

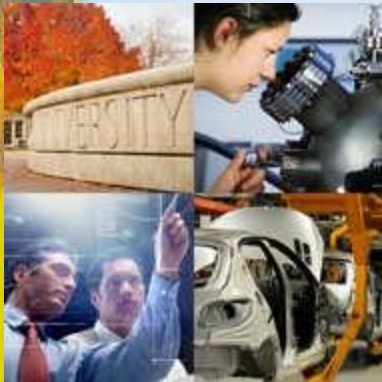


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The significant problems we face, cannot be solved at the same level of thinking we were at when we created them.

Albert Einstein

## R&D Cooperation between TUS and Industry



May 2016



# Who we are ?

## *The Technical University of Sofia is :*

- The biggest Bulgarian Technical University with more than 11 000 full-time, and a lot of PhD and post-graduate students.
- The academic staff of the TUS is more than 780 professors, assistant professors and researchers.
- The Research and Development Sector (R&D) of the TUS organizes, administrates and services of the research activities of TUS.





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## Trends and Challenges of the Innovations



**RESEARCH**



**CONSULTATION**

Interdisciplinary,  
praxis-oriented  
research and education

**Science meets Industry and Society!**



Innovative  
engineering solutions  
and qualifications



**ENGINEERING**

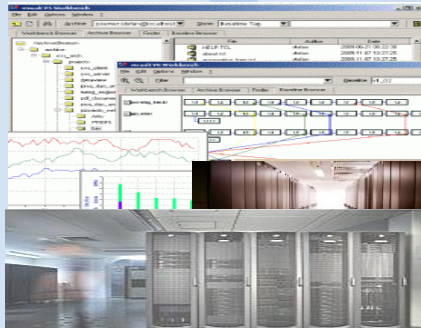
**TRAINING**



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## Trends and Challenges of the Innovations

Global competitive  
**clustering of knowledge  
and competence of  
science and business, IP  
management**



