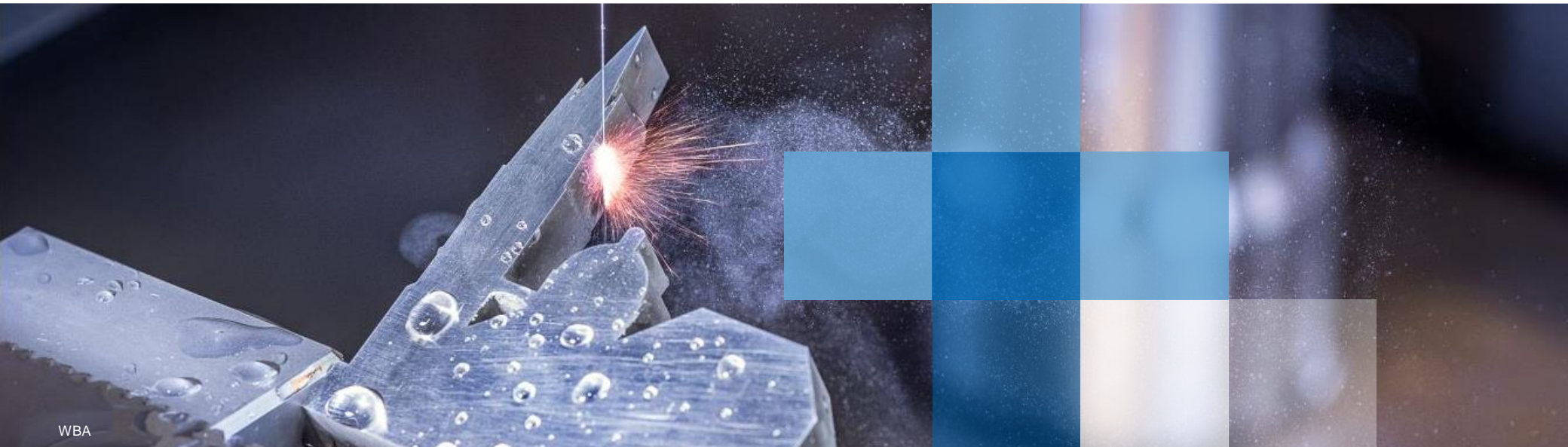




**WBA
WERKZEUGBAU
AKADEMIE**



WBA

WBA Tooling Academy Aachen

Presentation

Version 06 (2019)

Structure



- 1 RWTH Aachen Campus - the Engineering Valley
- 2 Production Engineering in Aachen - Excellence in Teaching and Research
- 3 The WBA Tooling Academy Aachen - Tooling in Series

RWTH Aachen Campus A Unique Research Landscape – the Engineering Valley



Building and exchanging knowledge...

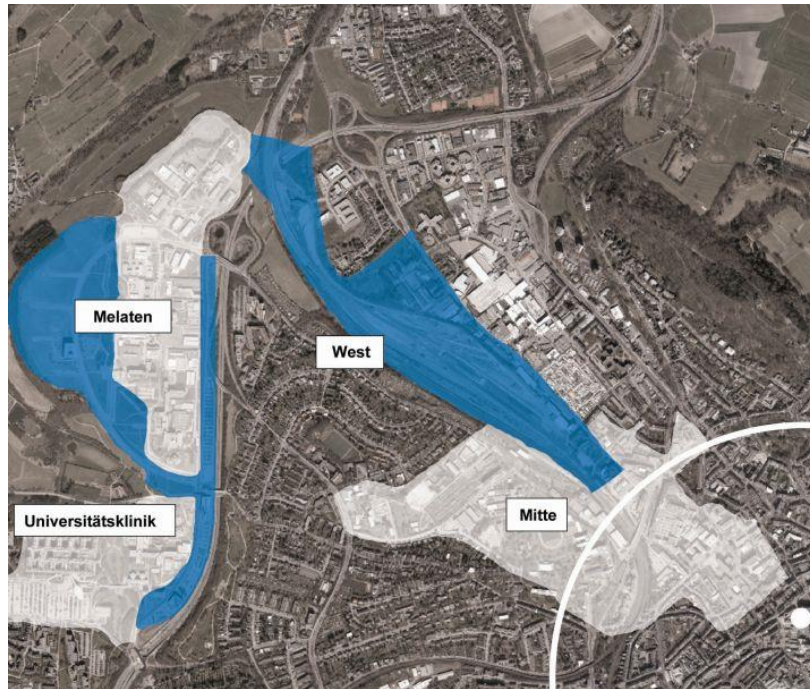


...between research and industry

Companies, institutes and the university share resources, utilize synergies and jointly conduct research on sustainable innovations.

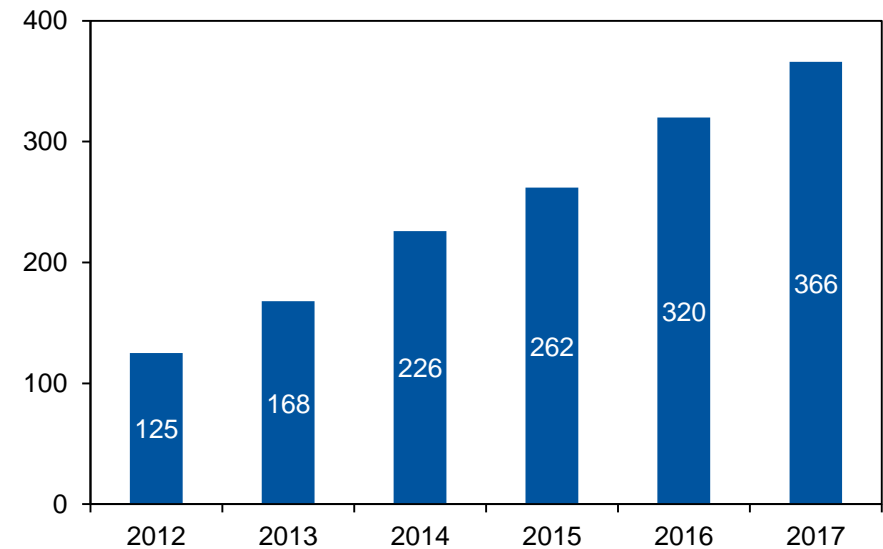


A campus for research. Learning. Developing. Living.



- The area grows by 800,000m² to 2.5km²
- Investment volume amounts to approx. €2 billion
- 10,000 jobs are created directly and indirectly

Number of enrolled companies



Start-ups / Spin-offs

- Around 45 to 50 start-ups originate in the science region Aachen per year
- The Campus initiative is a catalyst for further start-up activities

RWTH Aachen Campus

Campus Melaten Grows and Flourishes



Campus Melaten 2012

Campus Melaten 2016



RWTH Aachen Campus

Outlook: There Is Still a Lot to Do in the Engineering Valley





View from the South



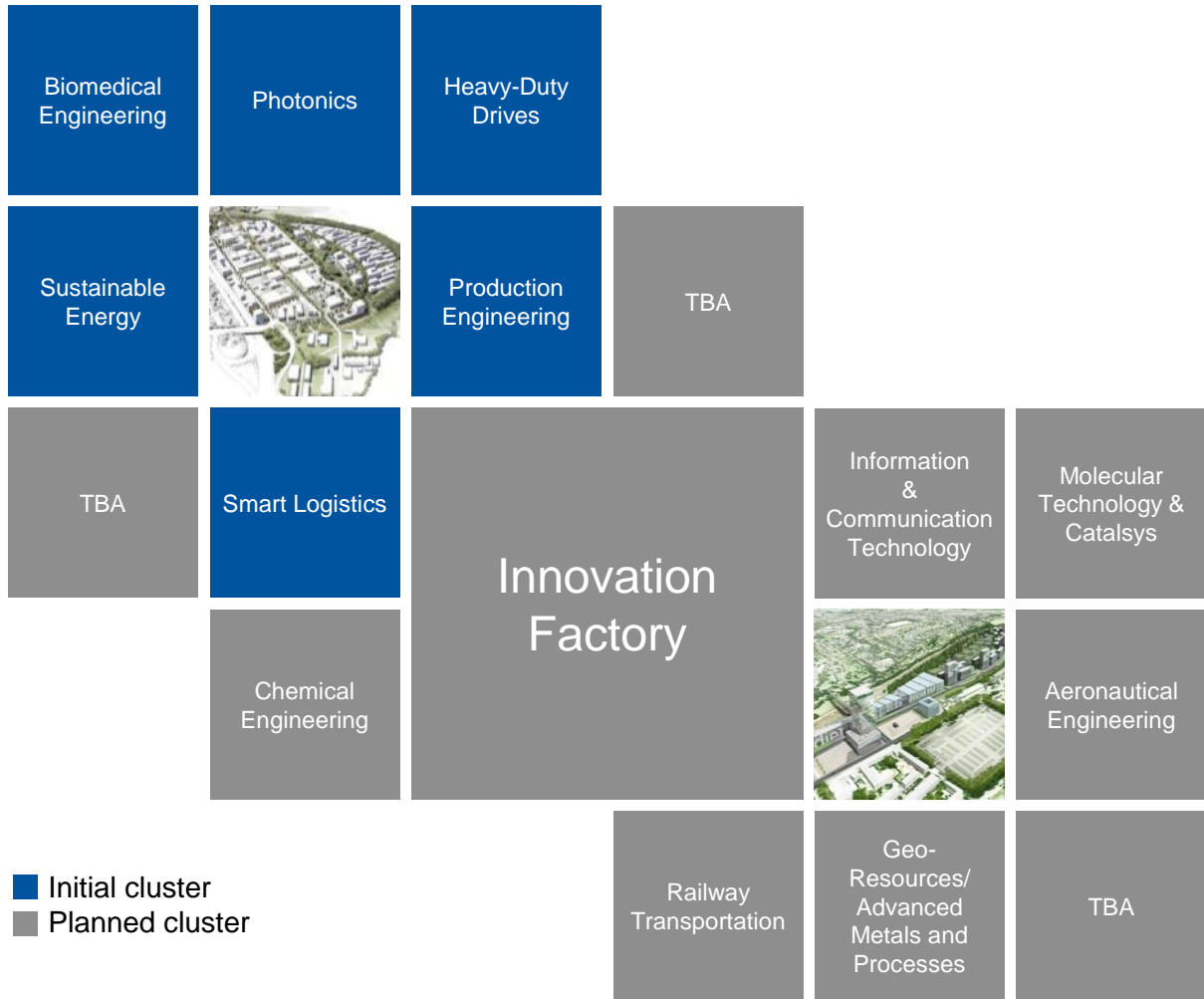
View from the Northeast

Legend:

