

Research Collaboration against the Backdrop of the Global Economic Challenges

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- 1. One Team – One Family: The Family-owned Enterprise SCHUNK**
- 2. Global Economic Challenges – the „New Reality“**
- 3. Industrial R&D Strategies in the „New Reality“**
- 4. Industrial R&D Topics for Research Collaborations**

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One Team – One Family

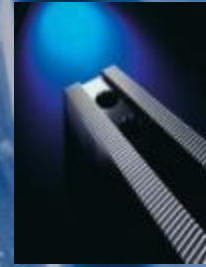
History



From One-Man-Operation to Global Player

„The only way forward
for any company
is through innovation.“

SCHUNK Philosophy
since it's Foundation in 1945.



1966

Product Division
Clamping Jaws



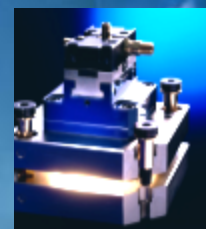
1978

Product Division
Hydraulic Expansion
Toolholder



1982

Product Division
Automation



1997

Product Division
Stationary Workholding

2007

Systems Engineering



One Team – One Family

Management of the Company



One Team – One Family

Synergy SCHUNK



SPANNTÉCHNIK · TOOLHOLDING AND WORKHOLDING



Werkzeughaltersysteme

- Präzisionswerkzeughaltersysteme
- Universalwerkzeughalter
- Auswuchttechnik

Toolholding Systems

- Precision toolholding systems
- Universal toolholders
- Balancing technology



Drehfutter

- Drehfutter
- Spannzylinder
- Lünetten

Lathe Chucks

- Lathe chucks
- Cylinders
- Steady rests



Stiftmontre Spannsysteme

- Nullpunktspannsysteme
- Kraftspannblöcke
- Hand- und Kraftspannfutter
- Mechanische Spannsysteme

Stationary Workholding

- Quick change pallet systems
- Clamping force blocks
- Manual and power chucks
- Mechanical clamping systems



Spannböcken

- Spannböcken in Standard- und Sonderausführung
- Weltweit größtes Standardbockprogramm

Chuck Jaws

- Chuck jaws in standard- and customized design
- The world's largest standard program of chuck jaws



MAGNOS Magnetspanntechnik

MAGNOS Magnetic Clamping Technology



Hydro-Drehspanntechnik Sonderlösungen

Special Hydraulic Expansion Technology



BRANCHENLÖSUNGEN · INDUSTRY SOLUTIONS

► Service

AUTOMATION · AUTOMATION



Greifmodule

- Greifmodule pneumatisch, elektrisch und hydraulisch
- Modulares Greifsystem
- Spezialgreifer

Gripping Modules

- Gripping modules, pneumatic, electrical and hydraulic
- Modular gripping systems
- Special automation



Drehmodule

- Pneumatische und elektrische Dreh- und Schwenkeinheiten
- Pneum. Schwenkköpfe und -finger
- Antriebe und Antriebssysteme

Rotary Modules

- Pneumatic and electrical rotary and swivel units
- Pneumatic swivel heads and fingers
- Actuators and drive systems



Linearmodule

- Präzise Minischlitten
- Pneumatische Hubmodule
- Biegesteife Portalachsen
- Achsmodule mit Lineardirektantrieb

Linear Modules

- Precise mini slides
- Pneumatic stroke modules
- High moment load gantry axes
- Single axes modules



Roboterzubehör

- Greifer- und Schnellwechselsysteme
- Drehdurchführungen
- Kollisions- und Überlastschutz
- Ausgleichseinheiten
- Sensortik

Robot Accessories

- Gripper and quick-change systems
- Rotary distributors
- Anti-collision devices and overload protections
- Compliant devices
- Sensor technology



Modulare Montagetechnik

Modular Assembly Technology



Modulare Robotik

Modular Robotics



Bildverarbeitung

Machine Vision



BRANCHENLÖSUNGEN INDUSTRY SOLUTIONS

► Service





One Team – One Family

Status Quo



Data

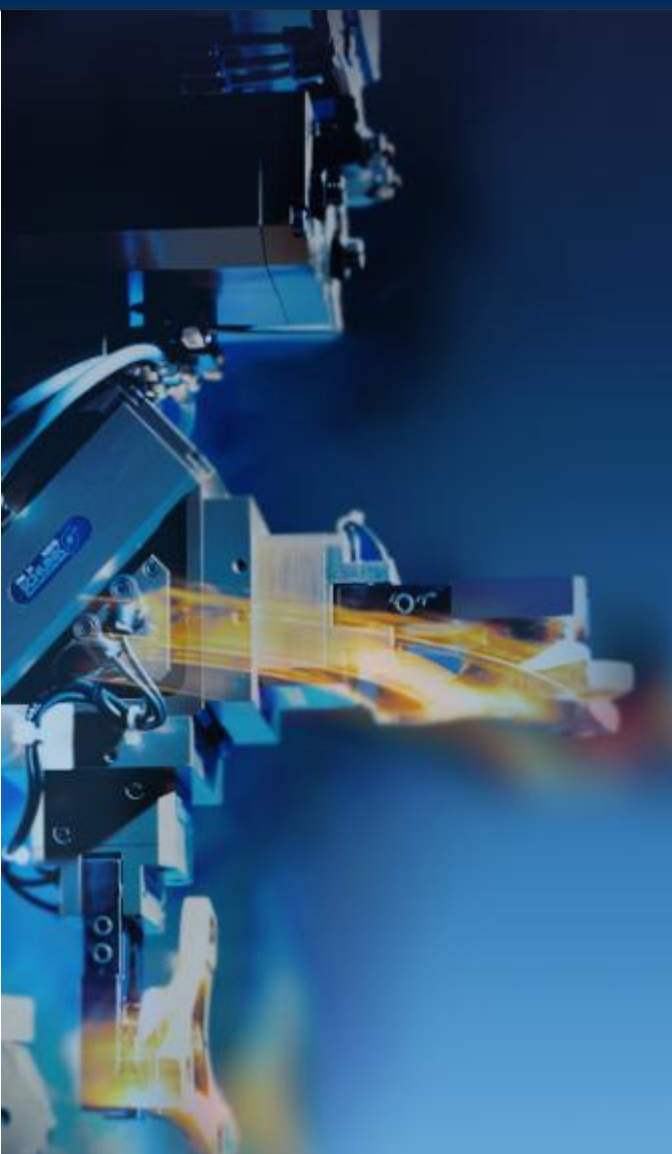
- 23 foreign Subsidiaries
- 40 Nr.1-Products
- about 100 Research Collaborations
- 16.500 Customers in 43 Branches

Company Development 1989 – 2009

- Employees: from 280 to 1800 MA
- Sales Volume: from 15 Mio. Euro to 210 Mio. Euro

Market Positioning

- Clamping Technologies & Automation: Competence Leader
- Gripping Systems: Market Leader
- Expert for Customer-specific Solutions



