Future of the Factory

Christoph Hanisch
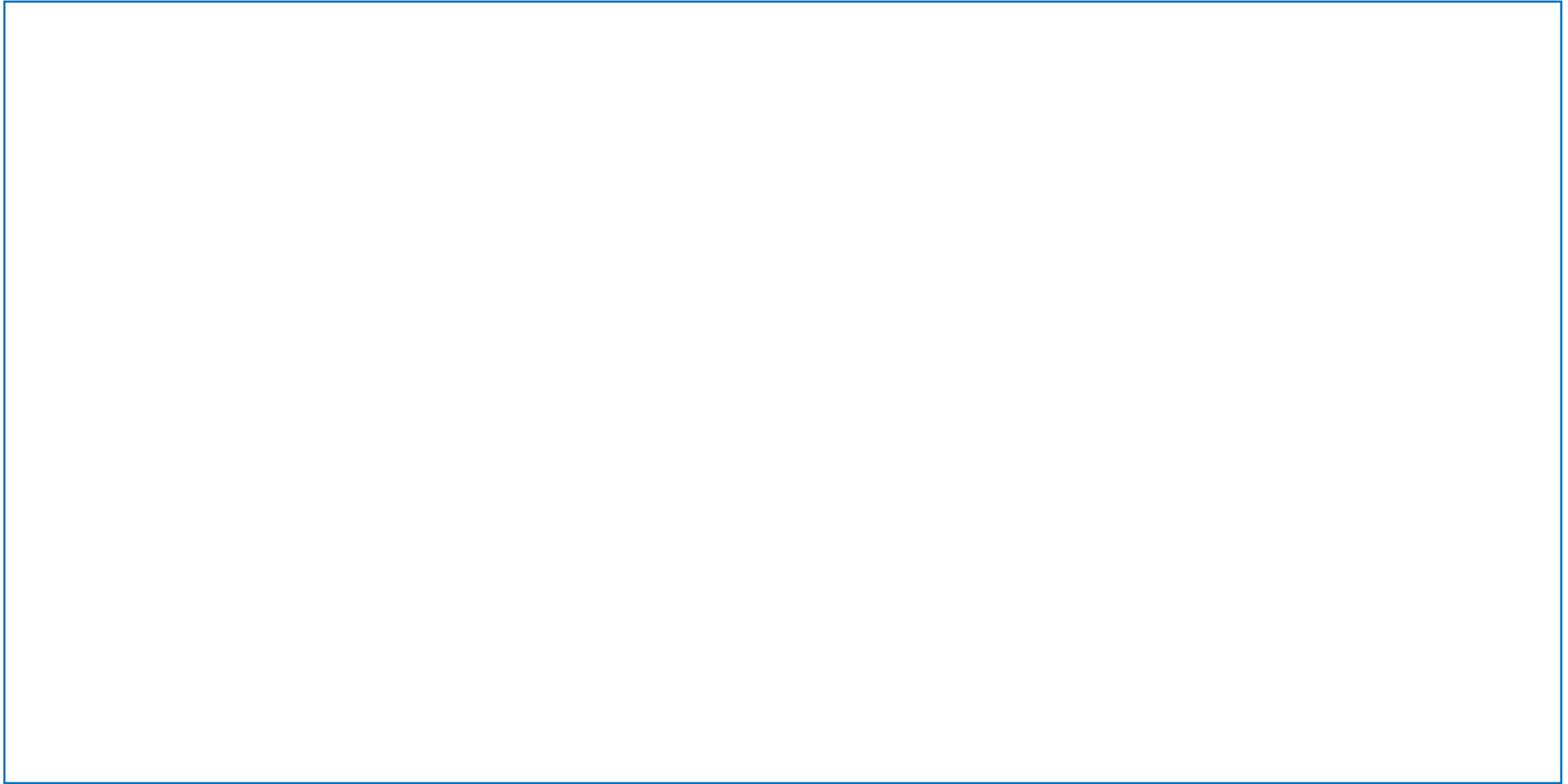
Esslingen

Germany

03.08.2016

Goethe

گوته

کوته

Agenda

Where I come from
A brief description of my work in technology
Research topics and aspects of research work
ManuFuture – or factory of the future
Time scale and the underlying mental process
Future of the Factory

Where I come from

Where I come from (German (my) history)

West Germany

East Germany

Where I come from

Festo – an independent family enterprise

Festo TechnologieCenter und Headquarter, Esslingen

Festo Factory and Customer Service Center, St. Ingbert

Some facts and figures

- Automation technology, training systems, services and consulting
- turnover 2.4 b€
- 18.000 employees globally
- R&D 8,5 % of turnover
- training and education 1,5 % of turnover

