Research in Production for Factories of the Future

Dr. Axel Gomeringer, Dr. Peter Post, Festo AG & Co. KG

20th DAAAM Symposium Vienna 2009

Research in Production for Factories of the Future

Safeguarding industry in Europe by development of high technology

- Production technology and engineering guarantee prosperity
- Create and sustain jobs through high-tech

Strategic areas of production research

- Strengthening strengths: Ensuring the worldwide pole position
- Application oriented definition of activities

Cooperation of science and industry

- Out of research into practice: create competencies
- Networking and holistic innovations management

Successful implementation in the industrial practice

- Market trends and customer orientation
- Transfer of research results in economic success

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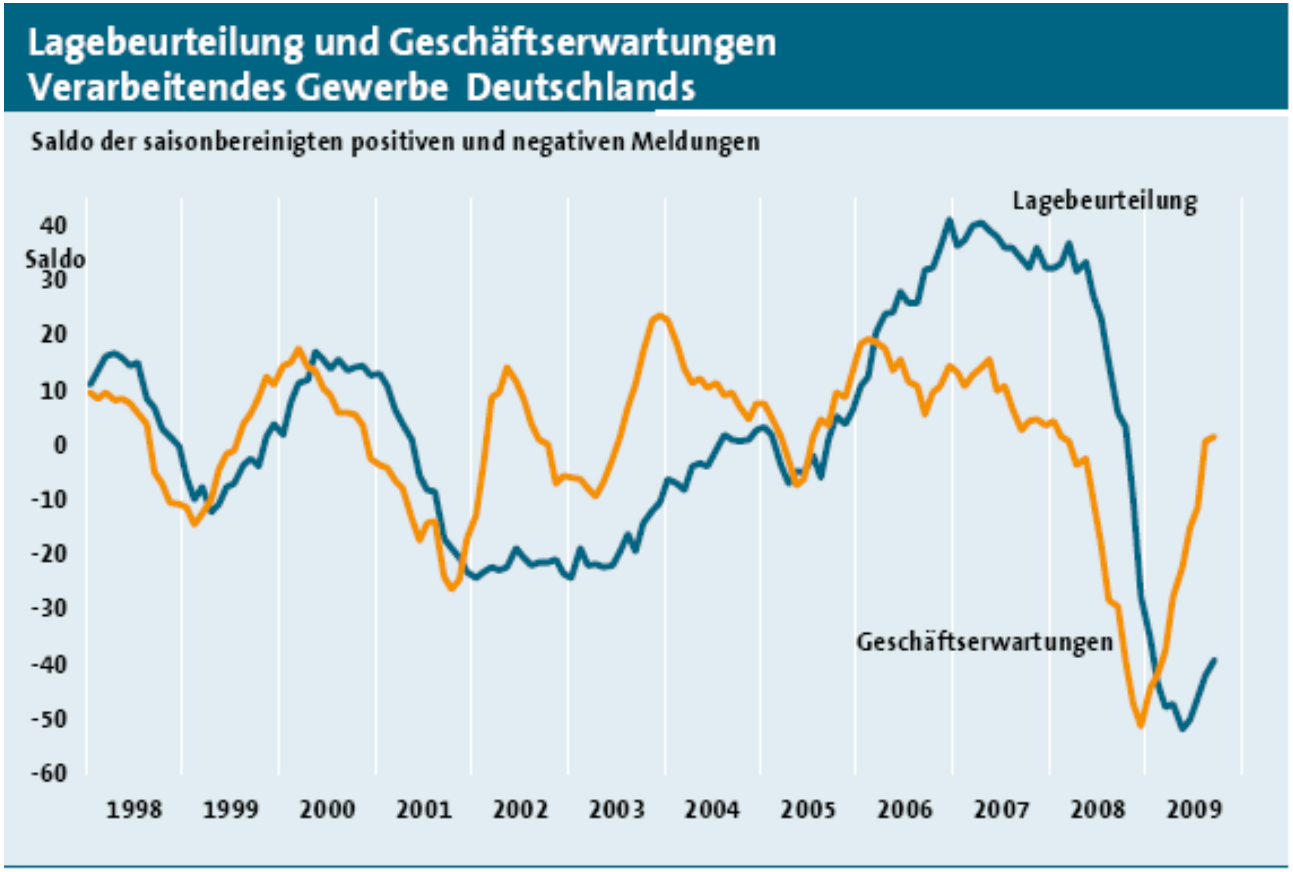
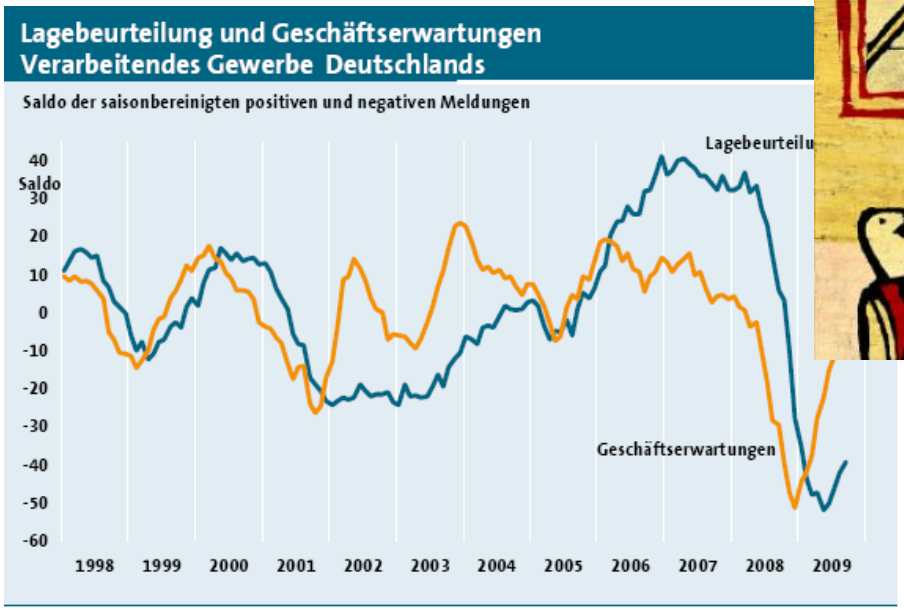
Highflying out of recession?