One Team – One Family

Mechatronic Unit Assembly System – Target Group Academia



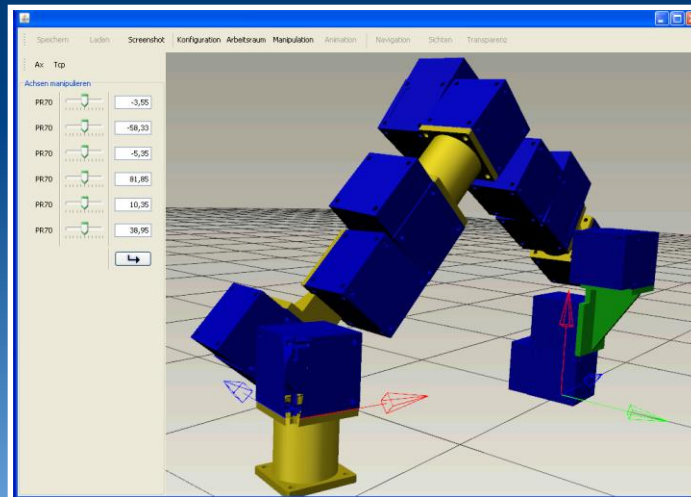
Rotary Modules



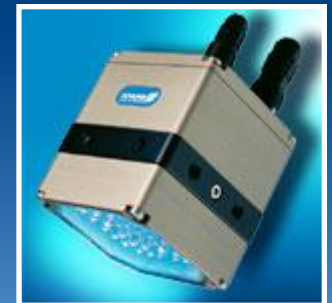
Linear Modules



Gripping Modules



Configurator/Simulator/Control

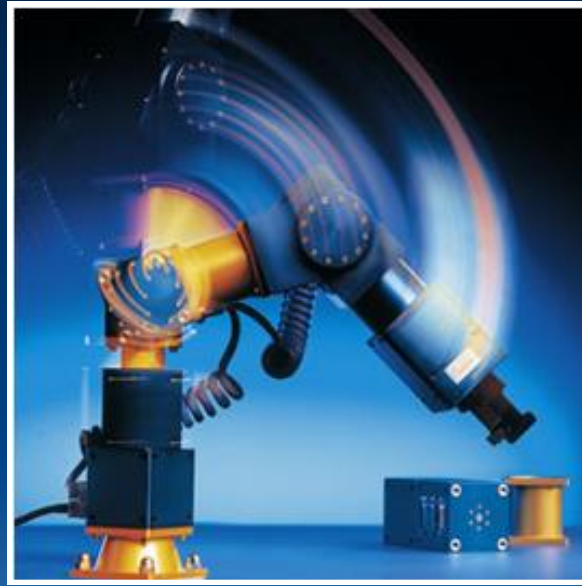


Sensors

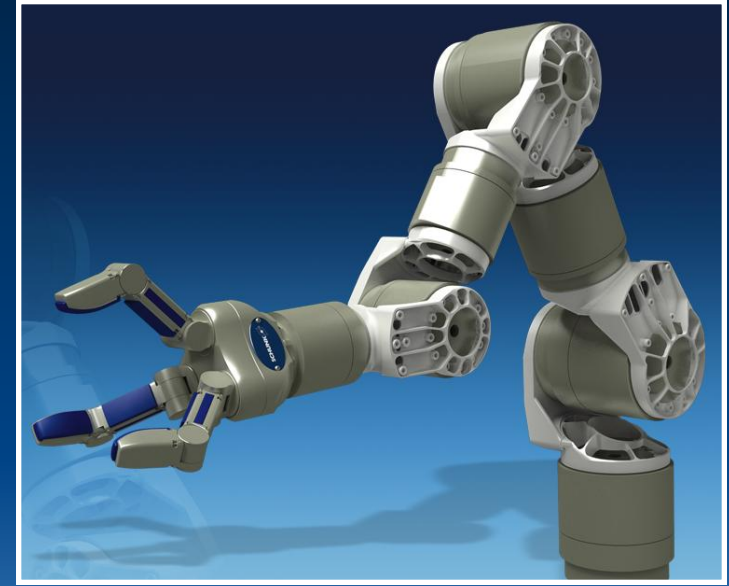




SCHUNK is the most successful supplier of complex gripping devices



The first modular robotic system worldwide was made by SCHUNK



The most power-dense and top-selling light weight robotic arm was made by SCHUNK

One Team – One Family

From Market Niche to Market Leader



From **Market Niche** to **Marktführer**

Consolidation of Nr.1-Position

Enhancement of Nr.1-Position

- Number of Competitors
- Product Standards
- Branch Segmentation
- Variant Diversity

Market Pioneer SCHUNK
Industrial Gripping Technology

Market Pioneer SCHUNK
Modules for Service Robotics

1983



PGG
Standardization

1985



PGN
Classic

1989



KONEX
First
Plastics Gripper
on the Market

2000



PGN+
SCHUNK Premium
Serrated Guides

2003



PEH
Megatrend
Mechatronics

2006



SDH
Flexibility

2007



Combinations
Megatrend
Solutions





AMAROB

What is good?

- Outstanding Quality of Results
- Highly motivated Scientists
- Tireless support from academia to meet industrial demands
- Excellent support from project execution organizations



What could be improved?

- Project **Preconditions** to be adapted to the „new Reality“



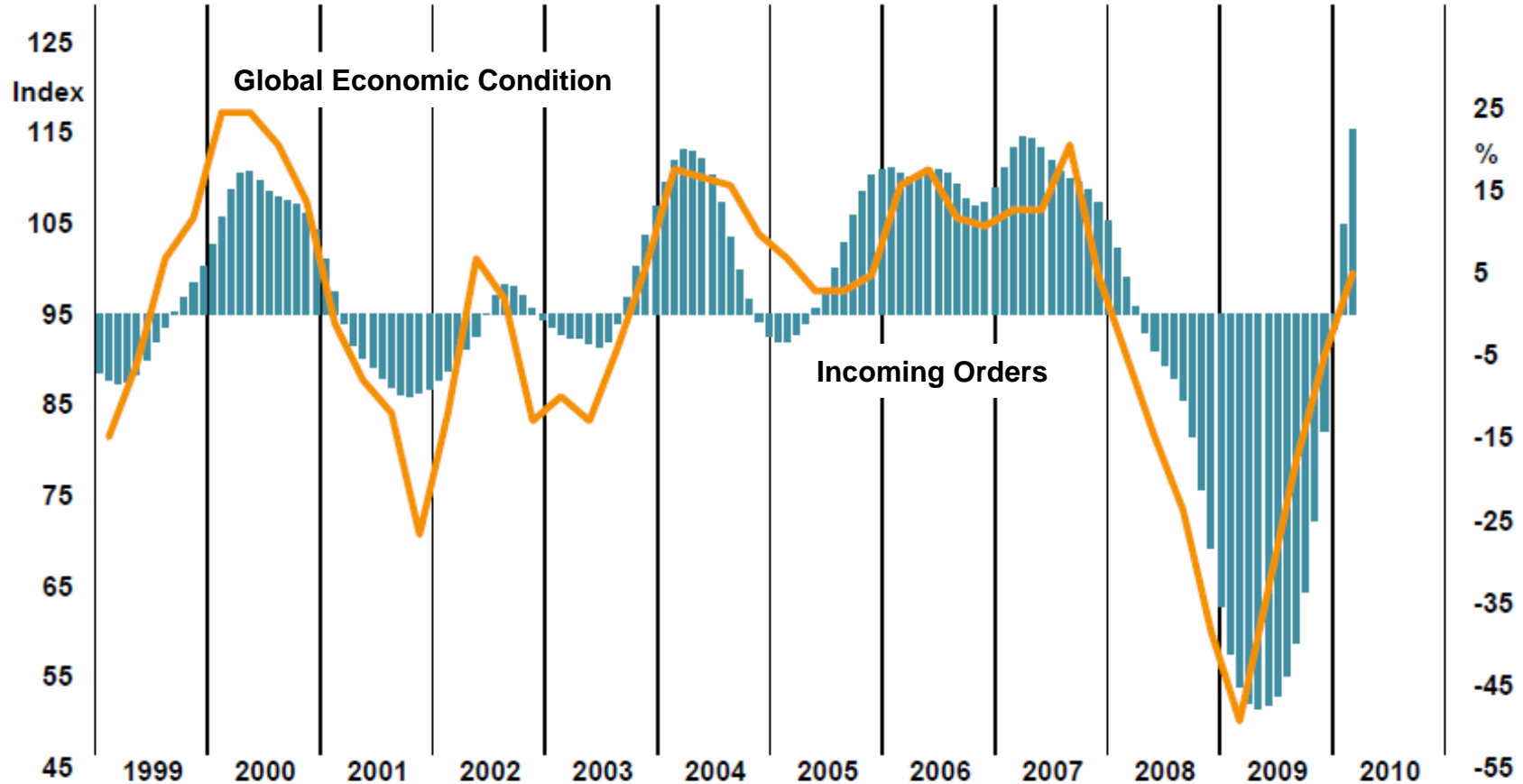
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Global Economic Challenges

Actual Economic Situation

Global Economic Condition

Incoming Orders



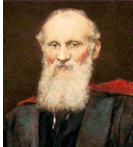
Source: ifo-Institute, VDMA

Global Economic Challenges

Where are we going? Ask the Experts!