Our business

A brief description of my work in technology
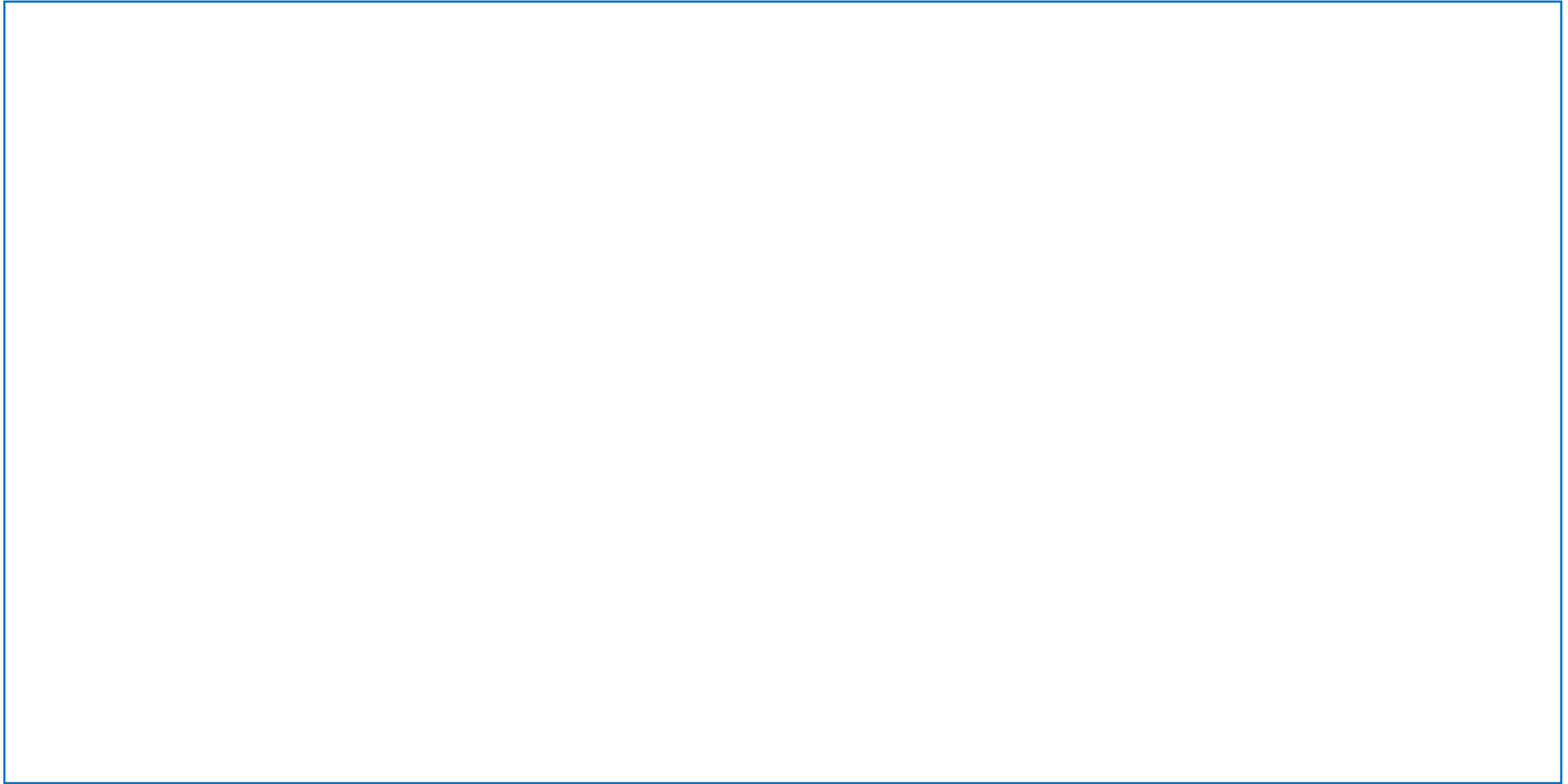
Future Technology
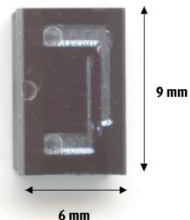
Micro system technology used for industrial products

- Fluidsensors
- MEMS design
- Micro actors

- study of basics
- preparation of design rules / methods for qualification
- prototypes

9 mm

6 mm
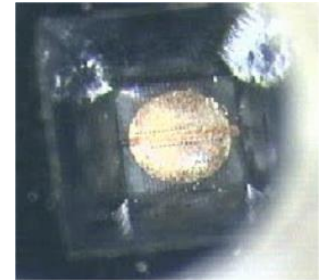
MS6-SFE

Key aspects

Function integration
Control on board (autonomous devices?)
Flexible machines and flexible systems
Exchangable systems

How to employ technology for human occupation

…. **Industrie 4.0**

Illustration for function integration

Starting point: kit of modular components
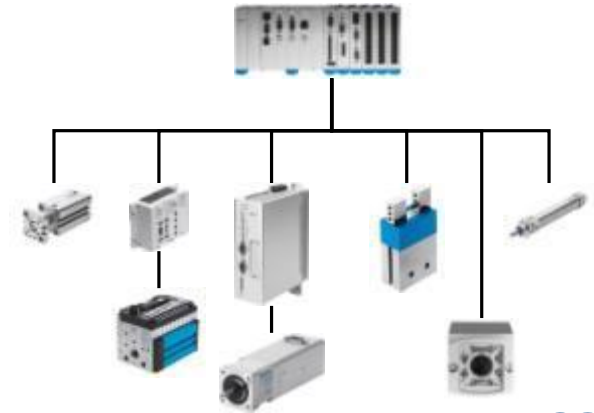
Change to combined modules with decentralised control
- ► Increased reusability
- ► Easy to excange
- ► Less time for the physical building
- ► Reduction of rampup time
- ► Redution of complexity
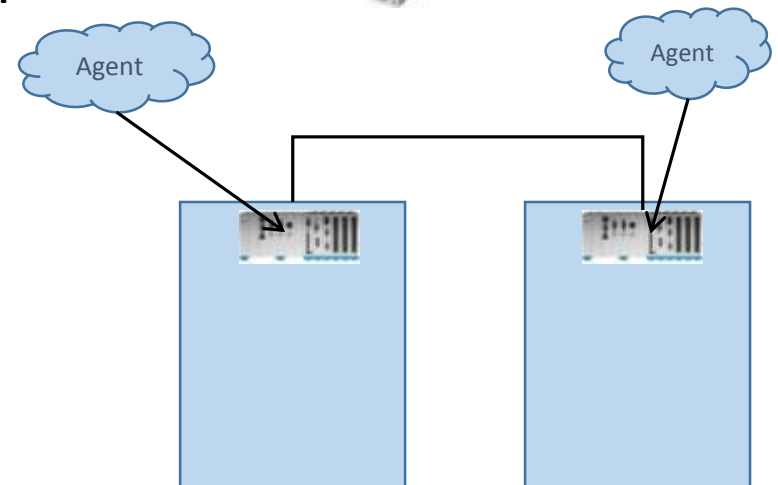
Illustration for „autonomous" machines

