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Faster, lighter, more efficient

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Insights from Steinbeis experts throughout the world

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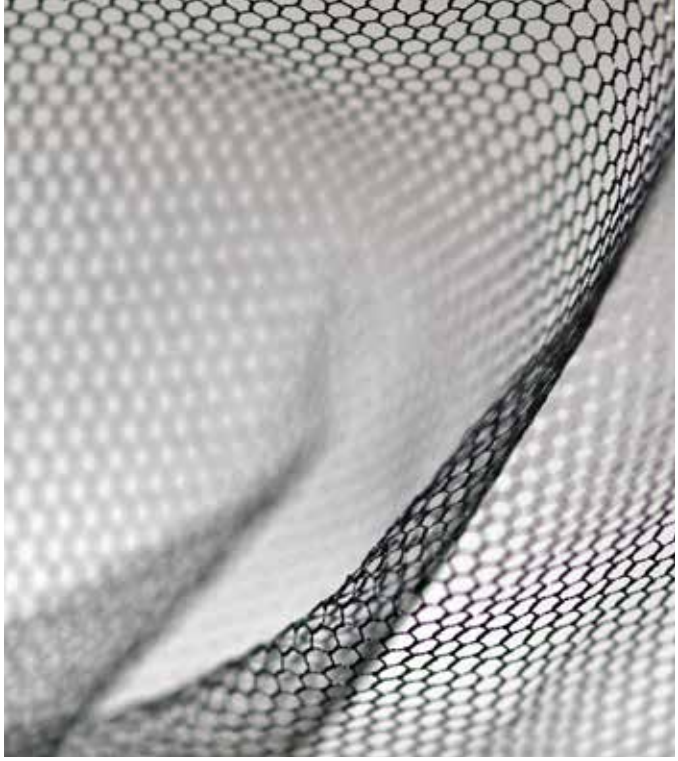
A review and key topics

"Technology transfer is immensely important to us."
An interview with Prof. Arnold van Zyl, president of the Baden-Württemberg Cooperative State University (DHBW)

Efficient Energy Use
Steinbeis develops a system for optimizing combined heat and power plants

02 | 2016



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Dear Readers,

Senator E. h. Wolfgang Wolf is a managing board member of the LVI, which is the association of regional industry in Baden-Württemberg. In this role, he is also an alternate member of the Steinbeis Foundation Board of Trustees.

Wolfgang Wolf can be contacted by writing to wolfgang.wolf@stw.de

Innovation is about taking the existing and sometimes radically changing or redesigning it in a process Schumpeter described as "creative destruction." It creates something new by banishing what exists to the past. This is precisely the potential offered by lightweight materials. They make it possible to move beyond current thinking and pave the way for new solutions.

Any reference to lightweight materials or construction inevitably involves an extremely broad variety of areas, transcending many different sectors of industry. There are new production methods such as additive layer manufacturing (also referred to as 3D printing), which allow developers to think far beyond the horizon. Nature shows us how new components can be made to withstand strong loads. The result? A more efficient use of materials only put in place wherever and whenever absolutely necessary.

Efficiency is a key facet to lightweight materials. Not only is less material required in the production process, but less energy is also needed to make a component if it requires less material. This is especially the case with end products such as automobiles or airplanes, although the equation is just as valid for all other kinds of machines and their constituent parts.

It goes without saying that lightweight materials hold major potential in economic terms. One particular reason for this is the way such technologies disrupt existing value chains, changing how they function and gearing processes toward future demands. At the LVI, our job as the association of regional industry in Baden-Württemberg is to bolster the competitiveness of our members in the state of Baden-Württemberg. We achieve this in the field of lightweight construction by fostering and promoting networks between key players in R&D and experts in design, development, simulation, production, and manufacturing. To share the know-how held by industry and research in Baden-Württemberg with other key players in production technology, automation, CAE, simulation, fiber composites, lightweight metals, and plastics, we have been working with the German Institutes of Textile and Fiber Research Denkendorf (DITF) as well as other industrial partners. Together we have established the AFBW, a fiber-based materials consortium called the Allianz Faserbasierter Werkstoffe Baden-Württemberg e.V. We are also a member of the Leichtbauzentrum Baden-Württemberg (LBZ-BW e.V.), we collaborate with Carbon Composites Baden-Württemberg (CCBW), and we are members of the advisory board of Leichtbau BW GmbH. In addition, we use our position in industry to keep downstream sectors of industry (such as mechanical engineering, the automotive industry, their respective suppliers, and the aerospace industry) up to date with lightweight technologies.

Driving the interests of lightweight materials also drives the competitiveness of Baden-Württemberg as a region of industry and this is in keeping not only with our core competences but also with the tenet of resource efficiency. At this point, I would like to come back to Schumpeter, who observed how economies and companies are able to safeguard and build on their competitiveness in the face of change, and that profits are the reward for successfully taking advantage of change.

On that note, I would like to wish you a pleasant read of this latest edition of Transfer magazine, and I hope that it provides you with many interesting insights into the world of lightweight construction.

With kind regards,

Wolfgang Wolf

Rare Earth Metals in Strong Demand

EU projects aims to optimize hard magnetic materials

It would be impossible to meet European demand for rare earth metals (REMs) without turning to external sources. The greater the gap between supply and demand, the more important it will be to use existing resources sustainably. To use REMs efficiently, it will therefore be necessary to develop production processes that meet this requirement. As part of an EU-backed project called REProMag, European partner companies from five countries are currently working on the development of new production processes for the manufacturing of high-precision permanent magnetics for use in sensors, engines, and generators. Steinbeis-Europa-Zentrum (SEZ) is just one of the 14 project partners involved.

The aim of the project is to develop a manufacturing route for rare earth magnets that is both innovative and resource-efficient. The process will be based on the use of recycled materials to significantly reduce dependency on magnet production using scarce and valuable raw materials. The new process promises to deliver innovative automated production methods for complex 3D and multilayer components. This should result in significant material efficiency enhancements of at least 30% in production. It will also improve part dimensions and help avoid wastage.

Rare earth magnets produced with this process can be used in a variety of areas, from electric motors to sensors, actuators, grippers and fixing devices used in (electric) vehicles, power applications, aviation, manufacturing, mechanical engineering, and medical technology. This new production method falls under SDS processes, where SDS stands for shaping, de-binding, and sintering.

The project team has already started enjoying its first successes. For example, the first metal compacts have been successfully produced and the team has made isotropic Nd-Fe-B magnets with strong coercivity from recycled materials. The project reached its halfway point in July and the project partners from Germany, France, the UK, Austria, and Slovenia will shortly be meeting for a midterm review. There will then be a series of presentations at a workshop in Darmstadt on rare earth and future permanent magnets and their applications with a further workshop planned at the World PM2016 convention in Hamburg. The results will also be presented at the 32nd International Conference of the Polymer Processing Society in Lyon (France).

The project is being coordinated by OBE Ohnmacht & Baumgärtner GmbH & Co from Ispringen with €5.7 million of backing from the European Commission over three years. Steinbeis-Europa-Zentrum (SEZ) is providing support with research and is acting as a partner on project and knowledge management. In 2015, SEZ also helped the consortium with concept planning and running the first partner meetings and workshops. The Steinbeis experts are also responsible for disseminating and exploting project results. Ohnmacht & Baumgärtner already received support from SEZ during the project bidding process and drafting contracts with the EU.

Image: The Baden-Württemberg Minister of the Environment Franz Untersteller on a visit to OBE Ohnmacht & Baumgärtner GmbH & Co. KG and other partners working on the REProMag project in Ispringen (west of Stuttgart) © OBE Ohnmacht & Baumgärtner GmbH & Co. KG

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Feature Topic: Lightweight Materials

Insights from Steinbeis experts

As key technologies that revolve around energy and material efficiency, one of the main aims of lightweight materials is to make machines and manufacturing more effective and productive. In this edition of Transfer, a variety Steinbeis experts and partners of the Steinbeis Network expand on how this is achieved in different sectors of industry. Dr. Frank Will, director of the Steinbeis Transfer Center Ino8 Pty Ltd Australia, writes about a modular tilting vehicle that can help solve many of the problems posed by modern transportation. Dr. Dietrich Birk, managing director of the VDMA in Baden-Württemberg, outlines the potential that lightweight construction can offer to business and the challenges and opportunities this entails. In an interview with Prof. Rudolf Voit-Nitschmann (director of the Steinbeis Transfer Center for Aerodynamics, Aircraft Engineering, and Lightweight Construction, as well as managing director of Steinbeis Flugzeug- und Leichtbau GmbH), we consider the importance of lightweight technology, especially in the field of aircraft construction, but also in other areas of industry. Prof. Dr.-Ing. Wolfgang Nendel and Mirko Spieler, who both head up the Steinbeis Research Center for Automation in Lightweight Construction Processes (ALP), describe how a pilot plant was developed for use in orbital coiling. Benjamin Kröger (director of the Werkstoffe Korrosion und Korrosionsschutz GmbH, also a Steinbeis Transfer Center) explains how to investigate the corrosive properties of honeycomb-shaped CFRP aluminum sandwich compounds. In an interview with Dr. Wolfgang Seeliger, the managing director of Leichtbau BW GmbH speaks to Beate Wittkopp of TransferWerk-BW (a Steinbeis Transfer Center) about current trends in lightweight construction and future prospects. Dr.-Ing. Khaled Alaluss, Prof. Dr.-Ing. Gunnar Bürkner and Oleg Nuss – all of whom work for the Steinbeis Innovation Center for Intelligent Functional Materials, Welding and Joining Techniques, Implementation – provide an introduction to a new and innovative processing technology and welding powder, both of which make it possible to weld together large cross sections of aluminum. Finally, the experts at the Steinbeis Advanced Risk Technologies Group describe new, lightweight aluminum and magnesium alloys that have been developed as part of the EU-funded project ExoMet.

Image: an example of how to make lightweight materials at the Institute for Aircraft Design (IFB) at the University of Stuttgart. This radial braider is as tall as a fully grown adult with bobbins mounted around the rim. As it rotates, it weaves together 78 threads made of different fibers. © IFB

“It will always be about spotting the right trends at the right moment.”

An interview with Dr. Dietrich Birk, managing director of the VDMA in Baden-Württemberg

Dr. Dietrich Birk talks to TRANSFER magazine about the opportunities lightweight materials present to companies and how research findings are shared in this area.

Dr. Birk, when people talk about connected or smart factories – or rather, Industry 4.0 – they often omit the opportunities and threats posed by technology convergence. Digital technology is just one area where this convergence is happening in engineering, but there are a number of reasons why energy efficiency and conserving resources are particularly important to engineering and machine construction. Yet another area of convergence is lightweight design. What potential do you think this holds for businesses?

Lightweight materials have been a key driver in the ongoing development of moving components for years. If something has to move faster but use the same amount of energy, then basically its mass has to be reduced. One of the most obvious examples of this is in the aerospace industry. The issue of resource and energy efficiency, plus achievements in the field of composites, have shed new light on the importance of lightweight construction in recent years – in many areas of the industry.

Machine building and engineering can initially be seen as business partners when it comes to preparing suitable production and joining technologies for mass production. But using hybrid lightweight components made with combined materials based on fiber composites, aluminum, or steel are also becoming increasingly important for engineering. This is about finding the right materials with certain properties and using these in the right application, and this makes it possible to save energy by reducing the weight, without making compromises in terms of material strength or stiffness. In this respect, engineering is actually a significant and growing market for lightweight technology.

Lightweight materials are in a field of technology convergence that transcends all industries, so research findings need to be transferred quickly into business. To push forward with this, the VDMA has done things like set up an action group to work on hybrid lightweight technology. SMEs in particular tend to need help with technology transfer. Is it enough to help businesses and their partners forge networks with the people who have the know-how, or do you think more should be done – for example by helping SMEs improve their agility?

The VDMA set up the hybrid lightweight technology action group to help engineering firms interact more with people working in downstream

industries and the supply chain, and to exchange notes on the possibilities presented by lightweight technology as well as the technologies themselves and the materials. It's important to cover the entire spectrum of lightweight construction to get a grasp of the market and all of the opportunities it presents. The scientific community is also part of this action group to ensure know-how is transferred to small and medium-sized enterprises. Also, the VDMA in Baden-Württemberg is involved in some important platforms at the state level to help companies network, not just with one another but also with politics and science. So there's a lot being done to make sure smaller companies also receive support in understanding and exploiting the opportunities presented by lightweight technology.

There's no denying that lightweight technology is the big trend at the moment. But how will things be going forward when it comes to sustainability?

Energy conservation and resource conservation are both gaining in importance at the moment. Lightweight technologies make a huge contribution to achieving such goals. They also help gain competitive advantage through new and innovative solutions. For example, simulations can be run on the structural mechanics of materials during the development process and this makes it possible to optimize virtual components. This can help save on materials without reducing strength. And every reduction in materials has a direct impact on resource conservation, so this makes it possible to save significant volumes of materials, especially in mass production.

There's no getting around the issue of sustainability when you're dealing with lightweight materials, but apart from saving materials on the components themselves, there's also the aspect of being energy-efficient in the way the components are actually produced. So one has to keep an eye on the entire production process to really act sustainably.

What will the big threats and opportunities be in engineering if everything "goes lightweight"? Which technology trends will build on this and how will they determine what happens to the industry in the future?

Lightweight design is a key issue when it comes to conserving resources and efficiency. One thing that will increasingly drive future developments will be digital technology. There'll be intelligent material structures that will be able to adapt their shape if stresses are applied in a certain way. They will be able to take on greater loads, whereas before the ultra-light nature of the material would have meant that the part would have failed. Such smart components will need to be connected to other ones and be fitted with sensors. There are already examples of this happening in the construction industry.

From a technology perspective, engineering in the state is basically on a good footing in competitive terms, but in the future, it will always be about spotting the right trends at the right moment and exploiting any potential to expand, not just at home but also abroad.

Image: A milestone in CFRP serial production: for the first time, preform technology has enabled the engineering company Dieffenbacher GmbH to produce complex dry carbon fiber preforms in short cycles lasting only 90 seconds. © Dieffenbacher GmbH

Dr. Dietrich Birk is the managing director of VDMA Baden-Württemberg, the mechanical engineering industry association. In this role, he is a also a member of the Steinbeis Foundation board of trustees. The VDMA represents the common commercial, technical, and scientific interests of engineering companies, especially with respect to national and international authorities and business stakeholders.

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Small, Safe, Efficient, Fast

Steinbeis Transfer Center Ino8 Pty Ltd Australia is developing a new generation of spacious tilting vehicles

The automobile industry is currently facing a number of problems: emissions scandals, excessive CO2 emissions, global traffic gridlock – just to name a few. One solution to many of these problems is the innovative modular tilting vehicle currently under development at the Steinbeis Transfer Center Ino8 Pty Ltd Australia. It is based on the center's own Safe8™ balance aid.

Every year 1.3 million die on the words roads, especially in developing countries. Many of these accidents involve two-wheeled vehicles. This number is forecast to rise to 1.9 million by 2020. In contrast, the number of accident fatalities caused by cars has been decreasing in recent years. Reasons include, among other things, the increasing use of e-bikes and the economic growth in emerging countries, which makes two-wheelers affordable for more people. The next big challenges are global warming - and the resulting new legislations to reduce carbon emissions.

But the biggest problem, however, is the global traffic gridlock, especially in megacities. Over the course of each motorist's life, two full years will be spent waiting in a car. And this doesn't even include really the time in traffic jams – it is just a reflection of the time a motorist sits idle, as defined by the New European Driving Cycle, which was developed more than 20 years ago. Globally the resulting economic damage is estimated to be around 1 trillion USD per year. The biggest cause of this traffic problem is that, on average, only between one and two people sit in each car, but a most cars car take up roughly four times the space compared to a motorcycle with two seats.