1492 Christoph Kolumbus **India!**



1897 Lord Kelvin **Radio has no future!**



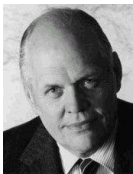
1901 Gottlieb Daimler **Worldwide demand on automobiles will not exceed 1 Million**



1932 Albert Einstein **Nuclear Energy will not be developed.**



1943 Thomas J. Watson (IBM) **I think there is a world market for maybe five computers.**



1977 Ken Olsen (DEC) **There is no reason for any individual to have a computer in his home.**

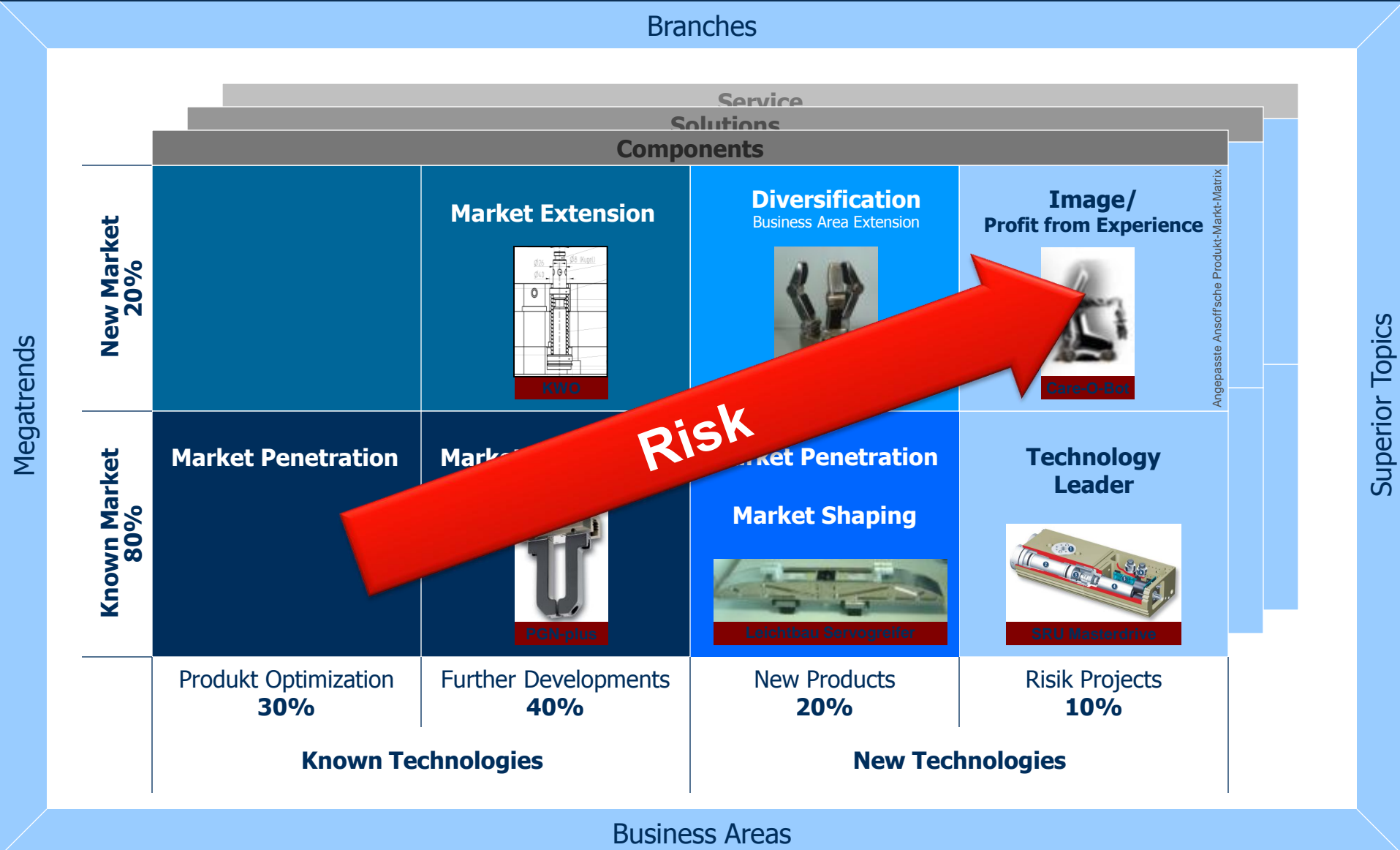


1995 Bill Gates (Microsoft) **Internet is just a hype.**

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Industrial R&D Strategies in the „New Reality“

Risk Management

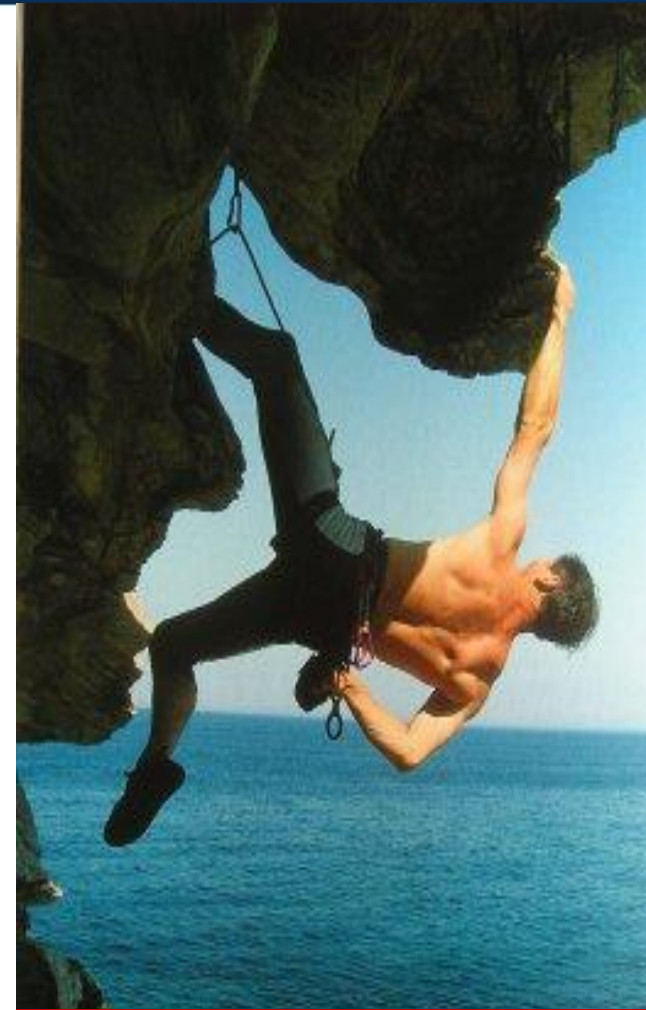


Initial Situation

- **Continuous Boom**
continuously and predictable
- **Ressources**
flexible Deployment

Consequence

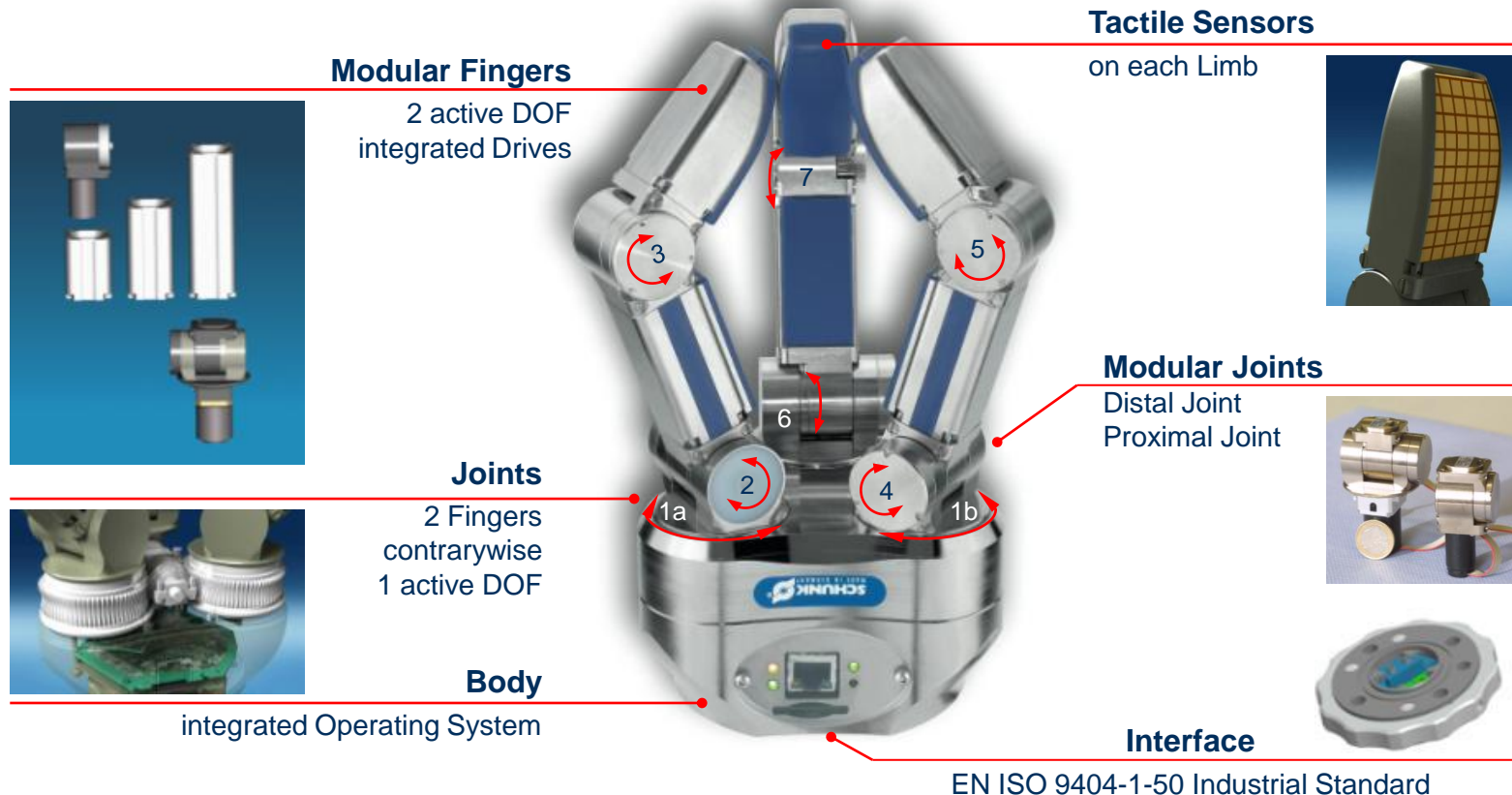
- ⇒ **Risk Projects** – Financial Scope!
- ⇒ **Innovations** – fundamental
- ⇒ **Diversification** – high Chances
- ⇒ **Following Innovations** – „Waste“ from Risk Projects