**KNOWLEDGE**

**INNOVATION / IP**



**IMPLEMENTATION**

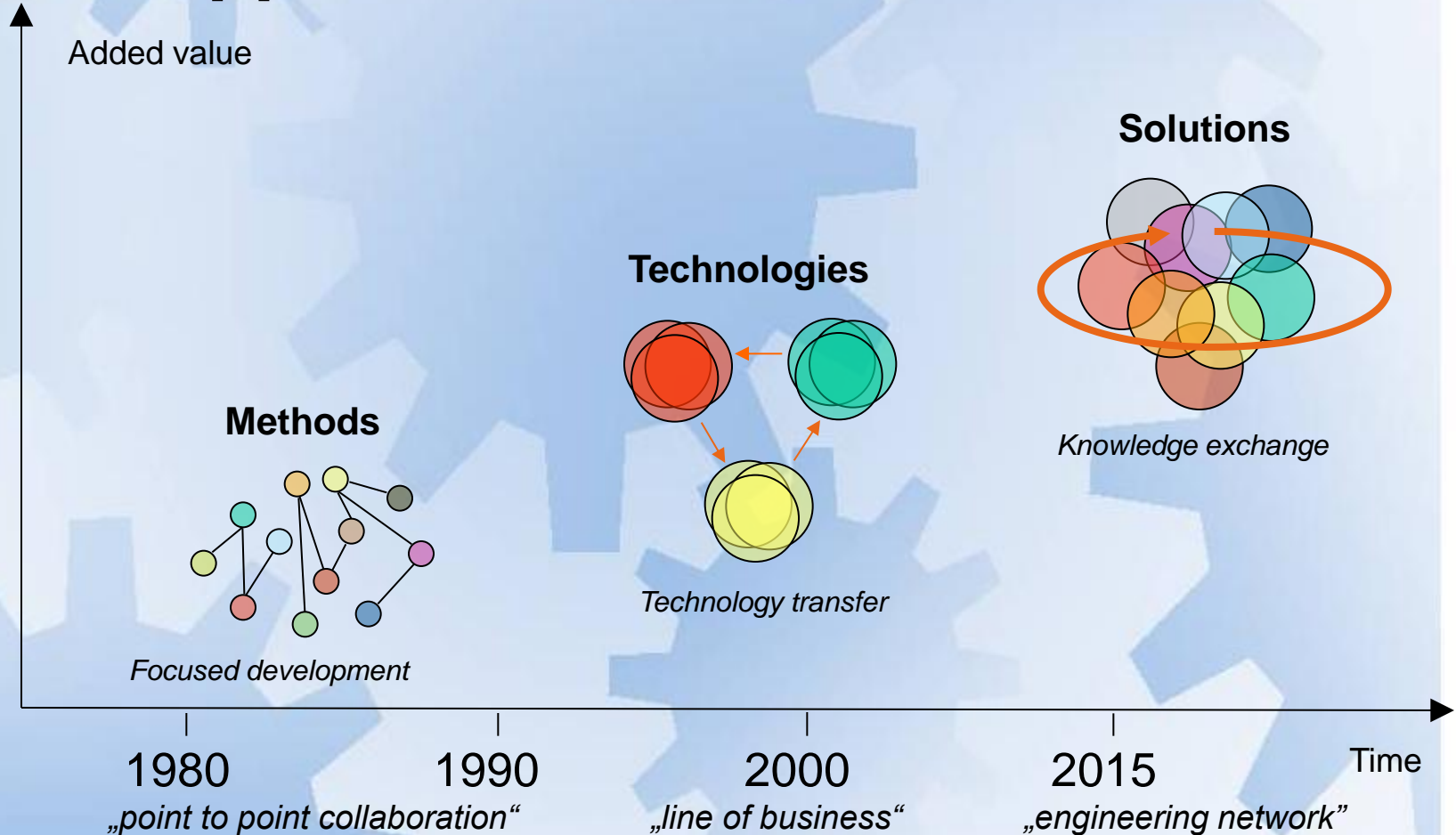


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## Approaches





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## **Challenges of the Innovations – UNIVERSITIES TO INDUSTRY COLLABORATION**