Quelle: ifo

Highflying out of recession?



Quelle: ifo

Back on the fast track – by joint research

European production technology has a worldwide leading position and contributes significantly to prosperity and employment.

“Strengthen strengths”
Manufacturing and mechanical engineering must be in the focus of research in accordance with their importance.

“Setting the right priorities”
Research activities according to research areas identified by industry

“Challenge and promote outstanding performance”
Research projects to foster excellence and to promote the formation of powerful networks

“Provide awareness”
Public and political perception as high-tech industry

Research and innovation against recession – in Europe

www.manufuture.org

„Manufacturing industry is important for Europe“
Manuel Barroso

1,2 Mrd. € for EFFRA
„Factories of the Future“

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ManuFuture

Compete by
REDUCING COSTS

Cheap labour

MANUFACTURING
Research-Innovation based

European industrial sectors
e.g. Automotive, Mechanical Eng.

Compete by
HIGH VALUE ADDED
(HVA)

High performance
Customization
New business models
People

From cost cutting to value adding

„Factories of the Future“ PPP

Objective

- Developing enabling technologies to support EU manufacturing industry across many sectors by boosting their technological base

Topics

strategic multi-annual road map

- SD1: Sustainable Manufacturing
- SD2: ICT enabled Intelligent Manufacturing
- SD3: High performance manufacturing
- SD4: Exploiting new materials through manufacturing

* EC’s Recovery Plan - IP/08/1771

SD = sub domains

Research and innovation against recession

Europe		Strategic research agenda EFFRA - „Factory of the Future“
National		Research needs of industry Priorities of calls
Regional		Example: Cluster Manufuture BW "HiPerFacturing – Knowledge to added value fur sustainable production“

Research and innovation against recession – in countries (national platforms)

www.manufuture.de

Main focus of industrial research

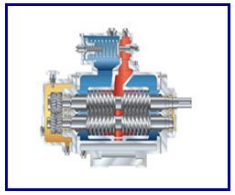
Production Systems

Modules and Subsystems

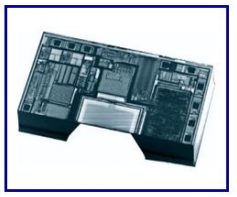
Components and Elements

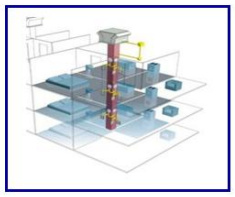
14 Workshops
25 Sectors
> 200 Companies









TOP 1: Intelligent Products

TOP 2: „High Performance“ Processes

TOP 3: Energy efficiency

TOP 4: Product concepts & product configuration

TOP 5: Adaptive production

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TOP 1

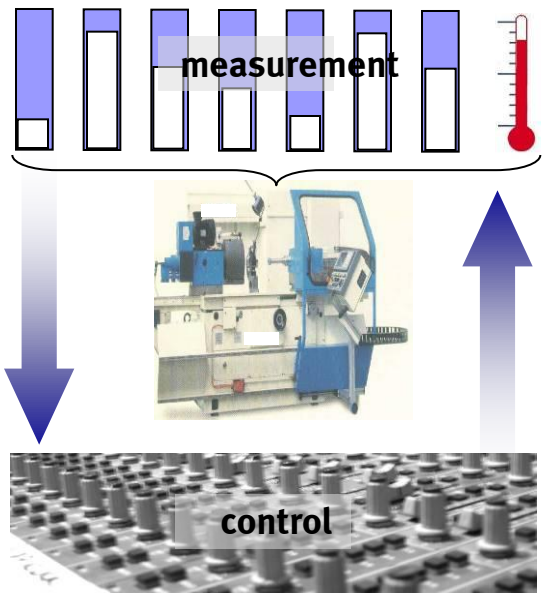
Intelligent Products

Self optimizing systems via sensor-actuator integration, Identification concepts and control mechanisms.

Development of new **diagnostic systems** with improved functionality, remote diagnostics, safety functions etc.

Improved human machine interface via new mechatronic approach, barrier free, improved safety requirements.

Self optimizing machine in a changing environment



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TOP 2

High Performance Processes

Technology beyond existing borders of machining tools with higher performance, applicability and efficiency.