The first try to solve this problem was to reduce the length of a standard car by half, as with the Smart. Although this helps open up options in the parking space parallel to the streets it doesn't help in most car parks. And on the roads such cars are even less helpful to reduce the space requirement since this is determined by the minimum distances between cars. For example, at a speed of 50 km/h, the legally required minimum distance to the car in front is 27.5 meters. A difference of 1.5 meters between a 5-seat Ford Fiesta and a 2-seater Smart only increases the use of road infrastructure by just about 5%. Driving at highway speeds of 130 km/h this drops to a meager 2%. The short body design of a Smart type two seater car is also less aerodynamic. Another attempt was made by Toyota with their i-Road, which, like a two-wheeler, takes up significantly less space. Unfortunately, the car's active balance control is very complex and uses a lot of energy. Due to safety reasons related to driving dynamics its top speed is limited to 60 km/h and it comes with a hefty price tag, which is why the vehicle isn't currently available for sale but only used in fleet trials, for examples in car sharing programs.

A genuine solution for many of the problems mentioned here is a modular tilting vehicle. The relatively simple balance control called Safe8™ Balance Aid offers a basis for such vehicles. It was developed and patented by the Steinbeis Transfer Center Ino8 Pty Ltd Australia. The Safe8™ works very similar as electronic stability program (ESP) in cars. A num-

ber of sensors – many of which are already installed in the car for other systems like the antilock braking systems that are required by law – measure the movements of the vehicle in different directions. A minimum of two balance dampers each with two separate oil chambers and a valve regulate the flow between the two oil chambers. In dangerous driving conditions, the amount of oil flowing through the valves is reduced based on a predefined model. As a result, the vehicle is stabilized almost passively by generating a reaction force in the opposite direction to the movement of the dampers piston.

There are plenty of advantages to this approach: Even at relatively low speeds, the system can stabilize itself. In normal, non-critical driving conditions, the piston of the balance damper can move freely from one side to the other apart from the internal friction, and making use of the self-stabilizing effect of a typical two-wheeler. This is a built-in redundancy. Furthermore, the damper valves are only activated in less than 10% of driving time, so the energy is very small. Another typical characteristic of a leaning two-wheeler is that drivers can shift their weight to steer the vehicle – without the need to use the steering wheel. This is an additional technical safety redundancy that simply isn't possible in a car. The Safe8™ system also detects and compensates for crosswinds, a feature that, up until now, has only been available in very high-end luxury cars.

Electrorheological dampers from the company Fludicon are used as balance dampers. They are far more dynamic than, for example, electromechanical or magnetorheological hydraulic valves, and they offer the equivalent value for money. More importantly, the compact valves contain no moveable parts, so they are not prone to wear and can not get stuck. That makes them far more advantageous in terms of safety. Before defining the most important dimensional parameters of the new tilting vehicle, the Steinbeis experts went through a number of rounds of market research.

In Australia, Prof. Paul Couchman and Associate Prof. David Bednall supervised eight focus groups with respondents from Australia, India, and China. Prof. Werner Hagstotz from the University of Applied Sciences in Pforzheim, and co-founder and partner of the company Hagstotz ITM, initiated a series of expert interviews within the German automobile industry. The findings led to several changes in the initial concept. Since the number of people holding a standard car license is ten times bigger than those with a motorcycle license, the vehicle will be built modularly – with either three or four wheels depending on the target market. The length of the vehicle is also scalable and can be anywhere from 2.5 to 5 meters, depending on whether one, two, three, or even four seats are required. The first version are planned to have a top speed of approximately 200 km/h. This was determined in cooperation with the motorcycle unit of the Australian police department in Melbourne. The number of motorcycles in their fleet was reduced by roughly 2/3 in recent years on account of safety concerns and a lack of qualified motorcycle drivers. This comes despite the fact that motorcycles are faster to arrive at the scene of an accident or crime and despite the fact that the elevated rider position makes it easier to spot people not wearing seatbelts or using their cell phones while driving. That's why the police department in Melbourne is willing to pay the same price for the new tilting vehicle as for their current police cars.

This April the Steinbeis Transfer Center Ino8 Pty Ltd Australia reached another milestone on the path to realizing their revolutionary vehicle: The center's founder and director, Dr. Frank Will, was the only German participant to qualify for the finals of the first innovation competition for international talents in Shenzhen, China. The contest covered four continents, and, at the finals, the municipal government of Shenzhen showed great interest in the vehicle, since the daily traffic situation is one of the city's biggest problems.

As a result, the authorities quickly arranged meetings with the battery manufacturer BYD, as well as with several investors. A letter of collaboration was signed with one investor. Even BYD, which produces luxury electric cars under the Denza brand as part of a joint venture with Daimler, is interested in a cost-effective and energy-efficient solution. This highlights further advantages of the new vehicle: Thanks to the reduced frontal area and the lengths similar to a normal car, the wind resistance is reduced, which makes the vehicle very efficient. The market research conducted by Hagstotz ITM showed that the driving range expectations for tilting vehicles are like those of motorcycles – only about 20% of the range of standard road vehicles – so the battery size and associated costs can be minimized to a fraction of those of electric cars. This means that as leaning cars, the costs of electric vehicles are no longer a prohibitive, so this could be the break-through for electromobility!

Image: © Richard (Chaoyi) Li

Dr. Frank Will is the director of the Steinbeis Transfer Center Ino8 Pty Ltd Australia. The enterprise focuses on the issues related to reducing fuel consumption and exhaust emissions, improving safety for tilting vehicles, and offers its customers engineering consulting in the automotive field and in research and development.

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"The most import requirement is still weight reduction."

An interview with Prof. Rudolf Voit-Nitschmann, director of the Steinbeis Transfer Center for Aerodynamics, Aircraft Engineering, and Lightweight Construction, as well as managing director of Steinbeis Flugzeug- und Leichtbau GmbH

We talked to Prof. Rudolf Voit-Nitschmann, who explained the significance of lightweight construction, primarily in aircraft engineering but also in other industries. He also tells us about some of the developments he thinks the German lightweight construction field can expect further down the road.

Professor Voit-Nitschmann, lightweight construction has always been a key success factor in aircraft engineering. How is that relevant for establishing lightweight construction in other industries?

Looking back through history, we can see that aluminum lightweight construction was first introduced in Germany with the construction of Zeppelin airships. Back then Claude Dornier made major contributions to this area as an employee at the Zeppelin plant, and later when he founded the Dornier plant. Still today, the aerospace industry is the driving force behind lightweight construction – even in other industries. Lightweight construction is mainly becoming more important now because of electric vehicles. Take, for example, the BMW i3. Its passenger cell is composed entirely of fiber-reinforced plastics (FRP).

In the beginning, lightweight construction could be boiled down to one simple principle: replace heavy materials with lightweight ones. Simply speaking, this meant replacing steel with aluminum. This definition won't work anymore – there's far greater demand for intelligent solutions, combining materials with functionality, to ensure the components are not just lighter, but also safer, easier to work with, and more resource efficient. What does this mean for the future?

It's true that lightweight construction goes back to simply selecting lightweight materials. To do this, identical components were simply replaced with those made of lighter materials. With the rise of what we now call functional lightweight construction, combined with integrated lightweight construction, we can now meet other functional requirements in addition to simply reducing weight. FRPs can be designed based on the intended use, knowing the stresses that the fibers will ultimately be subjected to. With the right mold forms it's easy for us to meet aesthetic or aerodynamic requirements and get the geometry right. In car passenger cell construction, we can reduce the number of components compared to sheet metal construction. In integrated lightweight construction, functional features such as insulation and sensors can also be integrated.

The use of hybrid materials is opening up new avenues for industrial processes. What potential do you think exists in terms of fu-

ture developments, especially in Germany which is a stronghold for industrial manufacturing?

Developing hybrid lightweight materials is a big part of the modern automotive industry. The whole idea is based on selecting just the right materials for each component, taking various aspects into account relating to lightweight construction, manufacturing, and costs. But hybrid materials are also used in aircraft engineering, like the use of glass laminate aluminum reinforced epoxy (GLARE) in the A380. This is a glass-reinforced aluminum. One of this material's main benefits is that it reduces the risk of cracks spreading from damaged areas. We haven't begun to fully tap into the potential of hybrid materials and construction methods. Here in Germany, we are among the leaders in the field of materials research.

Part of what you do is look at the use of lightweight construction technologies in aviation. What kinds of things does this industry hope to achieve with lightweight construction? Or to be more specific and provocative: Does anything ever change in the aerospace industry?

The most important requirement is still weight reduction. Construction regulations also stipulate further important requirements for an aircraft to be registered, so properties like damage tolerance or good fatigue behavior are also important. Electric aircraft are becoming more and more popular – at least in general aviation. The e-Genius touring motor glider is an example of this. It was developed as an experimental aircraft at the Institute for Aircraft Engineering at the University of Stuttgart. Carbon fiber composite constructions are essential for the next generation of electric aircraft.

If you wouldn't mind making a prediction for the future, what do you see for the future of lightweight construction in Germany, particularly in Baden-Württemberg?

The impending energy transition, the demand for energy savings, and environmental friendliness will come together to drive electric vehicles forward in all sectors – cars, two-wheeled vehicles, aircraft. Lightweight construction and fiber composites will become more prevalent, even in the fields of medical technology and robotics engineering. The focus will be on improving processes in order to make series production more economical. What's more, the automated textile manufacturing processes for fiber composites will become more important for producing high-stress components. There is a competence center that focuses on these aspects in its research, at the Institute of Aircraft Engineering, which is based at the University of Stuttgart. And finally, I'd like to mention the glider manufacturers Schempp-Hirth Flugzeugbau and DG-Flugzeugbau. They're industry forerunners in Baden-Württemberg. These two companies are global leaders in their field. There are also a great number of Steinbeis Enterprises working in the field of lightweight construction. At our Steinbeis Flugzeug- und Leichtbau GmbH, we create lightweight structures for aircraft made exclusively of fiber-reinforced composites. In addition to lightweight construction, our core competence lies primarily in the area of materials certification in accordance with the respective aerospace regulations.

Prof. Rudolf Voit-Nitschmann is director of the Steinbeis Transfer Center for Aerodynamics, Aircraft Engineering, and Lightweight Construction, as well as managing director of Steinbeis Flugzeug- und Leichtbau GmbH. His Steinbeis Enterprises provide customers with access to extensive know-how and expertise in the field of aircraft development and lightweight components in fiber-reinforced plastic construction. In 2011, Rudolf Voit-Nitschmann was awarded the Steinbeis Foundation's Transfer prize – the Löhn award – as a special award for outstanding contributions to technology transfer.

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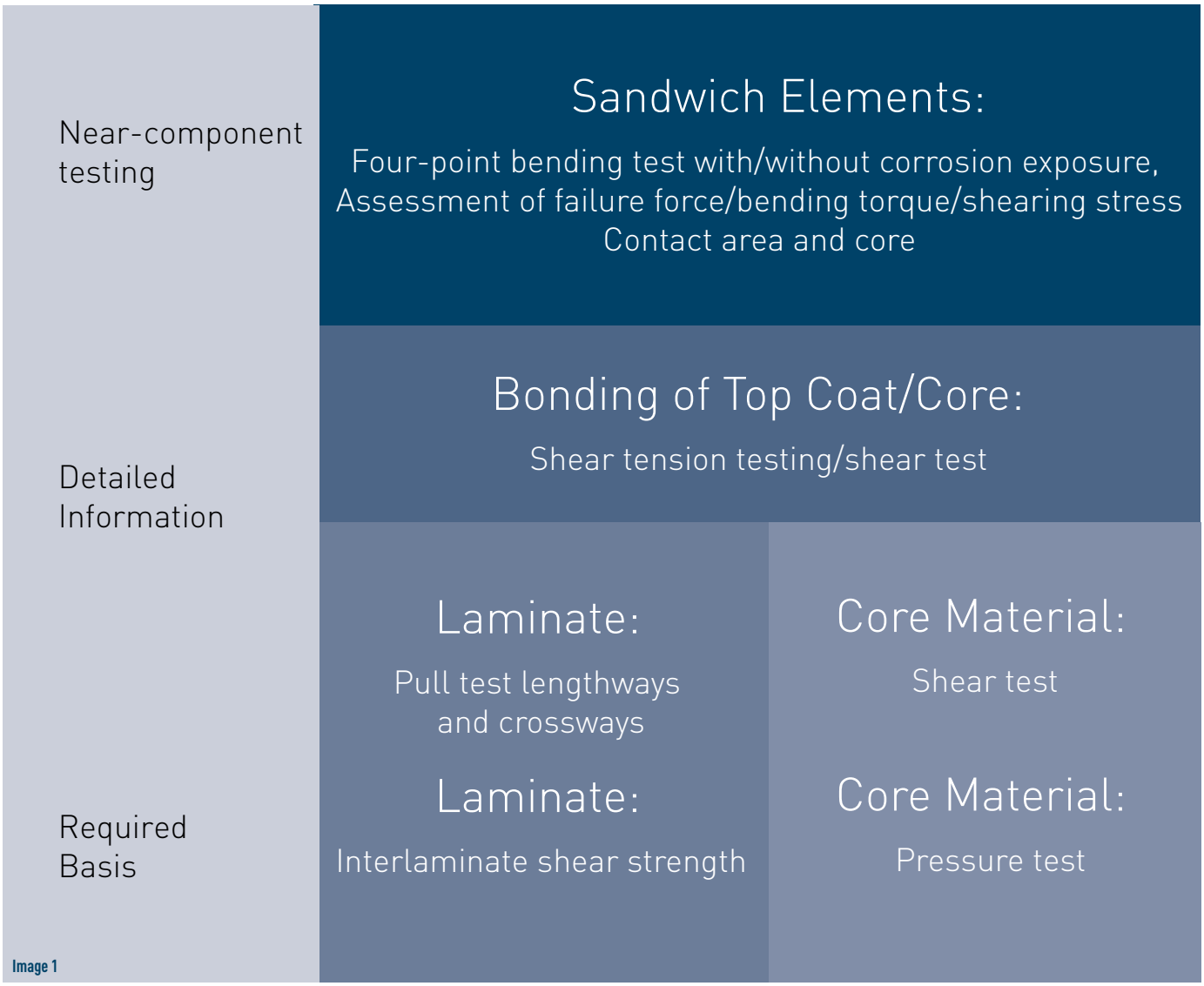

Image 1

A Closer Look at CFRP Sandwich Compounds with Aluminum Honeycomb Structures

Steinbeis experts develop new testing method

Sandwich elements are often used to gain significant weight reductions in aerospace applications, but they can also be used in terrestrial vehicles. As part of internal research, the materials corrosion and corrosion protection experts at Steinbeis-Transferzentrum Werkstoffe Korrosion und Korrosionsschutz GmbH, a Steinbeis Enterprise based in Friedrichshafen, have developed a system for testing the corrosive properties of sandwich compounds made of CFRP aluminum honeycombs.

Continuous carbon fiber reinforced polymers (CFRP) have an edge on metal materials thanks to their extraordinary specific strength and rigidity. Aluminum honeycomb structures are a classic kind of lightweight material that have been tried and tested in engineering for decades. They offer excellent mechanical compatibility between the CFRP laminate top coats and the aluminum hexagons thanks to the matching stiffness of both materials. However, in electrochemical terms, combining CFRP and aluminum can be extremely problematical.