**Demo line PV2 –EUPASS
built on decentral agent
control**

Industrie 4.0 – slowly surfacing to reality

Scharnhausen Festo Technology Plant

New concepts:
Logistics
Energy supply
Automation
Human in the loop
…

Research topics and aspects of research work
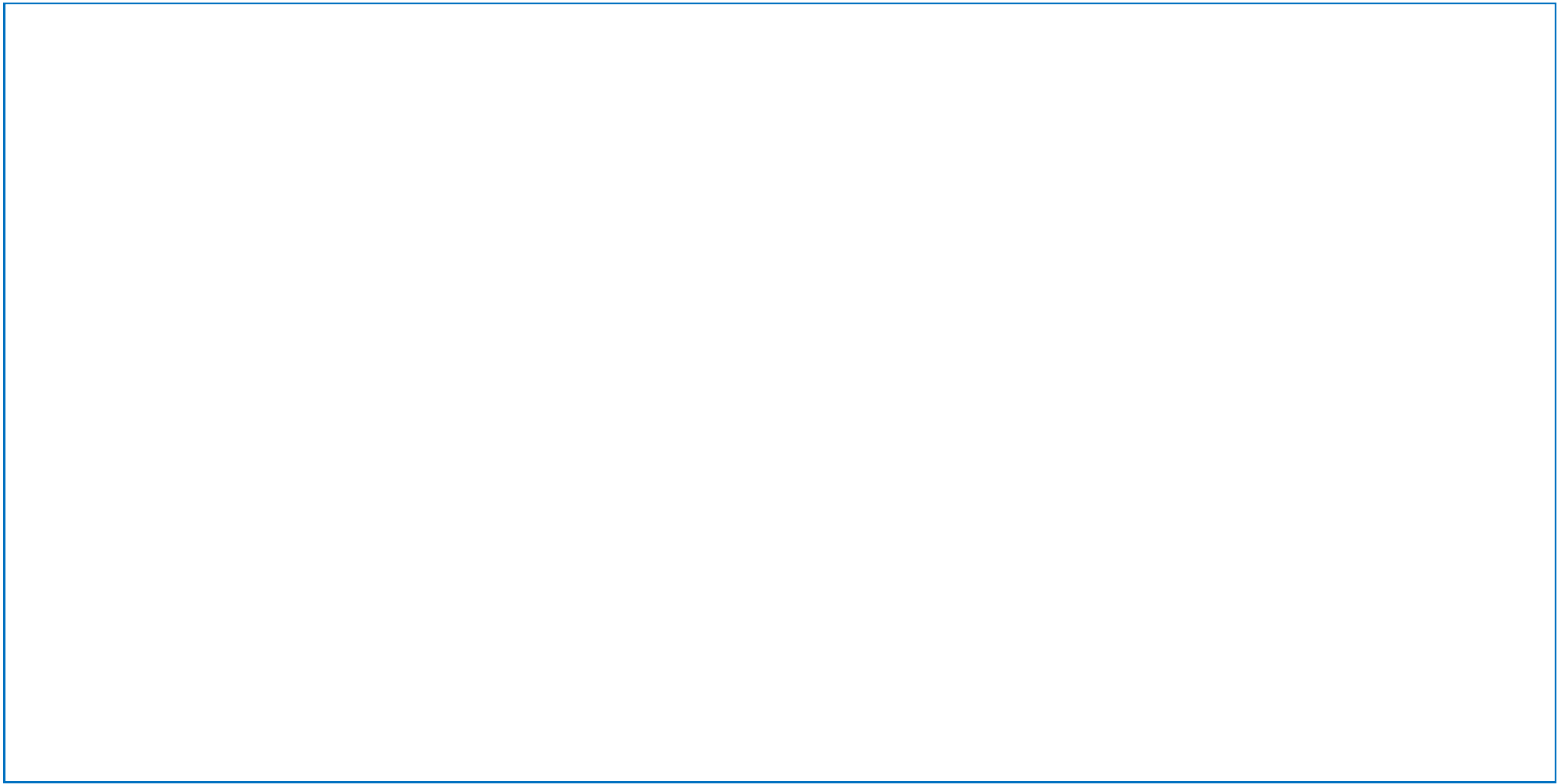
Research topics (ingredients of the industrial revolution)

Theoretical models

Materials

FOCUS

Mechanics

Electronics

Technological processes

IT – control + software

+ ....