Increased **speed** and **precision** with **highly dynamic components** and **sensor-actuator systems** of higher performance

Robust and **sensor controlled** processes

High performance in all areas of production

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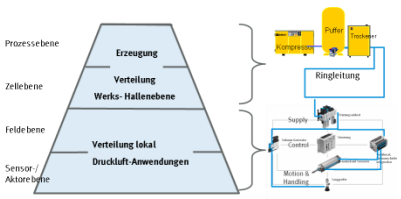
TOP 3

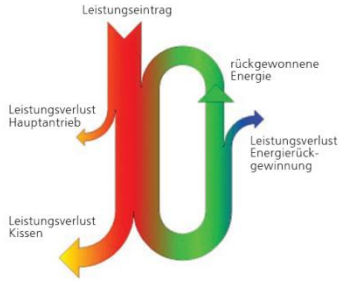
Energy Efficiency

Reduced **energy consumption** of machines and production systems and **reuse of energy**

Development of absolute novel technologies for reduced energy consumption: New **technologies for energy generation,** development of **self-sustaining systems.**

- ✓ **Drive systems with high efficiency ratio**
- ✓ **Energy supply systems of factories**
- ✓ **New systems to use regenerative energy**
- ✓ **Energy management systems**





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TOP 4

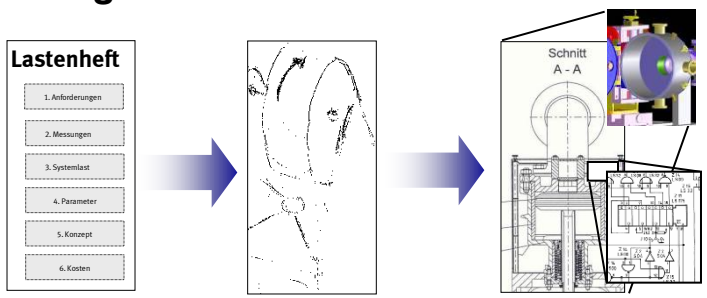
Product Concepts and Configuration

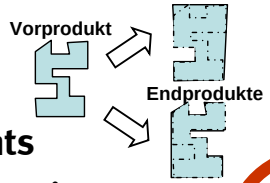
Development of concepts and methods to **protect against product piracy: Specific solutions** for systems and components.

Methods for **modularization Concepts, Scaling Principles** and **aspects of life cycle**

Configurations for flexible combination of modules

Conceptual methods for reliable High-Tech- Products





- ✓ **Modularized elements**
- ✓ **Product specific protection**
- ✓ **Evolutionary system design**

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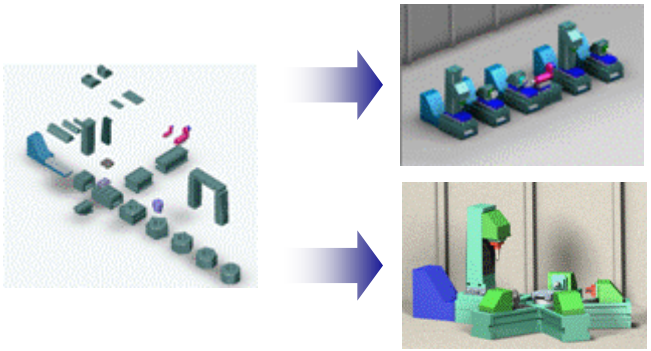
TOP 5

Adaptive Production

Development of **adaptable production equipment** for higher capacity utilization: **Flexibility** and **changeability** at considerably changing demands.

Free configurable **modular** systems, design of small **integratable units** and **scalable systems**

- ✓ **Adaptive robotics**
- ✓ **Multi sensor systems and actuators**
- ✓ **Reconfigurability of machines for changing requirements**
- ✓ **Plug & Produce**