⇒ **Calculable Risks**

Example of R&D Collaboration for Diversification (risky project)

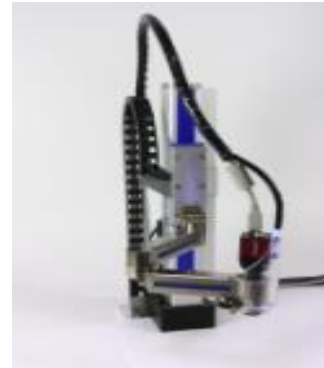
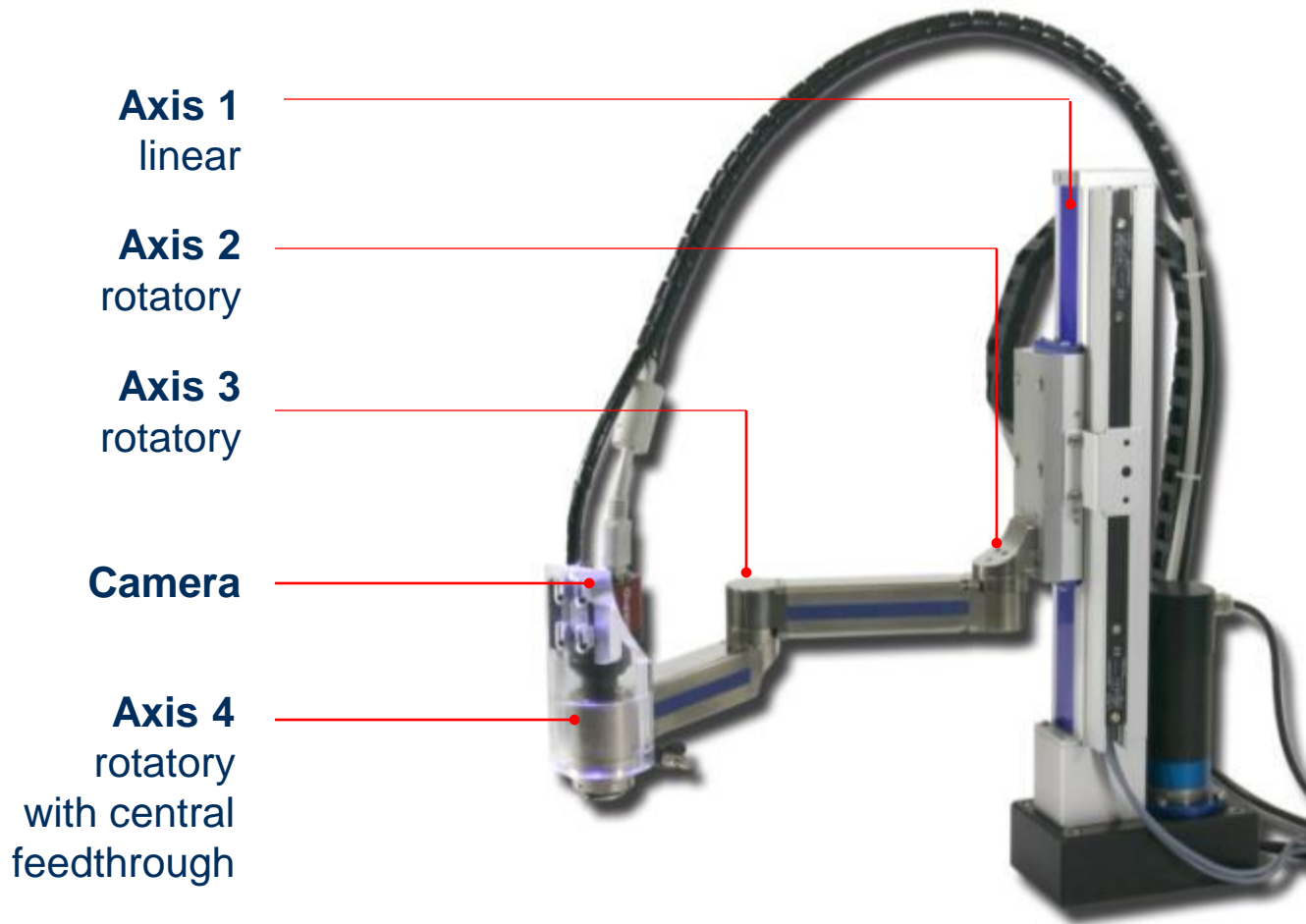
The SCHUNK Dextrous Hand (SDH) – 7 DOF