Inter-laminar shear testing is absolutely essential if engineers want to understand the qualities of a CFRP laminate. Ideally, testing should be supplemented with laminate data by conducting tests both lengthways and crossways. With aluminum honeycombs, sufficient compressive strength is required and the shear modulus has to be appropriate for the sandwich design, depending on directional forces. The sandwich samples tested by the Steinbeis experts in Friedrichshafen were produced by using an autoclave process with a twin-component epoxy adhesive. Current density (short circuit current) was measured between the "more pure" CFRP laminate and the "less pure" honeycomb alloy (AlMg5) and this served as a basis for electrochemical corrosion testing. The tests conducted for the research project were carried out in accordance with DIN standard 50918. As such, the cut or sawn edges of the components

CFK laminate	Aluminum honeycomb	Sandwich element
Prepreg: Cyanate-Ester-Matrix, UD-C-fiber M55J, autoclave process, laminate thickness t = 0,5 mm	AlMg5 Core thickness c = 14 mm	**Dimensions** Overall thickness h = 15 mm Width b = 40 mm Length L = 360 mm
Adhesion using 2-component epoxy adhesive in an autoclave process		

Image 2

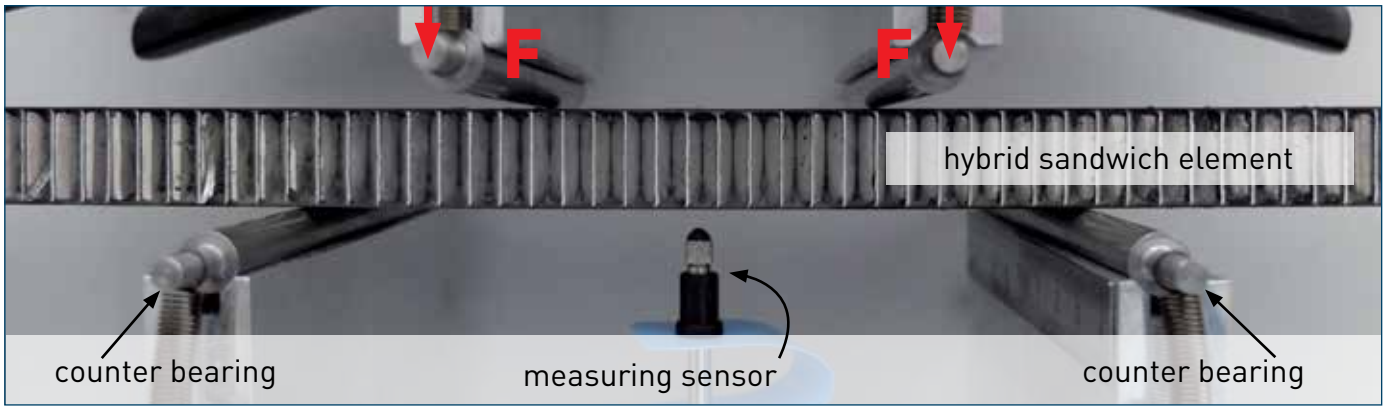

Image 3

used in the research were left exposed. Corrosive testing on the sandwich elements was carried out over the course of 336 hours. This involved two approaches. The first was based on VDA233-102 methods. This allows for cyclical corrosion testing of materials used in the automotive industry because it creates reproducible corrosion profiles, although in this case the Steinbeis team deviated from VDA standards and used a 5% sodium chloride solution. The second method that was selected was ISO 9227 salt spray testing, using 5% sodium chloride solution with a pH value of between 6.5 and 7.2. This was in order to examine the weaknesses caused by corrosion on the sandwich elements. The specialists then carried out a mechanical assessment of residual load-bearing properties after corrosion, based on a four-point bending test according to DIN standard 53293.

Four-point bending strength testing ascertained that the specific mechanical properties of the sandwich samples suffered particularly strongly with the samples exposed to salt spray testing (ISO 9227). Indeed, these differences were significant compared to reference samples. Creating lengthways cuts on treated samples breaches the surface of the laminate and the honeycomb structure. By the influence of the cutting process a direct contact between the carbon fiber fragments and the AlMg5 has been created. Electrochemical measurements showed that corrosion is mainly promoted through material contact and not through intrinsic corrosion. This also explains why there was more corrosion on the honeycomb structure subjected to salt spray testing than with the VDA 233-102 approach, primarily due to the long-term effect of electrolytes. The ISO 9227 salt spray test resulted in corrosion along the entire sides of the honeycomb, while the VDA233-102 samples only had localized corrosion near the CFRP top coat. Despite the high levels of magnesium (5% of the honeycomb alloy), there was more contact corrosion on the CFRP.

The Steinbeis-Transferzentrum Werkstoffe Korrosion und Korrosionsschutz GmbH looks back on more than two decades of advanced know-how, both in the field of lightweight construction materials and in hybrid construction methods. The testing methods developed at the center have proven immensely useful in assessing the properties of corroded hybrid lightweight components, and the methods will now be used for development projects involving assessment of sandwich structures.

Image 1: The hierarchy used for mechanical assessments carried out on sandwich elements by the Steinbeis Transfer Center Werkstoffe Korrosion und Korrosionsschutz GmbH
Image 2: Composition of the hybrid sandwich samples
Image 3: Four-point bending test on a CFRP-aluminum honeycomb hybrid sandwich element

Benjamin Kröger is the director of the Steinbeis Transfer Center Werkstoffe Korrosion und Korrosionsschutz GmbH. The work carried out by the experts at the Steinbeis Enterprise includes consulting and support in the selection of raw materials, applied research and development in the fields of materials analytics and testing and damage assessment. Additionally expert reports are published and research findings, education, and training courses on materials, corrosion, surface technology as well as lightweight construction are carried out.

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"Lightweight technology is much more than just replacing materials!"

An interview with Dr. Wolfgang Seeliger, managing director of Leichtbau BW, the Development Agency for Lightweighting Baden-Wuerttemberg

Beate Wittkopp, director of the Steinbeis Transfer Center TransferWerk-BW and an active networker and advisory board member of Leichtbau BW, spoke to Dr. Wolfgang Seeliger on behalf of TRANSFER magazine to discover more about the importance of lightweight technology as a cross-industry driver of innovation, about the shift to digital technology, and about future prospects for the industry.

Dr. Seeliger, you're a chemistry graduate with an MBA and you completed your doctoral studies at Helmholtz-Zentrum Berlin, which deals with materials and energy systems. The focus of your Ph.D. work was renewable energy. After that you worked in places like the automotive industry and the Baden-Württemberg State Bank. So how did you end up in lightweight technology?

I'm fascinated by innovations and developments, the juxtaposition between finite resources on the one hand and the huge market potential for new materials on the other. Lightweight construction opens the door to amazing sustainable solutions for saving energy, materials, and money. It also allows you to achieve lower weights and still raise load capacities and improve functions – just as our slogan goes: "less is more." As well as presenting our companies with tremendous commercial potential, we can also save valuable resources.

Why is it that lightweight materials are such an innovation driver across so many industries?

Lightweight technology transcends a number of industries, from cars to mechanical engineering, the aerospace industry, medical technology, construction, and architecture. So the lightweight materials industry is safeguarding the future of many valuable jobs in Baden-Württemberg, as well as its industrial clout overall. From what we can see, the potential of conventional lightweight construction will already be leveraged in the automotive industry within the next two vehicle generations. So in the medium term, there will be a paradigm shift and this will not just result in digitalization of the value chain, but it will also result in more emphasis on lightweight concepts and process innovations.

What do you believe will be the key industries in this respect?

Market forecasts indicate that the transportation sector will remain the key customer for lightweight design. Studies point to a market volume in this area of around €40 billion by 2020. Over the same period, mechanical engineering will grow to a market size of up to €30 billion. And for whom will lightweight design be particularly interesting? An analysis of the most recent patent registrations has shown that, in the long term, the construction industry could topple transportation from its leading position. It's a visionary idea at the moment, but a broad field of growth for lightweight design could come from the merging fields of architecture and public travel – or construction in the transportation industry. This is about translating the principles of lightweight design into urban development. So in essence, it's about transferring lightweight materials and functional integration into buildings.

What are the important trends at the moment? Where will this journey take us?

Lightweight technology not only allows you to reduce mass consumption and cut carbon emissions, you can also achieve essential cost savings. To leverage their full potential, lightweight materials have to be looked at from a broader angle. Simply substituting materials will still be important, albeit with more of a focus on multi-material design. And another paradigm shift has now entered the scene with mid-term lightweight developments – one example of which can be seen in the automotive industry. There are some excellent ways to transfer people's experience in this area into other industries. The idea behind our monthly ThinKing program is to introduce people to innovative lightweight solutions and provide an incentive and stimulus, but also to give a higher profile to lightweight technology excellence in the state.

How important is the shift toward digital technology for lightweight construction?

Digital technology is essential for lightweight design. Lightweight construction pushes materials to the extreme in terms of the stresses they can take; products are made completely differently and functions are integrated into actual components. To exploit the full potential of lightweight construction, data has to be shared at all stages of the value chain. The result is significant gains in terms of competitiveness, but also for the customer. It does make the engineering process more complex, however, and there's a shift away from being a consecutive process toward becoming a complex process with feedback loops along the entire process chain, that is, at different stages. So this is nothing less than digitalizing the entire process chain and to do that, data exchange has to be standardized.

What do you believe is the best way for companies to deal with such technology-driven transformations?

As was shown most strikingly by an analysis of training requirements carried out by Leichtbau BW, the "hot potato" for companies involved in lightweight design is changing business processes. This will mean changing work practices. Production and development will have to pull together more and wield more influence on one another, but it will also require new calculation methods. This will all come along with lightweight design, so process innovations will be needed.

So training and continuing professional development (CPD) will also be crucial as part of career development?

Indeed. Lightweight technology requires a complete rethinking in terms of processes and methods, as well as materials. This is what comes from a carefully considered, sustainable design and construction process, but it's also what happens when you have to master production technologies and select the right materials. All of these changes come hand in hand with new training requirements for the people working at a company. Lightweight technology is already a central feature of academic training. There are more than 50 different degree options in Baden-Württemberg which involve teaching on lightweight technology – from architecture to business engineering. Where we still see challenges at the moment are in CPD at companies. We also conducted an analysis of requirements within companies and we're planning to introduce certification courses and innovative training models in the future.

One prerequisite that needs to be fulfilled to foster the right kind of interdisciplinary collaboration and give lateral thinkers the room they need is to network lots of key players. How do you pool resources?

One thing we find extremely important is collaboration with industry associations like the LVI in Baden-Württemberg (the regional industry association) and the capital goods industry representative VDMA Baden-Württemberg. We do this not just by involving them in our advisory board, but also by organizing shared events and offering ways for providers and users to exchange views. This is an especially important B2B platform for our SMEs. Then there's collaboration between each federal state and the federal government, for which there's strong interest within our network. To help market innovations involving "lightweight technology from Baden-Württemberg," Leichtbau BW offers a number of vehicles, mainly by working with a variety of partners from industry and science to offer companies events, platforms, and project groups. We exhibit at most technology trade shows and this year we shared a booth under the banner "Lightweight technology from Baden-Württemberg" at Hannover Messe; it was extremely successful for the companies that took part. We would also like to pull the key players together that inject momentum, so one step has also been to set up a technology day on hybrid lightweight technology in collaboration with the fiber materials alliance AFBW, Carbon Composites Baden-Württemberg (CCBW) and Leichtbauzentrum Baden-Württemberg (LBZ). This was the third year the conference took place and it was accompanied by a special exhibition. There were 250 participants at the event and 15% of those were from outside Germany. We invest a great deal of energy in work with the LVI to organize cross-industry workshops, for example there was an event called "Aviation Meets Lightweight Technology" organized with the LRBW Forum. Our members also attach a lot of importance to internationalization, so we also collaborate with Austria and Switzerland. We've been involved in lots of lively exchange with the state of Michigan and this is intensifying. There have been a number of highly promising tours on both sides of the Atlantic and preparations are already underway for the next automotive manufacturing meeting. The aim is to boost innovation and, with that, the competitiveness of Baden-Württemberg, meanwhile helping to create new jobs. The role lightweight design plays is that of an enabling technology. As a 100% state-owned enterprise, we support industry and research on the path to global leadership in lightweight technology.

Image: The shared Lightweight Technology from Baden-Württemberg booth at the Industrial Supply 2016 trade show at Hannover Messe. The booth was used by 11 firms from Baden-Württemberg to showcase their hands-on lightweight design know-how, from design and development to actual production. © Leichtbau BW GmbH

Dr. Wolfgang Seeliger

Beate Wittkopp

Dr. Wolfgang Seeliger is managing director of Leichtbau BW, the Development Agency for Lightweighting Baden-Wuerttemberg. Leichtbau BW is a limited liability company that fosters and promotes economic development and science. As a neutral and cross-industry port of call for companies, research bodies, and society as a whole, the agency's role is to help organizations share lightweight construction technology and know-how. It also helps with searches for new organizations interested in closer collaboration.

Beate Wittkopp is the director of the Steinbeis Transfer Center TransferWerk-BW, which is a member of the Steinbeis Network. As well as offering professional support with managing networks involved in technology projects, she also provides help with change processes. Among other bodies, Wittkopp is a member of Baden-Württemberg: connected bwcon e.V. and the regional industry association of Baden-Württemberg (LVI). She is also an LVI advisory member for Leichtbau BW.

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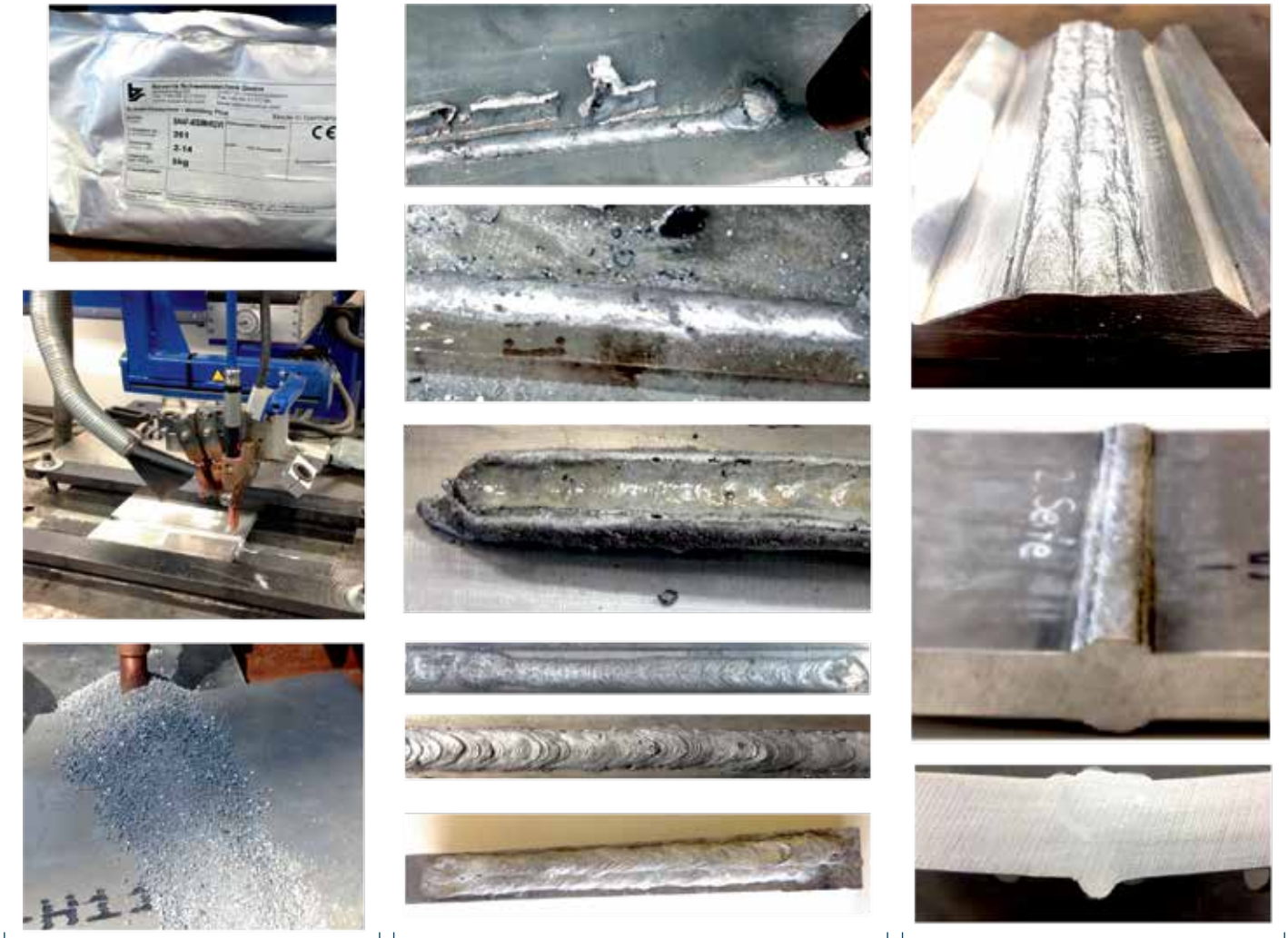

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Innovative Welding of Solid Components

Steinbeis project team develops welding process and welding powder

Aluminum and its alloy relatives are marching ahead at full speed as an alternative construction material in a variety of areas of industrial application. They offer low material density, making them an especially appealing option for engineers working in the automotive sector, the aerospace industry, shipbuilding, and trains. Aluminum sheets with the required material thickness can be rolled into pipes before welding lengthways. This is particularly important in industrial applications involving tubular components or profiled parts. Until now, producing larger sections of materials has not been financially viable, because the only possible conventional method was to use multiple-pass welding. Not only is this time-intensive, it is also expensive. One alternative has been to use electroslag welding or submerged arc processes. The Steinbeis Innovation Center for Intelligent Functional Materials, Welding and Joining Techniques, Implementation has been investigating this process and has successfully developed a new process along with a welding powder that are now capable of achieving the required performance when joining larger aluminum cross sections.