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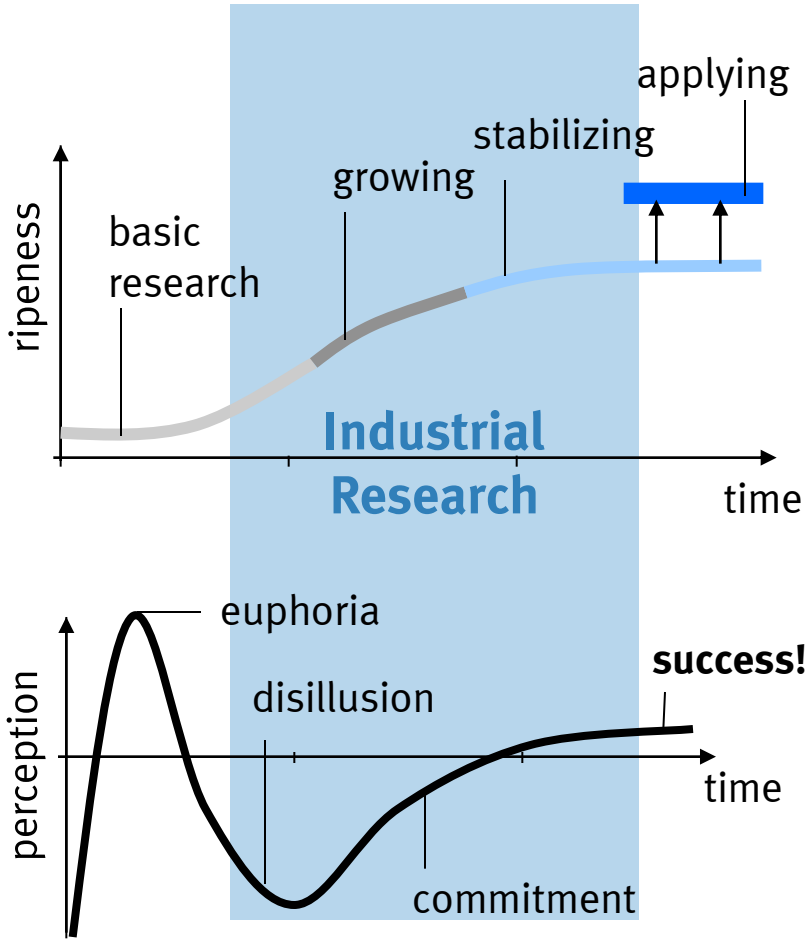
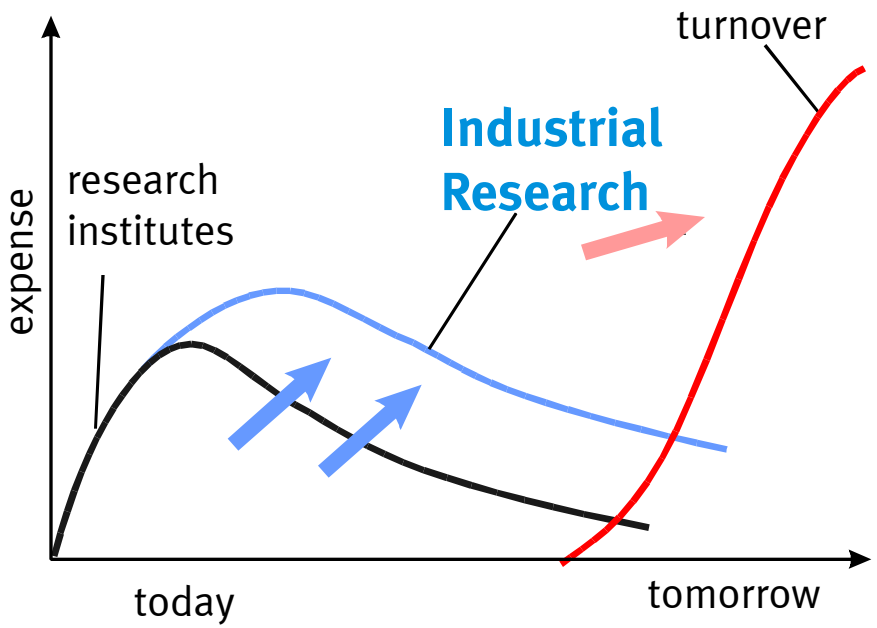
From research to innovation



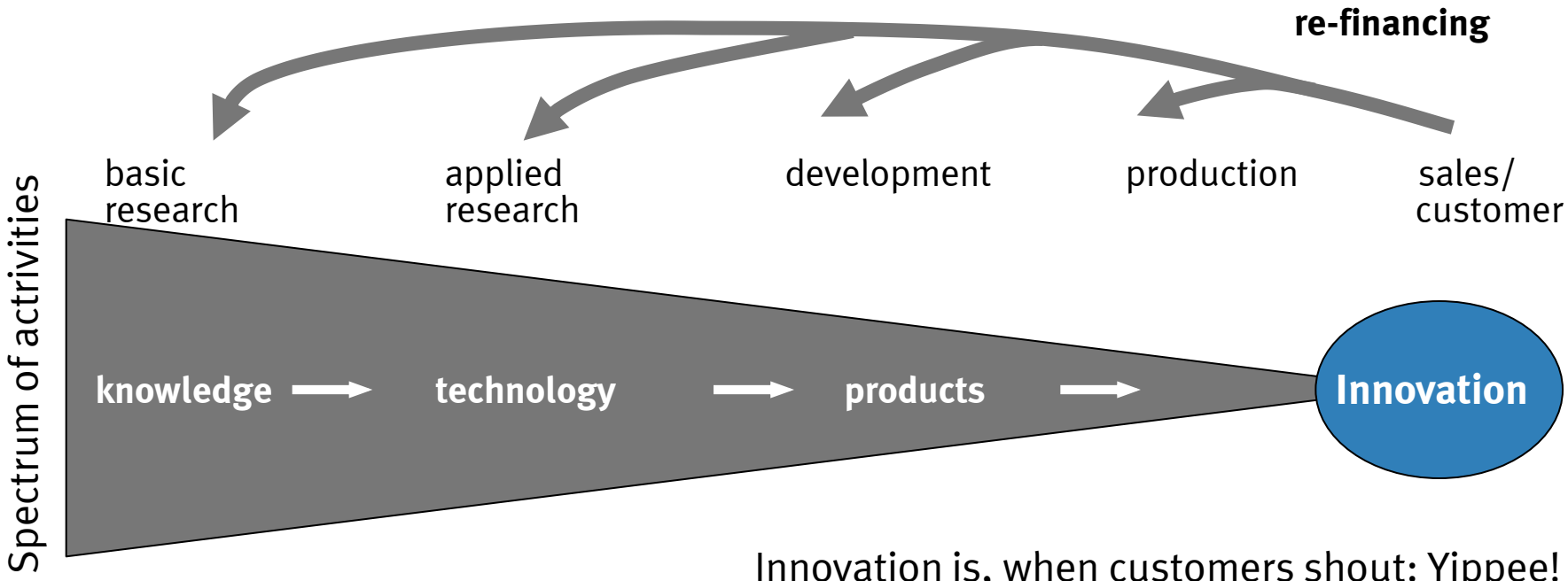
Evaluation and establishing of new Technologies and methods for innovation