human

economic

brackets

consequences
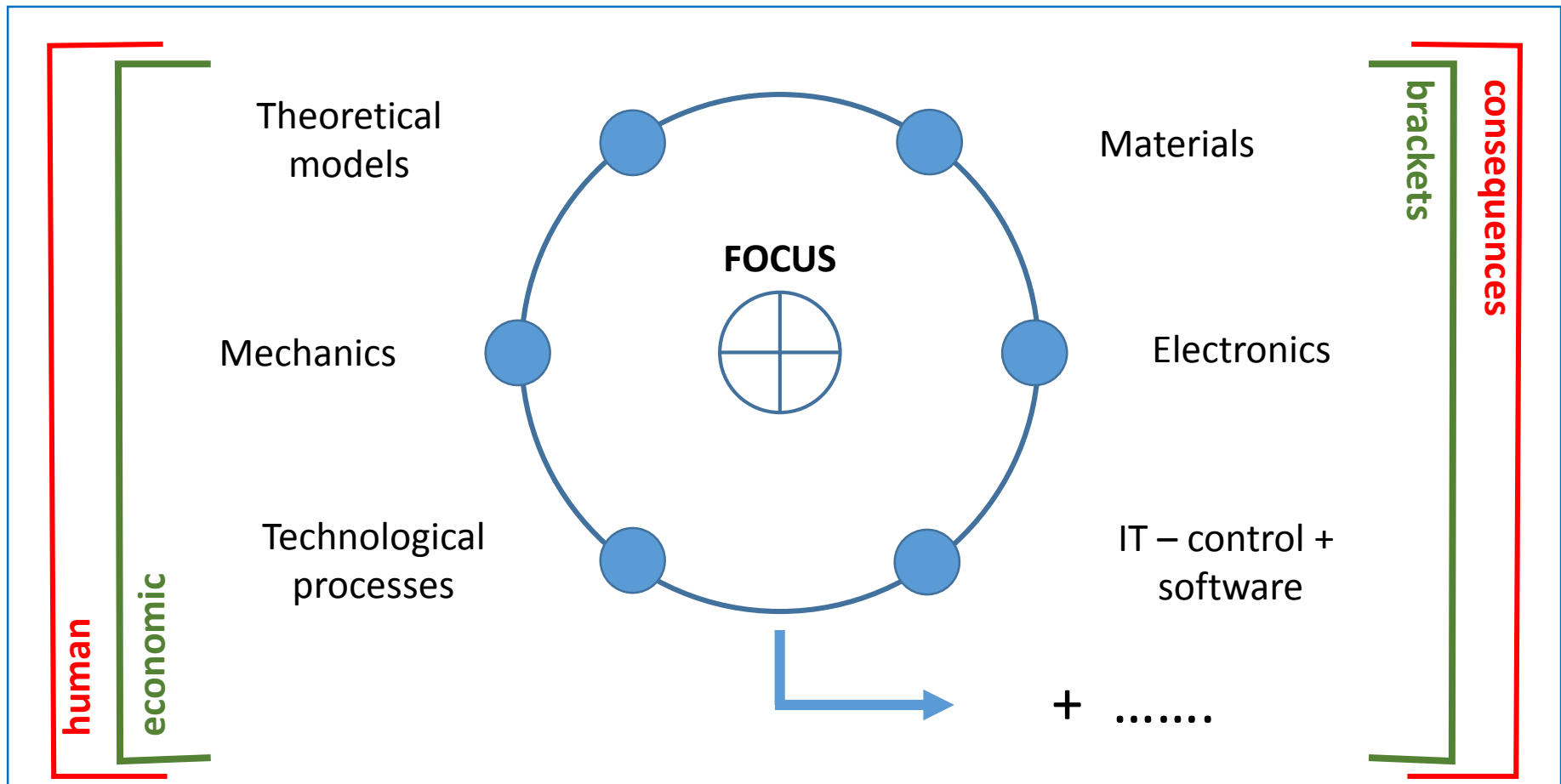
Research mechanisms

nach P. Post
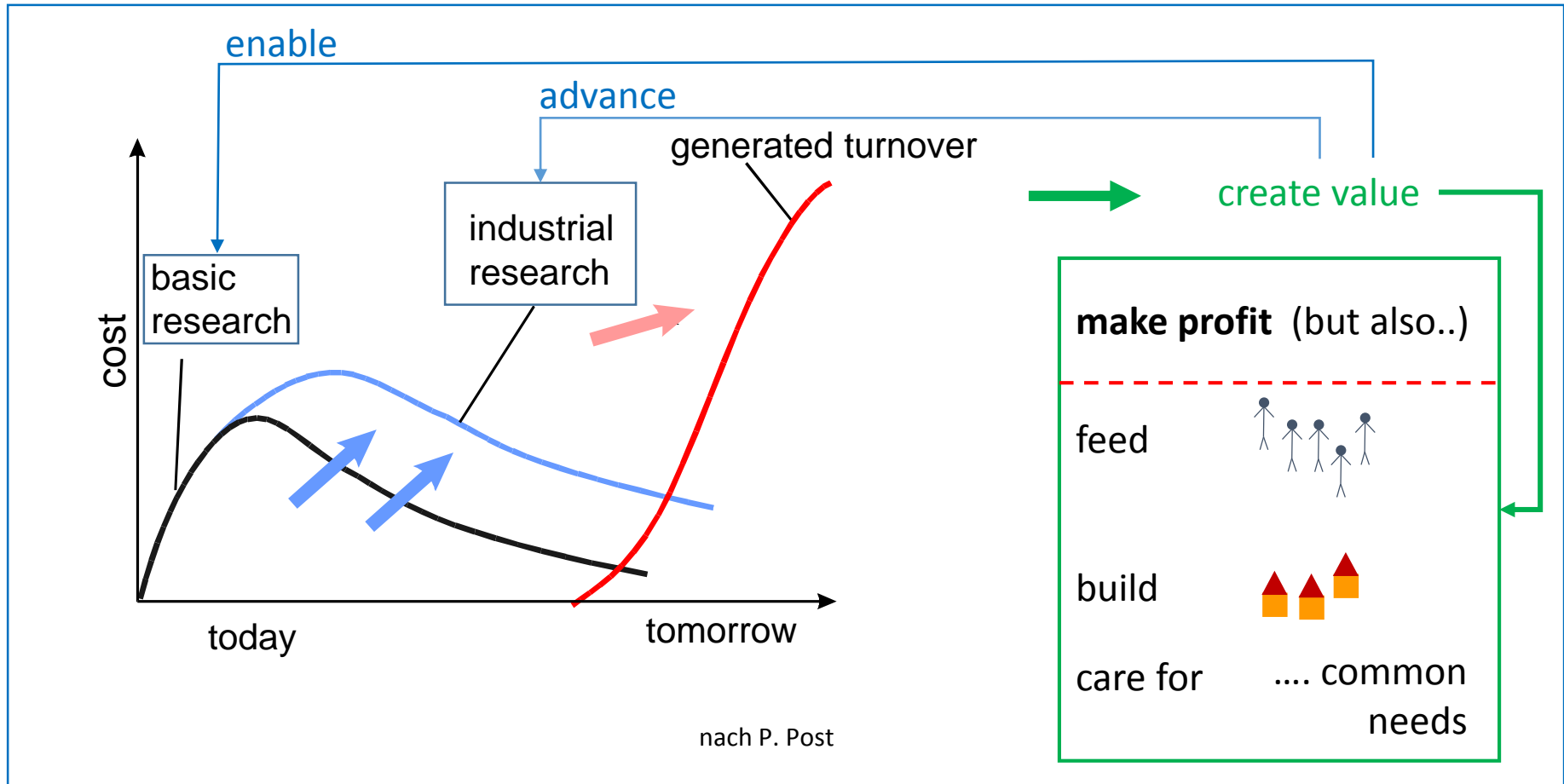
Technology is only one crank wheel in the mechanisms