-  Already existing buildings
-  Buildings to be constructed

RWTH Aachen Campus

16 Research Clusters Are Developing...



■ Initial cluster
■ Planned cluster



Cluster Biomedical Engineering



Cluster Photonics



Cluster Heavy-Duty Drives



Cluster Sustainable Energy

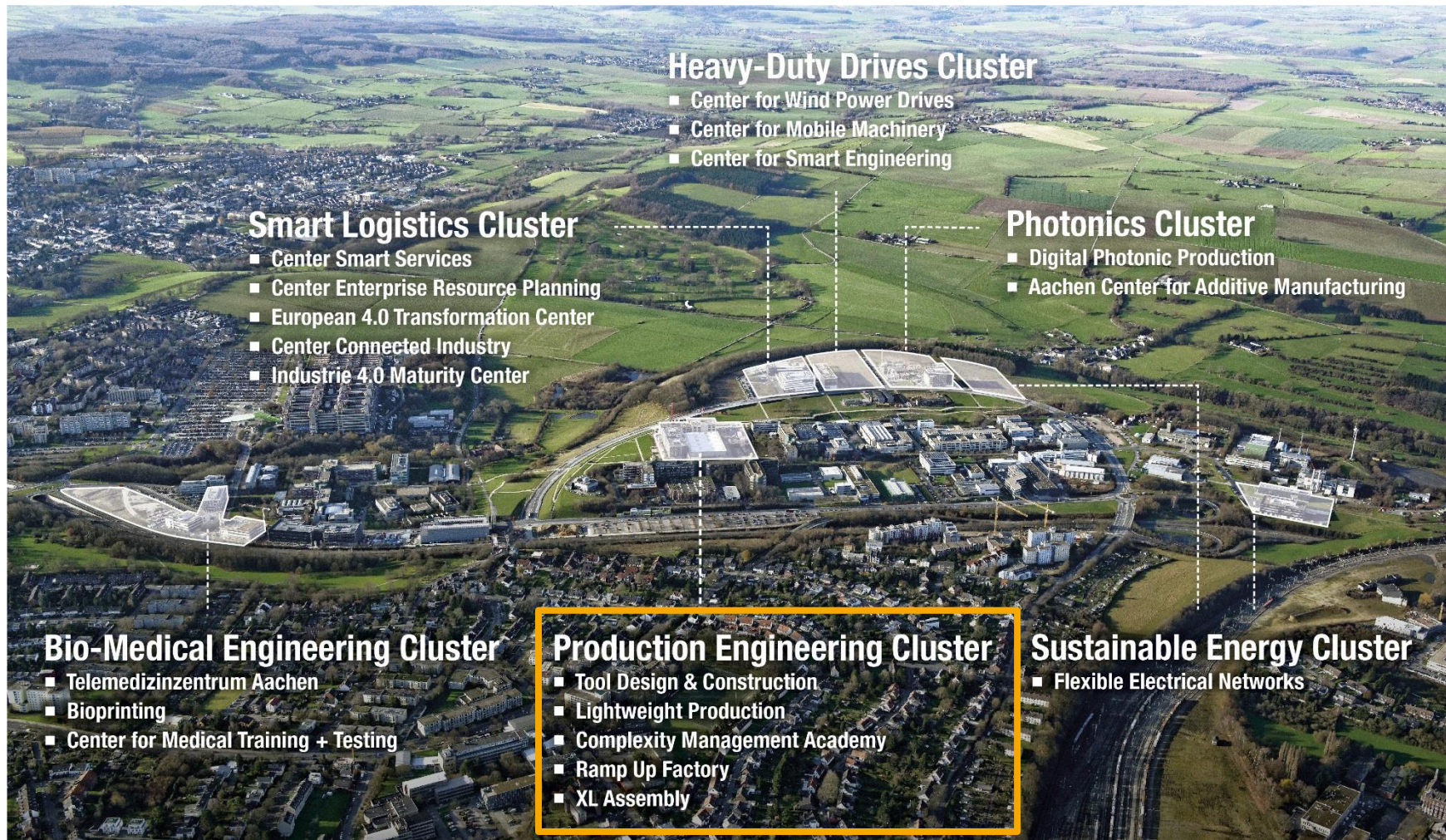


Cluster Production Engineering



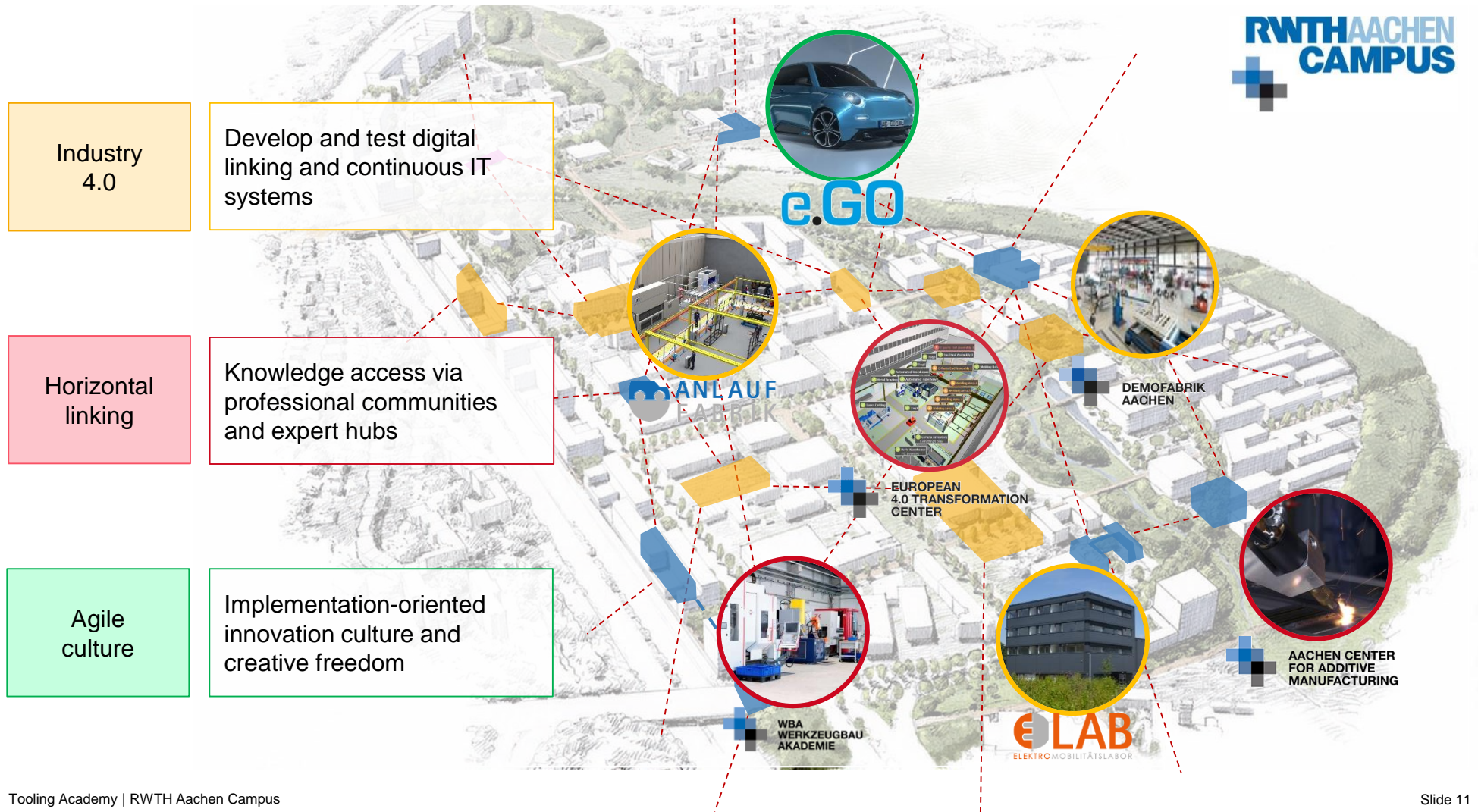
Cluster Smart Logistics

RWTH Aachen Campus ...Divided in Organizational Centers



RWTH Aachen Campus

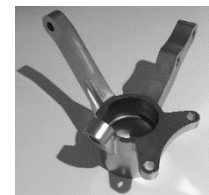
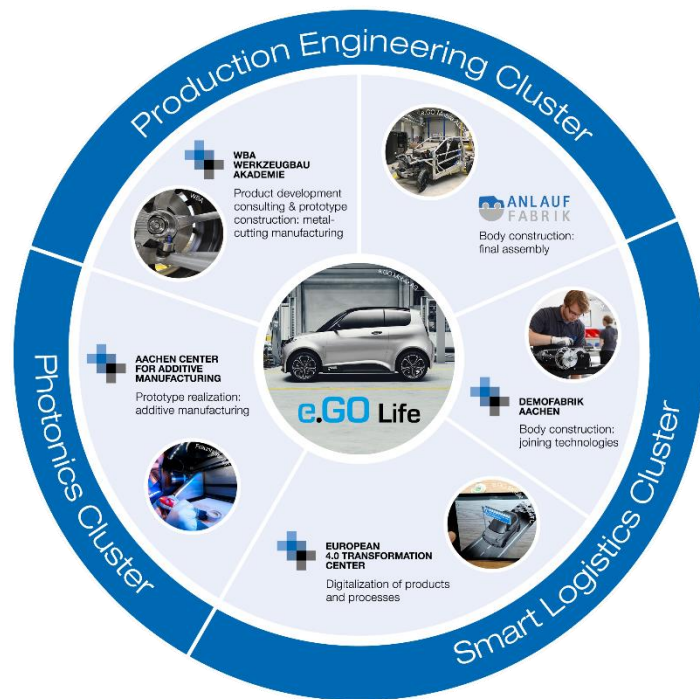
e.GO as a Result of Campus Performance





The intelligent connection of all competencies and resources available on campus...

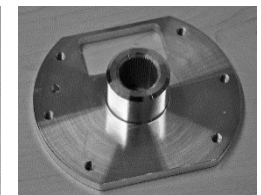
... has enabled the fast and cost-efficient development of an affordable electric car.



Front-wheel carrier



Rear-wheel carrier



Adapter plate for steering wheel

The WBA is a central component of the RWTH Aachen Campus and development partner of e.GO Mobile AG.

Excellence in Teaching and Research

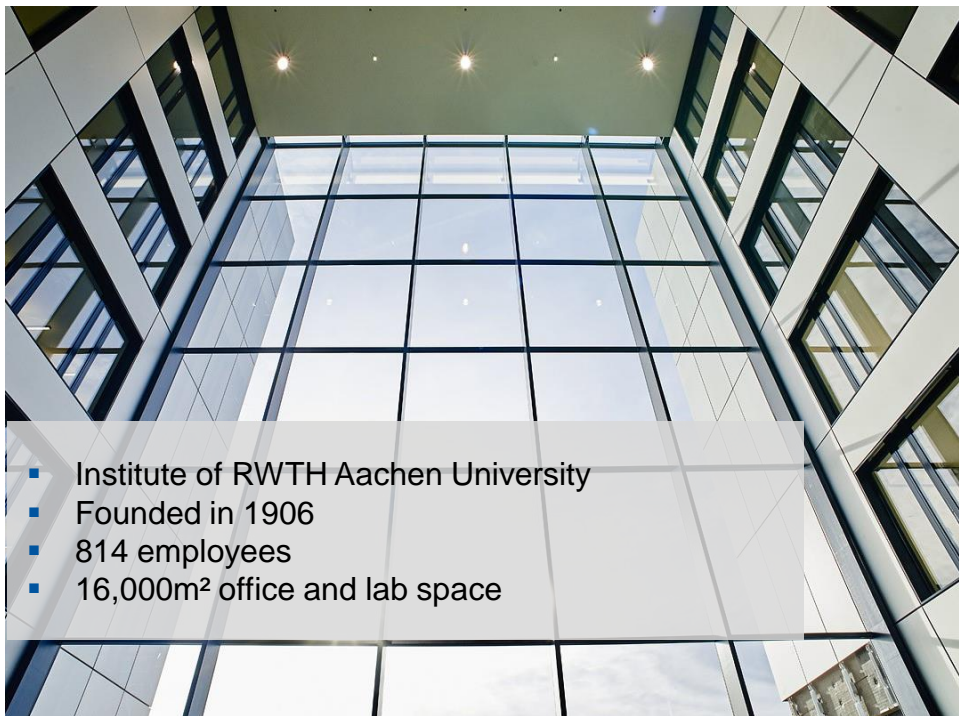
Production Engineering in Aachen – WZL and IPT



Laboratory for Machine Tools and Production Engineering WZL of RWTH Aachen University



Fraunhofer Institute for Production Technology (IPT)



- Institute of RWTH Aachen University
- Founded in 1906
- 814 employees
- 16,000m² office and lab space



- Institute of the Fraunhofer-Gesellschaft
- Founded in 1980
- 459 employees
- 9,000m² office and lab space
- Certified according to DIN EN ISO 9001:2008

WZL and IPT constitute one of the worldwide leading research institutes in the area of production technology.