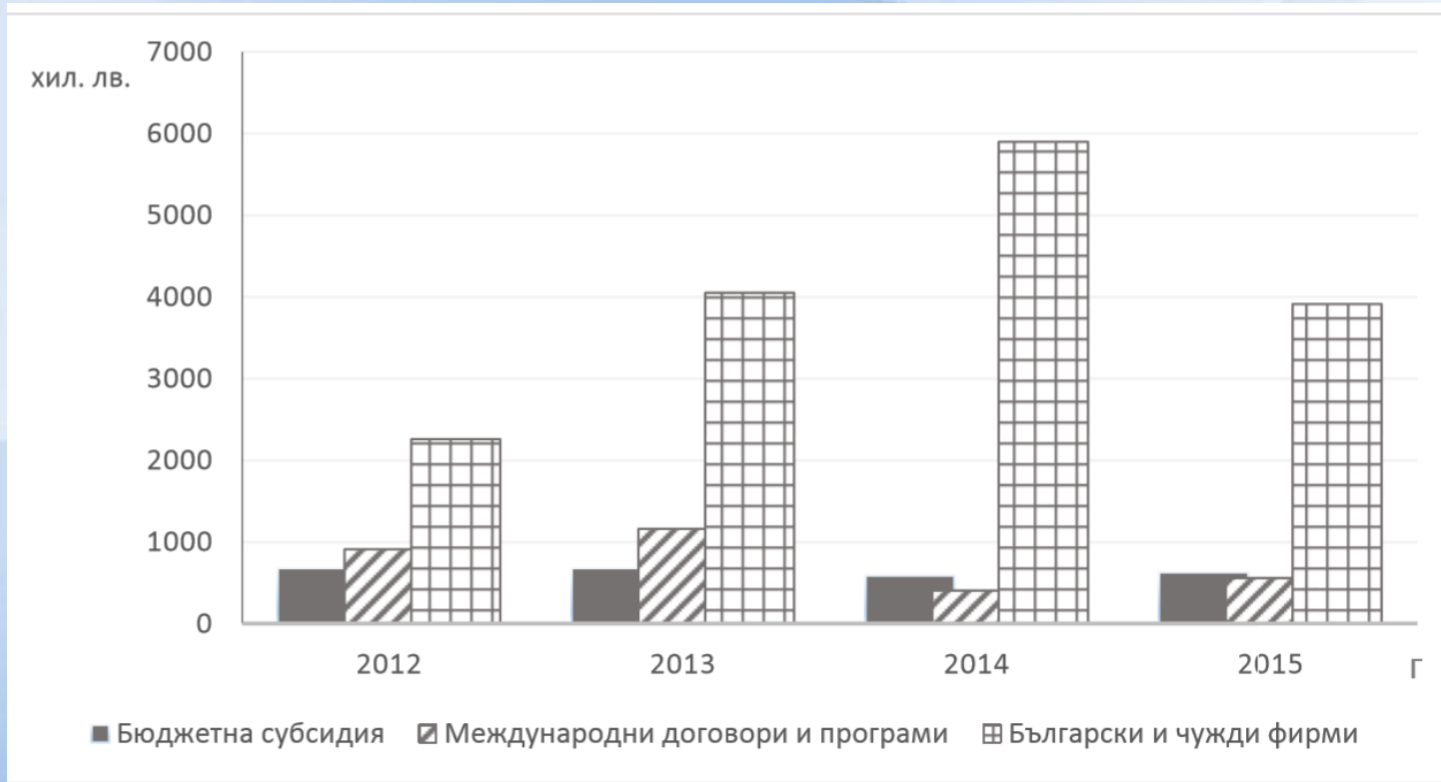
**Industrial Partners and Universities look together  
for:**

- New solutions
  - New products
  - New services
  - New business models/IP management
- 
- New curricula for modern engineering professions
  - Individualized education and new competences
  - Space for visions, communication and knowledge exchange with industry and society



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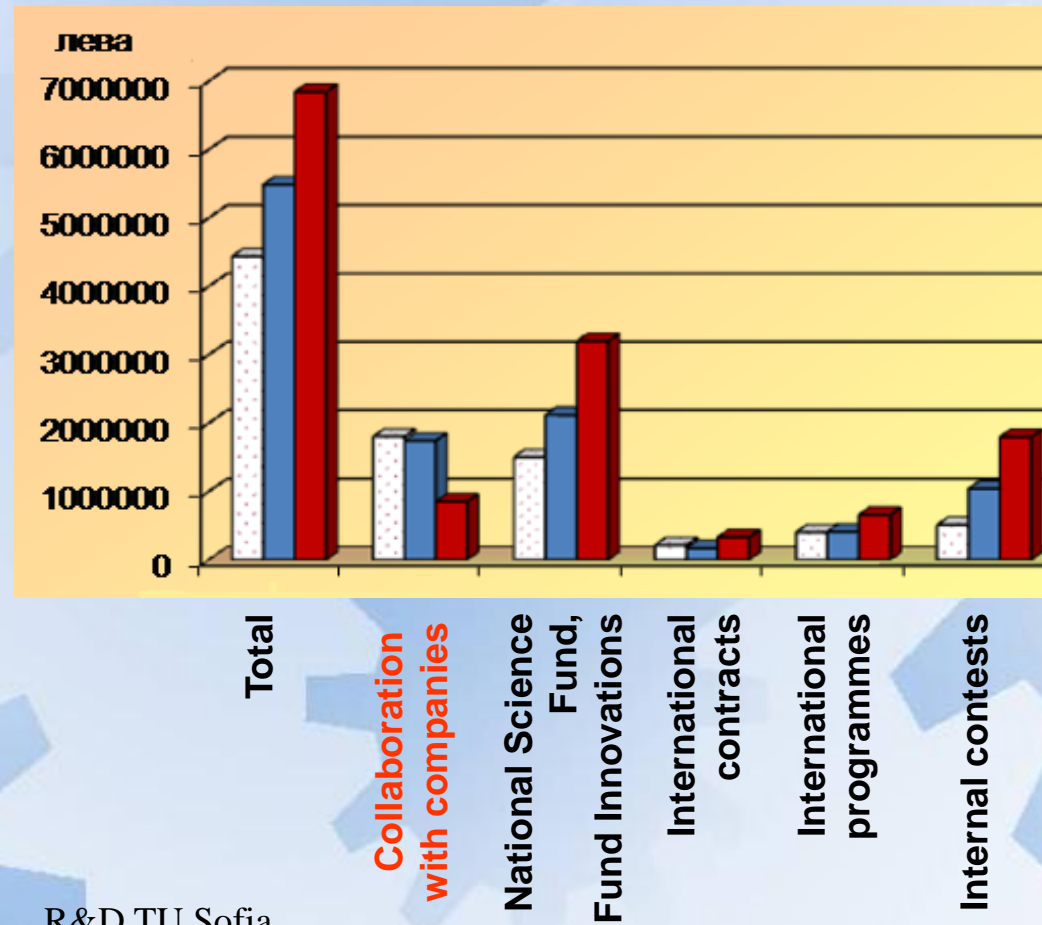
## **Facts: Research and Development Sector (R&D) Annual Income**