Research product cycle



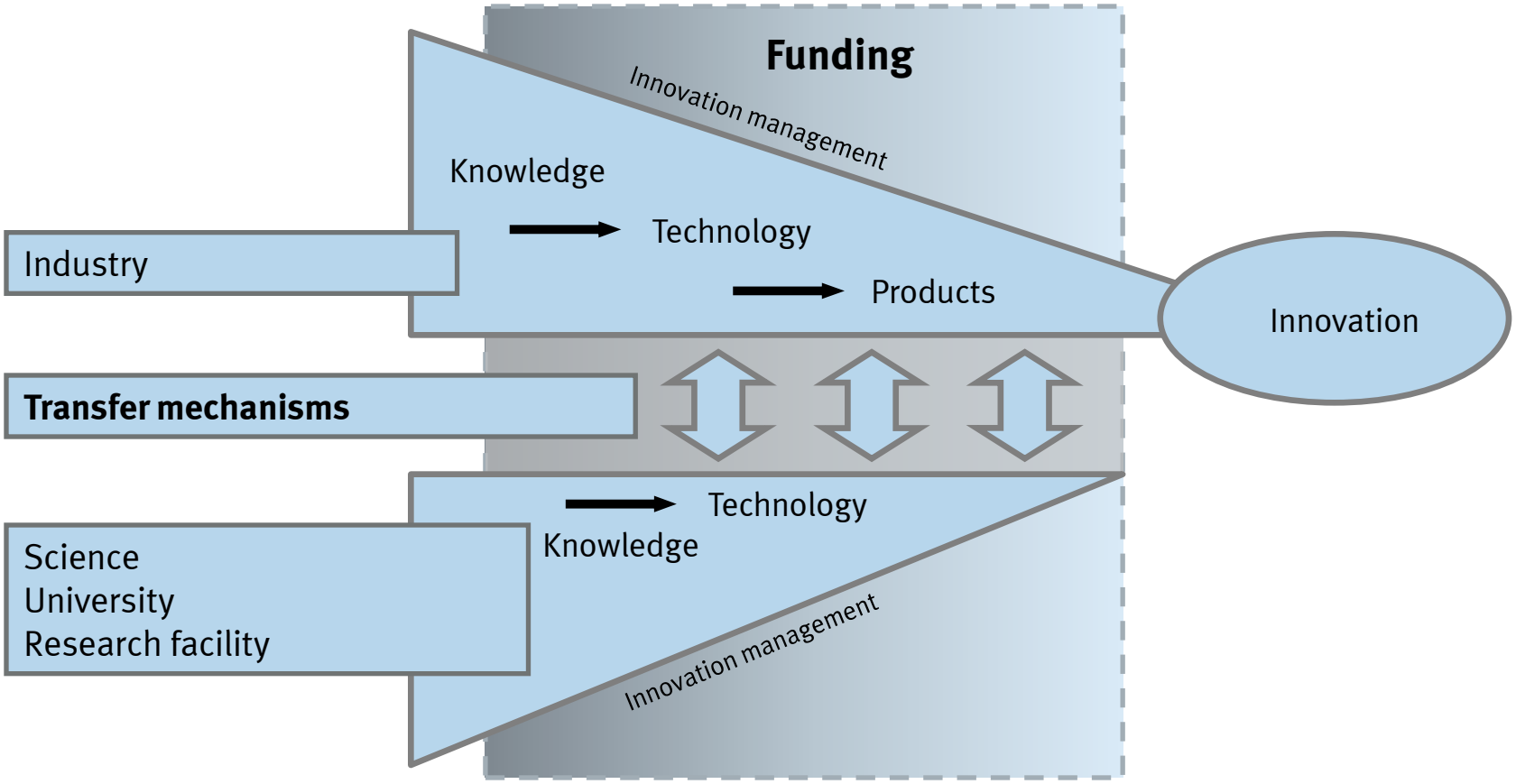
From research to innovation

Problem 1: long time to market before benefit
Problem 2: high investment sum with only long-term returns



Innovation is, when customers shout: Yippee!