Excellence in Teaching and Research

Two Institutes – one Philosophy



- Process technology
- Production machines
- Production quality and metrology
- Technology management

- Technology of manufacturing processes
- Transmission technology
- Machine tools
- Production measurement technology and quality management
- Production systems

As part of RWTH Aachen Campus, WZL and IPT are integrated into one of Europe's largest research landscapes.

Excellence in Teaching and Research

The Cluster for Production Engineering on RWTH Aachen Campus



- Gross floor space: 30,000m²
- Usable floor space (office and machine hall): approx. 11,000m²
- Mixed use: approx. 3,500m²
- Investment: approx. €60 million



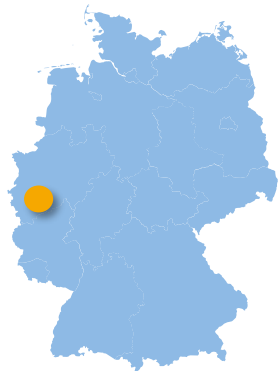
The new home of WBA lies at the heart of RWTH Aachen Campus, within the cluster for production engineering.

The WBA Tooling Academy Aachen

Tooling in Series



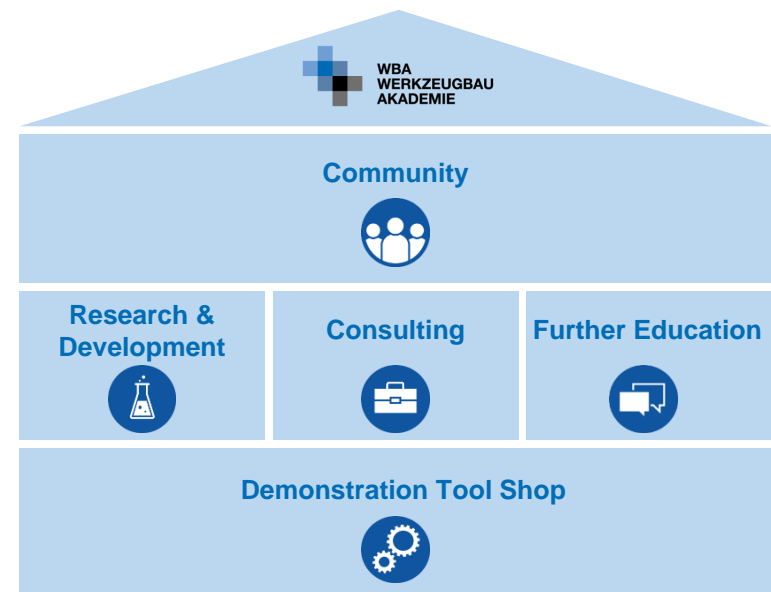
University and research institutes in Aachen



Further institutes relevant to toolmaking



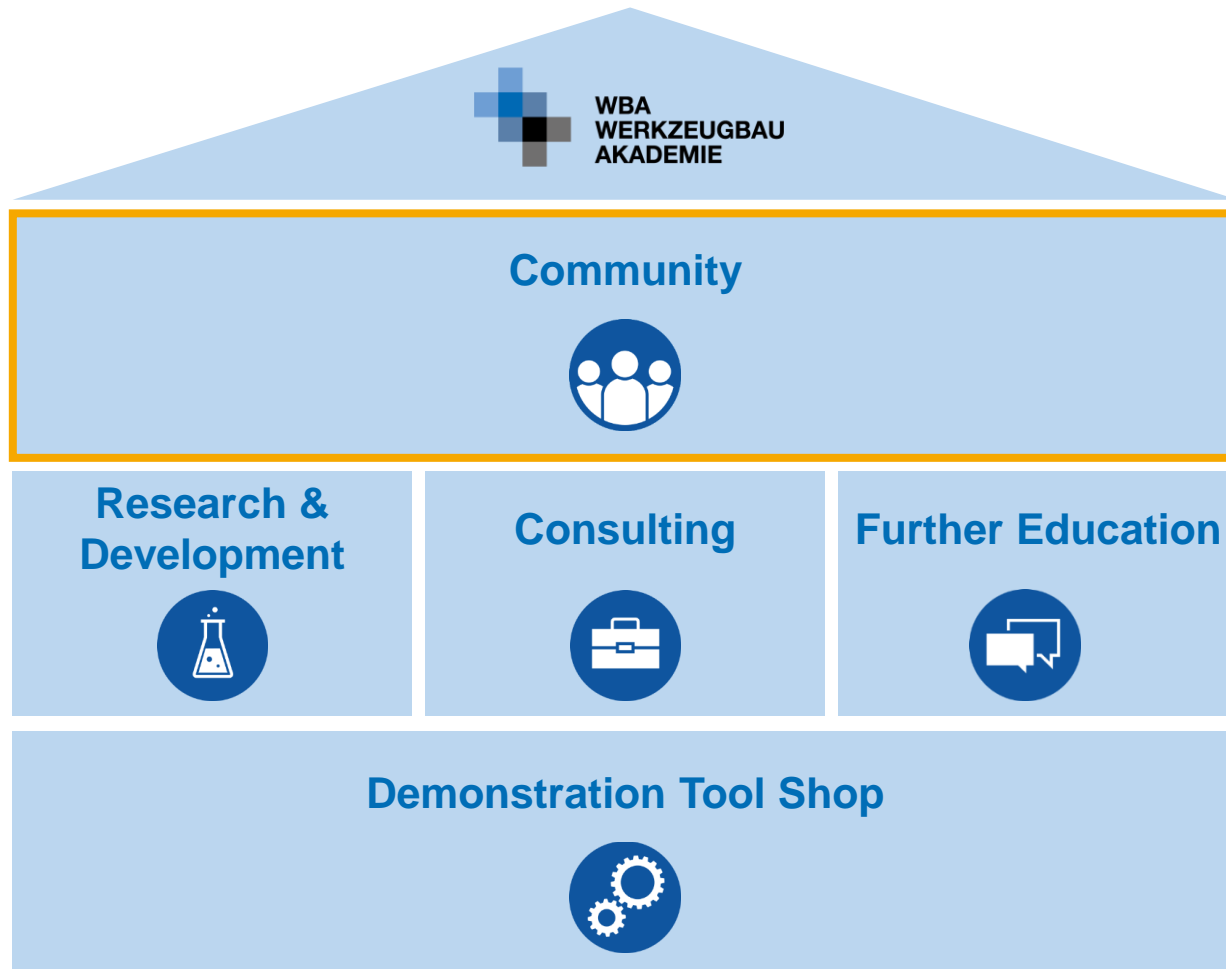
WBA Tooling Academy Aachen



- Founded in 2010 as a spin-off of RWTH Aachen University
- 30 scientific and non-scientific employees

In 2010, WBA was launched as a spin-off of WZL and IPT as a central point of contact for toolmaking companies and has by now developed into a leading partner in tooling worldwide.

The WBA Tooling Academy Aachen Community



Community

Members of the WBA Tooling Academy



Premium

Business

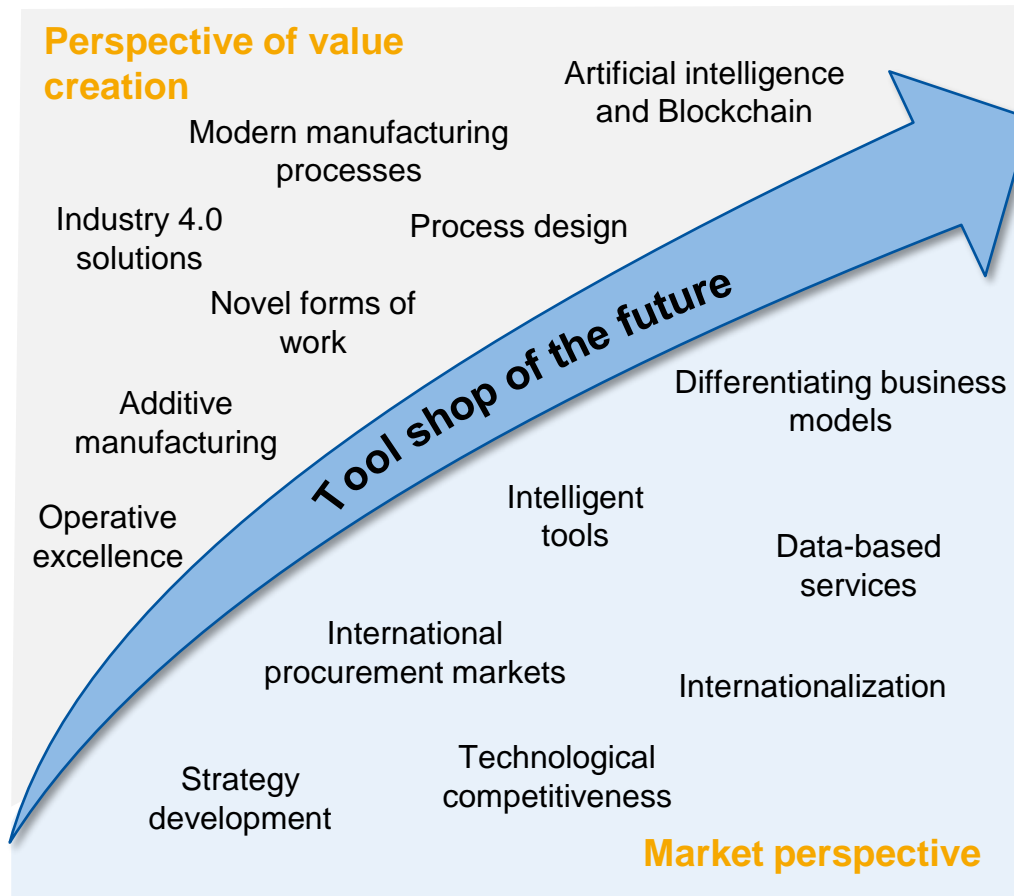
Basic

Cooperation

Community WBA research roadmap



WBA research roadmap



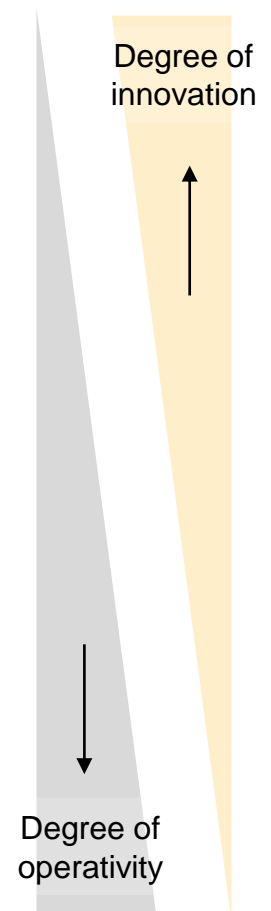
Categories of WBA projects

Trend scouting

Concepts & prototypes

Technology application

Best-of benchmark



Community

Exemplary WBA projects from the last five years



Categories of WBA projects

WBA projects from 2014-2018 (excerpt)