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**The Research and Development Sector (R&D)  
annual income, structure by sources**

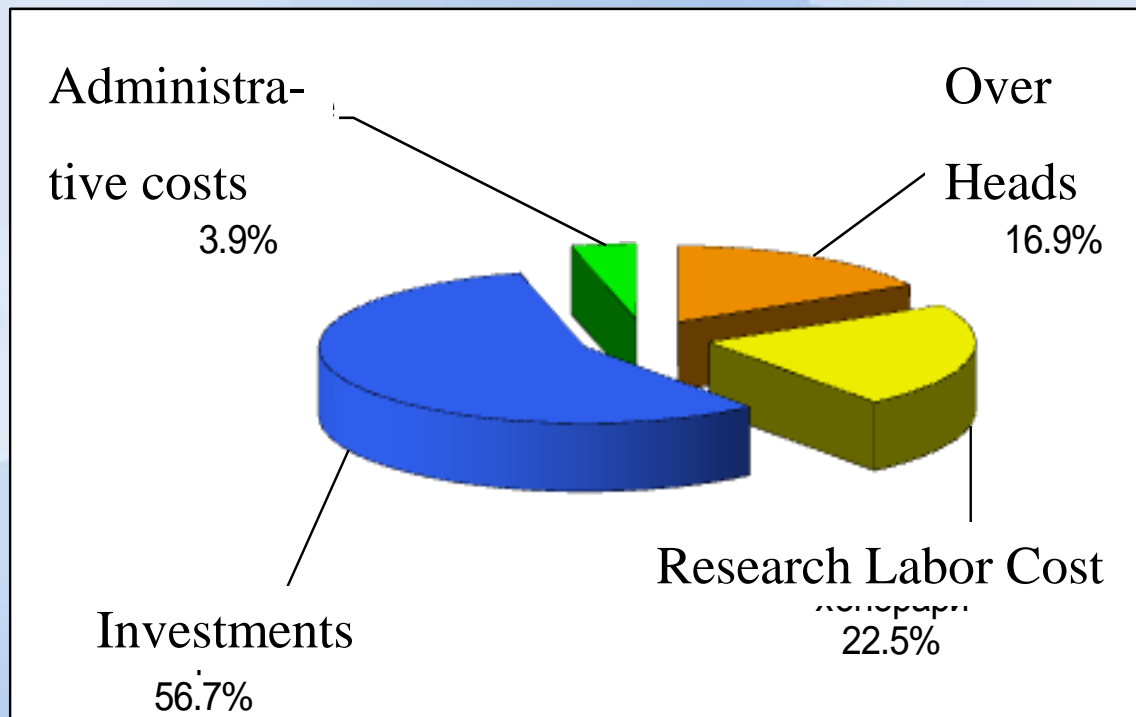






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## **The Research and Development Sector (RDS) -Type of Expenses Distribution, 2011**