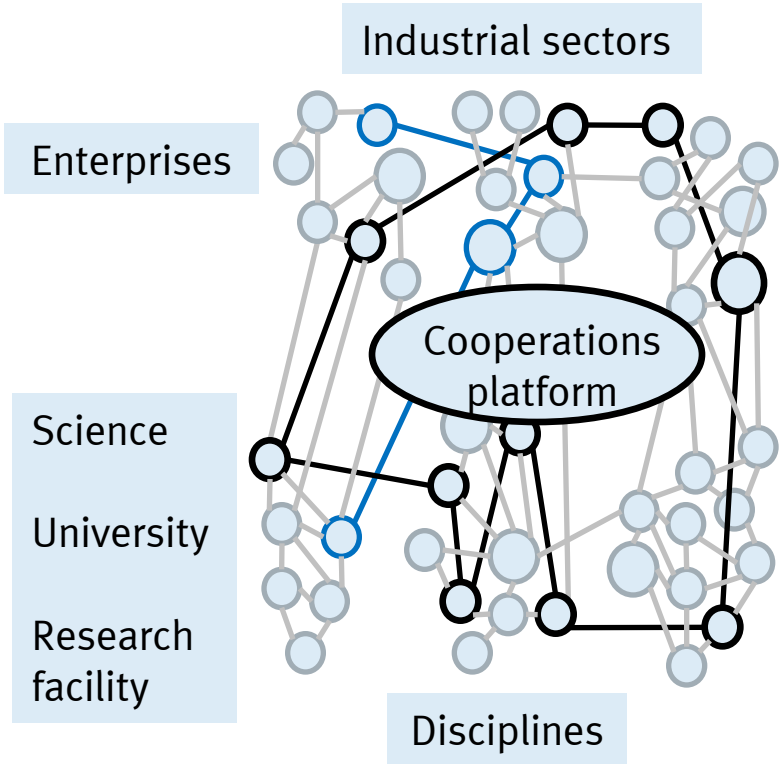
From research to innovation



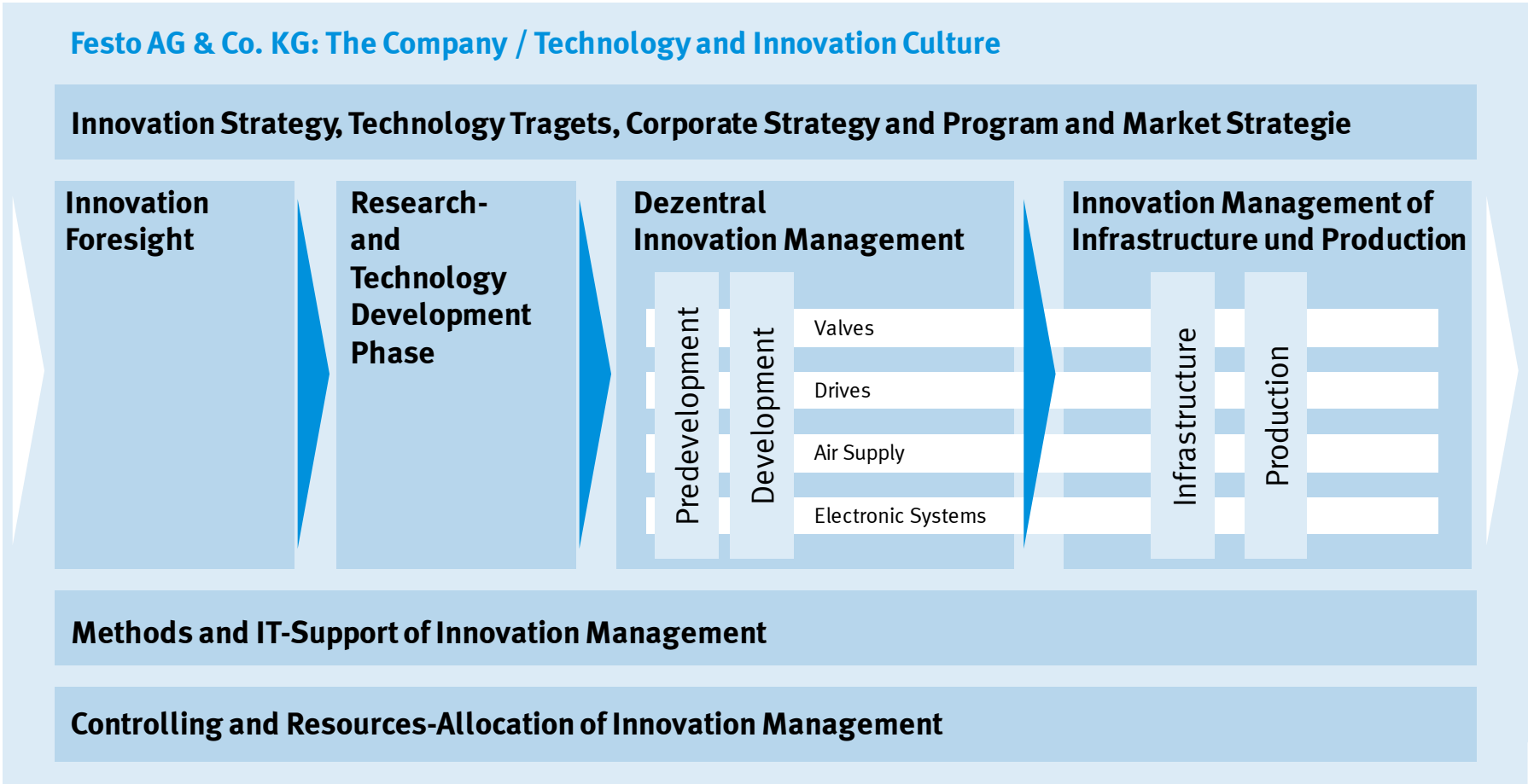
From research to innovation

Systematic management of networks for applied industrial research

- Networking between
  - research centers
  - industrial cooperation partners
  - governmental funding institutions
- Holistic platforms for research
- Fund raising
- Development of long term strategies
- Technology transfer between partners
- Speedup of innovation process