Trend scouting → *Identification of trends and generating applications for the tool and die industry*

- Artificial intelligence (2018)
- Data analytics in procurement (2018)
- Business models via Smart Services (2016)
- Evaluation of generative manufacturing processes (2014)

Concepts & prototypes → *Development of guidelines, concept books and prototypical applications*

- Try-out application (2018)
- Smart Manufacturing (2017)
- Tool calculation (2016)
- Quality management (2015)
- Planning and steering (2014)
- Digital order processing (2018)
- Supplier qualification (2017)
- Intelligent tools (2016)
- Milling tool management (2015)
- Tool standardization (2014)

Technology application → *Testing of concrete applications for novel technologies and concepts*

- CheckPoint5 – 5-axis processing centers (2018)
- Applications of augmented reality (2017)
- Applied industry 4.0 (2016)
- Manufacturing control (2016)

Best-of benchmark → *Data-based comparison as well as derivation of success factors and best practice solutions*

- Benchmarking of the sinker EDM process (2018)
- Milling (2017)
- Procurement of components and materials (2015)
- Wire-cutting strategies (2014)

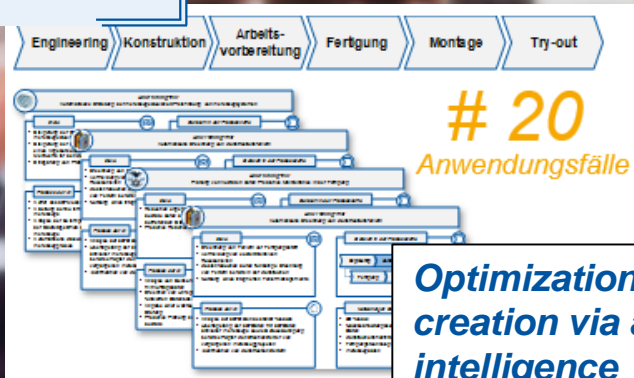
- Organizational focus
- Technological focus

Community

Exemplary results of WBA projects

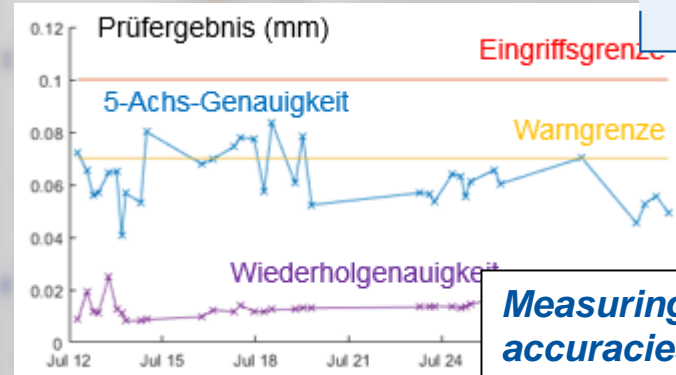


Trend scouting



Optimization of value creation via artificial intelligence

Technology application



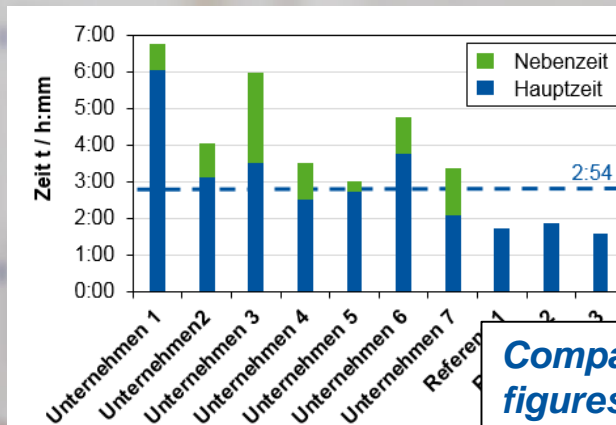
Measuring machine accuracies by means of „CheckPoint5“

Concepts & prototypes



Application for paperless order processing

Best-of benchmark



Comparison of key figures in the sinker EDM process

Community Participation Model for Toolmaking Companies



BENEFITS	PREMIUM	BUSINESS	BASIC	COOPERATION
----------	---------	----------	-------	-------------

Membership

Number of Project Checks p/a	4	3	2	-
Project Check Budget p/a	€10,000	€7,500	€5,000	-
Validity of Project Checks	All Activities	All Activities	Consortial Projects	-
Saving Limit of Project Checks	€25,000	€15,000	€0	-
Regular Newsletter	Yes	Yes	Yes	Yes

Research & Development

Project Proposals	Yes	Yes	Yes	Yes
Project Prioritization	Yes	Yes	-	-
Project Selection & Participation	Checks	Checks	Checks	€
Annual Research Report	Yes	Yes	Yes	Yes
Access to Publicly Funded Research Projects	Yes	Yes	Yes	Yes

Community

Semiannual Meeting at a WBA Member	Yes	Yes	Yes	Yes
Annual Meeting in Aachen	Yes	Yes	Yes	Yes
Access to Virtual Campus	Yes	Yes	Yes	Yes
Participation of Career Fair/Use of Job Portal	Yes	Yes	Yes	Yes
Studies in Printed Version	Yes	Yes	Yes	Yes

BENEFITS	PREMIUM	BUSINESS	BASIC	COOPERATION
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Further Education

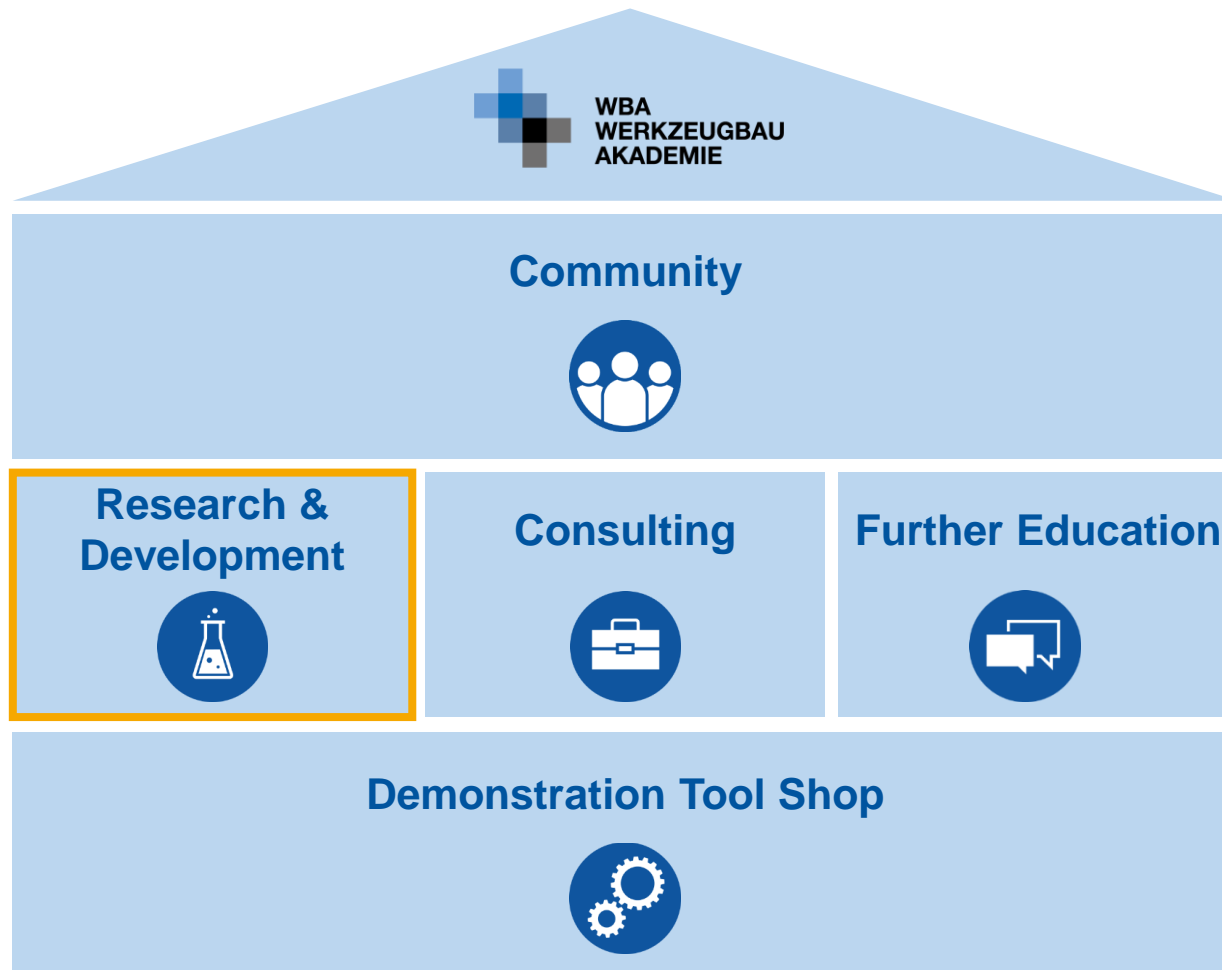
Senior Expert and Expert in Toolmaking	Checks Usable/ -30%	Checks Usable/ -30%	-	-
Certificate Courses/Modules	Checks Usable/ -30%	Checks Usable/ -30%	-	-
Workshops and Intensive Trainings	Checks Usable/ -30%	Checks Usable/ -30%	-30%	-30%
Basic Courses and Advanced Courses	Checks Usable/ -30%	Checks Usable/ -30%	-30%	-30%
Webinars	Free of Charge	Free of Charge	Free of Charge	Free of Charge

Services

Industry Consulting	Checks Usable/ -10%	Checks Usable/ - 10%	€	€
Software Development	Checks Usable/ -10%	Checks Usable/ - 10%	€	€
Manufacturing in Demonstration Tool Shop	Checks Usable	Checks Usable	€	€
Access to "Tooling Theme Park" ("Erlebniswelt Werkzeugbau")	Yes	Yes	Yes	Yes
Utilization of Offices and Premises	Yes	€	€	€
Membership Fee p.a.	€40,000	€20,000	€10,000	€30,000

The WBA Tooling Academy Aachen

Research & Development



Research & Development WBA as a Test Environment for Industry 4.0 Applications



PLATTFORM
INDUSTRIE 4.0

4 KMU 14.0-TESTUMGEBUNGEN
FÜR KMU

LNI4.0 LABS
NETWORK
INDUSTRIE 4.0



1. Contribution of an „industry 4.0“ idea into the WBA
2. Joint discussion and ascertainment of the idea
3. Approach of the granting authority by the WBA
4. Submission of a joint application by the WBA
5. Joint project execution


WBA is present on all relevant BMBF, BMWi and other platforms as a test environment for industry 4.0 applications and hence disposes of facilitated access to publicly funded research projects.