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## **WAYS OF COLLABORATION WITH INDUSTRY:**

### **DIRECT TUS R&D to INDUSTRY COOPERATION**

- Direct R&D PROJECTS with PRIVATE SECTOR Companies- National and International (approx. 20% of the annual income)
- R&D Projects with Industrial Companies SUPPORTED BY NATIONAL INNOVATION FUND
- Establishment of R&D centers in TUS with Company's support
- Participation of TUS R&D in Industrial clusters as a full partner



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## **WAYS OF COLLABORATION WITH INDUSTRY: BULGARIAN PUBLIC FUNDS SUPPORTED PROGRAMS AND INITIATIVES**

- R&D CONTRACTS, SUPPORTED BY **NATIONAL SCIENCE FUND**, REFLECTED TO INDUSTRIAL INNOVATIONS
- **INSIDE TUS R&D - FUNDING** OF THE PROJECTS FOR NEW IDEAS, TECHNOLOGIES AND SERVICES DEVELOPMENT AS A BASE FOR NEXT INDUSTRIAL INNOVATIONS , FUNDED BY “MINISTRY OF EDUCATION, YOUTH AND SCIENCE”



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## **WAYS OF COLLABORTION WITH INDUSTRY:**

### **EU and INTERNATIONAL PUBLIC FUNDS SUPPORTED PROGRAMMES AND INITIATIVES, indirect IMPACT TO TUS R&D**

- **R&D EU Programmes to SME– THROUGH PRIVATE SECTOR FUNDING RESEARCH PROJECTS TO TUS R&D**

**“DEVELOPMENT OF THE COMPETITIVENESS OF THE BULGARIAN ECONOMY” PROGRAMME SUPPORTED PROJECTS– THROUGH PRIVATE SECTOR FUNDING RESEARCH PROJECTS TO TUS R&D**



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**Challenges of the Innovations : GOOD PRACTICES**

**Example**



**NATIONAL SCIENCE FUND**

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**TUS, Research and Development Sector**  
Lab. "CAD/CAM/CAE in Industry"

**PROJECT**



**CENTRE OF EXCELLENCE**

[www.ce-tus.eu](http://www.ce-tus.eu)

**„Center of Excellence” at TU-Sofia with a focus in the field of micro-electromechanical systems and energy recuperation” ”**

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## **Example of GOOD PRACTICES**

R&D Laboratory "CAD/CAM/CAE in INDUSTRY" was established on 1992.

Since 1993 Laboratory was grow up by collaboration and Projects with Industrial Partners from West Europe and USA.

Over 110 successful subcontracted projects with West European and USA Companies was developed in Laboratory.