Universität Karlsruhe (TH)
Forschungsuniversität • gegründet 1825

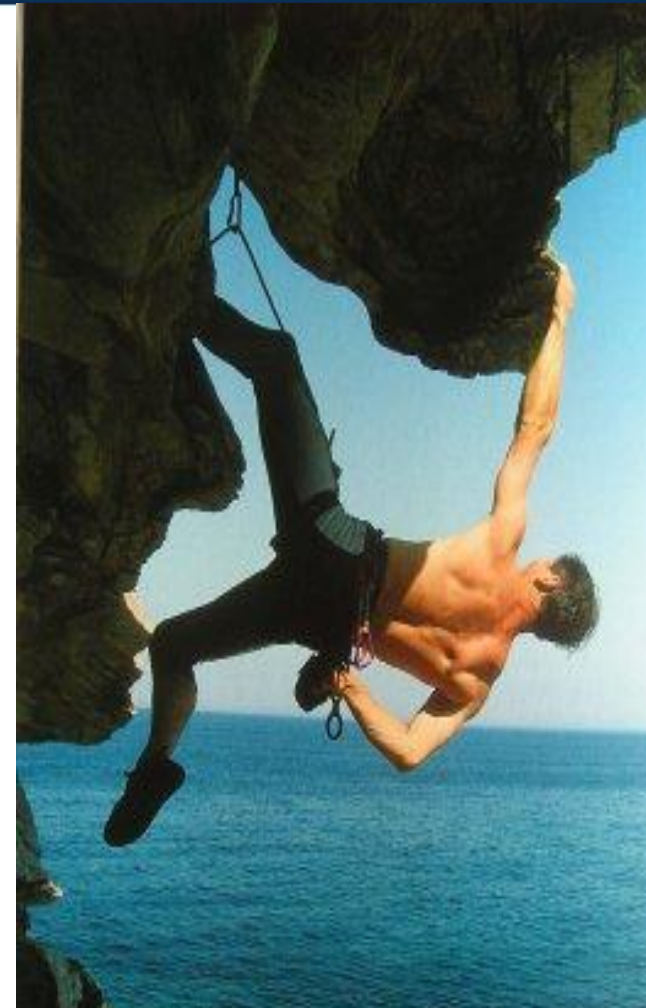
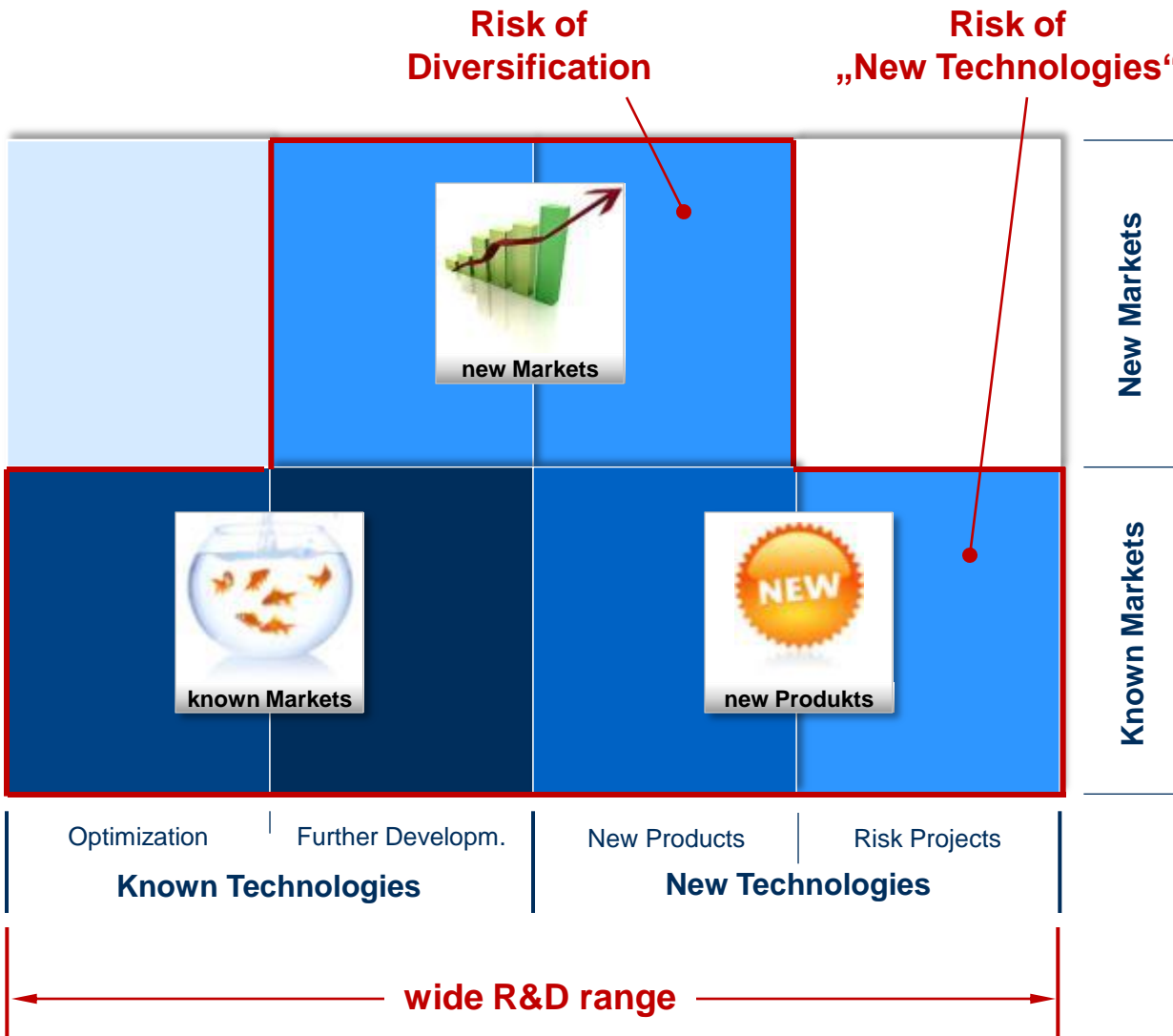


Example of Following Innovation (from „Waste“ of SDH): The „On-Table SCARA“ (MGA)



Industrial R&D Strategies in the „New Reality“

Risk Management until 2008



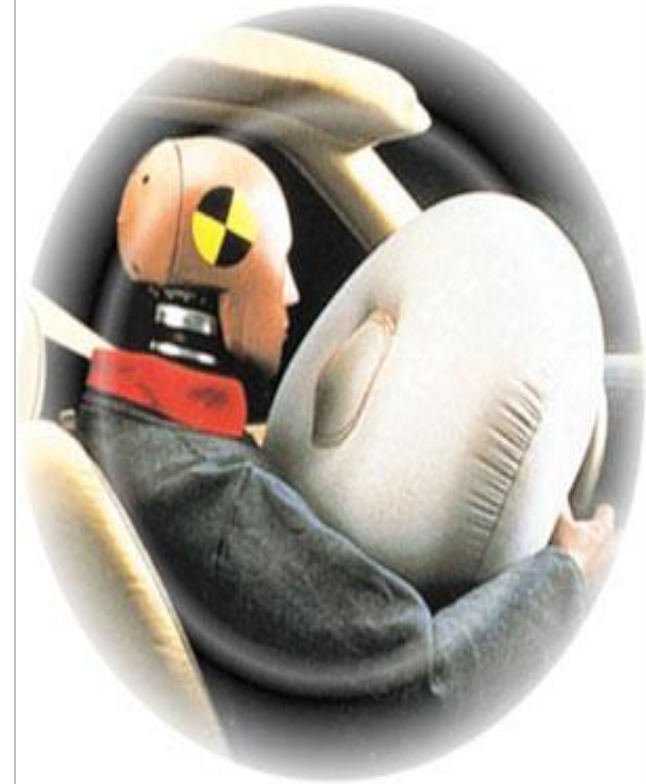
⇒ **Calculable Risks**

Initial Situation

- **Continuous Boom**
not predictable
- **Ressources**
Restricted Scheduling

Consequence

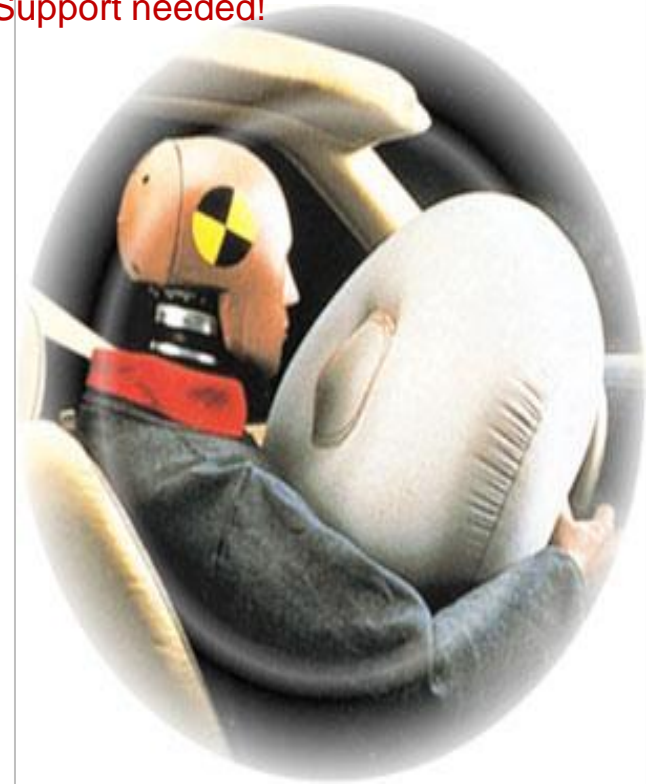
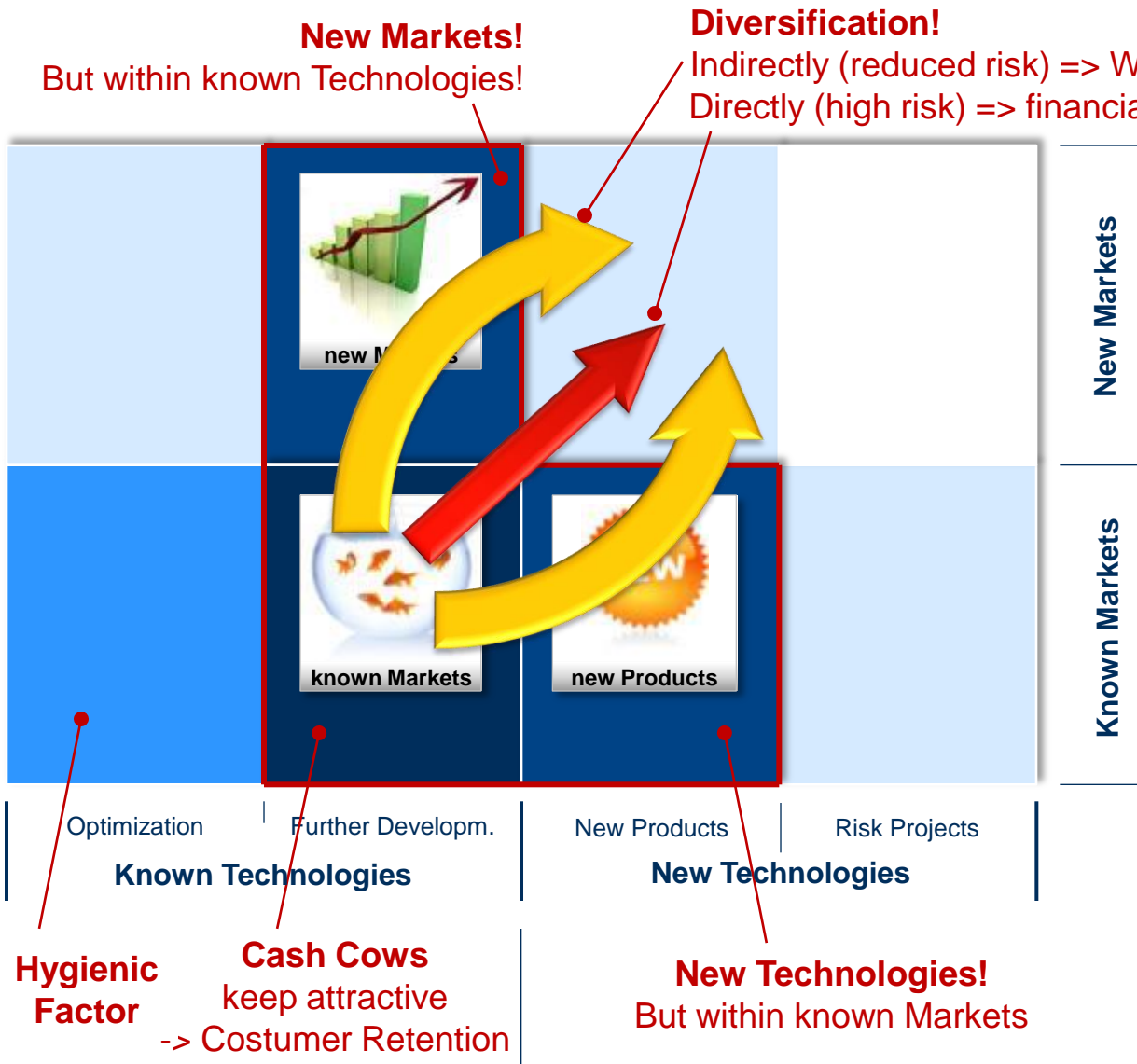
- ⇒ **Risk Projects** – Reduction
- ⇒ **Innovation** – Smaller Steps (but faster!)
- ⇒ **Diversification** – reduced Chances
- ⇒ **Following Innovations** – Decreasing