technology

logistics

product

people

organisation
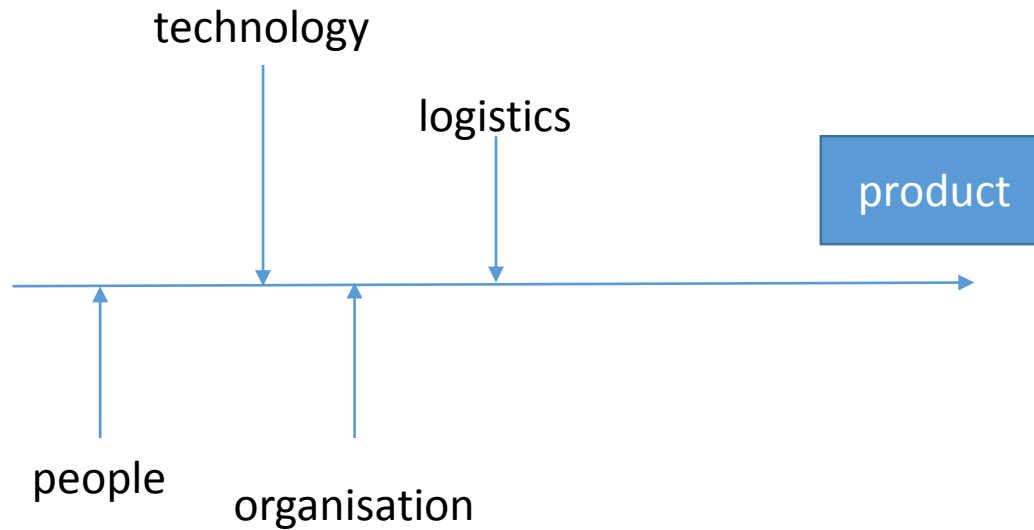
Otto Lilienthal – a historic case

The image in mind: flying as the option for unlimited access between the cultures and thus peace

Beyond that:
Otto as entrepreneur was very successful, abolished in his own company the piece rate and distributed 25% of the profit at the end of the year to his employees (before 1900!)

He was very concerned to do something about the social situation, he linked to the best technology available in his time and was **economically** very successful.

… and there are more in every country

A relevant question

Whose houses do we want to build?

Coal miners' houses in the
Ruhr valley

Gustav Lilienthal – social
reformer
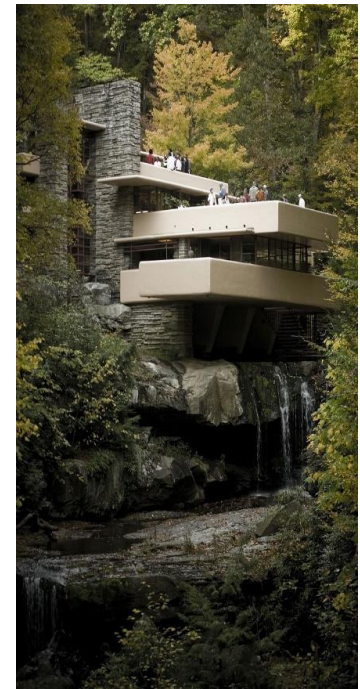
Frank Lloyd
Fallingwater

ManuFuture – or factory of the future
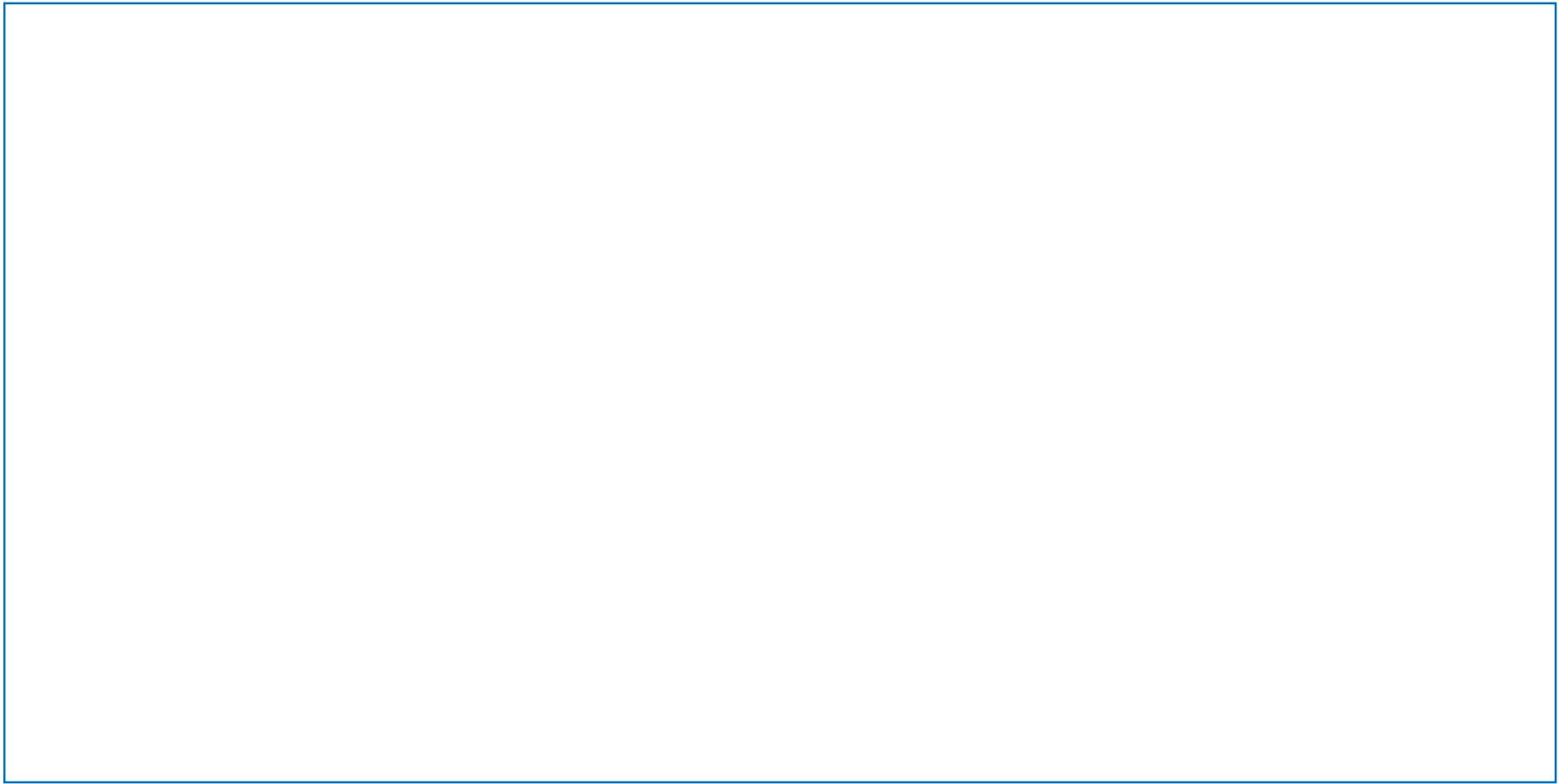
Factories of the future