Research & Development

Current Publicly Funded Research Projects of WBA




PrioTisch

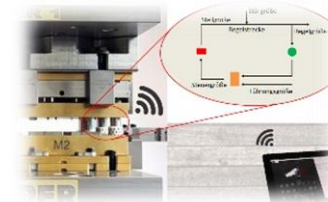
 Bundesministerium für Wirtschaft und Energie
Bundesministerium für Bildung und Forschung



Interactive order management on the shop floor using a digital order management table

SeMeSta

 Bundesministerium für Wirtschaft und Energie
Bundesministerium für Bildung und Forschung



Development of a self-learning mechatronic punching tool

FixTronic


 EUROPÄISCHE UNION
Investition in unsere Zukunft
Europäischer Fonds
für regionale Entwicklung

2014 EFRE.NRW
Investitionen in Wachstum
und Beschäftigung



Industry 4.0 during the milling process: Flexible, mechatronic clamping systems with active vibration damping

E-Mas

 Bundesministerium für Wirtschaft und Energie
Bundesministerium für Bildung und Forschung

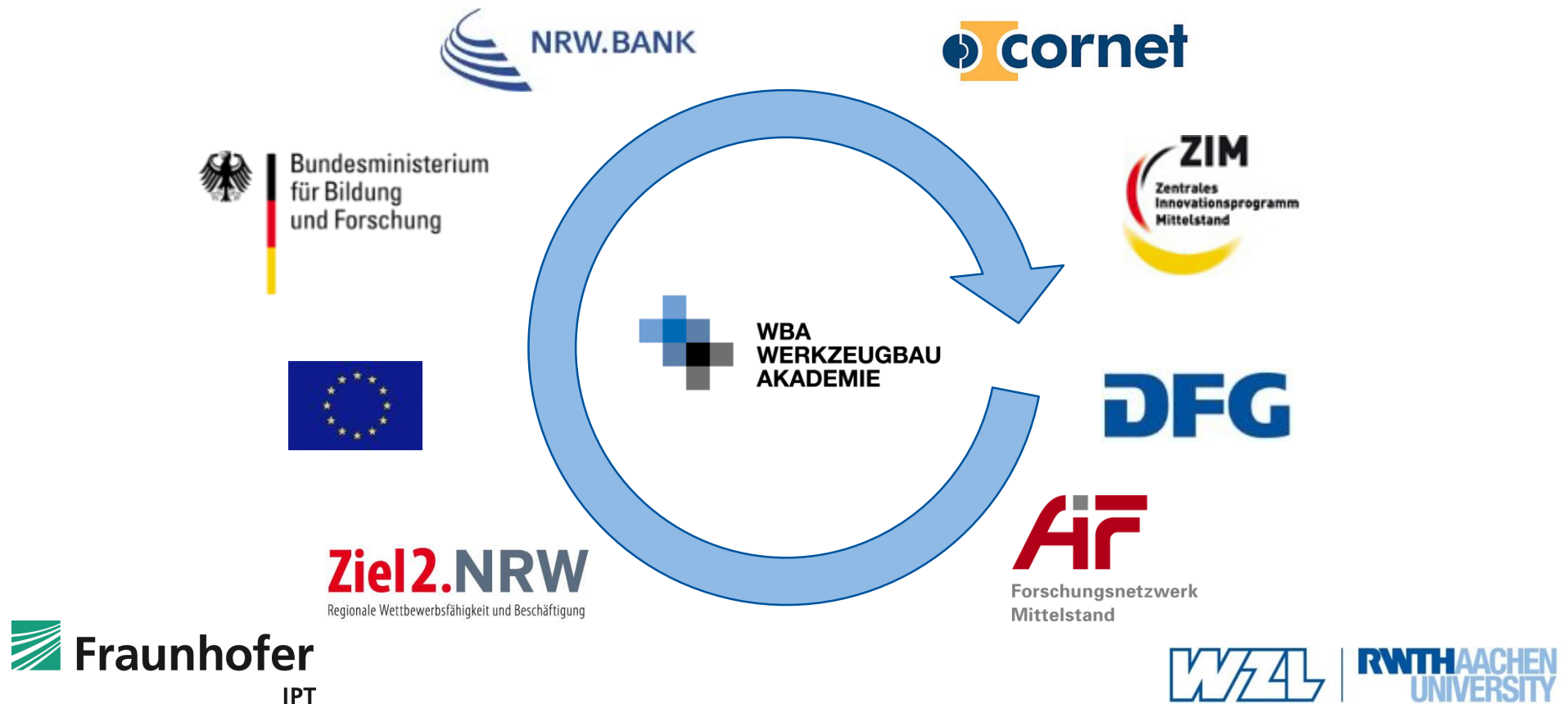


Education export to the Mexican automotive industry concerning work planning and process optimization using a blended learning approach

WBA is intensively involved in toolmaking research and participates in publicly funded research projects. The focus of approved and research projects and submitted applications lies on digital interlinking.

Research & Development

Conduct Research Together with WBA



If you would like to participate in publicly funded research projects do not hesitate to approach us! Together with our research partners WZL and IPT we collaborate with all relevant research bodies.

Research & Development Studies of the WBA Tooling Academy Aachen



Strategic
Development



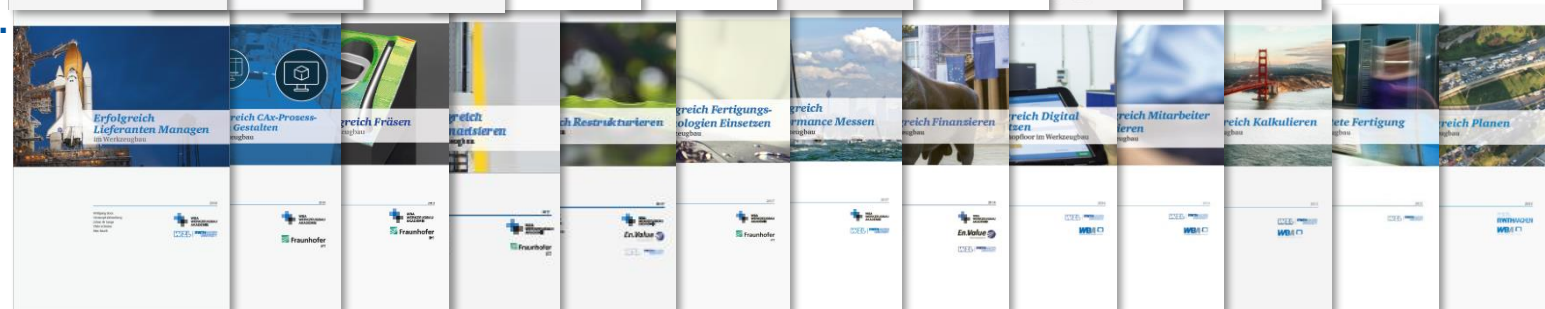
29

Studies have been published by WBA since 2014

Tooling in...

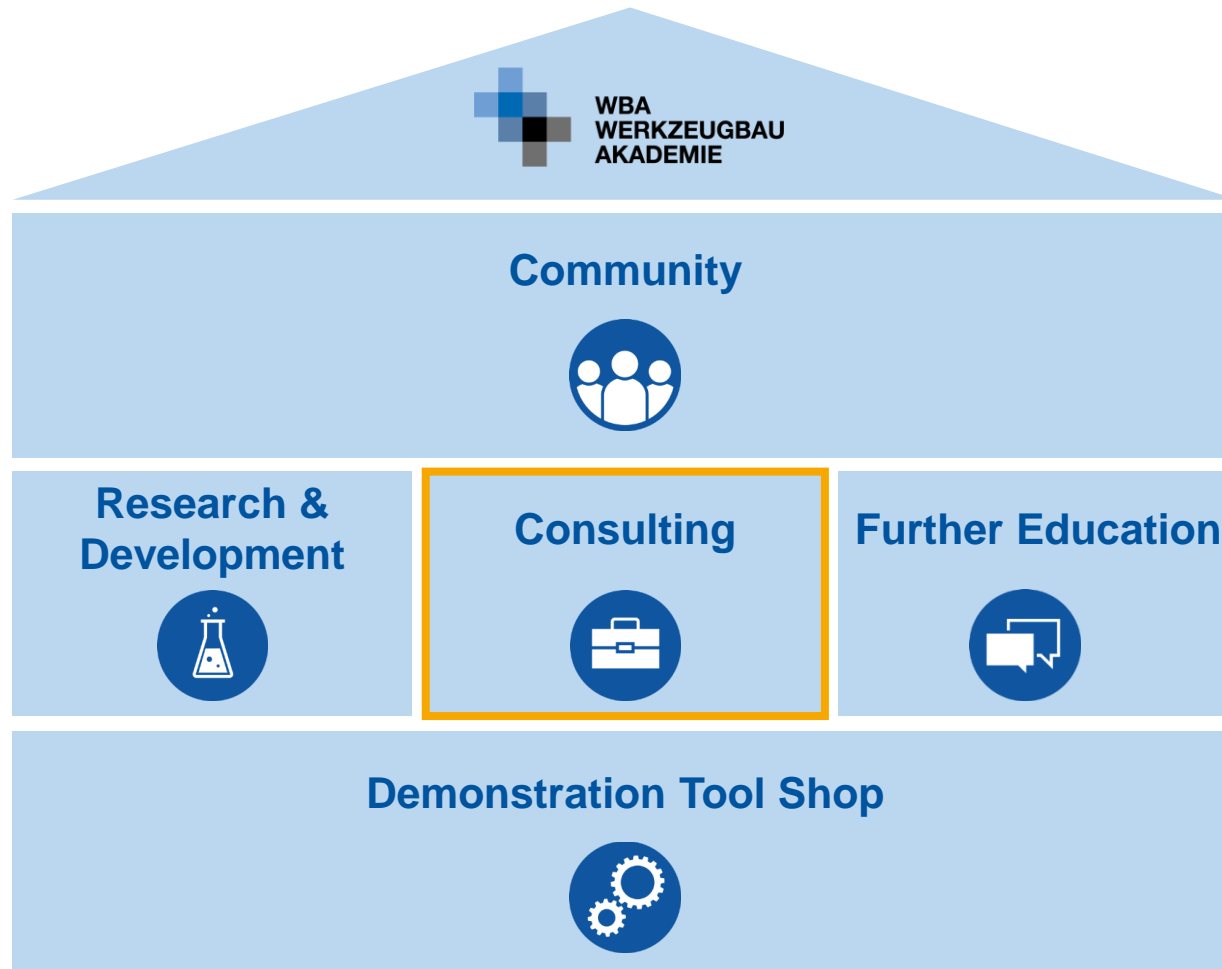


Successfully...