⇒ **Reducing Risks**

Industrial R&D Strategies in the „New Reality“

Risk Management since 2009

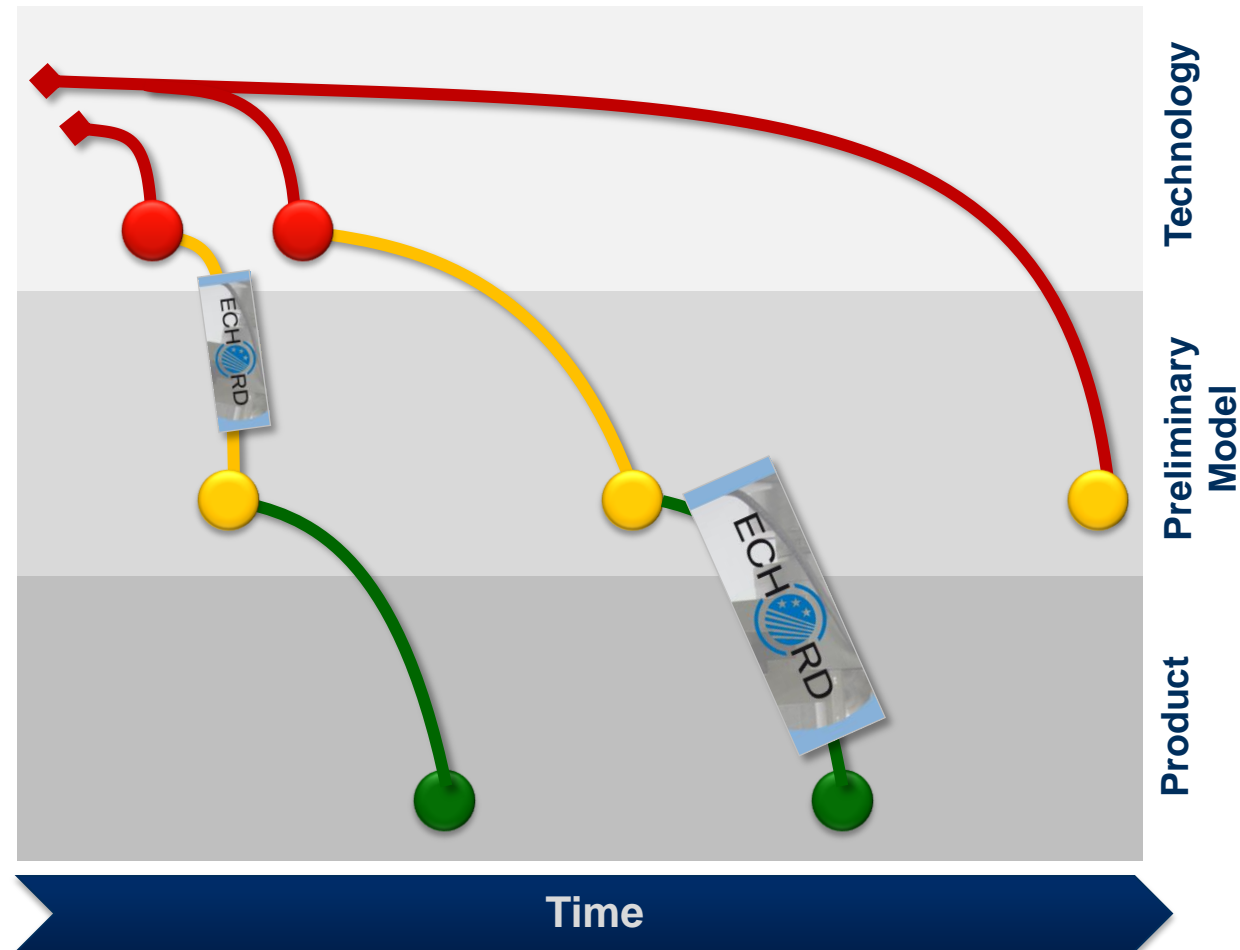


⇒ Reducing Risks



Industrial R&D Strategies in the „New Reality“

Demands on Research Collaborations



Excellent Basis for European (Service) Robotics Market !!!

BUT ...

Industrial R&D Strategies in the „New Reality“

Demands on Research Collaborations



Promotion: Technology Transfer / Cooperation & Dialogue

Exchange of knowledge between research and industry (ISR!!!)