With submerged arc welding, the electric arc burns inside a gas cavern underneath a layer of welding powder. As the parts are welded, the powder melts and develops into a liquid called welding slag. This moves around on the weld metal, shapes it, and protects it from oxidation. This technique offers a variety of benefits compared to other electric arc welding processes. For example, the high electrical current needed when using thick wires (> 3mm) is excellent for the rate of deposition and this makes it possible to achieve large seal volumes economically. Thick aluminum parts can be used in a large number of areas such as toll frames (mounted over highways), shipbuilding components for high-speed vessels, aluminum car wheel rims, or components required for large engines. As a result, there was strong demand for an effective submerged welding process and a suitable welding powder to go with it. The experts decided they needed to move forward with aluminum submerged welding and develop it into an economically viable joining process that would enjoy widespread acceptance in industry.

Working in collaboration with an industrial consulting firm called Bavaria Schweißtechnik GmbH, the experts at the Steinbeis Innovation Center for Intelligent Functional Materials, Welding and Joining Techniques, Implementation have now developed an innovative welding powder as well as a suitable submerged welding technique for use with thick sheets of aluminum. At the start of the project, the experts experimented with and optimized the chemical composition of the new welding powder. They focused on technical processes to improve the quality of the seal. The main job of welding powder is to remove aluminum oxide layers during the welding process and prevent pores or cavities from forming. It also helps avoid poor joins along the welding seam. To this end, the Steinbeis experts developed a variety of powder mixtures focusing on the chemical composition and the ratios of various ingredients. Following a series of welding tests, they successfully identified the influence of different ingredients within the powder and their impact on arc ignition and arc properties. They also examined seal formation and slagging. "One thing we noticed with the samples we welded using the different powder mixtures – which were mainly composed of oxides – was that the welding process was relatively stable and the seals were good," explains Dr.-Ing. Khaled Alaluss, who is co-director of the Steinbeis Center in Dresden. The welding slag this produces keeps the welding process stable and it is easy to detach and remove.

To improve the chemical composition of the powders, the two teams working on the project examined significant influences on the materials. Based on this they succeeded in using the new powder mixtures to produce aluminum welding joins of the required quality – with no pores and no problems with the joins. Finally, the welding experts developed a corresponding welding system to produce submerged arc welds on aluminum and aluminum alloys (AlMg4.5Mn). The quality of welding results depends on:

- unconnected submerged arc process parameters (welding current, welding voltage, speed, and steak out)
- component size (thickness: 10-30 mm)
- heat dissipation (arc energy, component heating/cooling)
- the specific kind of aluminum alloy

To conclude their project, the experts considered the specific conditions encountered in industrial welding and made an evaluation of the new submerged arc welding technology. They did this by producing aluminum demonstration parts, in this case with a high quality joined connection (linear join, v-shape join, twin v-shape join), which they then examined in detail for technical properties and performance.

The project was completed successfully and the experts at both Steinbeis and Bavaria Schweißtechnik were satisfied that they had proved that the seals they had produced delivered the required component quality in terms of strength, porosity, the welding root, and hardness/structural texture. "So we showed that the properties this produced with the welded aluminum joins, both in mechanical and technological terms, depends entirely on the main process parameters," says Prof. Dr.-Ing. Gunnar Bürkner, summarizing the result of the project. The strength of the welded joint was 75% of the minimum value of the base material (AlMg4.5Mn), another confirmation of the quality of the seal.

Image: Examples of results of the projects: a) the new welding powder and the process technology, b) the seal and slagging, c) welded aluminum alloy parts (AlMg4.5Mn)

Dr.-Ing. Khaled Alaluss

Prof. Dr.-Ing. Gunnar Bürkner

Hubert Lettner

Oleg Nuss

Dr.-Ing. Khaled Alaluss and Prof. Dr.-Ing. Gunnar Bürkner head up the Dresden-based Steinbeis Innovation Center for Intelligent Functional Materials, Welding and Joining Techniques, Implementation, which primarily works in the fields of applied research and development, design, and the application of components and materials. Oleg Nuss is an assistant at the center and also a member of the project team that worked on the development of the welding process. Hubert Lettner is the managing director of Bavaria Schweißtechnik GmbH, a welding firm based in Unterschleissheim (north of Munich) that specializes in powders, wires, and ligaments.

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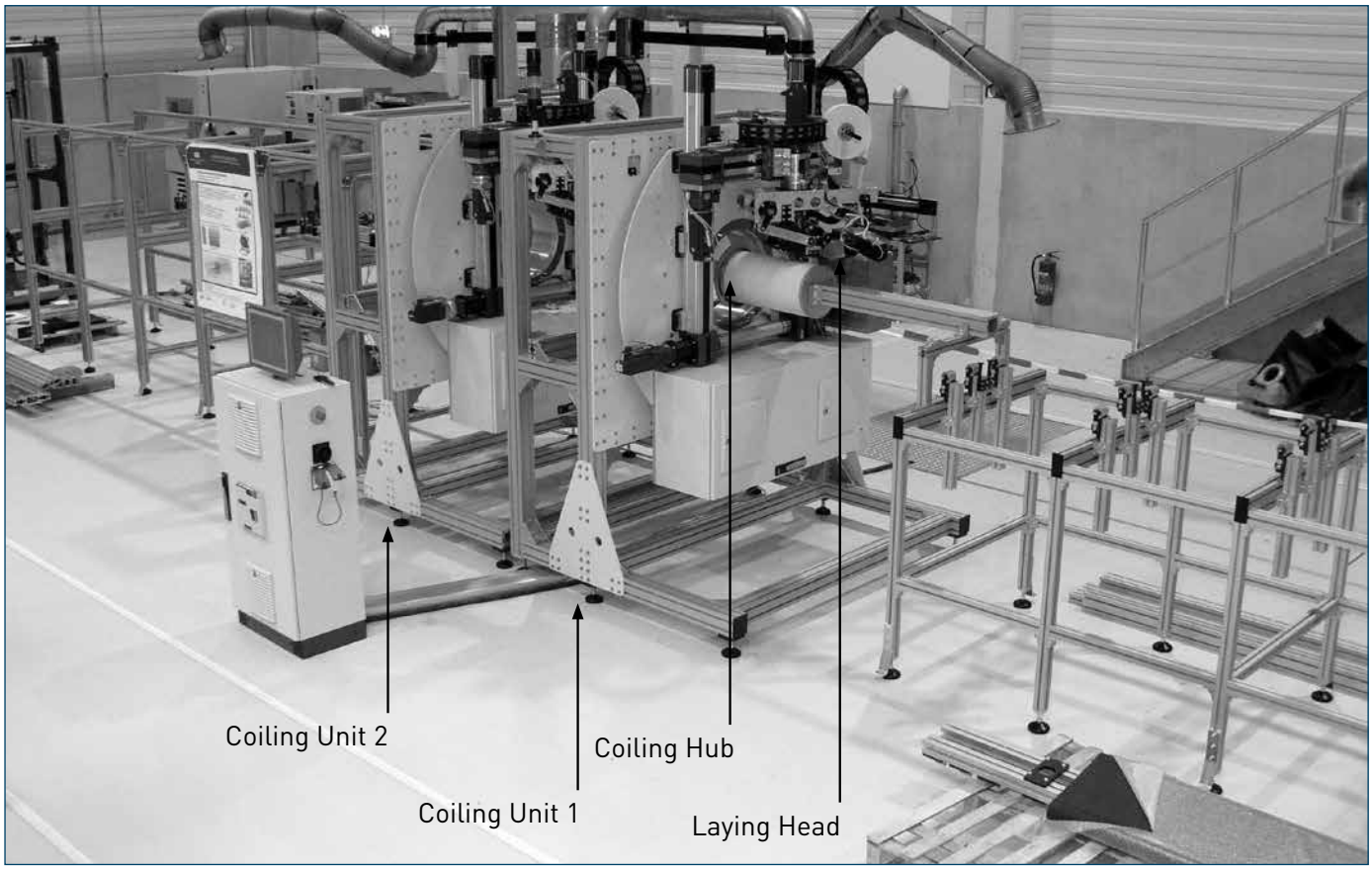

Modular. Adaptable. Efficient.

Steinbeis experts help develop pilot plant for use with orbital coiling technology

A team of experts from the professorial chair for structural lightweight design and polymer processes at Chemnitz University of Technology (TU Chemnitz), the Steinbeis Research Center for Automation in Lightweight Construction Processes (ALP), and Cetex gGmbH have been looking into ways to create fiber-reinforced thermoplastic structural components that are suitable for mass production. The aim is to develop a production technique that would improve productivity compared to conventional methods, reduce manufacturing costs, and thus open the door to new applications. To examine mass production suitability, the teams have developed a pilot plant.

The project is part of a cluster of excellence called MERGE at TU Chemnitz, which is headed up by Prof. Dr.-Ing. Lothar Kroll and backed by the German research alliance DFG. The team involved in the project developed a sequence of processes that would make it possible to combine and synchronize different steps resulting in continually functioning upstream and downstream work processes – a coiling process that would, for example, make it possible to lag and, if required, fiber-reinforce extruded sections. The process guides an "endlessly produced" strand (a coiling hub or "liner") through a coiling unit where it is coated with a fiber-reinforced material. The machine has also been designed so that asymmetrically rotating cross sections can be coiled. It includes a pinch and compacting roller to make it possible to form different surfaces more flexibly, meaning that undercuts (concave sections) can also be layered with materials.

Orbital coiling is a combined process involving thermoplastic tape layering and coiling in one, and this is the function of a so-called coiling unit. Fiber-reinforced thermoplastic ribbons – or tapes – are used to "coat" materials. For their research project, the three partners from Chemnitz decided to completely consolidate the reinforcement fibers within these tapes and wrap them in a plastic matrix. The tapes are melted during processing by an end effector. This forms the shape and individual layers are firmly bonded to one another through molding adaptation. Assuming the coiling hub is made of the same plastic as the matrix material, it can also be joined with the material composite. Alternatively, it can be removed after production in a fixed state.

Synchronizing processes into continual upstream steps is made possible by the orbital movement of the individual coiling units. These rotate around the coiling hub which is in continual translational movement during the coating or coiling process. The pilot plant developed by the lightweight design experts for their project was based on modular principles so it can also be adapted by adding individual coiling units constructed along the same lines. By rotating individual coiling units around the coiling hub, each step works like an inverted coiling process. In essence, the kinematic elements of a coiling module consist of groups of multi-axis kinematic parts and a specially developed end effector – i.e., the orbital laying head. The groups of parts that work by interacting

with one another are a mechanical drive, the tape feeder, a heating unit, a mechanism for consolidating individual layers, a cutting system, a sensor system, and a control unit for the overall machine.

The first stage of machine development and commissioning is to wind a section with a uniform diameter. Once the unit is running, the output section – in this case the consolidation roll – is guided systematically around the coiling hub at a constant speed (up to 200 mm/s). The required guiding curve is then based on kinematic criteria, and, as movements will be critical, these will have to be defined at each stage. The end effector on each coiling unit (the orbital laying head) is equipped with all features required for the technical process of processing semi-finished thermoplastic parts. The pinching force required for laying tape is applied by a special mechanism on the consolidation module. This is typically attached along standard lines to the local surface by swiveling the consolidation module into place. The machine is currently being ramped up and plans are already underway to transfer the findings of research to other applications.

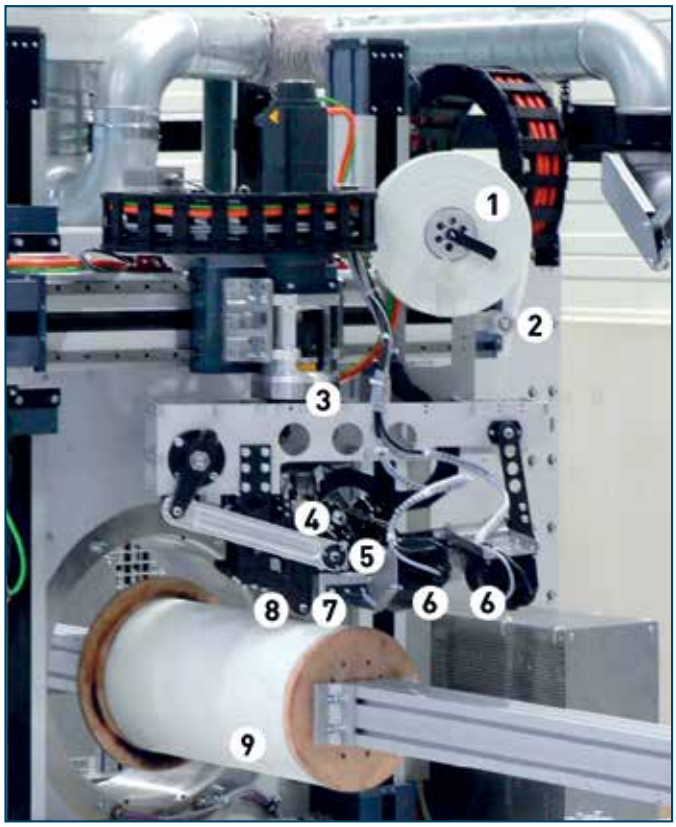

Image left: An orbital coiling pilot plant
Image right: An orbital laying head and coiling hub:
(1) Material storage (2) Guide roll (3) Slewing ring (4) Consolidation module (5) Cutting module (6) Heating unit (7) Tape guide (8) Consolidation role (9) Coiling hub

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New light-weight materials for new technology applications

Steinbeis Advanced Risk Technologies (R-Tech) contributes to the health & safety assessment, life cycle assessment and cost-benefit analysis in the European development of light-weight materials.

In order to meet the future EU challenges about light-weighting and pollution reduction, especially relevant in transportation sector, one of the biggest EU projects: ExoMet, was launched in 2012. The ExoMet project has successfully produced new light weighting aluminium and magnesium alloys with improved mechanical properties by exploring grain refining and nanoparticle additions in conjunction with novel melt treatment.

ExoMet, entitled Physical Processing of Molten Light Alloys under the Influence of External Fields, is a 7th Framework Project funded by the European Commission and coordinated by the European Space Agency (ESA). The Consortium of ExoMet is composed of research institutions and universities from Russia and Australia as well as European industries such as Airbus, Fiat and Volvo. The project had a budget of approximately €20 million from public and private sources. The project looks at improving grain refinement at various ways of mixing the nano-particles in metal melts, casting test-bars, scaling-up external field equipment and prototyping of components.

Manufacturing scale-up was tackled in the ExoMet project using a variety of techniques such as low and high-pressure die casting, sand casting, investment casting, differential-pressure casting, twin-roll casting, ultrasound-assisted casting and twin-shear casting. The novel application of external fields to these industrial techniques would bring major savings in energy, scrap and processing cost.