Manu*Future*
(start 2002)

Research needs to look beyond mere technology
and understand how it is employed in manufacturing

Value added and jobs in the EU-25
Manufacturing is the dominant sector

Value Added

(billion Euro)

- 1 535 (41,5 %)
- 878 (23,8 %)
- 515 (13,8 %)
- 392 (10,5 %)
- 157 (4,3 %)
- 145 (4,1 %)
- 71 (2 %)

Jobs

(million)

- 34,0 (30,4 %)
- 26,5 (23,2 %)
- 20,2 (17,8 %)
- 11,8 (10,2 %)
- 10,6 (9,8 %)
- 7,5 (6,7 %)
- 1,5 (1,3 %)
- 0,7 (0,6 %)

Legend
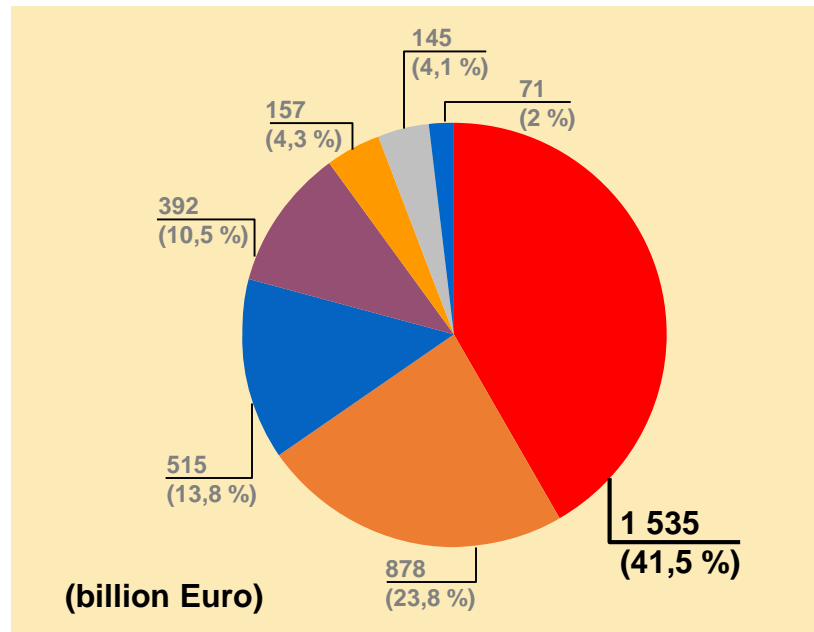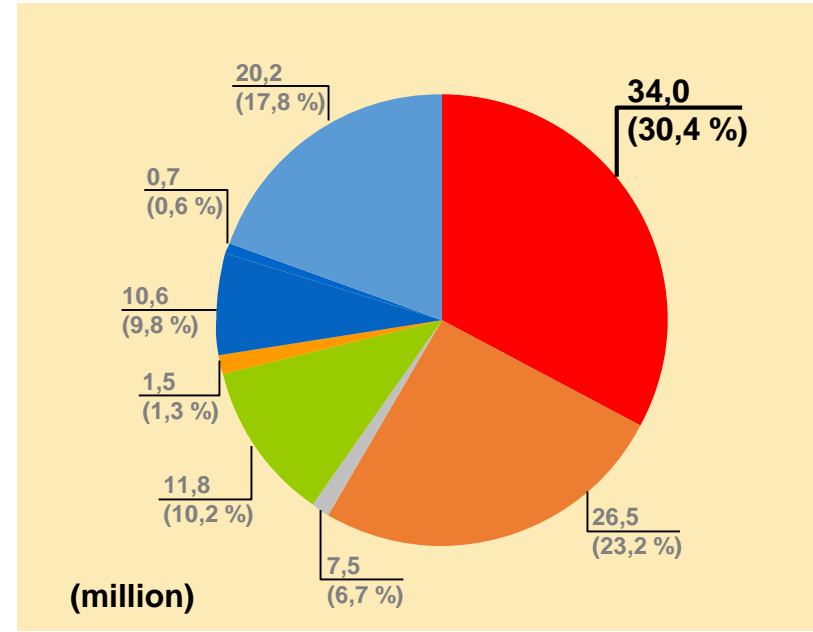
- **Manufacturing**
- **Wholesale and retail trade; repair of motor vehicles, motor-cycles and personal and household goods**
- **Transport, storage and communication**
- **Construction**
- **Electricity, gas and water supply**
- **Hotels and restaurants**
- **Mining and quarrying**
- **Real estate, renting and business activities**