Simplification: Reduce Complexity of Research Projects

Concentrate on small consortia

Concentrate on simple and market focused project goals

Minimize Complexity of application for funds



Motivation: Robotics community to put R&D results into practice

Research to result in concrete products

that are successfully introduced to the market

Support: start-ups and SMEs to bring new products into the market

Access to venture capital, risk management

Engagement: Cooperation on a worldwide basis

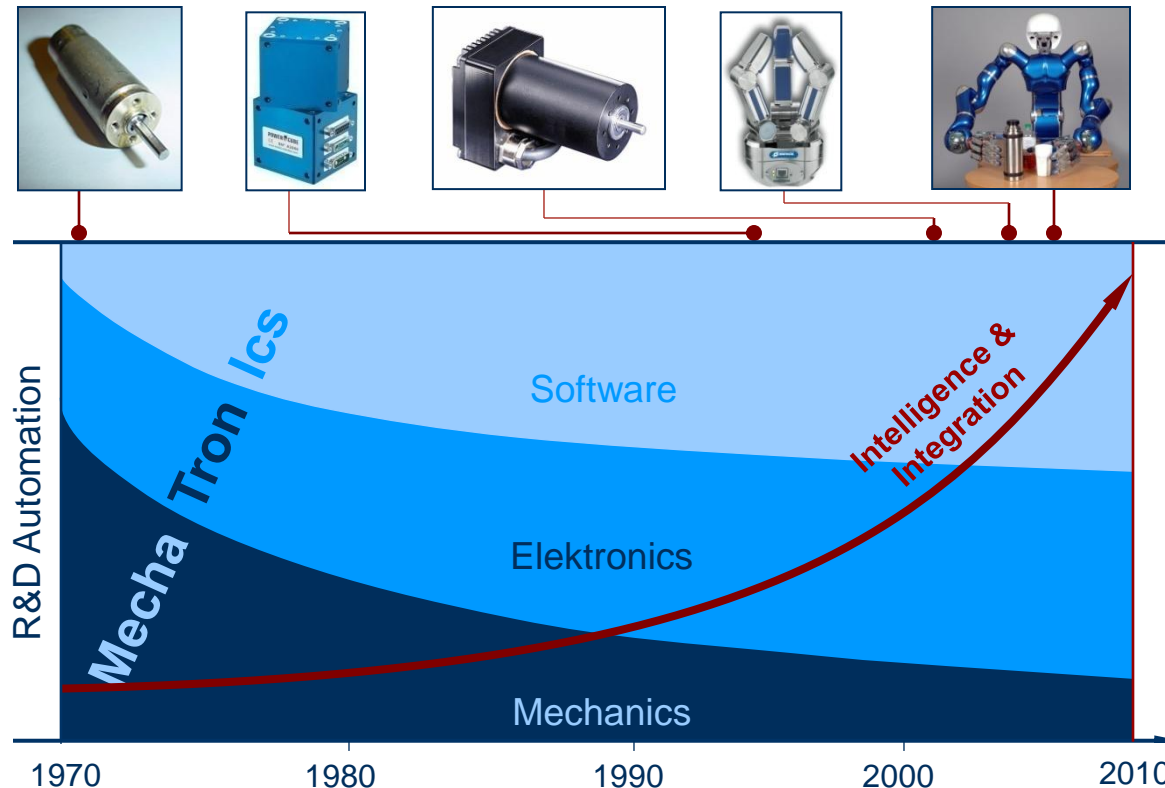
Standardisation, ethical, legal and societal issues on a worldwide level



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R&D Topics for Research Collaborations

History of Mechatronic Development



Technology Push
Computer Power
Miniaturisation
Sensors

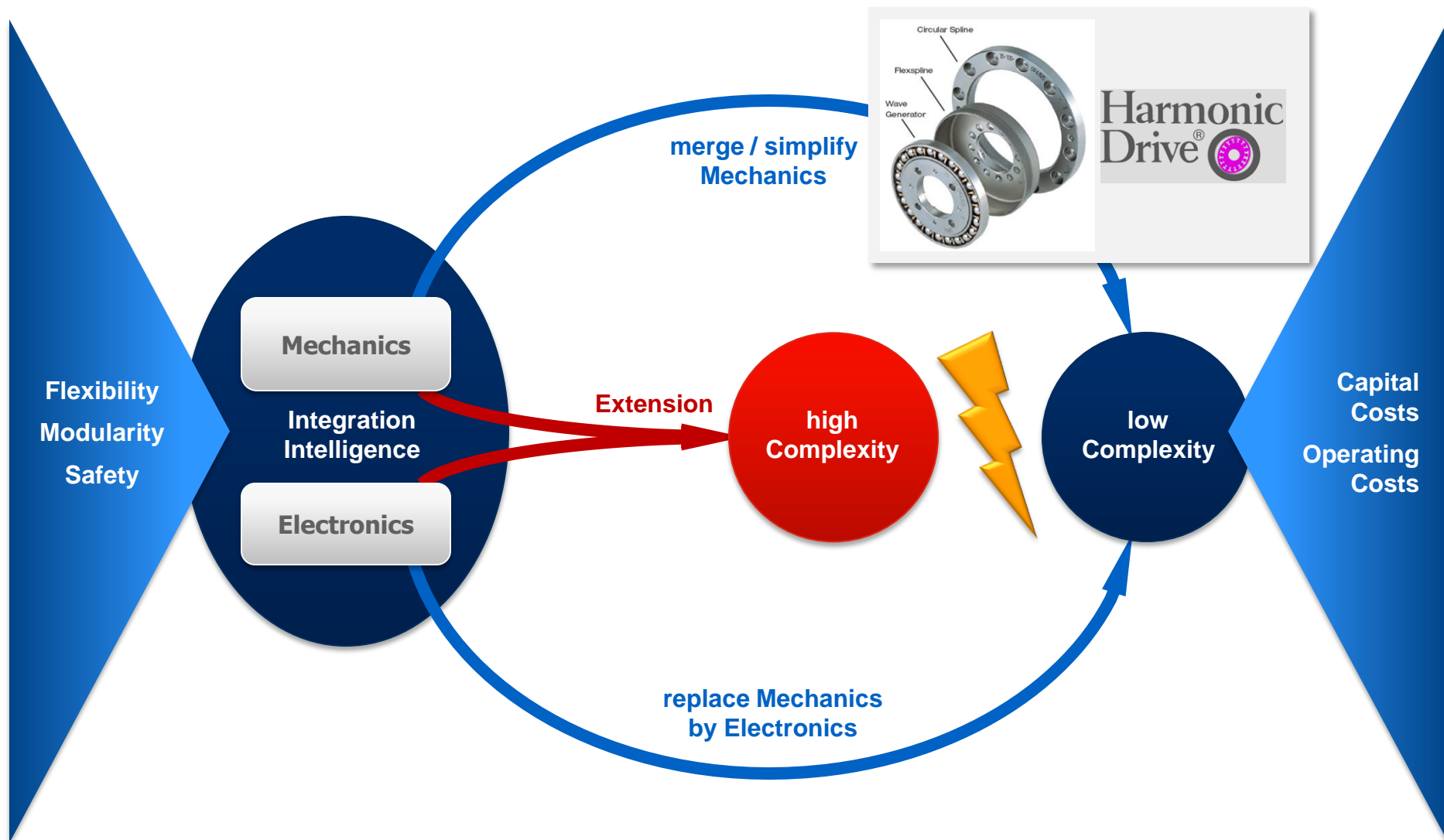
Market Pull
Flexibility,
Modularity,
Safety

=> Decreasing R&D Activities on Mechanics !



R&D Topics for Research Collaborations

Demand on „Intelligent“ Mechanics





R&D Topics for Research Collaborations

Demand on „Intelligent“ Mechanics



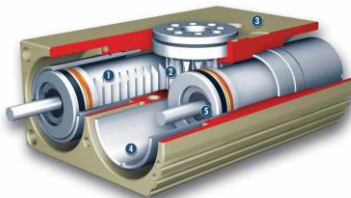
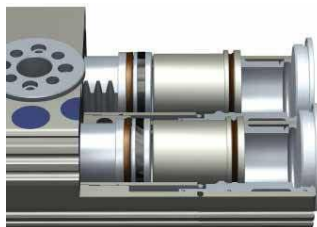
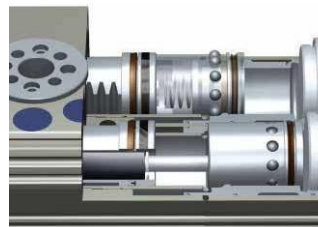

Replace Mechanics by Electronics:
SCHUNK Rotary Unit (SRU)