From research to innovation: Technology management in companies



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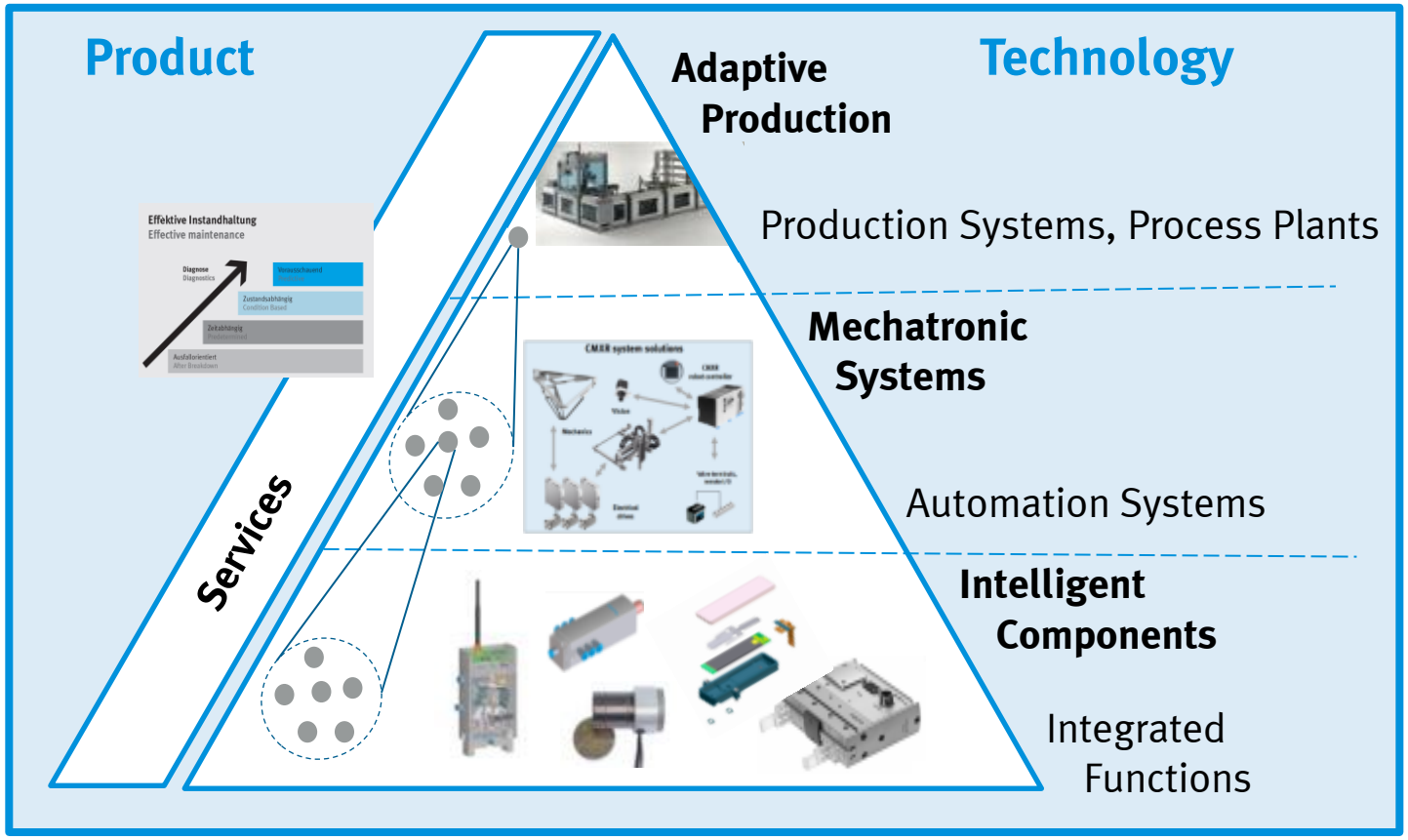
Mechatronic concepts for flexible conguration of systems

Integrated solutions on all levels of application



Intelligent components with optimal energy efficiency

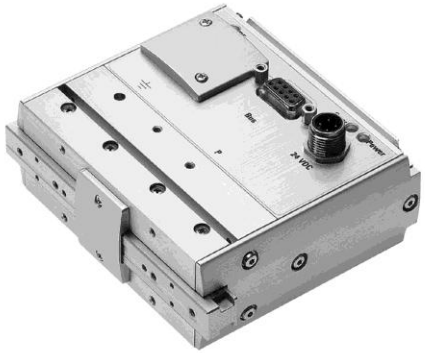
see TOP 1 & 3

Highly integrated gripper HGPPI

Servopneumatic tactile gripper

Integrated functions:
Actuator, sensors, controller

Low power piezo actuator



Institut für fluidtechnische Antriebe und Steuerungen

„Finray“ gripper

Extremly lightweighted

Bionic antetype:
Mechanical adaptive gripping fingers

Integrated actuator

Fraunhofer IPA

Handling and Assembly System of the Future

see TOP 2 & 5

Highly flexible production platform

- „Plug and Work“ process modules
- Self identification on basis of autonomeous intelligence
- Flexible exchange of modules via standardised interfaces

Programming and visualisation

- Status visualisation
- Graphical programming of material flow
- Direct control of hardware

MiniProd
MINIATURISIERTE PRODUKTIONSSYSTEME
(www.miniprod.de)

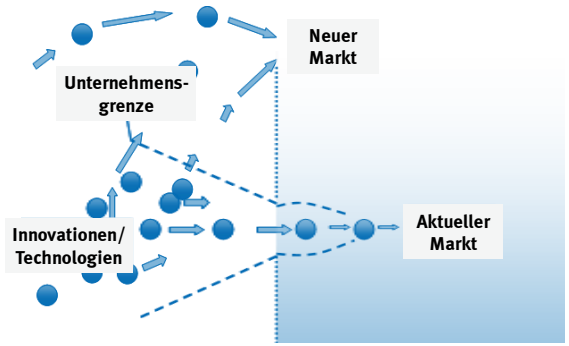
EUPASS
Evolvable Ultra-Precision Assembly SystemS
(www.eupass.org)