**In 2009 was established " Centre of Excellence" , based on Synergy of 5 TUS R&D Laboratories**

*From the Idea to the Prototype ...*

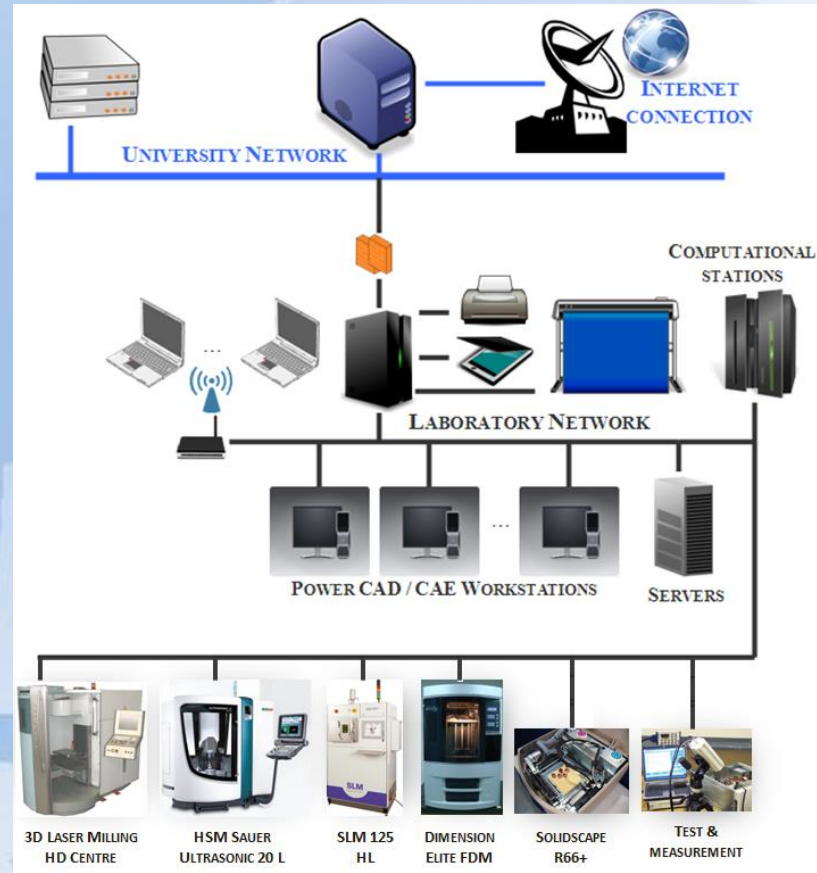


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## INFRASTRUCTURE

- ✓ 24 Power Workstations
- ✓ 4 High Performance Servers
- ✓ Communication services: FTP & e-mail
- ✓ Printing/Plotting Facilities
- ✓ 5 axis Machining Center
- ✓ 4 Rapid Prototyping Systems
- ✓ **Laser MILLING Technology DMG Lasertec**





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## **Industrial Partners**

Over 90 projects are successfully finished in the CE's Laboratories

- ViTECHNOLOGY - France
- SIGUREN Ingénierie - France
- ASSETIUM - France
- IndustrieHansa - Germany
- MANTOVANIBENNE - Italy
- GLOBAL DESIGN sas - Italy
- CMS- Italy
- SPARKY M&T - Germany
- GENMARK Automation - USA
- SENSATA, Bulgaria
- DELTICA - USA
- Badestnost Jsc. - Bulgaria
- SPESIMA GmbH - Bulgaria
- VISTEON - Bulgaria
- and many others.





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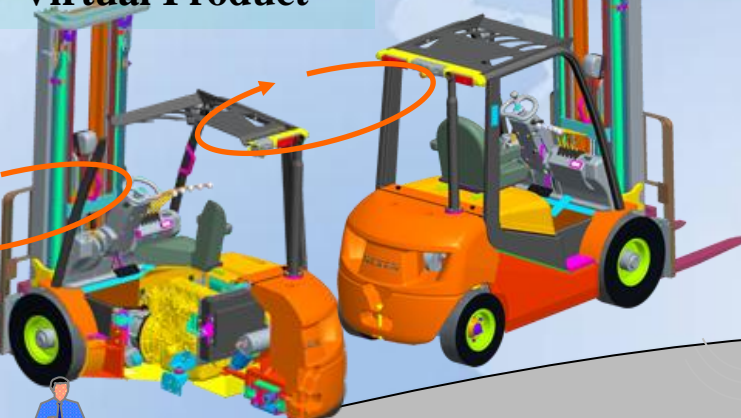
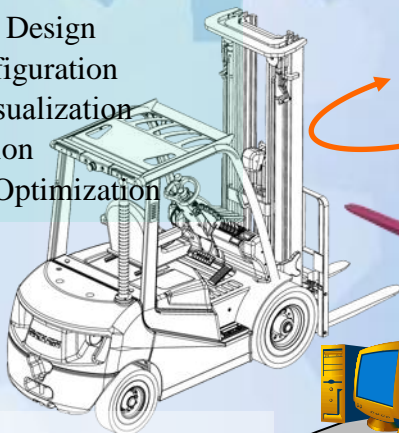
## Product Development: A family of forklift trucks



