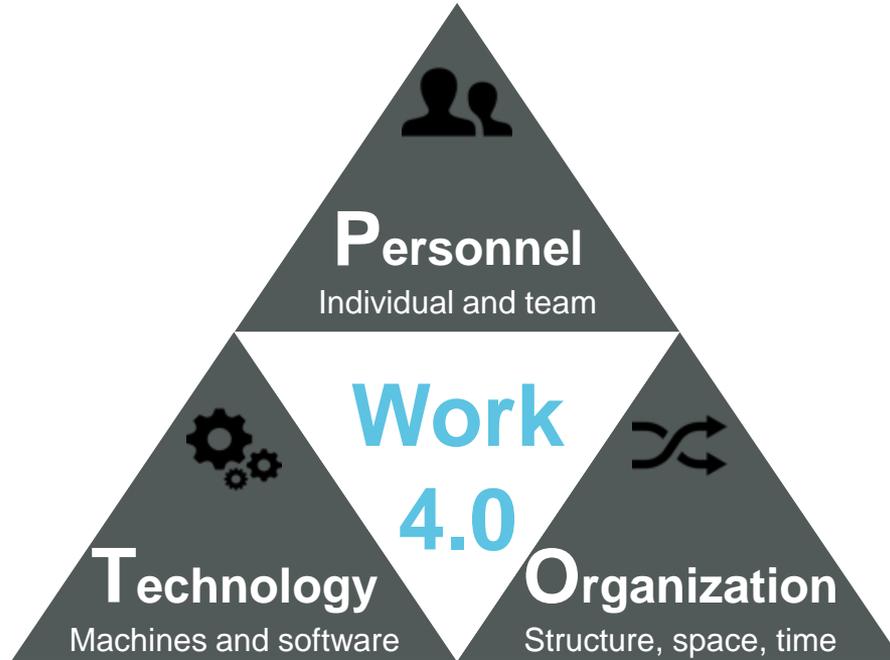
Digital Transformation and Future of Work

How does industrial work of the future look like?