SRU Classic



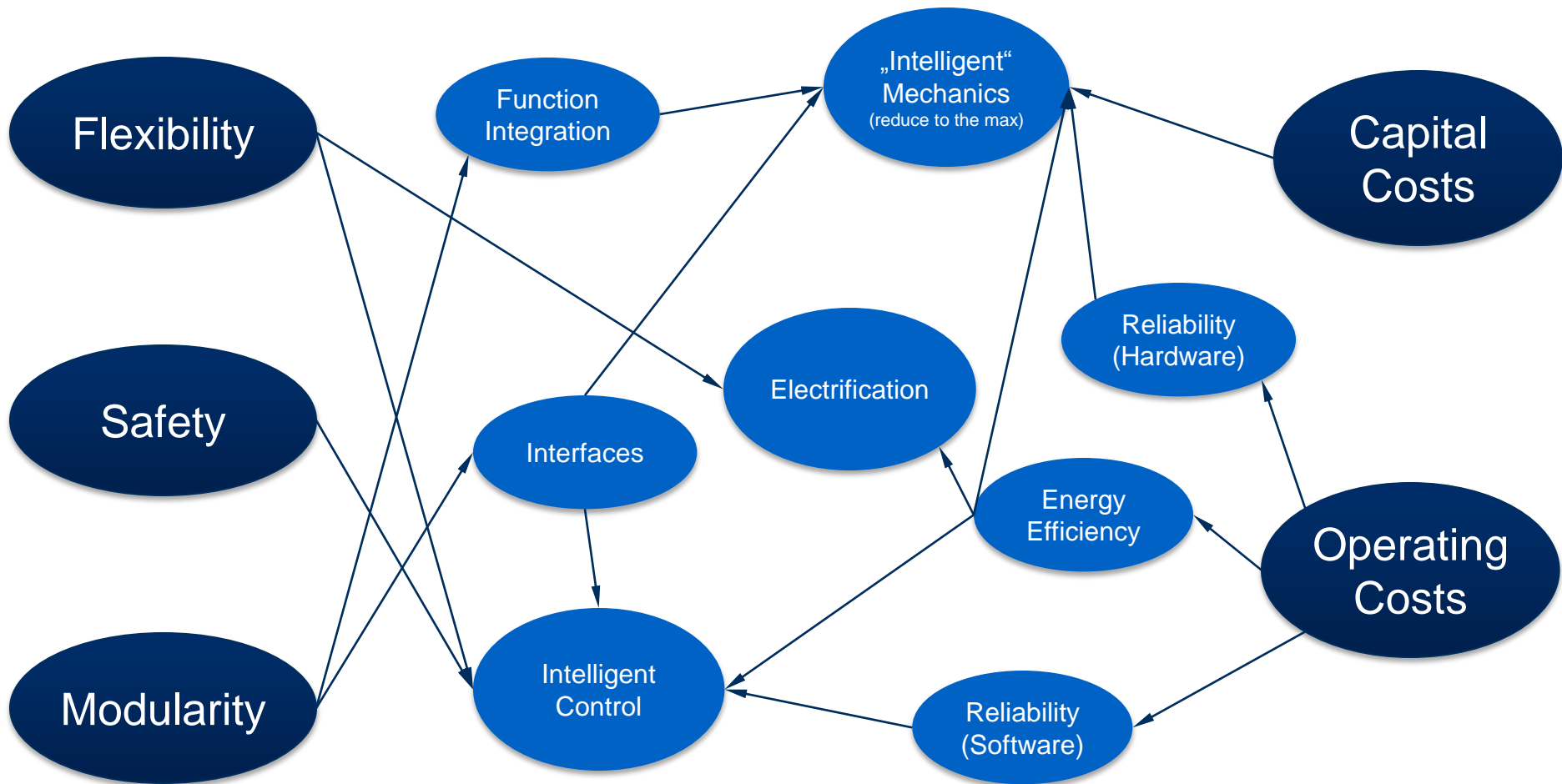
SRU Masterdrive

| Conditions | 2 End Positions 0° and 180° | 2 End Positions 1 Middle Position 0°, 90° und 180° | 2 End Positions 1 Middle Position mechanically locked 0°, 90° und 180° | 2 End Positions 3 Middle Position mechanically locked 0°, α , β , γ , 180° |
|------------|---|---|--|--|
| Mechanics | 2 Cylinders 2 Dampers 1 Valves | 4 Cylinders 4 Dampers 2 Valves | 6 Cylinders 4 Dampers 3 Valves | 2 Cylinders 0 Dampers 2 Valves 1 Drive |
| Control | simple | average | complex | highly complex |
| |  |  |  |  |



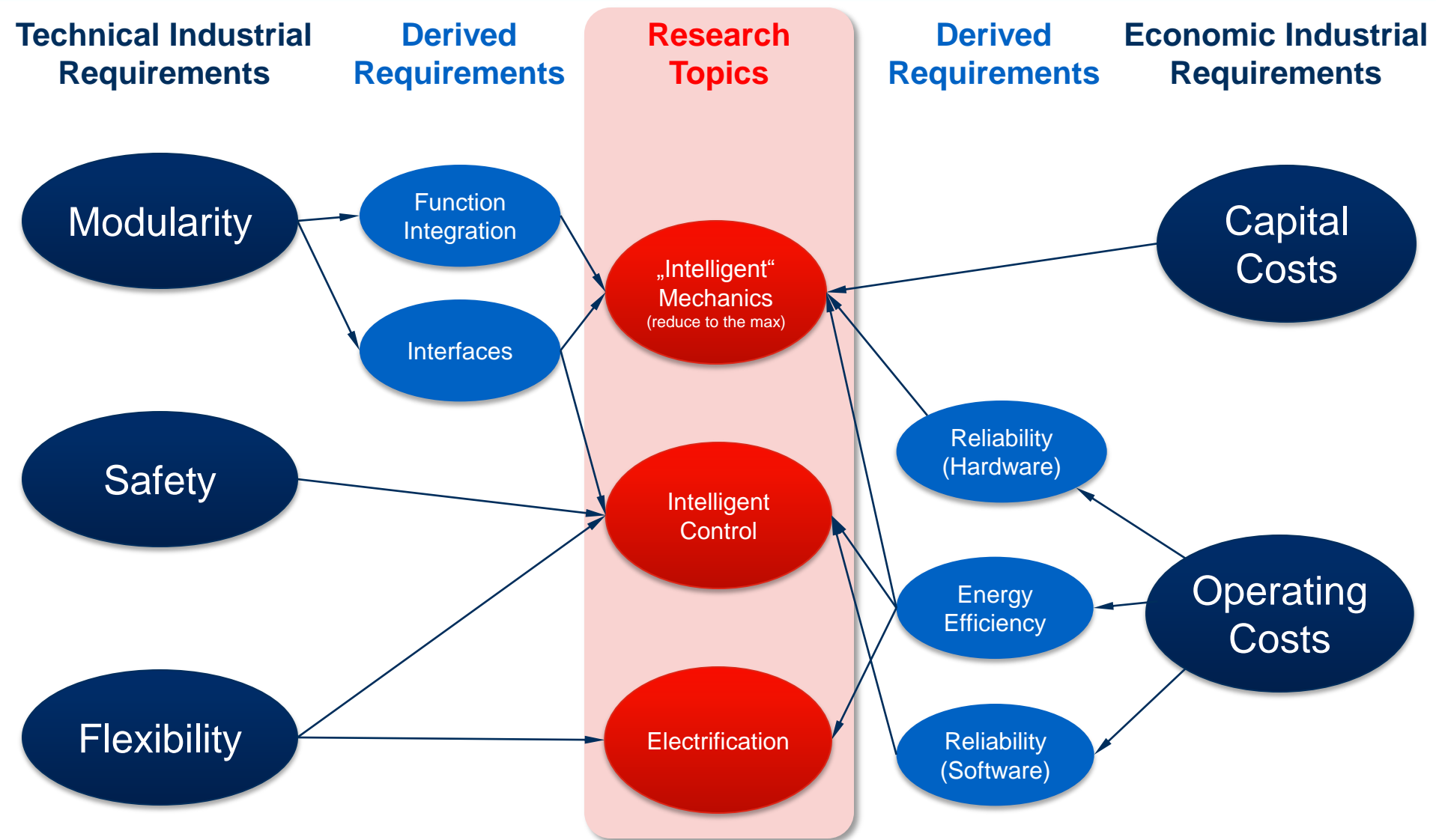
R&D Topics for Research Collaborations

Basic Industrial Demands on Mechatronic R&D



R&D Topics for Research Collaborations

Basic Industrial Demands on Mechatronic R&D



R&D Topics for Research Collaborations

... and where do we work on?



Intelligent Control

- Safe autonomous Navigation => Sensor Data Processing
- Safe flexible Grasping => Sensor Data Processing
- Skill Data Bases
- Common Software Architectures (Modularity)



BUT :Suitability for industrial standards still missing



„Intelligent“ Mechanics

- Mechanics & Control in Harmony
- High Efficiency Low Cost Gears
- Mechanical Interfaces (Coupling Systems)



Research demanded!!!



Electrification

- Electric Industrial Actuators



**Good start.
More!**

Conclusions

Research Collaborations in the near (!) Future

Current Situation

High Quality of Work within Research Projects

- Highly motivated and highly qualified research institutions

Excellent Basis for Market focused R&D

- Support of Academia/Industry Communication&Cooperation
- First EU-Programs for Short-Term R&D (low bureaucracy)

Academia
Keep it up!

Everybody
Use it!
Support it!

What can be improved

Strengthen Focus on Market focused R&D

- Short Term Projects
- Manageable Project Consortia
- Market focused Topics

Support Start-Ups and SME

Cooperate on a Worldwide Basis

- for standardization, legal-,ethical- & societal Issues

Focus on REAL Mechatronics

- „Mechatronics“ = „intelligent mechanics“ x „intelligent control“
- Minimize Complexity for REAL products

EU
Strengthen the fundament
with more appropriate programs

Academia
Think „simple & reliable“



„Go for Innovation! – but not alone...”