*Product Life Cycle*

**Virtual Product**

- Context driven Design
- Prototype Configuration
- „High-end“ Visualization
- Virtual Validation
- Feedback and Optimization



*Team Collaboration*

*Engineering Network*



- CAx
- PLM
- VR/AR
- Web Portals
- Telecommunication Services

*Best Practices*



- Iterative Work Tasks
- Workflow & Workload Management
- Quality Gates
- Deliverables & Progress Management

**Information and Communication**



**Product Creation Process**

**3CLab Activities**



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✓ **Product Development: Physical prototype**



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## Project: Development of Lathe FM360 CNC (ZMM Metallik)

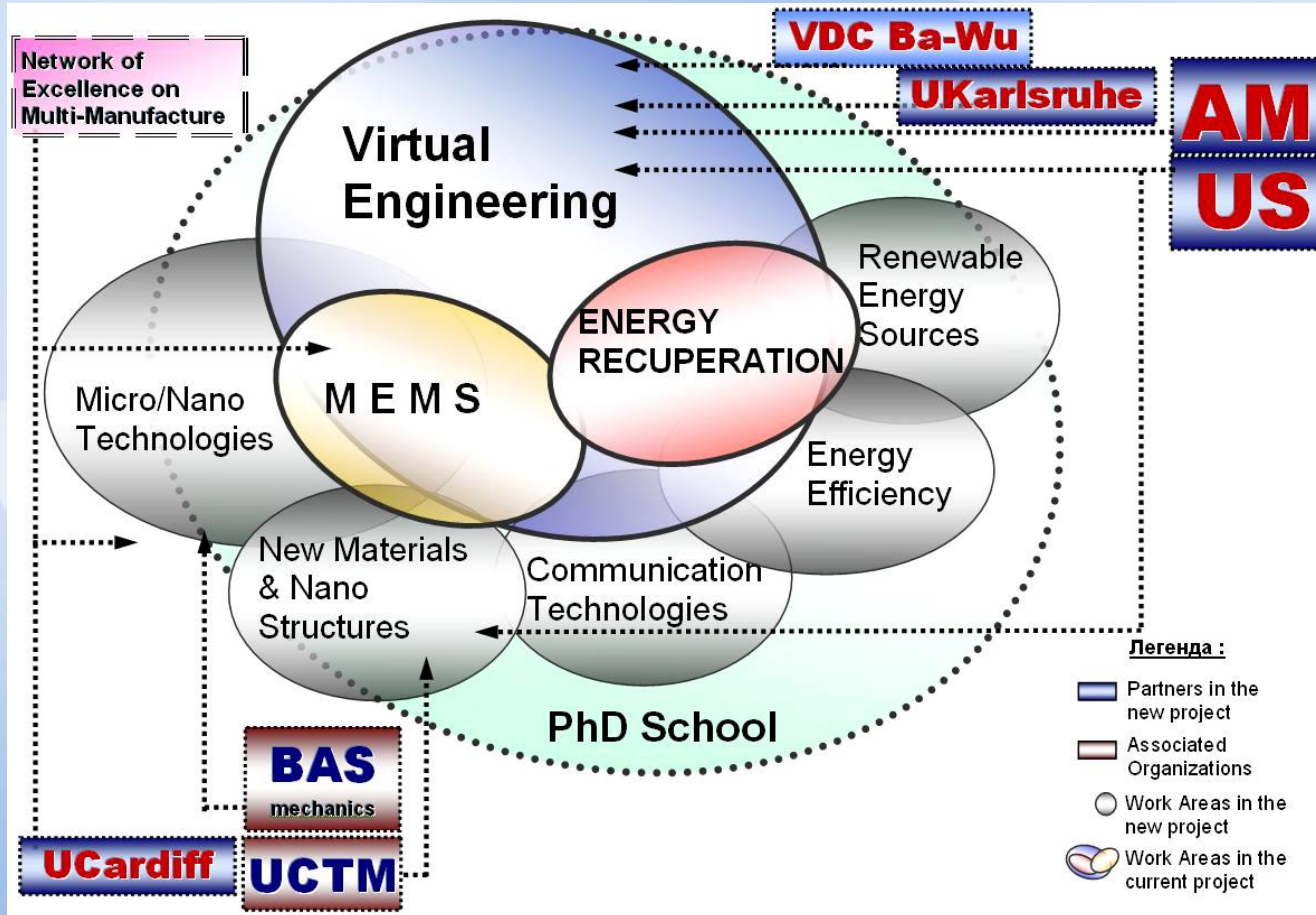
TECHNICAL DATA	TECHNISCHE DATEN		LM 360 CNC
Height of centres	Spitzenhöhe	mm	185
Distance between centres	Spitzenweite	mm	760
Max turning length	Drehlänge	mm	735
		mm	50
		mm	360
		mm	230
	ds Seitensupports	mm	500
	ette	mm	10 - 80
	len Linette	mm	80
			M6
	genmaterial	mm	Ø 52
		rev/min	50 - 2000
		mm/min	10000
		mm/min	6650
	ischen Stützungen	mm	0.1-20
	ewinde	mm	1-140
	elgewinde	M	0.1 - 1.75
	ewinde	DP	70 - 4
		mm	185
		deg/mm	360 / 8x45
		mm	25 x 25
	Pinole		10
	chiebung		
	ebung		
	Pinole		
	bung		
	ee	Drehzahl	
	over	Leistung	
	ensions	Gesamtmessungen	
	weight net	Nettogeicht	