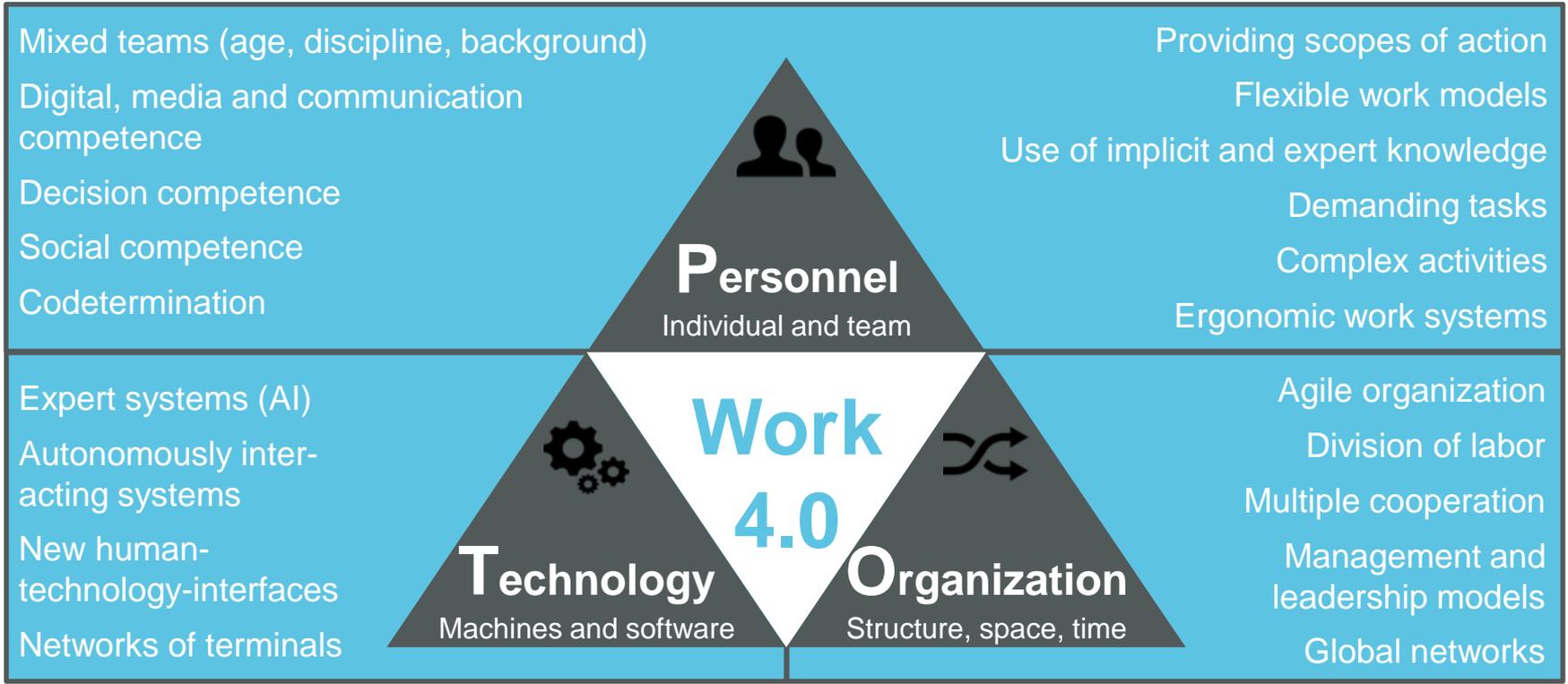
The traditional triangle of work T-O-P

Is still valid...



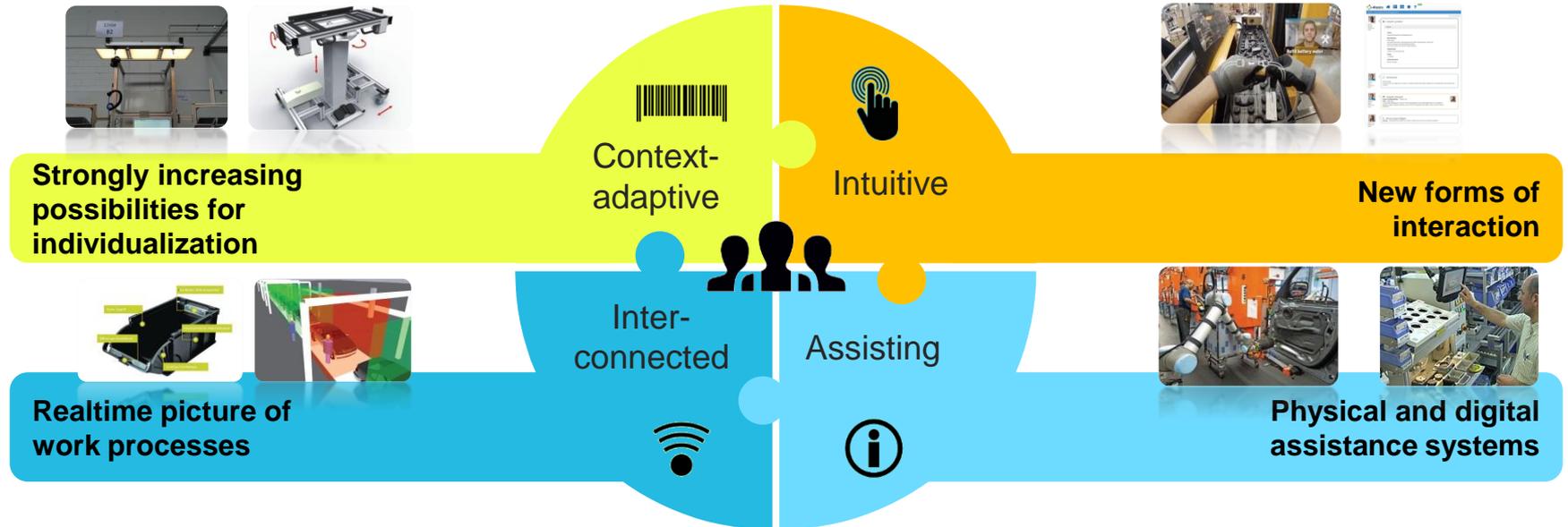
...but in a redefined way!