The ExoMet project is now in the 4th (last) year, where the prototype components are developed and tested by the industrial end-users participating in the project. Four commercial sectors were selected for the industrial applications: (i) automotive powertrain and chassis, (ii) aircraft and aero-engine structures, (iii) satellites and rockets and (iv) high-strength high-conductivity Al electrical cabling. Some major results achieved during the project are specified herewith.

1. Novel grain-refining master alloys

Master alloys were developed by using new grain refiner compositions.

The innovativeness of the new master alloys is to provide higher efficiency of grain refinement which means lower addition and/or enhanced product quality versus conventional TiB-based master alloys. The unique selling point of these new materials are the smaller intermetallic, better surface finishing and better toughness. These new alloys will provide better technical characteristics for the industrial applications. In that case, aluminium foundry industries will be the main market for these materials.

2. Contactless device for microstructure refinement and stirring of alloys
Contactless device technology basically covers two parts which are; (i) grain refinement of light alloys by stirring / cavitation using a non-chemical, and (ii) dispersion of strengthening particles in light alloys using a non-contact method. Existing grain refining methods rely on ultrasonic treatment using a consumable immersed sonotrode, or alternatively on the addition of chemical refiners. In the first instance, the melt is contaminated and in the second one, undesirable agglomerates can be formed. The new technique requires no chemical additions, and because it is non-contact, it can avoid contamination. In addition, the technique combines acoustic vibration with bulk stirring and heating of the melt.

3. Prototypes
The prototypes demonstrators will prove the ExoMet technology beyond the laboratory scale: The components are aluminium and magnesium based cast:

- Satellite frame with AM60+nano particles
- Electrical cabling with aluminium+nano particles
- Seat frame with AM60+nanoparticles

Steinbeis R-Tech Role
R-Tech contributes to health & safety assessment, life cycle assessment and cost-benefit & supply chain analysis of selected light alloy/MMNC components. R-Tech also advised the coordination of the project in regards to the IPR (Intellectual Property Rights) activities.

In the context of Life Cycle Assessment, for a selected component (seat frame), environmental, health and resource related impact categories of aluminium alloy (AlSi10Mg) and steel were compared. The results of the analysis showed that aluminium alloy have a better environmental performance when compared with steel. The Environmental assessment was done by using the impact assessment method, ReCiPe. Concerning Cost-Benefit & Supply Chain Analysis, first of all, Net Present Value (NPV) of fuel was calculated for selected industrial components (seat frame and engine piston) which were produced with new alloys. Regarding the analyses, it was showed that the usage of the new materials can contribute some benefits in economical, technological, technical and environmental manner. Due to commercial sensitivity, the detailed technical reports will be largely kept confidential within the consortium. However the research developed within the ExoMet project was openly published in journals and conference proceedings in order to make the project results available to the broader scientific community. Also, a number of high-impact dissemination and education deliverables ensure good broadcasting of project results and standards into the public domain. In addition, the consortium will provide a publishable executive summary report and a "European Research Roadmap for Light Alloys and Liquid Metal Engineering" that will help steer future research in this area.
Thanks to the developments of grain refinement additions and new processes to achieve better master alloys, the ExoMet project has largely contributed to generate new technological applications which will help the European Industries to reach the targets of light-weighting and reduction of emissions.

Image: Commercially obtainable Aluminium

Flor Angela Quintero

Gözde Kara

Prof. Dr.-Ing. Aleksandar Jovanovic

Dr. Wim Sillekens

Professor Dr.-Ing. Aleksandar Jovanovic is director of the Steinbeis Advanced Risk Technologies Group in Stuttgart. The alliance of enterprises offers its customers a variety of services related to business risk management, the analysis and management of technical risk, data analysis, and project management. Flor Angela Quintero is a director of a center belonging to this group alliance and Gözde Kara is a research assistant at Steinbeis Advanced Risk Technologies.

Dr. Wim Sillekens is a manager working on the ExoMet project at the European Space Agency (ESA).

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Transfer
Business!
















The Funds are There – and the Ideas?!

Review of the 2016 Steinbeis Financing Arena

Venture capital, credit, funding programs, crowd investing – at first glance, there seems to be plenty of funding available in Germany to translate potential innovations into reality. Despite this, politicians, intermediaries, entrepreneurs, and companies throughout Germany grumble about an unwillingness among capital providers to conscientiously take risks. The Steinbeis Financing Arena took place on April 7, and posed a provocative question: "The money is there – so where are the ideas to go with it?!" A number of funding partners, startups, and established companies were in attendance to take part in an interactive and sometimes contentious discussion. The arena was moderated by Prof. Stephan Ferdinand (Stuttgart Media University) and Tina Kraus (public broadcasting company SWR). The event was clearly in tune with the times and the interests of industry, as witnessed by the many people in attendance. With an audience of roughly 200 people assembled at the Stuttgart Hospitalhof, many more were interested in the proceedings and had to be consoled with video highlights afterwards.

Christine Gysin-Rosenberger (L-Bank), Eleftherios Hatziioannou (smoope GmbH), Dr. Alex von Frankenberg (the startup fund High-Tech Gründerfonds), and Guy Selbherr (Mittelständische Beteiligungsgesellschaft Baden-Württemberg and Bürgschaftsbank Baden-Württemberg) took part in the panel discussion in the central circle of the arena. As representatives of both capital providers and business founders – the ones seeking funding – their opinions were sometimes polemical. The outer ring of the discussion forum also made an essential contribution to the interactive nature of the event. It consisted of Heinz Liebrich (tax advisor), Thomas R. Villinger (Zukunftsfonds Heilbronn GmbH & Co. KG), and Axel Wittig (WEBO GmbH), who were allowed to take a critical view of the discussion. One thing everyone agreed on as the discussion got underway was that the situation in Baden-Württemberg is in no way comparable with the high-tech Mekka of Silicon Valley or the situation in Berlin. What they could not agree on was whether this is because the conditions are wrong in the state to promote "success through setbacks" – perhaps, in reality, the cliché that "you need to have setbacks and start again to make progress" is actually entirely different in places like the U.S., which is often pointed to as a role model. The panelists found it more important that people are conscious of the strengths of the state and that these should be shared much more openly and more confidently. This was seen as a weakness that stems from the German business mentality, particularly in Baden-Württemberg, where things are about understatement and where patting yourself on the back or blowing your own trumpet is considered "improper," according to the panelists.

The different views of capital providers and capital users were not the only issues discussed. Even within the funding community there are sometimes quite diverse opinions. Traditional banks primarily considered themselves obligated to savers and shareholders and severely restricted in their ability to enter risk by regulations. Business angels and family offices, of which there are many in the state, often operate in the wings and are at a strategic advantage. For them, it is often easy to take a risk for a startup since they are investing their own money. This prompted the audience and panelists to wonder whether traditional banks should actually not be considered as risk capital providers or financers of business startups, because they would be expected to behave in a manner which is incompatible with their purpose as an organization.

The discussion regarding the general unwillingness to take risks was followed by a question regarding the mentality of self-starters. What makes successful entrepreneurs and what makes them tick differently to the many who dare to become self-employed but then fail? The panelists pointed instantly to an ability to "think solution" and not "think technology," as well as an ability to see things from the customer angle. Networking is essential for a culture shaped by go-getters. In this regard, the startup scene has become much more proactive in recent years, although things could still be better.

For the final discussion round, the two moderators asked everyone the same question: If they could immediately eliminate one fundamental problem facing startups, what would it be? There were many different answers, ranging from negativity, which acts as a mental block, to barriers and the prejudices that some established companies have towards startups, and even the fear that potential entrepreneurs have of failure. Finally, one important request was made of all people at the arena, both in the audience and among panelists: To use the get-together afterwards for important networking and indeed a number of joint project ideas were explored by participants.

The panelists at the 2016 Steinbeis Financing Arena

- Christine Gysin-Rosenberger | Head of Business Finance and Market Management, L-Bank
- Eleftherios Hatziioannou | Managing Director, smoope GmbH
- Heinz Liebrich | Tax Advisor
- Guy Selbherr | Managing Director, Mittelständische Beteiligungsgesellschaft Baden-Württemberg GmbH
  And board member, Bürgschaftsbank Baden-Württemberg GmbH
- Thomas R. Villinger | Executive Partner, Zukunftsfonds Heilbronn GmbH & Co. KG
- Dr. Alex von Frankenberg | Chairman, High-Tech Gründerfonds
- Axel Wittig | Executive Partner, WEBO GmbH

Full video highlights of the Steinbeis Financing Arena can be viewed by going to the Steinbeis media library at www.finanzierungsarena.de.

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The Human-Machine Interface in an Era of Digital Technology

User-centered design is becoming a key production challenge in smart manufacturing

The shift to digital solutions (digitalization) and networking of products (smart connectivity) are opening innumerable doors to match product use to individual customers. But such individualization is also leading to a huge rise in the complexity of smart products. The challenge is therefore to design complex products in such a way that they can still by used by all customers. Understanding the issues raised not just by usability but also by user experience criteria, and covering this during the product development process, is one of the key goals of a German research project called PUMa (abbreviation for "project usability in SME applications"). The Stuttgart-based Steinbeis Innovation Center for Innovation Engineering is working as a partner on a project backed by the Federal Ministry for Economic Affairs and Energy (abbreviated: BMWi).

A typical example of a smart production/Industry 4.0 solution in a manufacturing environment is replacing an operating panel on a machine with a mobile device like a tablet. The operator taps on a screen to control the machine. Such human-machine interfaces (HMIs) create a vast number of options to develop products and make customer-based adaptations. But HMIs also mean that developers have to define products in more detail than in the past, so that users can operate machinery properly. Deliberately including aspects such as usability (and with this: software) when analyzing requirements and developing solutions can help determine the extent to which users will be able to carry out tasks effectively and efficiently with the finished product. As mobile end devices with touch-based inputs continue to enter more and more areas, even companies involved in "traditional" areas of engineering and machine building are being forced to look more closely at software issues to stay in the market, especially with respect to interface design and interaction options. Despite this, customer surveys point to the fact that many products fail to address their requirements properly. Usability aspects typically enter the equation too late in the product development process, and many developers are unaware of the full potential of usability factors to captivate customers.

It is against this backdrop that the PUMa project aimed to set up a know-how platform to promote networking among software developers and experts at SMEs involved in the aspects of usability and user experience. The scheme is part of a support initiative called "Simply intuitive – usability for the Mittelstand [SMEs]," which is part of the focal subtopic of "Digital Mittelstand – ICT Applications in Industry" and is backed by the BMWi. The platform provides examples of projects and usability methods, showing how simply and efficiently these can be integrated into an SME's own product development processes. This makes it possible for SMEs interested in the techniques to tap into the systematical methods knowledge of experts, or draw on example projects and lay

foundations for target group-oriented software development. A data model at the heart of the web-based know-how platform links information on experts, their fields of expertise, different methods, successful projects, and external concept maps.

The know-how platform is mainly targeted at SMEs working in IT and usability experts, with a separate open area and an area for members. The open area contains a comprehensive selection of networking options and information. There is a matchmaking function to offer suggestions to firms with a limited understanding of usability, pointing to suitable experts or one of the usability methods in the database (matchmaking). Users can also search specifically for experts or usability methods. The members area provides a large choice of project management tools and there are virtual project rooms for conducting, organizing, and managing projects. There are also plans to start offering tools to support user-centric development processes.

The know-how platform is underpinned by three regional centers of competence to provide a port of call in the real world. These centers act as local hubs for regional networks and business clusters and there are regular series of events and meetings to promote the networks. "The big idea is also to share this new approach to implementing product and process innovations as part of product development. For lots of SMEs, systematically integrating design – along the lines of user functions and contextual functionality, instead of the thinking that's often still dominant, which focuses on the technology – is a major shift in perspective," explains Prof. Dr.-Ing. Günther Würtz. As director of the Steinbeis Innovation Center of Innovation Engineering, Würtz has developed a variety of business models for the PUMa project to help run the know-how platform at the individual centers of competence. His business models will also help the platform users – such as companies, associations, and business clusters – to keep the online platform going even when the project draws to a close.

The activities Steinbeis is involved in will be continued after project PUMa has finished as part of an initiative called Digitalization – Networking – Convergence. The aim of this initiative is to adapt both existing business models and models that are still under development to the needs of companies involved in development and production. This will be done by making full use of the technical and organizational possibilities offered by digital technology, thus offering companies tangible support in mastering the transformation to a digital economy.

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Image: © iStockphoto.de/StephM2506

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An Easier Way to Make Clever Ideas Happen

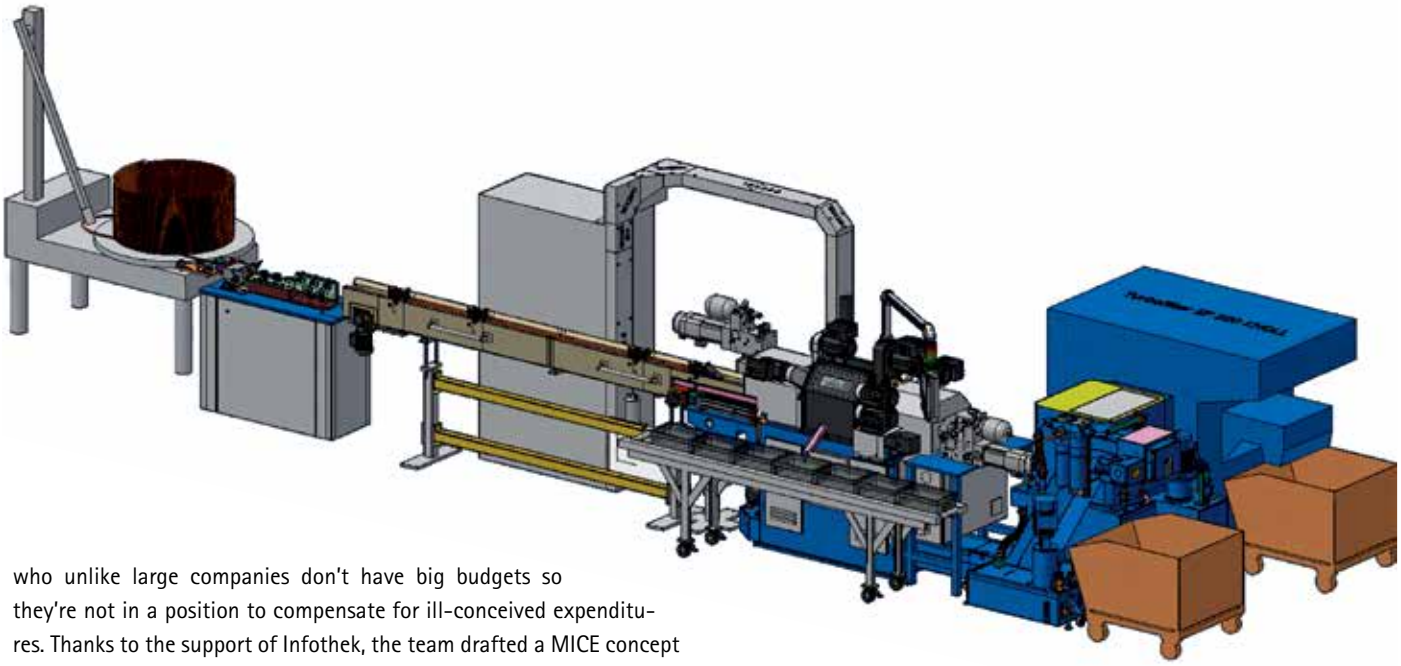
Two Steinbeis teams join forces with experts in forming technology to develop a special new machine

All inventors – regardless of their industry – usually have a few things in common: They generally don't have much time and they're experts in the field of their product idea. That said, they often neglect about commercial factors – issues that will be just as crucial to the success of their idea. That's when it's useful if advice is close at hand, from help with the underlying concept to advice on patents, and culminating in the finished product. A team made up of experts from the Biberach-based Steinbeis Transfer Center for Computer Aided Technical Simulations (C.A.T.S.) has been working with Infothek, the Steinbeis Transfer Center in Villingen-Schwenningen, to provide design and managing support to the forming specialist EKM-Roth GmbH.