Manu*Future*

Compete by
REDUCING COSTS

Cheap labour,
Automation

MANUFACTURING
Research-Innovation based

PRODUCTS PROCESSES
ENTERPRISES

European industrial sectors

Compete by
HIGH VALUE ADDED

High performances
Customization
New buisness models
New human capital

MANU_FUTURE_

Manufuture SRA response
Industrial transformation reference model and
roadmap for European enterprises

Agenda objectives	Transformation of industry				Transf. of R&D
Goals / **Drivers**	Make/ delivery products services	Innovating products			Inno- vating research
Competition	New added value products and services	New business models	Advanced industrial engi- neering	Emerging manu- facturing sciences and tech- nologies	Infra- structures and education
Rapid technology renewal					
Eco-sustainability					
Regulation					
Socio economic environment			Processes	Standards	
Values – public acceptability					
Time scale	Con- tinuous	Short- medium term	Medium term	Long term	Long term

Time scale and the underlying mental process

Information density

Technological complexity

1899
1920
1982
2005

Period of incremental changes

Disruption

Industrie 4.0

- ➤ Is claiming to be such a disruptive change

- ➤ Is a platform that promotes industrial technology and processes

- ➤ Needs to be seen in its historic setting
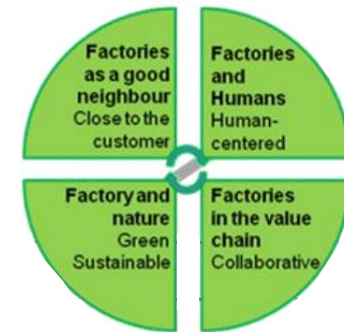
According to Prof. Westkämper

Images we create in thought

Great inventions came about by pictures people had in mind, not from abstract formula

Rudolf Diesel is reported to have derive the right conclusions for his invention while walking down a street looking at a chimney. The smoke dissolving in the air gave him the insight to first transform the fuel to the gaseous estate.

The First Diesel Engine, 1897

We need to form similar pictures for our field of research

Deutsches Museum

Future of the Factory

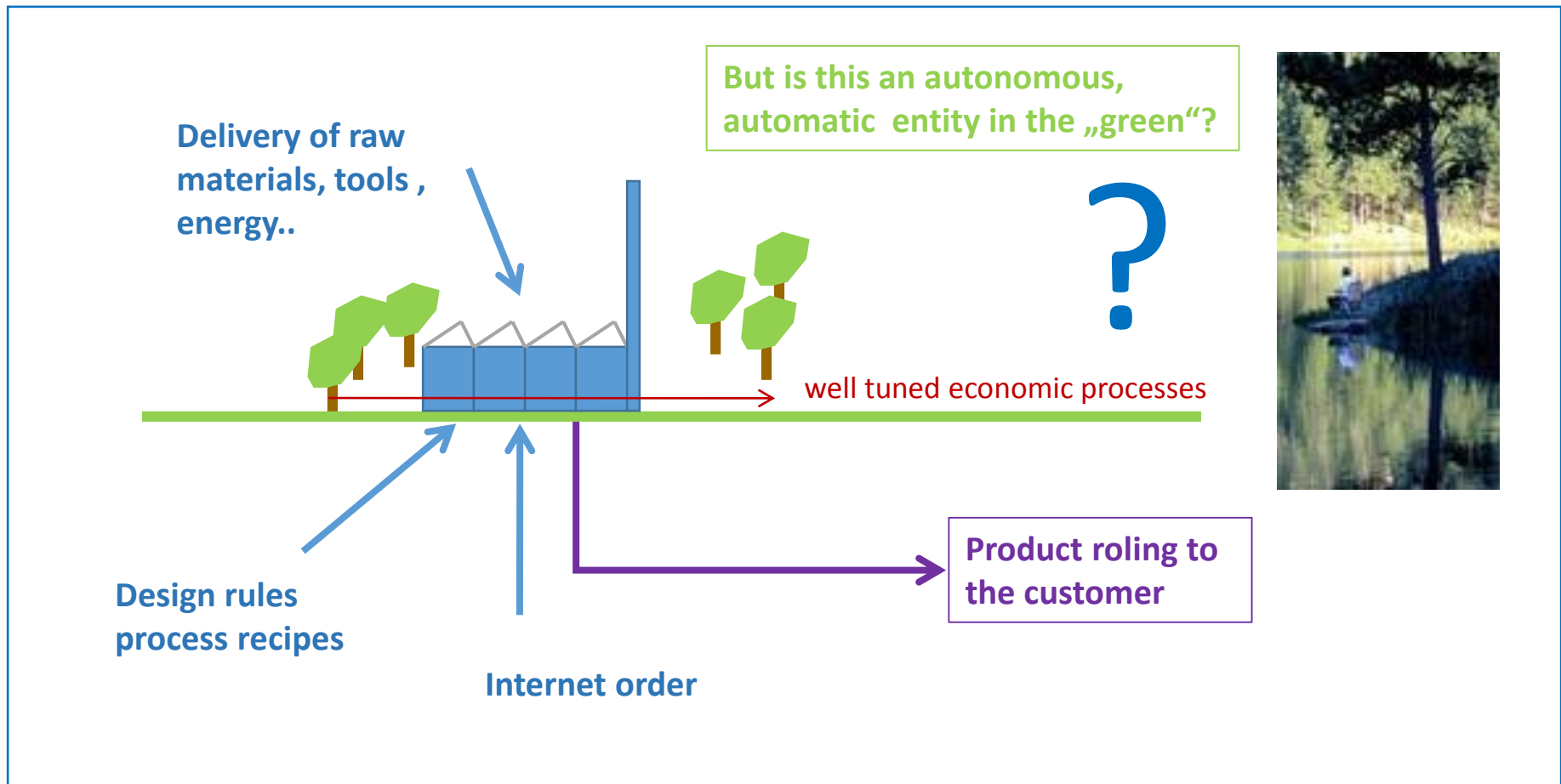**Learning machines replacing humans?**

► Fantasy?