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## Challenges of the Innovations – FUTURE PLANS

Establishment of the “University Scientific & Research Complex”, FUNDED BY “NATIONAL SCIENCE FUND”





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**Challenges of the Innovations – way to knowledge based Industry :**

**Establishment of the  
“University Scientific & Research Complex”**

**The established USDC will significantly expand and improve the scope of the studies and will consolidate research capacity in the areas, strategic for TUS R&D and having priority for Bulgaria**



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## **Establishment**

### **of “University Scientific & Research Complex”**

**USRC aims to expand the scope and deepening the studies through a synergy of the research capacity. The project research objectives are:**

- Virtual engineering innovations;
- Development of micro/nano objects and systems;
- New materials and nano structures;
- Research of energy recuperation systems and their integration in energy systems;
- Management of innovations in building, processing and industrial energy efficiency;
- Development and management of renewable energy sources;
- **Raising the qualification level of the research fellows and teaching staff and creative and innovation environment for young researchers’ development.**



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## R&D Impact to Education Quality and Sustainability



**EDUCATION  
QUALITY**

**KNOWLEDGE**

**IMPLEMENTATION**

**Education and  
qualification level  
improvement**



**INDUSTRY**

Scientific consulting,  
technology validation,  
execution and transfer

**INNOVATION**

**KNOWLEDGE  
GENERATION**

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R&D Impacts to Education Quality and Sustainability

Strong R&D Activities Reflect to  
Cooperation with a World leading  
Companies as:

- **HP International** Institute of Technology
- **DAIMLER BENZ AG**
- **SIEMENS AG**
- **SAP AD**
- **Sensata AD**
- **Visteon**

**KNOWLEDGE**

IN EDUCATION & TRAINING Programmes





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**Thank you for your time  
and cooperation**