"There has to be a more efficient way of doing this!" – this was the thought that motivated Hubert Roth, the managing director of EKM-Roth GmbH in Biberach, to keep plugging away at an idea he had. And after countless hours of effort, plus plenty of commitment and passion, the results were well worth it. What until now involved two processes and two machines, often at two different companies, is now possible in a single production run. EKM-Roth managed to invent a machine that could form and machine parts in the same plant. The forming process would take place seamlessly between feeding and machining. Now at this point, the SME should have been delighted with itself. Here was an innovative and practical product concept with plenty of promise. It would be able to turn a whole industry on its head and move the goal posts. But the reality was sobering. Day-to-day business left little time to actually translate the new concept into reality. The firm also lacked experience with patents and since competitors are often quick to copy good ideas, this would be extremely important. Oh, and the concept wasn't actually all that risk-free in technical terms, but the question was how to quantify that? And finally, the ingenious inventors quickly realized that groundbreaking innovations of this kind soon attract criticism from skeptics. Throw out the old to give a chance to the new and unknown? Not everyone's idea of the right thing to do. The team at EKM-Roth lost count of the number of times people muttered, "Nice idea, but can't be done."

For the formed component specialist, giving up was out of the question. Instead, it decided to talk to two Steinbeis Centers in the area, who joined forces to help the company. Steinbeis Infothek helped with the patents and different ways to market the idea, and the simulation experts at the Steinbeis Transfer Center for Computer Aided Technical Simulations (C.A.T.S.) dealt with the calculations to work out a good way of coping with high flux densities in a confined space. The experts also had to examine and document legal requirements. Simulations pointed to a number of weak points, but these were quickly eradicated. The team also managed to attract state backing through the ZIM program and this made an essential contribution toward helping EKM-Roth turn their product into reality.

The Steinbeis experts at Infothek were responsible for working with EKM-Roth on patents and selling. Together, they drafted a patenting roadmap and optimized selling to adhere to MICE principles (meetings, incentives, conventions, events). Taking part in trade shows, exhibitions, and events is an important part of a company's sales and marketing campaigns, but they are also expensive. Attending the wrong events is not just exasperating for financial reasons, it often makes it difficult to line up new partnerships – alliances that could lead to new contracts. This is especially challenging for small and medium-sized enterprises,



who unlike large companies don't have big budgets so they're not in a position to compensate for ill-conceived expenditures. Thanks to the support of Infothek, the team drafted a MICE concept that matched the firm's needs and a number of trade shows where included in EKM-Roth's tactical and strategic plans. They also organized a MICE workshop to work through an end-to-end marketing concept, making it possible to work out the right trade fairs and thus pool resources. The forming specialist can now attend events that are pertinent to its industry and use its expenditures more carefully in the long term. For example, EKM-Roth recently attended a Products Seek Producers event organized by Steinbeis in Stuttgart that revolved around mechanical engineering. The outcome: higher sales – because the target group fit like a glove and could be contacted without "collateral time-wasting." The SME has also found its first business partner, the machine maker Uldrian GmbH, and has high hopes for the future. In the meantime, a patent has been registered and a patent portfolio is in place.

Many engineering risks can now be checked using 3D CAD technology, even before products have to be made in physical terms. Of course not every company has its own simulation department, yet calculations can make such a significant contribution to risk reduction and investment security, especially with new developments. The problem small companies have is that it's simply not financially viable in terms of personnel and simulation licenses. The work carried out for the project by the C.A.T.S. Steinbeis Transfer Center addressed these engineering challenges. Whenever necessary, the experts even worked directly on site to gain access to the engineers. Also, they often had handy hints on how to make things more reliable and even reduce material costs. The company now uses a process common to the automotive industry, including optimized costs – the result of years of experience on a number of large and small projects, underpinned by endurance stability know-how gathered during component fatigue testing. The experts have also been using this to generate selling stories, because products that offer proven reliability are also easier to sell.

The results of the project speak for themselves. The prototype worked right away and it could be used immediately in production, demonstrating the major potential it offers for all to see. In parallel to this, the marketing and patenting strategy developed by Steinbeis Infothek has started to bear fruit. Another point worth mentioning is that the solution helps protect the environment because by merging the two previously separate processes of forming and machining, there is no more need to transport materials between different factories. The new solution even makes it possible to save up to 60% on materials – a positive aspect when it comes to carbon footprints.

Suddenly, yesterday's skeptics have become sales leads. That's because companies only involved in forming can now combine processes and offer less expensive end-to-end components that were previously completely machined – thanks to hybrids and e-cars, certain market segments in the automotive supply sector are experiencing great momentum.

Of course ardent inventors never rest, they just keep going. Managing director Hubert Roth has already made a variety of detailed improvements and added extra features, some of which drastically reduce tooling times. The large number of satisfied customers are with him all the way, as he continues on the successful journey he embarked on with the help of Steinbeis.

Image left: Ready-made formed products © fotolia.de/Therina Groenewald
Image right: A bar turning machine with extended functionality offered by a variable forming process: a complete module from the coil to the finished part © EKM-Roth GmbH

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Data Scientists Learn the Fundamentals of How to Manage Data

Collaboration between SHB and the Bitkom Academy offering university certificate

Data and information are the most important raw materials of the 21st century. A prerequisite for digital transformation and connected manufacturing (Industry 4.0) is the ability to analyze and process existing data and acquire and integrate new data. However, many companies lack the skills and know-how to manage big data affectively and this competence gap is now being filled by data scientists. These scientists are not just specialists with powerful processing tools up their sleeves. More and more, they are slipping into the role of managers. Data scientists manage data projects and make analysis results more useful when a company is confronted with specific issues. The underlying aim is improving turnover and business performance. The Institute for Organization & Management (IOM) is a Steinbeis Transfer Institute based at Steinbeis University Berlin. It is now working with the Bitkom Academy to offer joint training to become a data scientist.

The training consists of five modules each spanning two days of classroom instruction. During these sessions, participants are taught all of the fundamentals required for their future role as data managers. The training offers detailed insights into the entire life cycle of data science projects, with particular emphasis on future application areas likely to involve data science projects; the techniques used to gather, process, and evaluate data; enhancing management skills required in professional data management.

The five training modules are:

- Data Scientists – a vocation with a promising future: profile, application areas, potential
- Data management and data governance: analysis and management, databases, data access, and data stewardship
- Data acquisition and data integration in companies: in-depth modules on data engineering, data flows, IT architectures, data exploration
- Data science algorithms – analysis and output: analysis techniques, statistical methods, and predictive analytics
- Generation of business value and outcomes: visualization and communication of analysis results

The training is aimed at people in all areas of industry in decision-making roles – in management, business development, IT, project and data management – but also people responsible for teams beyond IT. After the course, participants are in a position to manage data projects at their own company, spearhead successful decision-making processes, and manage cost efficiency. They learn how to derive genuine value for their company from predictive analysis methods. The lecturers come from a variety of innovative and leading technology companies. After passing the final exam, students gather the official title of a Certified Practitioner of Data Science (SHB). This is awarded by SHB in collaboration with the Bitkom Academy. The first round of training starts in September 2016.

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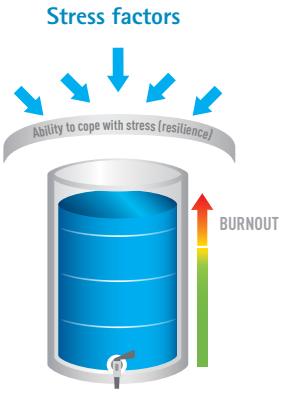
Personal Resilience: A Key Qualification

SHB certification course provides solid training

People in business often hear the word "resilience" – the mental ability to cope with pressure. Why talk about problems and setbacks if personal resilience provides you with the means to solve those problems? Resilience is about staying calm when the going gets tough and stress starts to build, about standing tall after setbacks or a crisis, about taking a constructive approach to negative situations and changes. The demand for professional training with a real long-term impact continues to grow, and more and more attention is being given to health issues in a variety of areas – from private situations to professional settings. Statistics on the growing number of burnout cases show that more and more people display the telltale signs of too much stress, in all occupations. As part of a collaborative project with the Mauritz Academy, the competence institute unisono, a Steinbeis Transfer Institute at Steinbeis University Berlin, is now offering a modular university certification course to become a Resilience Trainer (SHB).

Many courses these days focus on symptoms and medical conditions whereas the Steinbeis course is about learning ways to promote health and personal resilience. The new Resilience Trainer (SHB) qualification enables people to run courses within their own company, thus making their firm more adaptable to change and improving the overall health and efficiency of staff members. The focus throughout lies in seeing resilience as a new skill, one which will be increasingly defined by being adaptable and efficient, while also staying comfortable and in good health. More and more successful companies are now achieving this goal and these are skills that can be learned through resilience training.



The Resilience Trainer concept brings together not just the classic seven pillars of resilience (optimism, focusing on solutions, acceptance, commitment, self-awareness, self-reflection, and self-efficacy), but also other aspects of systematic working methods, solution-orientation, hypnosystemic therapy, and NLP. The aim of the training is to improve people's ability to make things happen, foster flexibility, and combine this with personal interaction that is empathic, consistent, and based on right-brain communication.

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Examples of Best-Practice in Technology Transfer in Baden-Württemberg

Steinbeis and BIOPRO Baden-Württemberg release joint publication

To promote the ongoing development of technology transfer in Baden-Württemberg and safeguard the leading position held by the state in European innovation rankings, the Ministry for Finance and Economy (recently renamed the Ministry for the Economy, Employment and Housing) has started working with representatives from industry and science to promote business dialogue on technology transfer. This business dialogue has led to a new initiative called Best Practice in Technology Transfer in Baden-Württemberg, or BestPract TT-BW for short. The aim is to establish a system in Baden-Württemberg for continually improving technology transfer in the state. As a first step, the initiative has published a guide on key players in the state and their approaches to technology sharing.

The publication outlines the classic sources of technology (traditional universities, universities of applied science, and research bodies) and the intermediaries of the transfer system. This includes a snapshot of different transfer models as a basis for other initiatives. The key players' aim is to build a network for the various parties involved in transfer, so people can exchange notes on different strategies, coordinate activities, and work together on improving the methods of technology transfer.

The BestPract TT-BW Initiative stems from the activities of BIOPRO Baden-Württemberg and Steinbeis. The aim is to facilitate an open process and map the varied nature of successful transfer systems in the state, leveraging existing potential to exchange views and explore collaboration. The publication should kick-start further activities currently being planned. Around 20 different parties involved in technology transfer are working together to promote the initiative.

The publication was issued by Steinbeis-Edition and can be accessed by going to www.steinbeis-edition.de.

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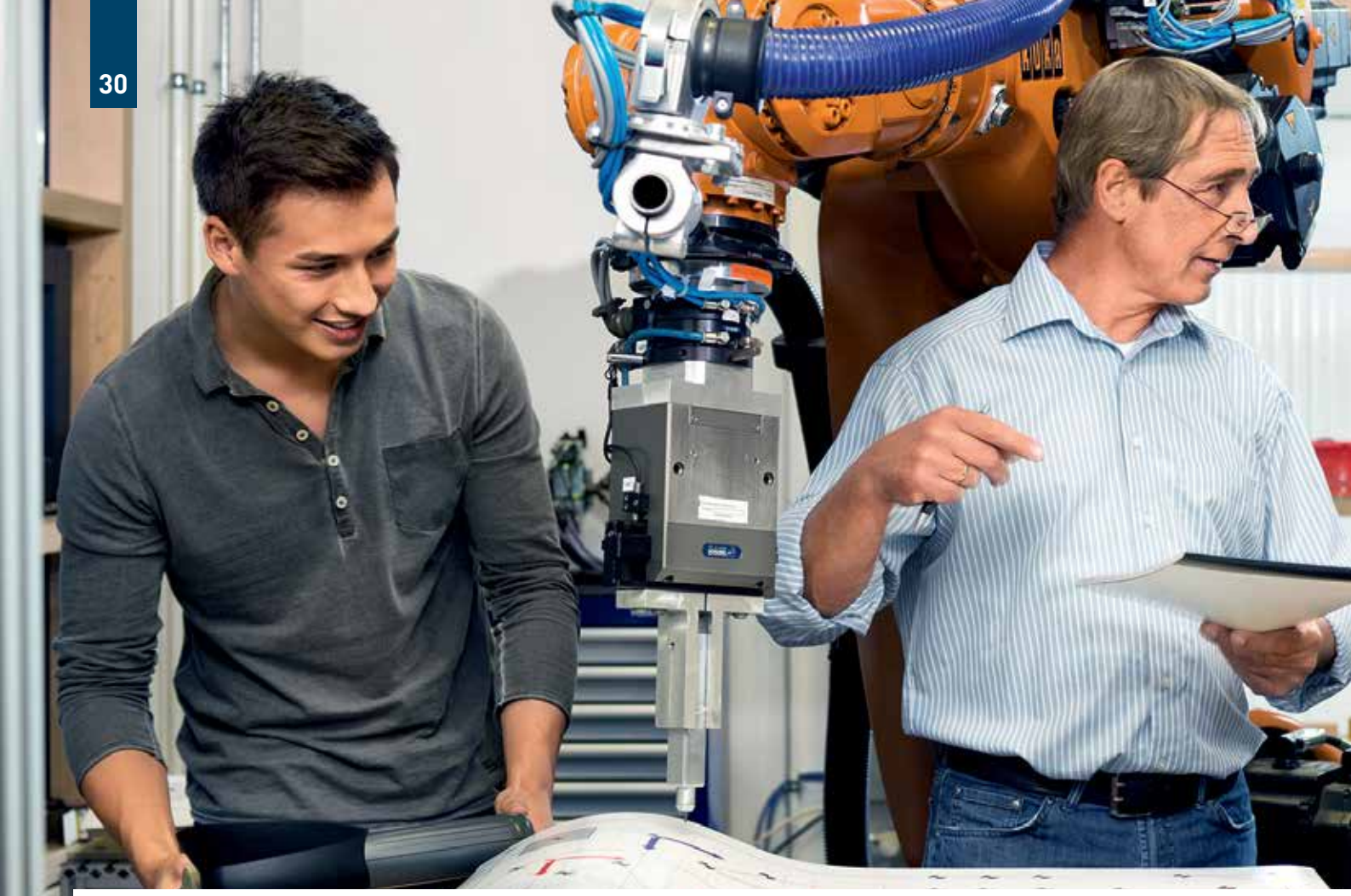

“Technology transfer is immensely important to us.”

An interview with Prof. Arnold van Zyl, president of the Baden-Württemberg Cooperative State University (DHBW)

Professor Arnold van Zyl has been at the helm of the Baden-Württemberg Cooperative State University (DHBW) and steering its fortunes since February 2016. There are high expectations regarding further developments for the successful concept of cooperative education degrees, and thanks to a long track record – not just in research but also in the automotive industry – the professor with an engineering degree has an exact understanding of these expectations, especially when it comes to training the next generation. TRANSFER spoke to Arnold van Zyl about the demands placed on modern university education and the increasingly important overlaps between science and academia in relation to trade and industry.

Professor van Zyl, what was once a vocational college has been an official part of the higher academic world since 2009. One change that comes with transforming into a university is that the DHBW now has to fulfill a cooperative research mandate. One of the four action points you named when you entered office was that you would like the DHBW to develop its own image as a research institution. What do you see as the USPs of the DHBW and what makes this image what it is?

Research at the DHBW is based on actual application and transfer, in keeping with the principles of cooperative education – so it's carried out with partners in business, especially SMEs, local authorities, and social institutions. Collaborative research is carried out through a variety of different projects and types of organizational setups. There's particular emphasis on “trans-disciplinarity,” in other words, even if projects are about technical issues, the business and social factors are also examined. Collaborative research contributes to knowledge acquisition and adds value for our partners in industry. It also has a strong impact on teaching. This really helps produce well-rounded graduates by adding scientific and research methodology competences.