Film Miniprod

Service robotics

From closed to open innovation

- Development with lead customer
- Mechatronic design, leading edge engineering approach
- Kinematic optimisation and closed loop control with multi axis controller



Source: Lely Industries NV

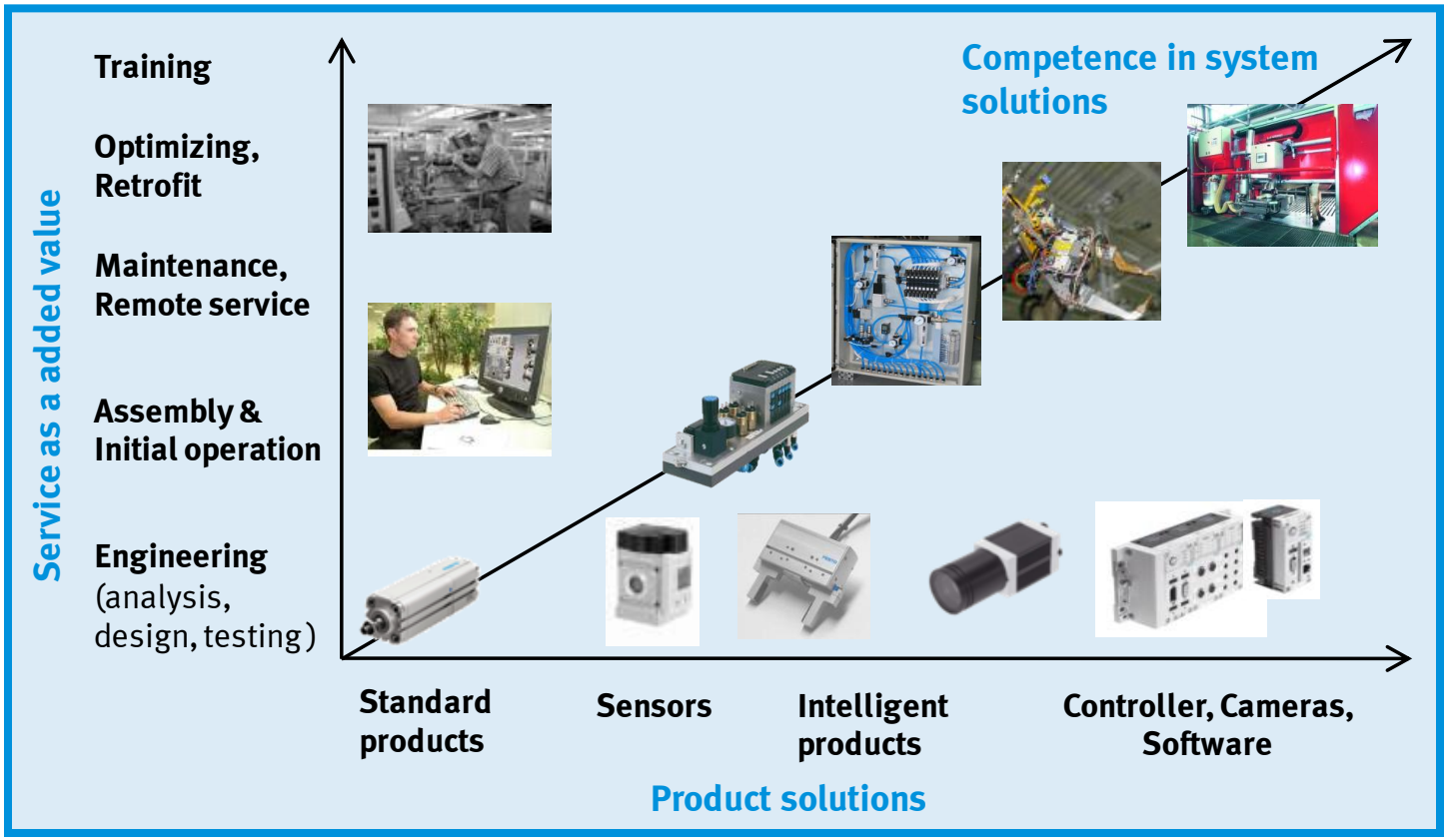
see TOP 1 & 2

Film Lely

Customer oriented solution concepts

see TOP 4

Hybrid portfolio: Products **plus “Added Value”**



fit2solve
(www.fit2solve.de)

Research in Production for Factories of the Future

- **Production technology guarantees prosperity and jobs in Europe** and contributes overproportionally to the entire value creation.
- **These jobs can only be kept** at this level if **high technology** will still be expanded and the innovation capability of industry strengthened the **industry innovation**.
- This requires that the **strategic areas of production research are defined** along the **needs of producing companies** and their facilitators.
- Most important is **to come out of research into practice**. Thus know how and competencies are developed, which can be done by **a close cooperation of science and industry**.
- The aim is: **to generate research results with highest implementation relevancy** that **move quickly and efficiently into application**.
- This also means to perform research along the entire value chain through **comprehensive networks** which have one big advantage: **they are sustainable**.

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Thanks for your attention!
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