Many new elements define Work 4.0



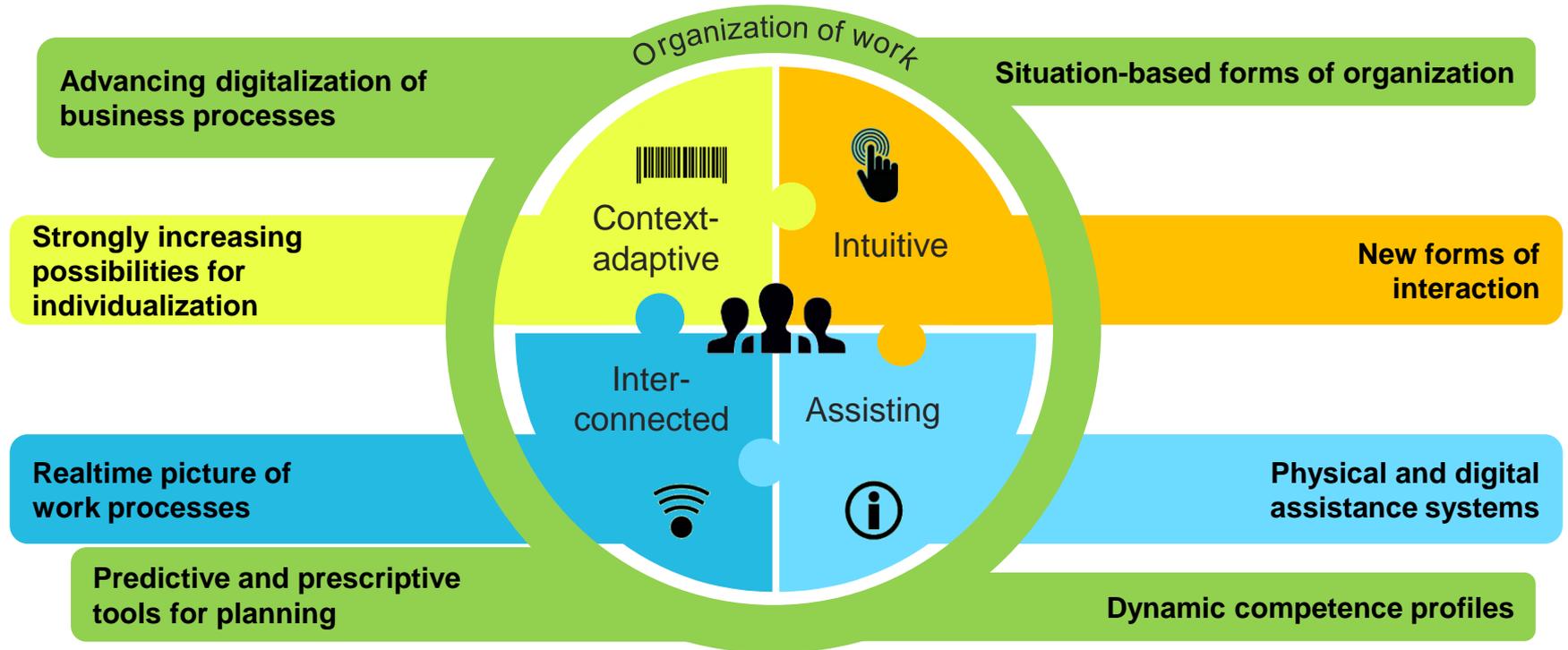
Work design trends are changing

Workplaces will be smart, organization of work will be digital



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Workplaces will be smart, organization of work will be digital



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Research partners in the Future Work Lab