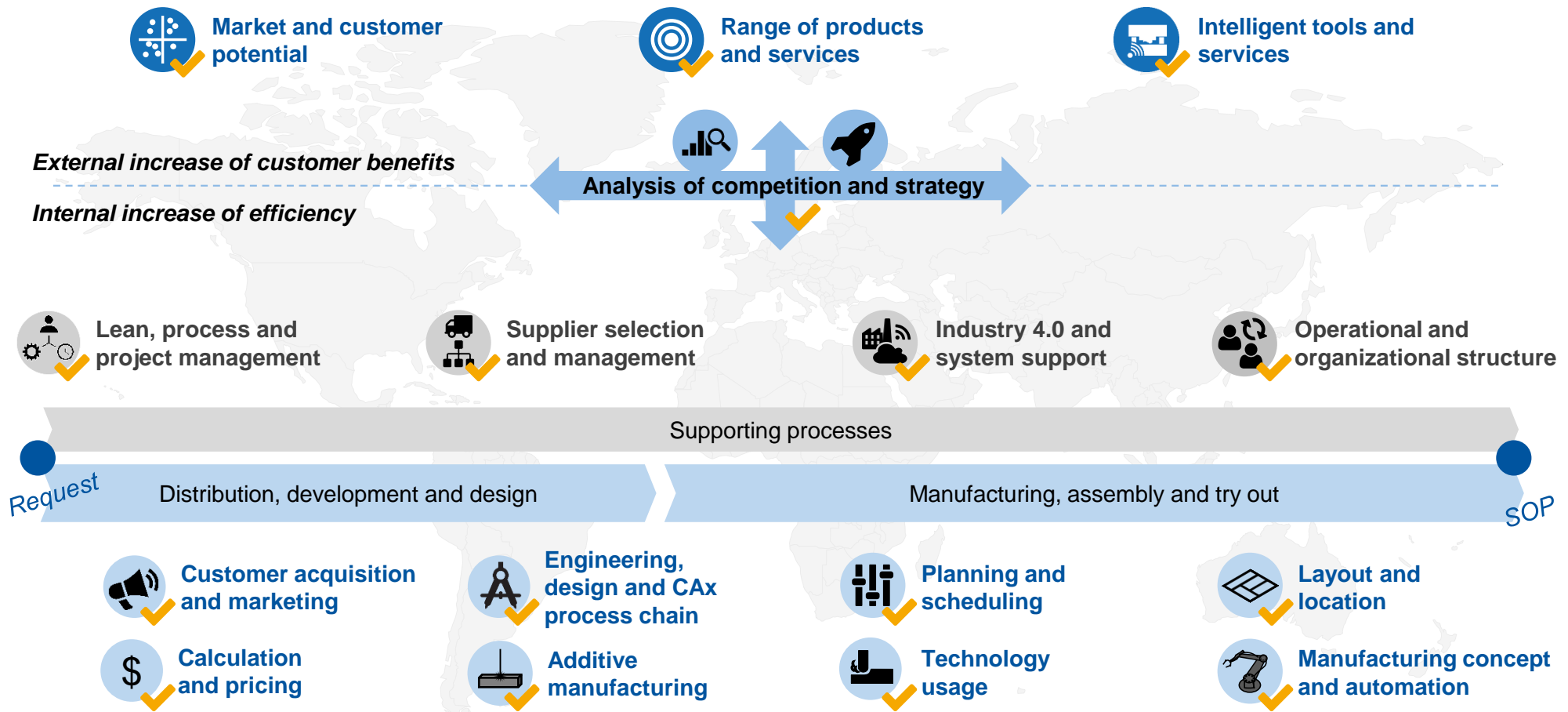


Since 2014, WBA regularly publishes studies regarding strategic development, international tooling markets, and the successful value creation in the tooling sector.

The WBA Tooling Academy Aachen Consulting



Industry consulting: Overview of the consulting portfolio of the WBA



■ Market and customer (external) ■ Core processes (internal) ■ Supporting processes (internal)



Industry consulting: The detailed consulting offer of the WBA (I/IV)

Market and customer

Market and customer potential

- Analysis of technological trends
- Analysis of market sizes and market developments
- Determination of potentials for distribution and procurement
- Identification of potential customers and buyers

Intelligent tools and services

- Analysis of internal and external requirements
- Selection of sensors and actuators
- Conception of company-wide service platforms
- Development of data-based services and business models

Range of products and services

- Analysis of market and customer demands
- Analysis of the company specific range of services
- Analysis of core competencies
- Development of service and business models

Competition and strategy

Analysis of competition and strategy

- Benchmarking for the determination of the organizational and technological performance
- Identification of action fields
- Identification of strategical success factors and strategy development
- Development of an implementation roadmap and deduction of specific measures



Industry consulting: The detailed consulting offer of the WBA (II/IV)

Supporting processes

Lean, process and project management

- Process analysis and process design
- Definition of key performance indicators and IT-based illustration
- Conception and implementation of a (digital) shop floor management
- Definition and implementation of agile methods of project management

Industry 4.0 and system support

- Analysis and maturity assessment of the Industry 4.0 status quo
- Development of objectives, concepts and roadmaps including investment budgeting for Industry 4.0
- Deduction of specific Industry 4.0 use cases including implementation support
- Recording and analysis of machine and production data

Supplier selection and management

- Definition of scopes and relevant processes for procurement
- Identification, assessment and selection of suppliers
- Initiation and development of strategic partnerships
- Holistic assessment of options for national and international tool supply

Operational and organizational structure

- Analysis of organizational structures and assessment of the degree of value creation
- Procedural and organizational reorganizational
- Conception and implementation of agile structures of organizational
- Deduction of measures for the organizational change

Industry consulting: The detailed consulting offer of the WBA (III/IV)



Core processes

Customer acquisition and marketing

- Analysis of market and customer demands
- Development of strategies for distribution and marketing
- Identification and selection of relevant instruments for marketing
- Fine adjustments of selected analogue and digital instruments for marketing

Planning and scheduling

- Manufacturing process analysis and derivation of standard manufacturing processes
- Conception of a virtual/physical segmentation and clocking
- Conception of hard- and software for data capturing and provision
- Definition of requirements and selection of planning software systems

Calculation and pricing

- Analysis and optimization of the used methods of calculation
- Analysis of conducted calculations for cost optimization
- Development of solutions for data capturing and provision
- Definition of requirements and selection of calculation software

Layout and location

- Analysis and optimization of the material flow
- Rough and detailed layout design and optimization
- Conception and further specification of logistics concepts
- Planning and support for relocation to existing and newly built locations

Industry consulting: The detailed consulting offer of the WBA (IV/IV)



Core processes

Additive manufacturing

- Identification of technological fields of application
- Analysis of requirements and benefits with regard to the spectrum of workpieces
- Assessment of the technologies and machine selection
- Additive manufacturing integration in existing process chains with focus on subsequent processing

Technology usage

- Definition and improvement of the manufacturing performance
- Technology assessment and profitability assessment
- Analysis and optimization of manufacturing processes and methods
- Analysis and optimization of the operating times, idle times and set-up times

Engineering, design and CAx process chain

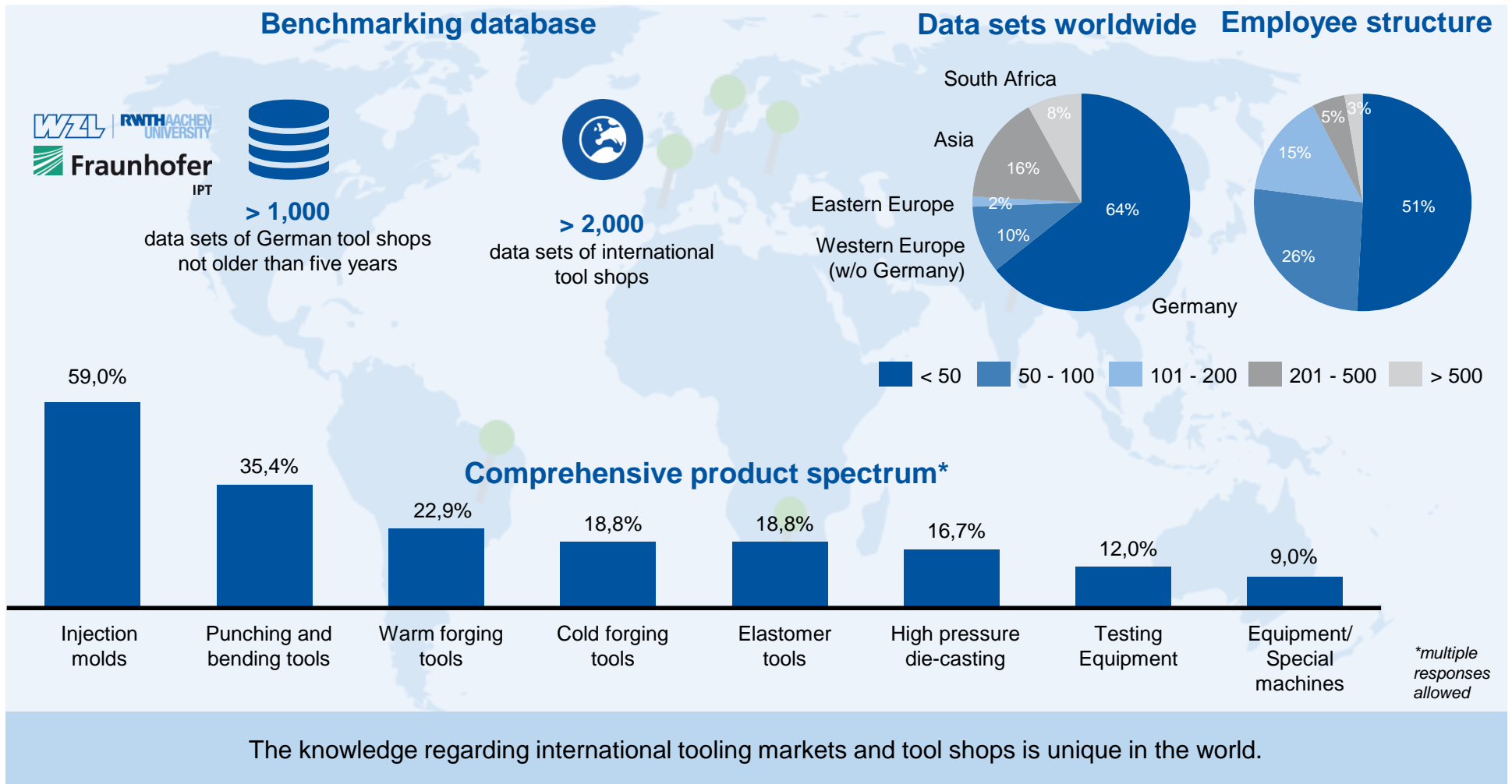
- Conception and introduction of synchronised and agile product design processes
- Assessment and optimization of the standardization for tools and tool components
- Definition of requirements and selection of CAx systems
- Analysis and optimization of the CAx process chain

Manufacturing concept and automation

- Analysis of the actual and future range of tools
- Development of a manufacturing concept and technology road-mapping
- Analysis of requirements, specification and selection of machines
- Conception and selection of automation solutions