The job of Transfer GmbH, the limited company of the DHBW, is to transfer research results into practical application in companies. The company has been an alliance between DHBW and Steinbeis since 2013, and a large number of Steinbeis Enterprises have been a successful part of this undertaking. How important is targeted technology transfer for a university with such a strong focus on application, as is the case with the DHBW?

This technology transfer is immensely important for us. We see our research mandate as being more than just generating new knowledge. This knowledge should enter a specific use at our partner companies and offer them possible solutions.

The DHBW is now based in nine locations in Baden-Württemberg and it's also on three university campuses. Despite being located across the region, you do place particular emphasis on local aspects and on striving to work more and more as a local partner. What impact will this have on your planned innovation and transfer programs?

The Baden-Württemberg Cooperative State University (DHBW) was previously known as Baden-Württemberg Vocational College. It was founded in 2009 to continue pursuing a successful concept that had already been in place for decades of merging theory and practice into a cooperative degree within the framework of university education. Transforming into a university earned the DHBW a cooperative research mandate. Cooperative research focuses on application and knowledge transfer with an emphasis on collaboration with partners in industry. Transfer GmbH is a limited liability company belonging to DHBW. Its remit is to promote the interests of knowledge sharing. Steinbeis offers possibilities to people studying and working at the DHBW to work in industry in accordance with their academic pursuits at the university. Steinbeis does this by allowing them to apply their specialist knowledge directly within a business setting. This transfer of knowledge and exchange of experience is of equal benefit, both to the university and to companies.

We have an extremely diverse innovation ecosystem in each of the places where we are based and this provides us with some wonderful options for our transfer activities. We believe there are lots of opportunities to form local know-how clusters and these can be especially well matched to local requirements. We basically see ourselves as local catalysts, who provide tangible knowledge sharing and technology transfer in the local area. This allows us to add value for society in general. Alongside research and teaching, these are some of the key responsibilities of a university. We work closely with our companies and social institutions, so we're practically destined to do this.

Students numbers at the DHBW have only been going in one direction for years: upward. Cooperative education degrees that combine theory with practice still fulfill the exact expectations companies have of training for up-and-coming graduates today. But regarding the future, what do you believe will be the important sign posts if this concept is to remain competitive?

The successful concept of cooperative education has allowed the DHBW to establish itself as a reliable partner in education. We'll also need to ensure that we continue to do justice to changing expectations in the future, not just of our students but also of our partner companies, and we'll need to keep developing in this respect. This will mean further enhancements when it comes to enabling people to work in industry (the so-called employability of DHBW graduates) and we'll have to continuously scrutinize the curriculum. Exchanging notes regularly with our partner companies and getting them involved in committees is not only good for safeguarding quality, but also when it comes to updating our model, as part of a critical dialog process. As well as comparing notes with the companies, we also now have a network of 140,000 graduates for exchanging knowledge on recent developments and requirements in industry.

Image: © DHBW/Klaus Mellenthin

Prof. Arnold van Zyl PhD/Univ. of Cape Town studied chemical engineering at the University of Cape Town and obtained his PhD in engineering in 1987. After working as a postdoctoral fellow at the Max Planck Institute for Solid State Research in Stuttgart, he held various positions in research and development in the automotive industry in Stuttgart, Ulm, and Brussels from 1990 to 2000. From 2001 to 2007, he was a European automobile industry representative in San Diego and Brussels. Between 2008 and 2011, van Zyl was the vice president of research, innovation and international affairs at Stellenbosch University, which now counts as one of the best universities on the African continent. In 2012, he was appointed as rector of Chemnitz University of Technology.

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A Brand that Offers Added Value

Steinbeis helps the city of Bremen update its branding

How do you integrate an old donkey, an unwanted dog, a grumbling cat, and a screeching rooster into the modern marketing of a city? Not just with a pinch of Bremen self-irony, but also by adding a bit of serenity and wisdom. The Town Musicians of Bremen is one of the most widely read and best known fairytales published by the Brothers Grimm. It's also a perfect fit with the city of Bremen, the epitome of courage, fearlessness, euphoric optimism, vision, and teamwork – values strongly associated with the city in the north of Germany. This was the starting point for a project given to the i/i/d, the Steinbeis Transfer Center Institute of Integrated Design. Its brief: update the branding of Bremen.

Bremen is a city, Germany's smallest state (Free Hanseatic City of Bremen), and an important port and trading point for the automotive industry, shipbuilding, the steel industry, electronics, the food and beverages industry, logistics, and aerospace. It is currently home to 550,000 people, making it the 10th biggest city in Germany. It is an outstanding university and research city and it is popular among tourists. But what only few people know about the state of Bremen is that it is one of the strongest and most productive economic regions in Germany. In fact it even tops the export table.

In the battle to attract (new) taxpayers, qualified workers, investors, and tourists with money to spend, 76 of Germany's largest cities compete for the number one spot as a great place to live. To hold its own against the competition (or even gain the edge), these days a city needs a clear image and an unmistakable identity. In short: a brand. Strong brands make it easier for cities to communicate and identify themselves. They also build an image from the inside out. The branding of Bremen was recently updated by the i/i/d Institute of Integrated Design, a Steinbeis Transfer Center, to provide the city with a visual toolkit that not only builds on its memorable trademark (the Bremen Town Musicians) but also gives it distinctive lettering and slogans. The Steinbeis experts also helped lay down a unique color scheme for use in different media, a new tone of voice for texts and pictures, and elaborate communication templates for print and online media. These all provide the city with a practical branding system. The experts know from experience that brand success is not dictated by creativity, but also continuity, avoiding arbitrary signals, continual repetition, and zero deviation. In essence, it depends on coherence through uniformity.

Bremen's key visual signal is its trademark, a symbol which is instantly recognizable. By inventing the Town Musicians, the Brothers Grimm gave Bremen a likeable, internationally famous, and distinctive identifier. So the Steinbeis experts made good use of the four friends in the city trademark. They also used the Bremen state flag (nicknamed the bacon flag) as the basis for a structural template to divide the city's brand label into two. This consists of a square and a triangle because the "two-city state of Bremen" also includes Bremerhaven, a port with a rich shipping heritage. To signal this, the brand device uses marine blue plus a new brand symbol consisting of a tall ship. This ship stands for change, a sense of adventure, and discovery. It also provides Bremen with an effective counterpart to stand alongside its Town Musicians.

The main slogans used by Bremen for the purposes of tourism will remain: Bremen erleben! (Discover Bremen!) and Meer erleben! (a wordplay me-

aning "discover the sea" that sounds like "discover more"). If Bremen and Bremerhaven need to be shown together, the two squares can be placed alongside the rectangle with the slogan Zwei Städte. Ein Land. (Two Cities. One State). To add to the main slogans used for tourism purposes, the project team came up with its own collection of slogans to be used when promoting different areas or activities. These make it possible to use slogans to refer to local parts of Bremen and Bremerhaven, or highlight different events or promotions.

Conveying the brand to the outside world will require the involvement of all key players in Bremen, as well as its establishments and companies. This will necessitate close collaboration, or coordination on a broader scale involving the city's marketing department. A unique aspect of the marketing strategy used by Bremen is its co-branding. This can be particularly useful – if not wise – when budgets are being earmarked for bigger projects. This is because it allows the city's bodies and departments to maintain control over content and design by ensuring that whenever the Bremen label is used, it also conveys messages about Bremen or Bremenhaven. Of course, this is in fact the original idea behind branding.

The new brand architecture also includes communication guidelines on the fundamentals of corporate designs for print media. The idea is to establish communication templates to emphasize recognition. In the future, clear user guidelines will be given to printers in the area to lay down permitted layouts and designs. These will help keep everything uniform and maintain central control without limiting the creativity of users.

Last but not least, Bremen will soon be launching a completely new city website to match the image of its new brand. This will pull together different content and information about the city, much of which was previously shared through different websites. This site will mark the first time Bremen has used the same channel to communicate with all target groups, whether they are at home in Germany or abroad, whether the content is targeted at potential students or day tourists, vacationers, art lovers, investors, or employees working for the many companies and scientific institutes in Bremen.

These days, pulling together a project of this magnitude and complexity – involving so many individual constituents, each carefully matched to one another, not just in terms of the detail but also the broader picture – would be impossible without transparency and the involvement of key players. It also takes multiple rounds of consultation and presentations to local politicians and industrialists, not to mention interaction with local citizens and any other parties, plus of course the people who will use the branding in the future. Apart from the satisfaction of coming up with strong branding, the fact that such a process works was probably the most valuable experience for the Steinbeis experts. The project carried out by the i/i/d Institute of Integrated Design once again underscored its expertise in managing such complex projects, even with so many different players involved – not just on behalf of clients at public bodies, such as city authorities and local government, but also research associations, networks, private enterprises, and corporations.

The i/i/d, or Institute of Integrated Design, is a Steinbeis Transfer Center based at Bremen University of Arts.

In its capacity as a center of interdisciplinary research and development, the i/i/d evaluates and examines, designs and creates, invents and optimizes, advises and coordinates, with a focus on user-centric innovation.

The center's philosophy of integrated design not only involves designing systems, structures, and processes (macro-design), but also analyzing companies and products, providing advice on creative strategies, moderating or planning processes, integrated marketing, communication planning, brand development and reinforcement, corporate identity and corporate design, communication and interaction design (incl. interface, web, and device design), industrial design, trade show design, interior design, and corporate architecture.

Its clients include companies and organizations of various sizes from a variety of industries. All work carried out by the i/i/d is project-based and is carefully tailored to the needs of the individual client.

Originally founded in 1998 as an affiliated institute of Bremen University of Arts, the i/i/d has provided design expertise to companies in over 500 projects to date. The i/i/d is an enterprise belonging to the Steinbeis Network and is involved in a variety of collaborative projects with other transfer centers and scientific establishments.

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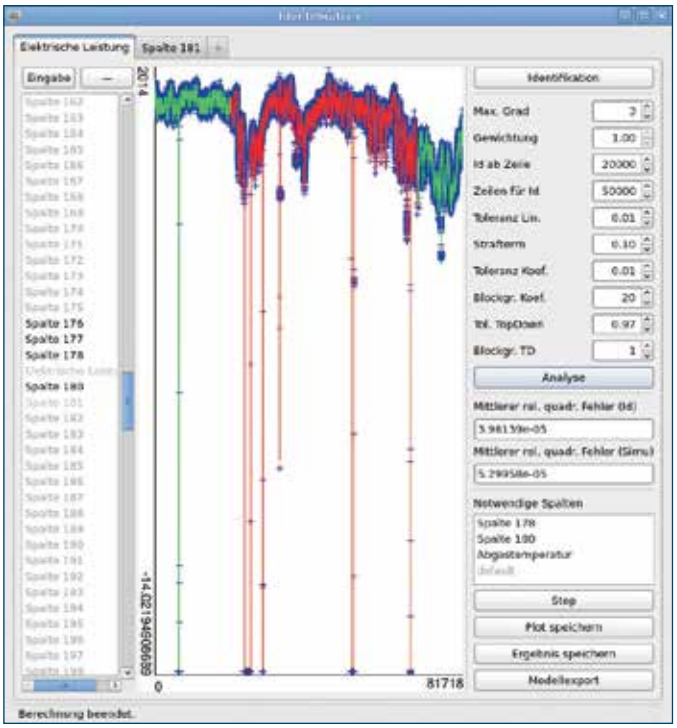
Efficient Energy Use

Steinbeis develops system for modeling, simulating, and optimizing combined heat and power plants

By 2020, 25% of all electricity generated in Germany should come from combined heat and power (CHP) plants. The aim is to save energy and the environment and thus help with climate protection. CHP plants also generate electricity and not just thermal energy required in heating systems or production processes. This allows for the use of between 80 and 90 percent of possible fuel output. Combined heat and power legislation and the German Renewable Energy Act (EEG) have freed up funding to extend current capacities. The Grasberg-based Steinbeis Innovation Center for Optimization, Control and Adjustment Control and a company called enable energy solutions GmbH from Bad Rothenfelde have been using the very latest mathematical models to develop a universal modeling method and optimize CHP plants. It is all part of a project sponsored by the Federal Ministry of Economics and Technology (BMWi) called High-Precision Modeling, Simulation, and Optimization of CHP plants.

The new modeling method only requires existing measurements – or data that is easy to measure – to develop highly precise CHP plant models. These can be adapted during operation or even optimized automatically. For the first time, this principle makes it possible to flexibly adapt modeling to new plants or even existing plants built with different constructions. The industrial partner, enable energy solutions, provided the information required for the project plus processed data from CHP plants. It also provided support with the programing of a graphical user interface. This was created to make it easier for users to work with and make the newly developed methods easy to understand.

CHP plants comprise a variety of different components that also have to be wired and operated in different ways. There are many ways to control such plants, for example, by connecting them to heat reservoirs or adding load regulators to turbines. While this is happening, it is important to take internal and external factors into account such as the outdoor temperature, atmospheric pressure, or contamination levels. This complex array of factors makes it impossible for operators to work out the optimum operating conditions based on commercial and environmental factors. Until now, plant operations were based on experience and previous measurements, focusing on thermal and electrical output requirements. Conventional systems for carrying out general modeling on CHP plants or power stations previously mapped systems by using thermodynamic and physical models, but these either ignored or paid too little attention to small changes within a plant resulting from cleaning, replacement parts, or similar factors. As a result, such traditional models can



often only reflect the exact situation encountered in reality, so it involved a major investment in terms of time and personnel to improve estimates.

It was this that inspired the Steinbeis experts from Grasberg to develop a suitable online optimization system. The new system helps operators control a plant by taking electricity and thermal energy requirements within the company into consideration, as well as commercial factors such energy prices and feed-in tariffs. The system draws on data generated during live operation and uses this as part of a model which updates itself automatically. The plant operators are no longer required to do modeling themselves. Instead, they merely need to select which data is required for the specific system component being modeled. The new data-centric modeling methods make calculations efficient and allow for quick updates via the internet. Such effortless updates are essential for automated optimization solutions, since these often require a huge number of model evaluations. The optimization solution used in this case is called WORHP (We Optimize Really Huge Problems, www.worhp.de) and this was also developed by the Steinbeis Innovation Center for Optimization, Control and Adjustment Control. WORHP is capable of efficiently solving optimization tasks involving hundreds of millions of degrees of freedom and constraints. An interface was created specially for CHP plants to connect WORHP to the tool developed for this project. This can be used to optimize different kinds of CHP plants.

Turning to environmental aspects, rising energy consumption, and the limited availability of fossil fuels, a great deal of discussion these days revolves around efficiency improvements and reducing carbon emissions. The innovative solution developed by Steinbeis and enable energy solutions is a shining example involving a real plant. It shows the tremendous potential there is for achieving savings with CHP systems. The experts showed how using data-centric modeling and making optimizations where necessary can provide a road map for reducing greenhouse gas emissions by around 7,200 tons per year, and natural gas consumption by about 34 GWh. In monetary terms, this is a saving of around €1.2 million.

Image left: © iStockphoto.de/Imants Urtans
Image right: The user interface on the modeling system

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Going up – Presenting a Business Idea in Very Little Time

Steinbeis accompanies winners of the Regional Cup to the Baden-Württemberg Elevator Pitch

Three minutes. That's all young entrepreneurs and startups were given at the Pforzheim/North Black Forest Regional Cup of the Baden-Württemberg Elevator Pitch in April. Three minutes to convince a jury of specialists and an audience of around 100 people at Pforzheim University that their business idea was a winner. Presenters coached by Business Startup, the Steinbeis Consulting Center, received hands-on support from Ruben Maier and Markus Riehl, coasting comfortably into first and third place.