Fraunhofer IAO and Fraunhofer IPA as well as the University of Stuttgart

Fraunhofer Institute for
Industrial Engineering
IAO



Foundation:

IAO 1981

IAT 1991

Head of Institute:

Prof. Dr.-Ing.
Wilhelm Bauer

Financials and Staff (2016):

€ 38.5 mio total operating budget, 34% industrial revenues
660 staff members

Institute of Human Factors and
Technology Management IAT,
University of Stuttgart



Fraunhofer Institute for
Manufacturing Engineering
and Automation IPA



Foundation:

IPA1955

IFF 1935

Head of Institute:

Prof. Dr.-Ing.
Thomas Bauernhansl

Financials and Staff (2016):

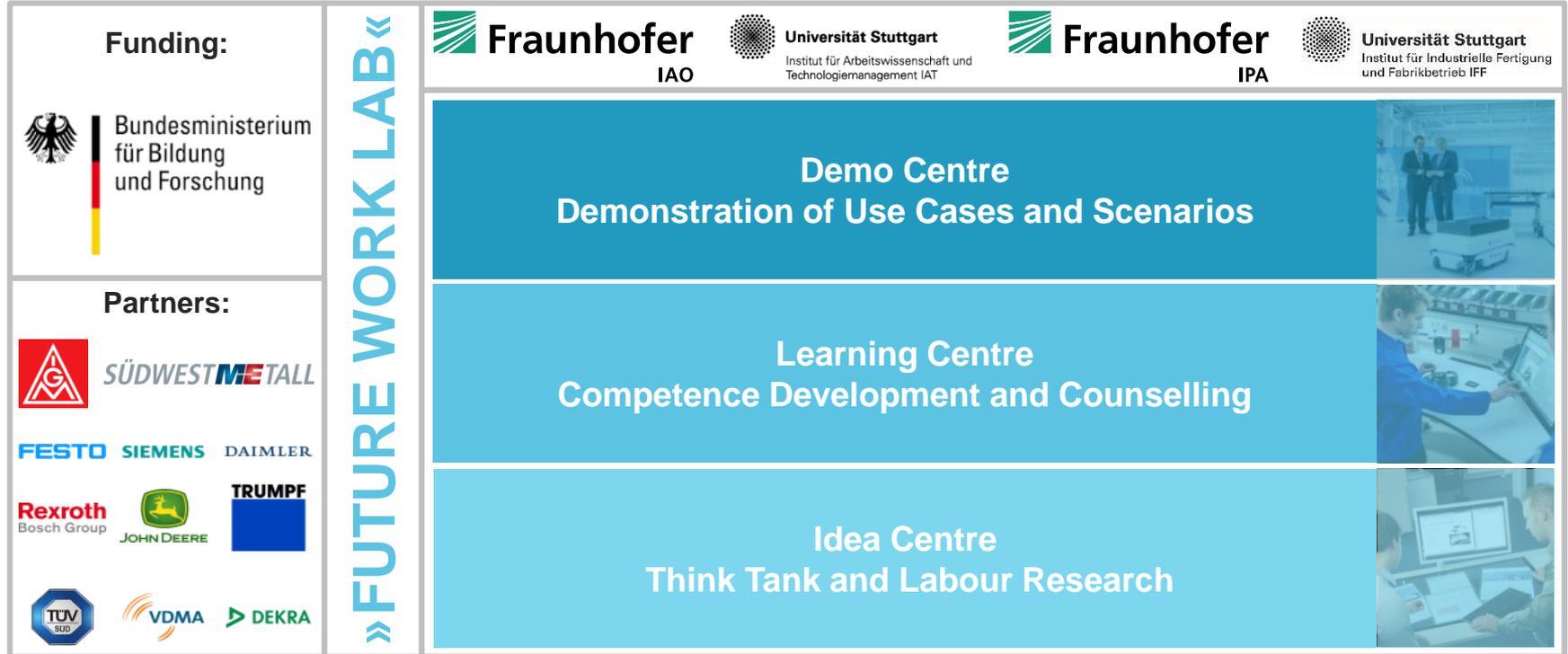
€ 70.8 mio total operating budget, 36% industrial revenues
1,145 staff members