► Vision of the future?

► Necessity?

control center?

Industrie 4.0 can help

But is this an autonomous, automatic entity in the „green"?

Delivery of raw materials, tools , energy..

well tuned economic processes

?

Design rules process recipes

Internet order

Product roling to the customer

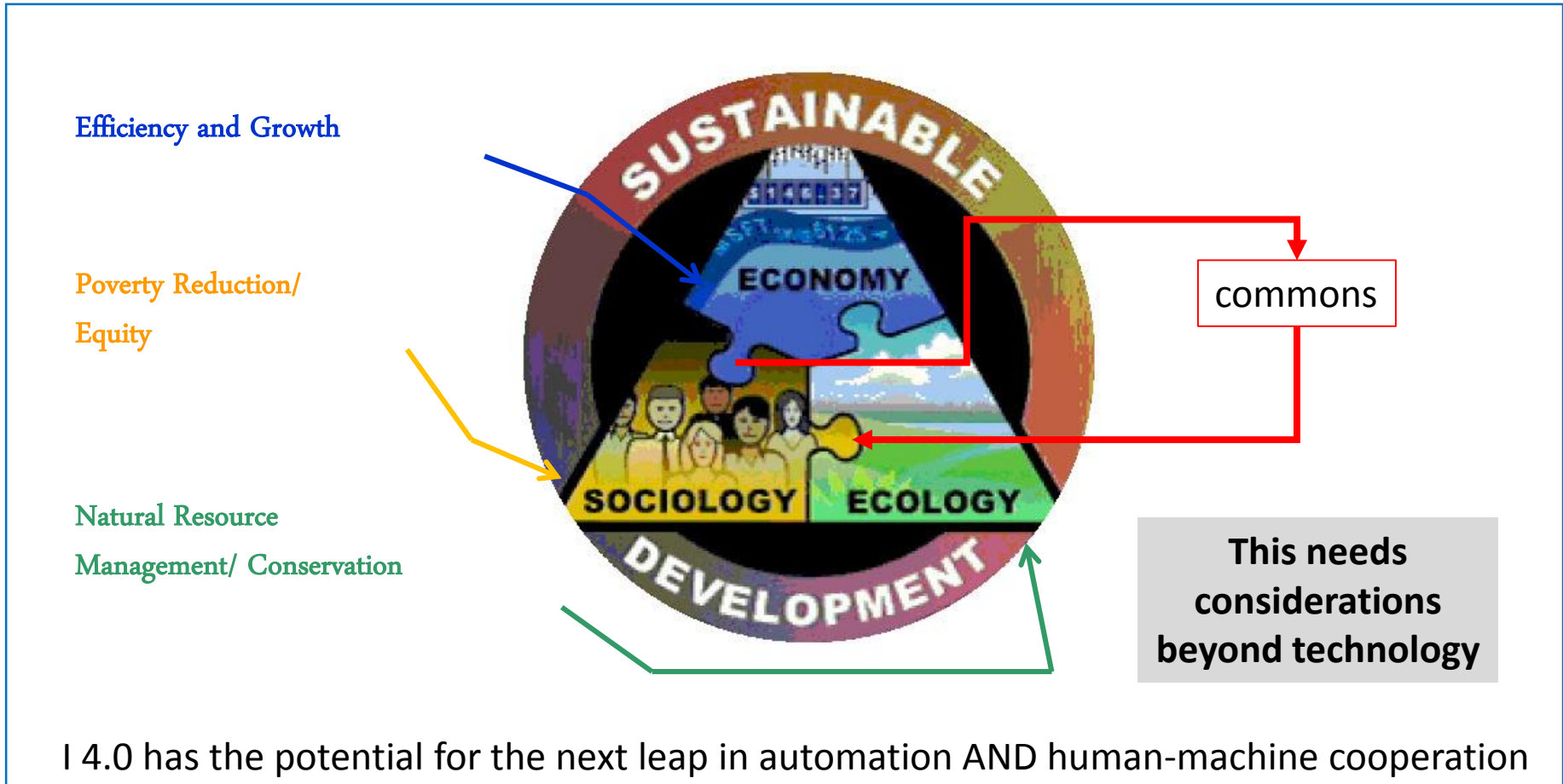# What is missing when a human has to leave

Some may argue that
- core competence is strengthened
- unqualified labor is not needed
- profitability is increased

Others understand, that the enterprise misses
-   friendliness
-   willingness to solve difficult problems
-   someone to encourage the colleague
-   …

Point of attack for the industrial revolution

Efficiency and Growth

Poverty Reduction/
Equity

Natural Resource
Management/ Conservation

commons

This needs considerations beyond technology

I 4.0 has the potential for the next leap in automation AND human-machine cooperation

Technology and humans

Questions relevant for the 4th Industrial Revolution:

- What is it without humans? A one way heater for maybe 6 hours!!!
- Can the machine develop the next generation laptop?

How many people do you need to design the next laptop generation?

But don't forget …

.. in order to have **this one engineer** in place at the right time
you need **a society** in which he could develop his qualities

If you think I am crazy

then have a look at why many Western countries try to reindustrialize so desperately

.. and underrepresent the role of technology

Summary- scientists need to think to the end

Technology has an important role

There is no alternative to a human centered viewpoint and subsequent action

We need to start to rethink value creation

That is worth an industrial revolution and the employment of I 4.0 technology

Thank you for your attention