Consulting

Comprehensive Product Spectrum via Benchmarking Database



Consulting

Overview of Selected Industry Projects



Injection molding

Sheet metal and massive forming

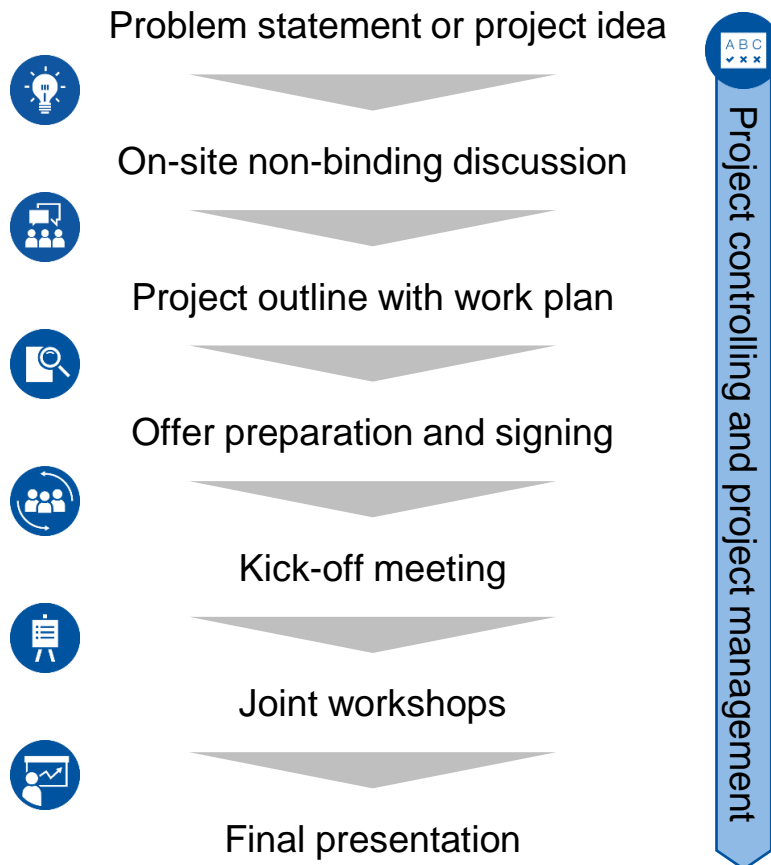
Internal
tool shop

External
tool shop

Consulting Presentation of the Project Approach



Approach



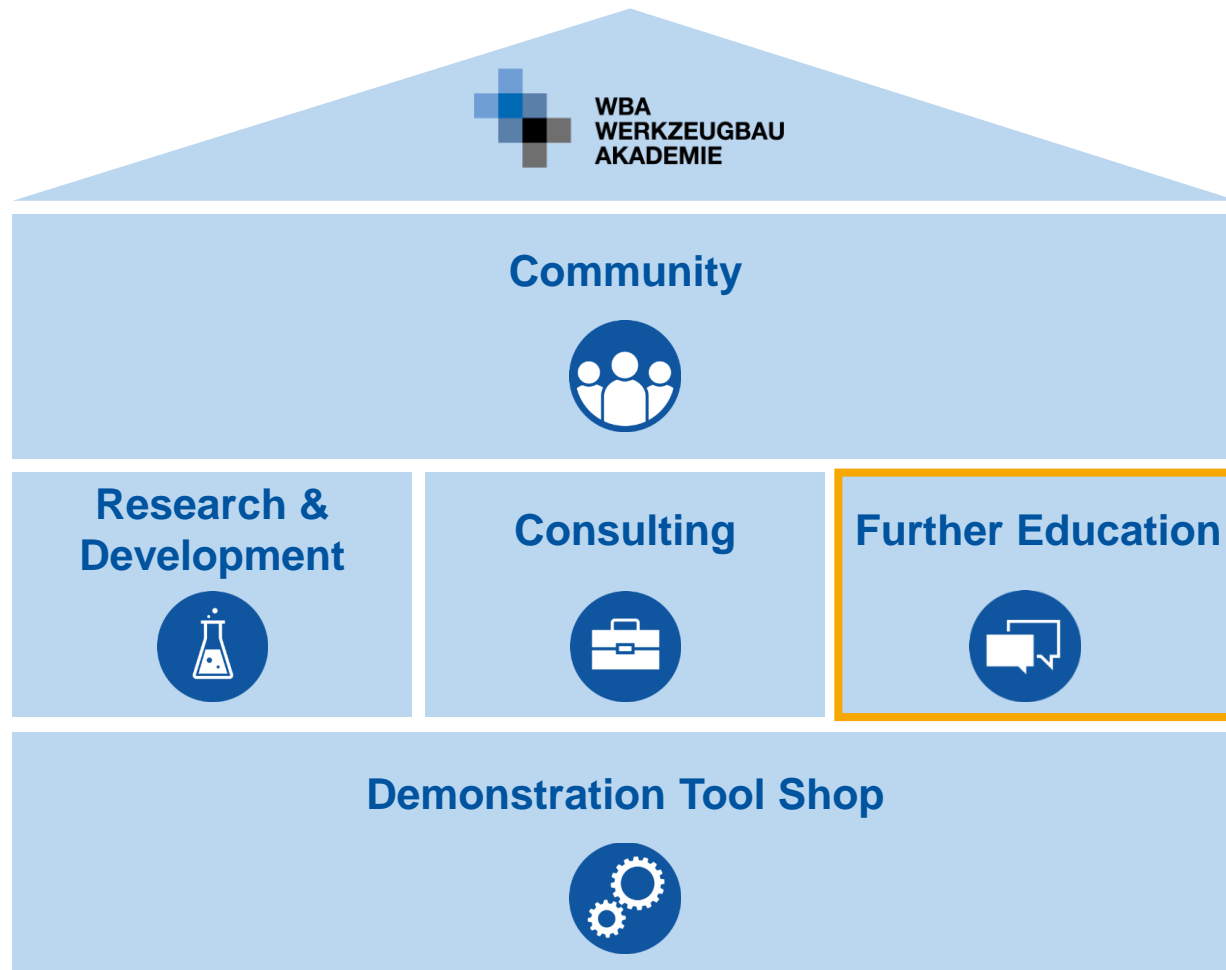
Success factors

- ★ **Workshop**-based elaboration of the results
- ★ Intensive **involvement** of all relevant employees of the tool shop
- ★ Contribution of **external impulses** and integration of topic-specific **best practices**
- ★ Detailed **documentation** of project results and clear definition of **further procedure**

Profit from WBA's experience gained during the approximately 50 consulting projects we conduct each year.

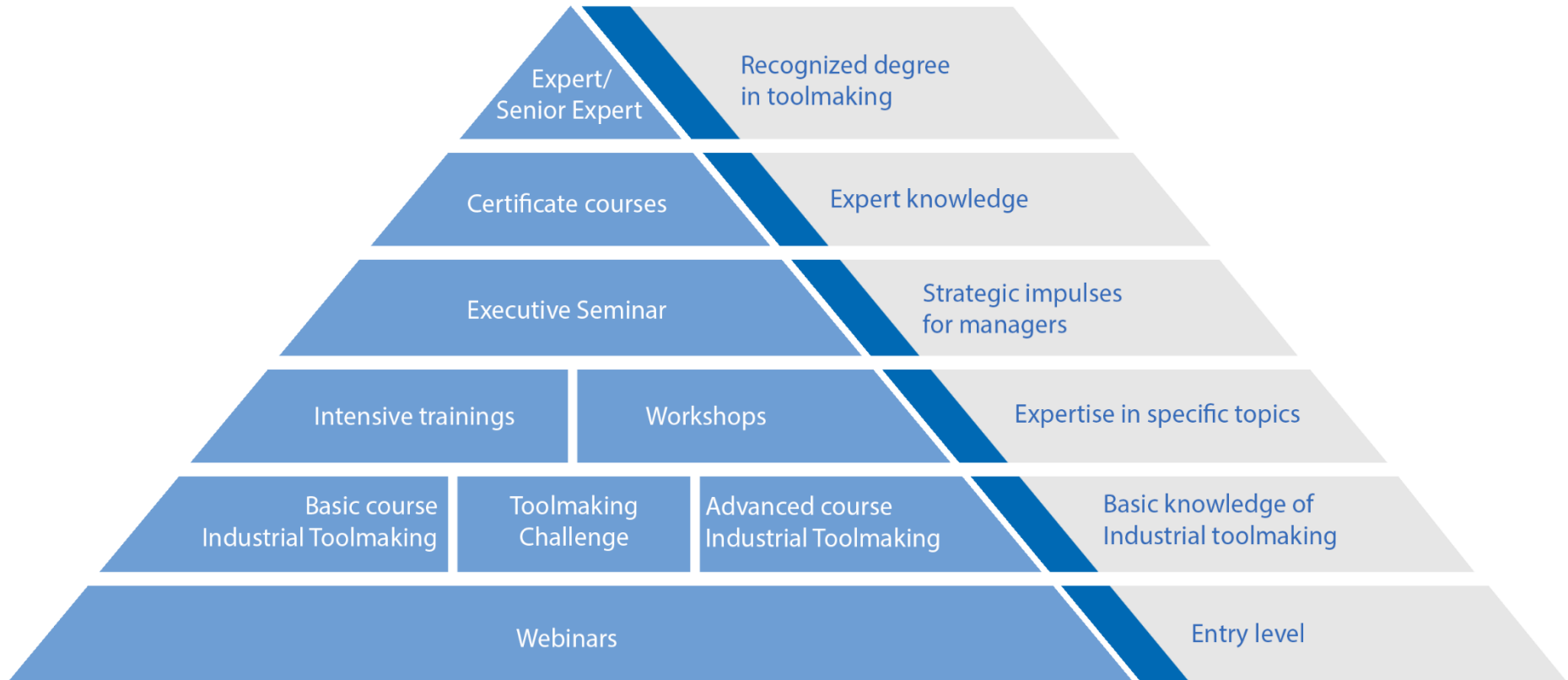
The WBA Tooling Academy

Further Education



Further Education

Further Education Formats of WBA



All events include practice-oriented lectures, educational games and guided tours through the „Tooling Theme Park“ as well as the WBA demonstration tool shop.

Webinars 2019



Dates*

Dates*	Subjects
17.01.2019	Methods of project management
31.01.2019	Non-conventional manufacturing processes
14.02.2019	Foundations of layout planning
28.02.2019	Methods of process analyses
14.03.2019	3-level-model of planning
21.03.2019	Visual management on the shop floor
04.04.2019	Lean management & 6S in tool shops
18.04.2019	Manufacturing conception for tool shops
09.05.2019	Employees in the smart factory
23.05.2019	Agile tool development
06.06.2019	Smart products, services & applied Industry 4.0 in tool shops
19.06.2019	Overview of the CAx process chain in tool shops
04.07.2019	Artificial intelligence in tool shops
18.07.2019	Additive manufacturing
08.08.2019	Automation in tool shops
22.08.2019	Tool cost calculation and cost transparency in tool shops
05.09.2019	Clocking in tool shops
19.09.2019	Smart manufacturing in tool shops
17.10.2019	Supplier selection and assessment in tool shops
28.11.2019	Self-organization made easy

*always from 10.00-11.00 am



Target group

All those interested in obtaining a first overview of a specialist topic

Registration

www.werkzeugbau-akademie.de/veranstaltungen
(access data for WBA members on the intranet)

Basic course „Industrial tool making“



Concept and objectives

- Compact training to generate an understanding for industrial tool making
- Discussion of all relevant topics relating to industrial tool making
- Conveying contents and methods for application

Target group

- Employees in work preparation, machine operators, tool designers, fitters, and all those who are supposed to gain an understanding of industrial tool making

Day 1

- Industrial tool making
 - Product standardization
 - Process standardization
 - Flow production and clocking

Day 2

- Process management and lean production
- Manufacturing segmentation
- Planning and controlling

Day 3

- Supplier management
- Technologies in tool making
- Automation and Industry 4.0 outlook

Dates

26th-28th February 2019

10th-12th September 2019

Registration

www.werkzeugbau-akademie.de/veranstaltungen

Advanced course „Industrial tool making“



Concept and objectives

- Compact training to deepen the understanding of industrial tool making by consolidating and supplementing the contents of the basic course
- Deepening the methodological competence in relevant organizational and technological topic areas

Target group

- Participants of the basic course and all tool shop employees who would like to expand their basic knowledge in further topic areas

Day 1

- Review of industrial tool making and outlook on future trends
- Deepening process management knowledge including learning and applying a process modelling language
- Project management

Day 2

- Layout design
- Shop floor management
- Outlook: Tool making in the future
- Next level industrialization

Day 3

- Iterative tool development
- Maintenance and servicing meeting the requirements

Date

9th-11th April 2019

Registration

www.werkzeugbau-akademie.de/veranstaltungen/



„Tool making challenge“ for apprentices and young professionals



Concept and objectives

- Young tool making talents develop an understanding of the industrial tool production
- Knowledge is imparted and consolidated during practice-oriented presentations, group work sessions, educational games and visits to best practice tool shops