Institute for Industrial
Manufacturing & Management
IFF, University of Stuttgart



Future Work Lab – organization

Innovation lab for work, people and technology at Fraunhofer Stuttgart



Future Work Lab at ARENA2036

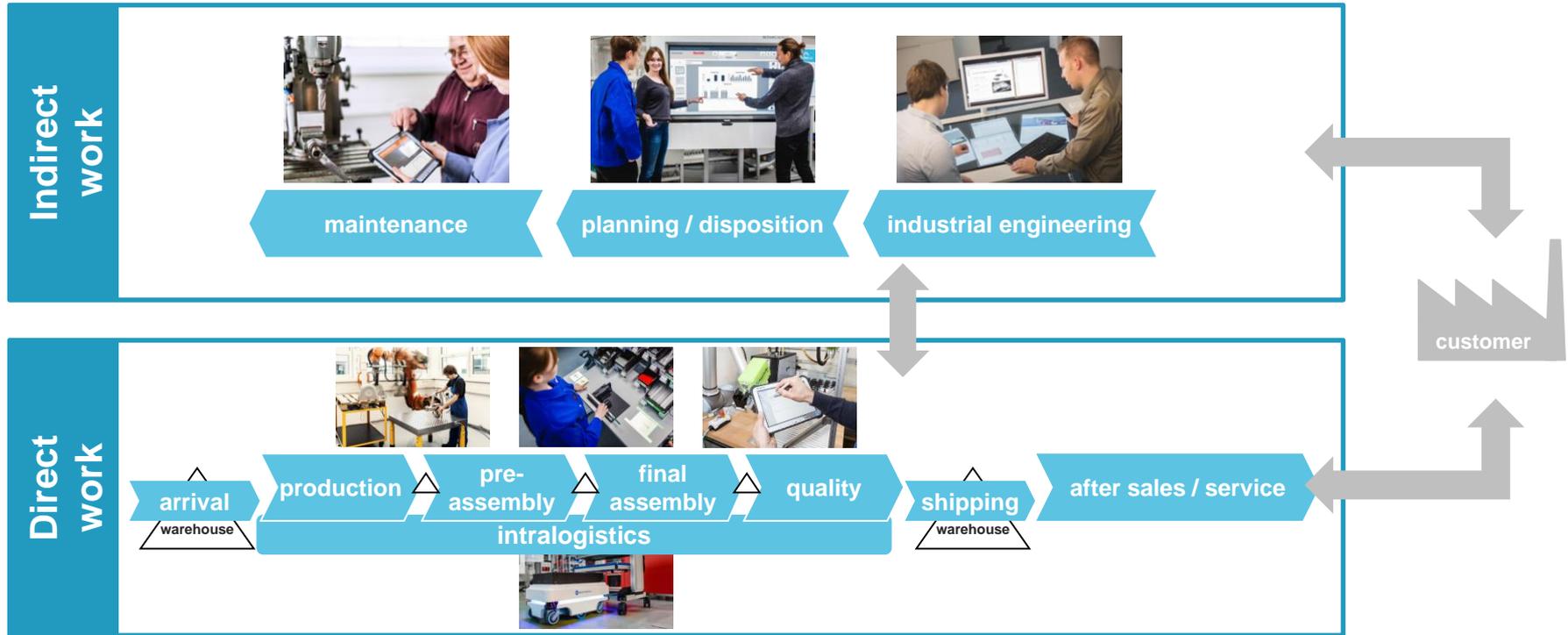
Industry on campus for research on future automotive production

- Biggest research campus for the future of automotive research in Europe
- Collaboration centre of companies, start-ups and research institutions
- Accelerator for start-ups in mobility and smart production
- Factory Size
> 7,000 m²
- Future Work Lab
> 1,000 m²



Future Work Lab – demo center

Demo center for all disciplines of the value chain



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Application Case: Future Work Lab as a Living Lab

Development of demonstrators

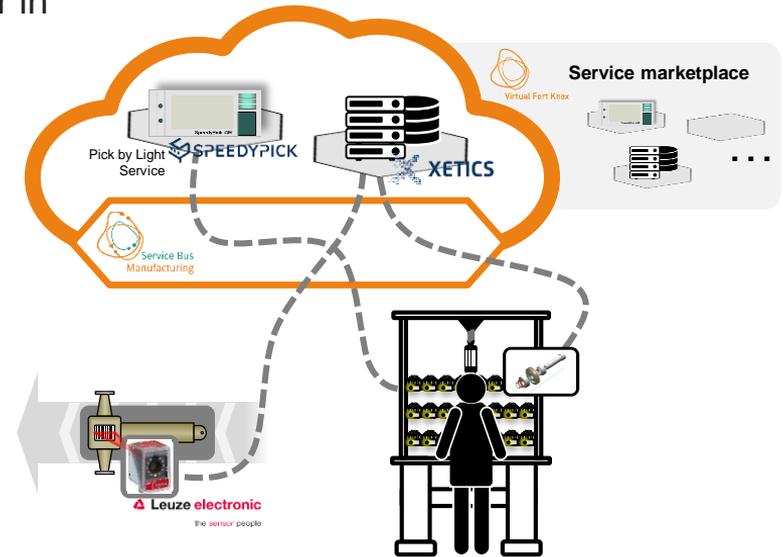
- Demonstrator for cloud-based assistance of the worker in quality assurance jobs

- Development with structured, iterative process:



- Involvement and co-creation of various stakeholders:

- Industry and direct users **FINCONS GROUP** **Leuze electronic**
the sensor people
- Startups **XETICS** **SPEEDYPICK** **Virtual Fort Knox**
- Research institutions **Fraunhofer IPA** **Universität Stuttgart**
- Networks and dissemination **EU** **I4MS** **FOF** **BE in CPPS**



[Götz, 2018]

Application Case: Future Work Lab as a Living Lab

Development of demonstrators

- Assistance system for manual workshop works with disabilities using optical 3D sensors (AMBOS-3D)

- Development with structured, iterative process:



- Involvement and co-creation of various stakeholders:

- Industry and direct users



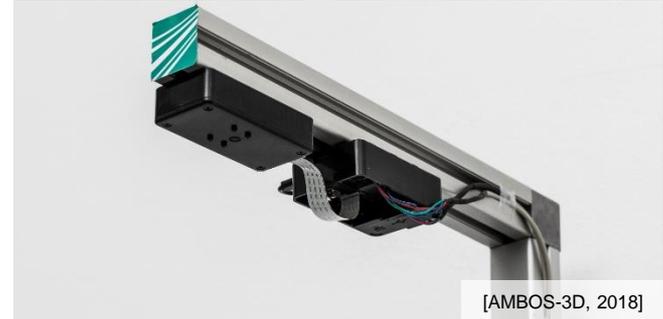
- Startups and maker community



- Research institutions



- Networks and dissemination



[AMBOS-3D, 2018]

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Robotic Home Assistant Care-O-bot®

Evolution of a complex assistance system over decades

- Assistance with household chores
- Multimedia, social integration
- Fetch- and carry services
- Safety, monitoring
- Home Management

Care-O-bot I (1998)



Care-O-bot 2 (2002)



Walking support,
mobile manipulation

Care-O-bot 3 (2008)



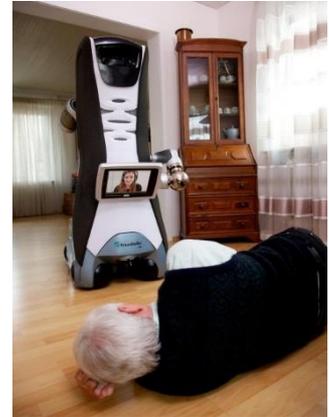
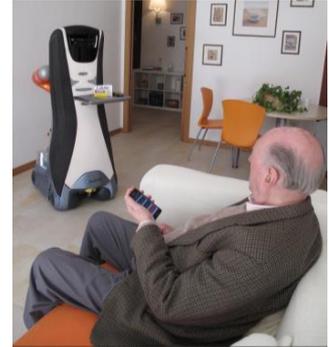
Product vision