Target group

- Motivated apprentices from the 3rd year of training onwards as tool and cutting mechanics as well as talented young professionals aged 18 or older

Contents

- Tool making in Germany and worldwide
- Pillars of industrial tool making
- Lean production
- Technologies in tool making
- Process management
- Shop floor management
- Layout design
- Industry 4.0 in tool making
- and much more

Link to the movie:



Date

29th July-2nd August 2019

Registration

www.werkzeugbau-akademie.de/veranstaltungen



Intensive training

„Current manufacturing developments in tool making”

„Only those who are always up to date with state-of-the-art technology and who are interested in innovation and technological progress, can produce technological high-tech products.“

(Dipl.-Ing. Michael Breme, Head of production and tool planning – AUDI AG)



Contents

- Overview of manufacturing technologies in tool making
- Current developments in milling
- Current developments in wire-cut and die-sink EDM
- Additive manufacturing processes in tool shops
- Automation in tool shops
- Guided tour at the Fraunhofer Institute for Production Technology IPT

Target group

- Machine operators
- Shop foreman
- Head of manufacturing

Date

13th March 2019

Registration

www.werkzeugbau-akademie.de/veranstaltungen

Intensive training „Planning & controlling and project management in tool shops“



Concept and objectives

- The participants acquire competences in implementing a sustainable planning and controlling of the production
- Methods for planning and carrying out projects are conveyed



Contents

- Challenges and factors of success of successful planning in tool shops
- The 3-level-model of systematic planning
- Successfully shaping planning
- Clocking in single or small batch production
- Foundations of project management
- Methods of project management
- Project prioritization and time management

Target group

- Work planner
- Project manager
- Team leader
- Head of manufacturing

Date
7th-8th May 2019

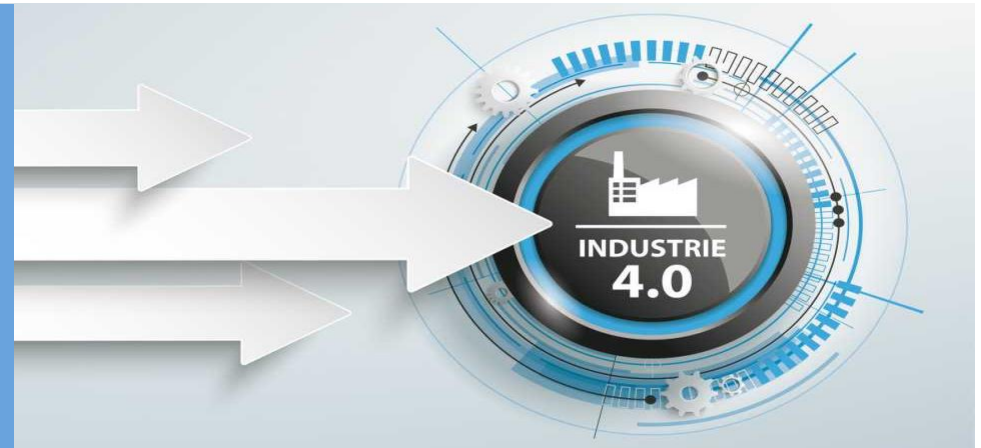
Registration
www.werkzeugbau-akademie.de/veranstaltungen

Workshop „Digital transformation“



„The aim of the workshop „Digital transformation“ is to communicate Industry 4.0 in tool shops in a comprehensible manner. In doing so, our “tooling theme park” will take a key role by demonstrating innovative technologies within the context of digital interconnectivity and letting participants test these. The focus of the workshop is both on Industry 4.0 applications for tool shops and the transformation process for introducing these.”

(Prof. Dr.-Ing. Wolfgang Boos, MBA)



Contents

- Modern information and communication technologies
- Smart tools und smart services
- Sensor technology on the shop floor
- Problem solving through modern technologies and concepts
- Employees in times of Industry 4.0
- Best practices in tool making and other industries
- Visit and use of the “tooling theme park” (“Erlebnisswelt Werkzeugbau”) and the WBA demonstration tool shop

Target group

- Team leader
- Head of manufacturing
- Technology officers
- CIP officers
- Quality managers

Date

10th October 2019

Registration

www.werkzeugbau-akademie.de/veranstaltungen

Workshop „Data analytics & machine learning“



„The new workshop “Data analytics & machine learning” provides insights into the world of artificial intelligence with theoretical background knowledge and practical applications, presented live on the RWTH Aachen campus. The use of this new technology in tool shops is the central topic of this workshop.”

(Prof. Dr.-Ing. Wolfgang Boos, MBA)



Contents

- Foundations of data analytics and machine learning
- Types of data analytics and machine learning as well as the application in the proper tool shop
- Applications in order processing of tool shops
- Technical requirements and operative implementation in tool shops
- Applied artificial intelligence
- Interactive Tour: experience Industry 4.0 solutions live

Target group

- Team leader
- Head of manufacturing
- Technology officers
- CIP officers
- Quality managers

Date

19th November 2019

Registration

www.werkzeugbau-akademie.de/veranstaltungen

Certificate courses 2019



Concept and objectives

- Expert and managerial knowledge in specific topic areas is built up using a blended learning approach
- The contents learned are applied in the proper tool shop and enable the participants to follow a strategic approach

Business & personnel management / Employee motivation

Topics: Importance, foundations, methods and concepts of business management, performance measurement, foundation of an enterprise, personnel management, personnel marketing and recruiting, change management, conflict management, employee motivation

Target group: Tool shop managers, head of manufacturing, team leaders, junior staff

Costs: € 3,950 including meals and evening program

Dates:

1st attendance phase: **10th-12th January 2019**

2nd attendance phase: **18th-20th March 2019**

Repair and service / Maintenance

Topics: KPIs, new technologies, planning and controlling, knowledge management in maintenance, damage patterns, data analytics, predictive maintenance, industrial services, pricing, service engineering, importance of service innovation, lean & smart services

Target group: Tool shop managers, head of manufacturing, team leaders, junior staff

Costs: € 3,950 including meals and evening program

Dates:

1st phase of attendance: **20th-22nd May 2019**

2nd phase of attendance: **8th-10th July 2019**

Strategic management and industrialization / Lean management

Topics: Fields of action of industrial tool shops, benchmarking, product and process standardization, flow production and clocking, employees as the key to success, lean management, corporate strategy

Target group: Tool shop managers, head of manufacturing, team leaders, junior staff

Costs: € 3,950 including meals and evening program

Dates:

1st attendance phase: **24th-26th January 2019**

2nd attendance phase: **21st-23rd March 2019**

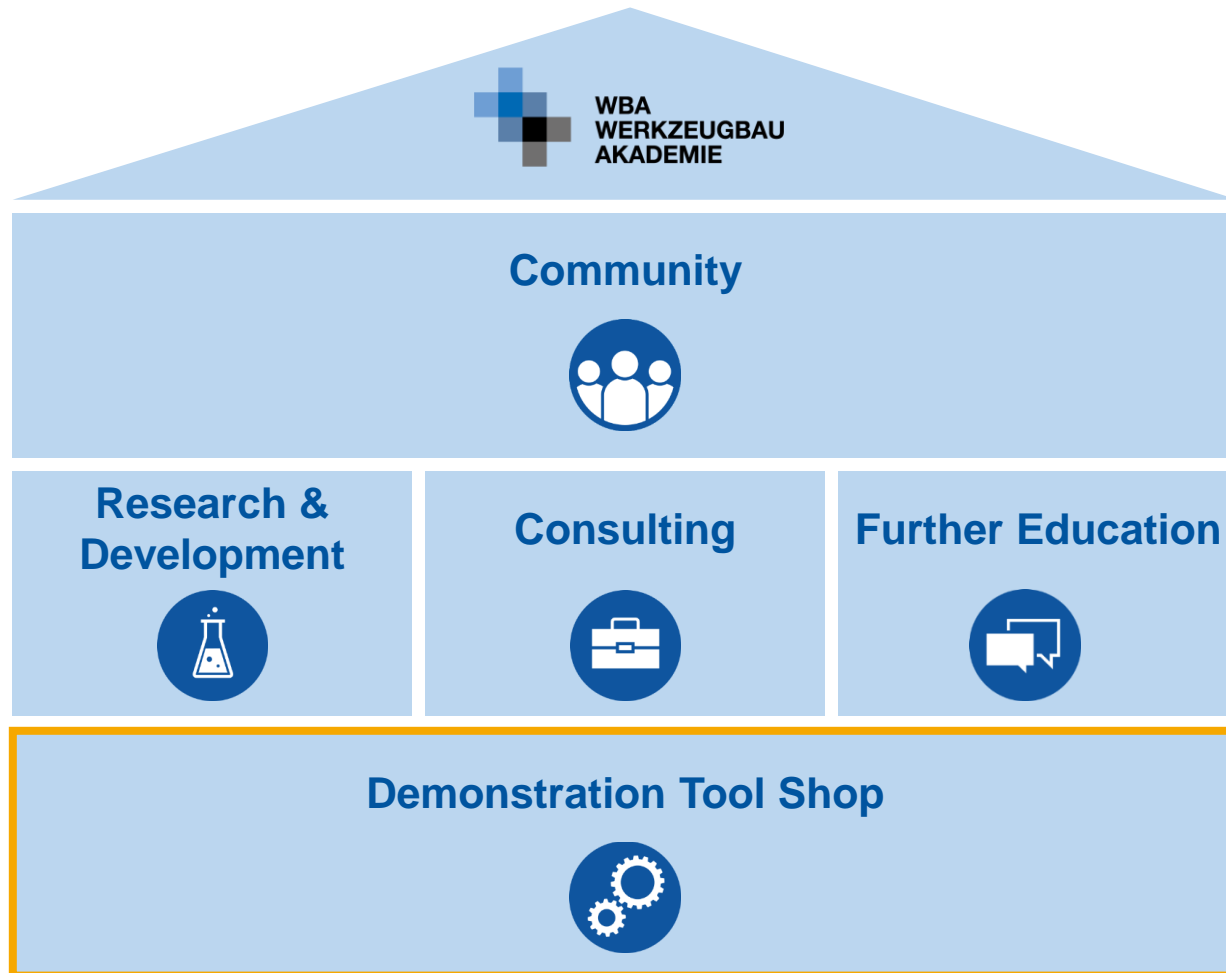
Expert / Senior expert tool making

By combining 4 or 8 certificate courses as well as project works and theses you can obtain the expert or senior expert degree in tool making, respectively.

The entire range of certificate courses can be found on our homepage **www.werkzeugbau-akademie.de/veranstaltungen**

The WBA Tooling Academy Aachen

Demonstration Tool Shop



Demonstration Tool Shop

The WBA Demonstration Tool Shop



Current machinery

- Hermle C40
- Hermle C22 (incl. automation)
- OPS Gantry Eagle & Agie Drill 20
- TransClean (incl. automation)
- Agie Cut 2000
- Erowa CMM Qi



Objectives

- Mapping the entire process chain
- Focus on innovation in the area of process optimization – both on an organizational as well as on a technological level

Demonstration Tool Shop “Tooling Theme Park” (“Erlebniswelt Werkzeugbau”)



In the “Tooling Theme Park”, the WBA presents new industry 4.0 applications based on modern technology. Within this unique infrastructure, digital networking and the future of toolmaking can be experienced live via demonstrators.

Demonstration Tool Shop Office and Seminar Spaces



The WBA rooms can be rented for exclusive events. Through their different room concepts they offer an ideal work environment to foster communication, creativity and innovation.

The WBA Tooling Academy Aachen

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