Care-O-bot[®] 3

Useful assistance in various scenarios

- Product vision of a robotic home assistant to assist people in their daily life
 - Abilities:
 - Navigates safely even in dynamic everyday environments
 - Learns, detects and grasps different objects automatically
 - Safely exchanges objects with persons using its tray
 - Interactive butler: Take orders, deliver snacks and drinks
 - Emergency assistance: robot used to communicate with emergency centre, support diagnosis with local sensors, support additional measures
- Field tests in elderlies' private homes and care homes

Video link: <http://www.youtube.com/watch?v=ABpOtvLzh2U>



Care-O-bot[®] 4: modular, agile and interactive



Video at
<http://www.youtube.com/watch?v=3n42WbbYGZI>

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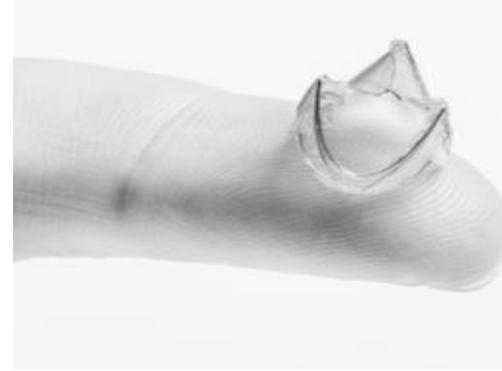
Biomechatronic Systems

Fields of applied research at Fraunhofer IPA and Future Work Lab



Biomechanic & Simulation

- Motion analysis
- Human body loads
- Ergonomics solutions
- FE simulation

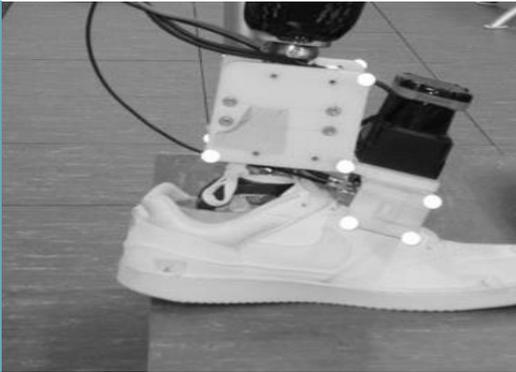


Test & Design

- Medical devices
- Mechanical testing
- Prosthetics
- Orthotics
- Bionics engineering

Motion Sensors

- Human movement detection
- Radar sensors
- Inertial sensors
- Sensor fusion concepts



Drive Systems & Exoskeletons

- Exoskeletons
- Mechatronic assistive solutions
- Electromechanical drive systems



Stuttgart Exo Jacket

Active driven exoskeleton for upper extremities

- Lifting and carrying tasks
 - Reduction of body loads
 - prevention of work-related diseases
- Modular concept
(active/passive support, leg/wrist/neck modules)
- Active support of elbow and shoulder
- full freedom of movement
- Battery pack exchangeable
- individually adjusted to the user



Video: Ergonomics and Stuttgart Exo Jacket



Work safety with digital measures

Active accident detection



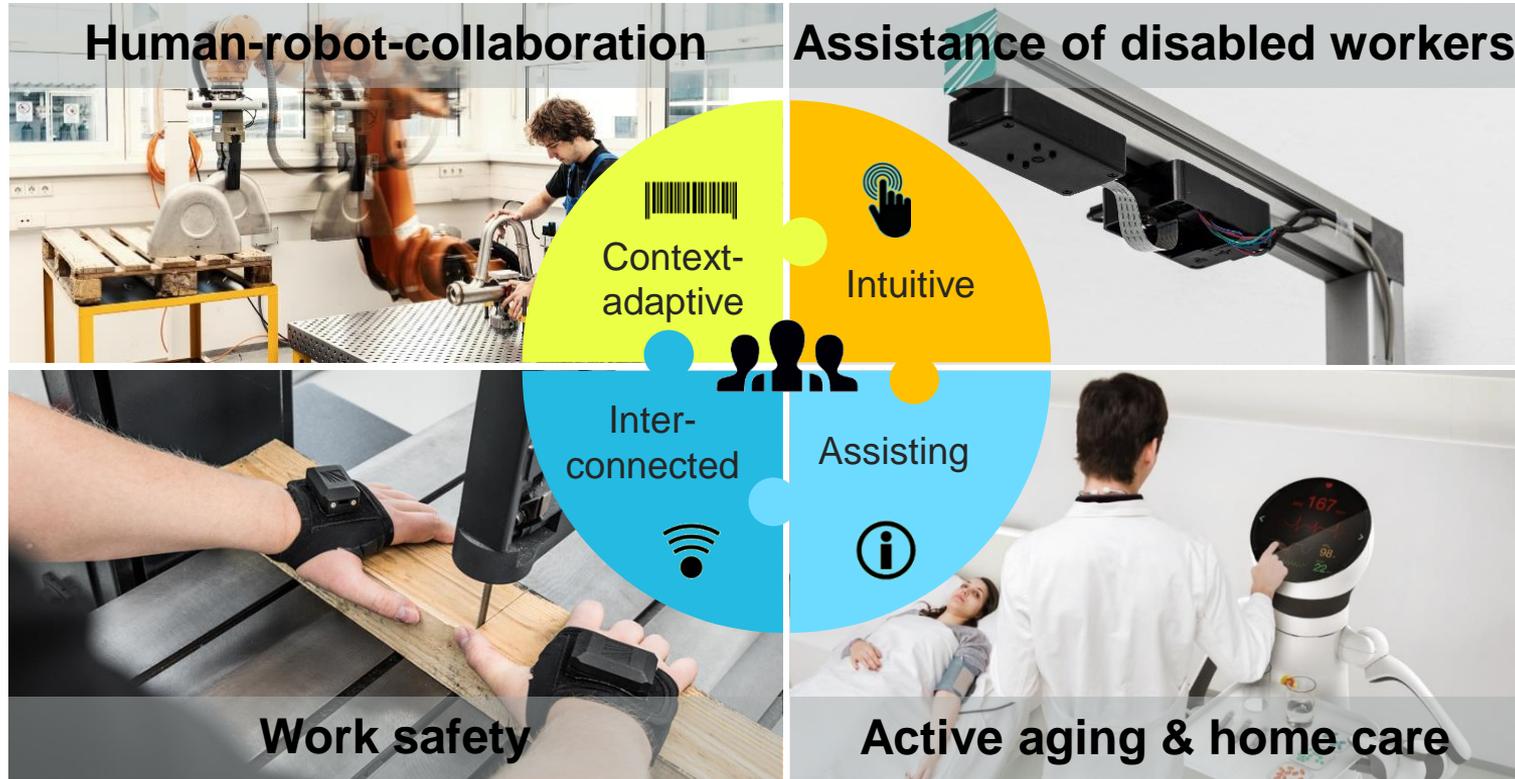
Active accident prevention



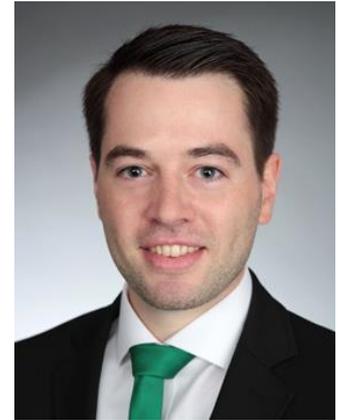
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Digital transformation in the workplace



Contact



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