The first prize including €500 in cash was won by Thomas Link and his team for a business idea called the FTT, which is a "drivable transportation table." The idea behind the FTT is that a self-propelled robotic table would help people with limited walking abilities to move around more easily. The FTT is a sturdy and extremely light robot mainly designed for use in the home. It can carry a load of up to 15 kilos. The innovative thing about this product is the way it combines the semi-autonomous transportation of household objects with its alternative use as an adjustable-height table with fixed legs. The FTT is equipped with various sensors spaced across its body to avoid collisions. The FTT can be rented or bought by private individuals through medical supply stores. The innovation project was supported by Steinbeis director Ruben Maier as part of a fast-track consultation lasting several days.

The winner of the third prize, and the most popular choice among the audience, was Bastian Marenbach, who used an EXI innovation voucher to obtain advice from Steinbeis director Markus Riehl on a business concept called MyTravelding. Marenbach's idea is to redefine the future of tourism for individual travelers by connecting discoverers and people planning their adventures through an online community. This would make child's play of planning a personal trip. The result would be a series of unique experiences that travelers would be happy to look back on. Everyone would be able to take part in this new kind of tourism. Marenbach's tag line for his model was "Lets write stories we can't wait to share with others!" As the winner of the audience prize, Marenbach has another chance to qualify for the 2016 State Final in Stuttgart. The finals will be contested by the winners of all 15 Regional Cups and the Baden-Württemberg winners of two Special Cups. Their task will be to pitch their business concepts in an attempt to win the title of The Best Startup in Baden-Württemberg.

Steinbeis advice before starting a business

Steinbeis has received a mandate from the Baden-Württemberg Ministry for Finance and Economics to provide pre-startup consultations within the scope of the European Social Fund (ESF) sponsorship program "EXI Startup Bonus – In-depth consulting for company founders during the pre-startup phase." The aim of the program is to expand the scope of pre-startup consulting available to (potential) startup founders. It also aims to deliver more focused consulting for growth-oriented startups, which typically have more acute consulting needs than average startups due to the complex nature of their planned ventures. To help develop ideas and make things happen, qualified Steinbeis consultants provide support to business founders from the initial planning phase to successful implementation. The service provides innovative technology startups from Baden-Württemberg with access to free brief consulting sessions and intensive consulting sessions spanning several days.

Key consulting areas include:

- Founder character/personality (competence assessment, profile of competence and requirements)
- Motivation for founding the startup
- Business plan
- Strategy and organization
- Marketing and sales
- Finance and management accounting

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Funding Programs Provide Subsidies for SME Consulting

Steinbeis is once again on the official list for ESF coaching and federal backing for entrepreneurial know-how

The Steinbeis Consulting Center for Business Coaching provides companies with support and advice on the development and implementation of business strategies relating to all aspects of technology and business. The center has retained its position on two funding programs: ESF Coaching and BAFA Backing of Entrepreneurial Know-how (BAFA is the Federal Office of Economics and Export Control).

The ESF Coaching program helps companies to help themselves when it comes to managing structural change in industry and strengthening competitiveness. The focus lies in mobilizing untapped potential, entering new product, process and service fields, and introducing sustainable measures that are based on market needs and help safeguard jobs. Funding is targeted at small and medium-sized enterprises in Baden-Württemberg that either had sales of under €50 million in the past 12 months or recorded no more then €43 million in their previous annual accounts. The program provides pro rata subsidies for coaching costs of no more than 300 euros per day. Depending on the subject area, funding is available for a maximum of 15 days lasting 8 hours.

The following topics are eligible for funding:

- Innovation projects
- Restructuring/change processes
- Environmentally friendly business operations
- Company succession
- Successful training
- Growth orientation at companies managed by women
- Securing specialist resources

Nationwide support for SMEs was reorganized earlier in the year to focus on promoting entrepreneurial know-how. The funding is intended to provide an incentive to companies to make use of the knowledge and experience of external consultants, thus meeting the growing challenge of globalization and demographic change. The funding offered through the program is aimed at new companies that have been operating for no longer than two years, companies in their third year since startup, and companies experiencing financial difficulties. Funding is provided for general consultation on all business issues such as finance, HR, and organizational issues relating to management. Specialist consulting is also available. Depending on the emphasis of the project, subsidies of up to €1,500 are offered to existing companies in Baden-Württemberg. New companies are entitled to up to €2,000 in backing, and companies experiencing financial difficulties can receive up to €2,700.

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Welcome to the Steinbeis Network

Steinbeis know-how: There are currently more than 6,000 experts actively involved in knowledge and technology transfer at over 1,000 Steinbeis Enterprises. The portfolio of services offered by the Steinbeis Network ranges from research and development to consulting, expert reports, training, and continuing professional development for all fields of technology and management – and this network continues to expand. For an overview of our most recently founded centers, go to www.steinbeis.de/en/news. Welcome to the Steinbeis Network!

Information on recently founded enterprises in our network can be found at www.steinbeis.de

More on recently founded enterprises in the network can be found at www.facebook.de/Steinbeisverbund

"Innovation hand in hand with precision and quality"

Transfer speaks to Axel Wittig, managing director of Webo GmbH

They were turbulent times, the world of business was holding its breath during the financial crisis, and scores of companies were down on their knees, but it didn't deter Axel Wittig from setting up his own company. Wittig founded Webo GmbH in 2008. And the success story of the tool manufacturer makes the question of whether he regrets his decision completely superfluous. TRANSFER met up with Wittig for an interview.

Mr. Wittig, most of the successful business startups you hear about these days have something to do with smart or virtual technology, or they're in the new economy offering services through the internet as the old economy gradually fades into the background and is replaced. The path you've been treading with your startup shows that things can be completely different. The old economy does still have the potential to innovate and offer technical advancement, even in a world of Industry 4.0 solutions. What's the secret to success? And what characteristics of a company or an entrepreneur do you believe are central to this success?

I believe there are three key ingredients. Firstly, the product idea in the old economy has to have a link to the new economy and the technologies it offers. At Webo, we do produce traditional tools, but we use state-of-the-art technology. The second key ingredient is professional marketing of the product idea. This can be in order to get the right funding, or to go out into the market and attract highly qualified workers. The third prerequisite, which is no less important, is that the founder has to be totally aware of the fact that he's not operating in some trendy, hip sector of industry. So he has to be all the more creative, because even if the idea's in the old economy, that doesn't stop the company culture from being part of the new economy!

You took part in the panel discussion at the Steinbeis Financing Arena in April and the central question was whether the lack of funding – not just from state coffers but also from private backers – is slowing down potentially successful startups in Germany. If we look back at your success, do you believe the right framework is in place in Germany to offer startup-friendly conditions, or do you think it could still be better?

The conditions in Germany are startup-friendly, I have no doubts about that. To win over funding providers or banks, an idea has to simply be so brilliant that it's practically risk-free for the investor; then you also get financial support. If the bank doesn't immediately understand the product idea then it will have to be all the more convinced about the team behind the idea and be given a credible reason to believe it will succeed. Where we do have some catching up to do is when it comes to supporting everyday businesses that are neither technologically cutting-edge nor hip. We actually need these totally conventional companies, no matter whether they're in the simple manual trades, or small suppliers, or contract manufacturers. This is where, I believe, the Main Street banks have an obligation to provide more support and investment.

Webo is headquartered in the quaint little city of Amtzell in Allgäu. How do you overcome the challenges of attracting specialists to such a rural area, especially when there's so much demand for young graduates and specialist engineers, as is currently the case?

We offer a highly appealing place to work not just in financial terms but also when it comes to the social benefits we offer our employees – this ranges from an extremely comprehensive accident insurance scheme to

an improvement suggestion scheme, which could end up with you driving a Porsche: whoever makes the "suggestion of the month" gets to drive a Porsche for the weekend! We also offer treats at work like free drinks, fresh fruit, and two fridges brimming with candies to keep everyone perky. The aim is to steer clear of the traditional, somewhat staid world of tool-making and convince people we're right for them.

German engineering is the international hallmark of quality. What challenges does the industry face at the moment when it comes to maintaining high standards and fulfilling customer requirements more profitably and more economically in terms of production costs? Also, how does an industry deliver in terms of speed, when quality was always about years of patiently tinkering about with things before starting again and making things better?

There's one big driver in our industry: innovation. You need to continuously come up with new product ideas and innovate, hand in hand with the precision and quality that Germany is famous for. Also, you mustn't be scared of foreign competitors; you have to be convinced you're doing the right things. I think we have just the right blend of old and young companies in Germany for our engineering industry, but what's important for all of us is that we constantly live the philosophy of innovation, development capability, and adaptability. In terms of the speed customers require, I think there's just one aspect: you have to invest continuously because speed isn't just about people, it's also about the machines. We only use the fastest and most modern machines in our factory alongside the corresponding software solutions in order to implement innovations as quickly as possible.

In addition to making traditional tools used in molding technology, Webo also offers engineering solutions and consulting. What's your strategic view of the future? Is the magic formula to shift the emphasis more toward services? And what are you already doing to respond to the demands placed by connected factories or Industry 4.0?

Webo has switched from classic tool manufacturing – that is, making tools based on drawings – to process-lateral tool making (which is parallel to processes). What this means is that customers come to us with a blank piece of paper and tell us the product they need and we make a component for them that'll work in serial production. This now accounts for almost half of our turnover. The other half – and of course this has to go together – comes from producing these tools, or rather, supplying the production means. I believe that this combination of accompanying the client throughout the entire process will become more important in all areas in the future. We're now getting more and more requests that are just ideas or concepts; the clients want us to tell them what these could look like in reality. So we start with development, create prototypes, and finally make serial production tools. We then send them to a company, which produces our Webo development concept for the customer.

Image: © Webo GmbH

Axel Wittig is the founder and managing director of Werkzeugbau Oberschwaben GmbH, or Webo for short, which is based in Amtzell. A highly modern engineering company specialized in process-lateral tool manufacturing, Webo offers its customers a portfolio of services ranging from component development to test bed calculations, FEM calculations, prototype manufacturing, process solutions, design, precision engineering, assembly, and "try-out solutions." Webo works within a network, enabling the firm to develop all kinds of metal components that are manufactured using molding to go into motors. It also provides the tools for these parts. Webo's success as an enterprise is underscored by numerous awards, including the Baden-Württemberg State Prize for Young Companies 2014 and being a finalist for the 2011 German Startup Award.

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Solid as a Rock

Steinbeis helps a facade construction company with the development of a permanent anchorage system

The facade of a building presents an unmistakable face to the outside world. Its occupants want it to look good and, just as importantly, to fulfill its intended purpose. These days there are many different types of wall materials with different types of surface consistencies and mounting options. That's why it's important to think about the safest way to keep scaffolding in place when working on a facade. This is achieved by planning and installing anchorage points as the building is erected. It is also essential in Germany, given DIN standard 4426 (Section 7). This isn't a task that should be swept under the rug if clients need professional support, neither by the architect, the planners, nor by the construction workers on site. And it is a problem that the plastering company Wessendorf Systembeschichtung GmbH is familiar with from everyday business. But it is also a problem it has tackled successfully with a new kind of permanent anchorage system. It was supported in its efforts by two teams of experts from Steinbeis.

Wessendorf Systembeschichtung is based in Emstek in the state of Lower Saxony. One of its specialties as a workshop business is building facades. The firm came up with an idea to develop a permanent anchorage system that could stay in place from the moment scaffolding is erected and would not need to be moved or modified. The aim was to ensure all elements of a facade could work independently of one another. The fixtures would have to adhere to DIN norm 4426 and be approved by the German construction competence center DIBT for use with concrete and masonry. As required for all German thermal insulation systems, the anchorage should be able to support 100% of loads placed on walls, it should leave plaster smooth around the edges, and it should work properly with joint sealing tapes. It had to be really simple to mount and be suitable for use in as many different application areas as possible. Finally, it should use premium materials, from the point of contact with the wall to the end cap on the outside, such that the system can still function properly after many years of exposure to the elements.

The specialists at Wessendorf were fully aware of the challenges and already had some initial ideas, but they were uncertain how to turn such a development into a reality. Help came for the SME from the Steinbeis Transfer Center for the Oldenburger Münsterland Region, which as a long-standing partner of the community in Cloppenburg and Vechta regularly provides support to firms in the area when implementing innovation projects. The Steinbeis experts immediately set to work in a number of areas. To develop the required plastic components, they got in touch with Merkutec GmbH & Co. KG, which jumped in as a development partner. Steinbeis also brought two other partners (and their expertise) on board: Irmler GmbH and the PHWT (a private university of commerce and technology) in Diepholz. The intellectual property experts at Infothek, another Steinbeis Transfer Center, helped the team at Wessendorf with its applications for financial backing from the ZIM (the Central Innovation Program in Medium-Sized Enterprises), also helping to ensure the funded project was made to happen, that property rights

were registered, and that the firm gained funding through the SIGNO program.

The results of the project speak for themselves and Wessendorf has now succeeded in developing a permanent anchorage system called isorocket®. The solution has all the answers to the many challenges faced with thermal insulation systems, especially ventilated curtain facades, walls built from traditional red bricks, concrete walls, and all kinds of walls with a thickness of between 100 and 400 millimeters. It offers:

- a secure anchorage for scaffolding, ingeniously transferring load through the fixture
- ultimate load bearing per anchorage point, for smaller walls but also thicker foundations
- perfect connections and rendering
- the possibility to extend the screw fittings to the required depth of plaster for each anchorage point
- neat connection to plaster and thermally insulated sealing system
- reattachment of each anchorage point without material loss or wear
- no need for subsections, simplifying all steps during mounting
- registration under DIN standard 4426 with the DIBT for concrete bases and masonry

The isorocket® system was officially launched at the European specialist trade show for facade and room design in Munich, where it was extremely well received. And this was just the first step. At Hannover Messe, the project earned the project teams a prize from the Lower Saxony Innovation Network, which was awarded by the Lower Saxony Minister for Economic Affairs, Olaf Lies, and the Lower Saxony Minister of Science, Dr. Gabriele Heinen-Kljajic. The prize is awarded to innovative collaborative projects carried out by companies with less than 50 employees in partnership with scientific bodies and economic development agencies.

Image 1 (left to right): Prof. Dr. Thomas Hanschke (Lower Saxony Innovation Network), Dr. Gabriele Heinen-Kljajic (Minister for Science and Culture), Hermann Blanke (Steinbeis), Prof. Dr. Heike Horeschi (PHWT), Stefan Irmler (Irmler GmbH), Franz Wessendorf (Wessendorf Systembeschichtungen GmbH), Markus Mechelhoff (Merkutec GmbH & Co. KG), Dr. Susanne Schmitt (Lower Saxony Innovation Network), Olaf Lies (Minister for Industry, Employment and Transport). Image: © Henning Scheffen
Image 2: A wall attachment, for example with a thermal insulation system
Image 3: A mounted anchorage system being shortened to remain flush with the plaster after removal of the scaffolding
Image 4: A rocket seal being mounted, which can be removed at any time to use the anchorage system again

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The SDHp2m project team

Solar District Heating Rapidly Expanding its Networks

Launch of the European SDHp2m initiative in nine European regions

A Horizon 2020 project called SDHp2m (where SDH stands for solar district heating and p2m refers to "policy to market") is underway with the aim of developing, improving, and implementing progressive policies and measures that support renewable heating networks. Over the three years of the project, initiatives should make a tangible difference to market developments. The program is being coordinated by Solites, the Steinbeis Research Center for Solar and Sustainable Thermic Energy Systems.

State authorities are functioning as project partners for the initiative in three key regions: Thuringia (Germany), Styria (Austria), and Rhône-Alpes (France). This will make it possible to implement measures directly and promote development in the three regions, thus providing an example to other regions in Europe. Six further regional authorities in Bulgaria, Germany, Italy, Poland and Sweden have also agreed to a statement of intent. Involvement in the European and German district heating alliance will safeguard close collaboration with district heating providers across the whole of Europe. "The political instruments and supporting measures provided by the SDHp2m program will give us a blueprint for developing solar heating networks in other European regions," says Thomas Pauschinger, who is acting as the project coordinator for the Steinbeis Research Center for Solar and Sustainable Thermal Energy Systems (Solites).

An advisory group is being set up in each region involved in the project, consisting of experts from industry and politics. Their job will be to plan and implement activities aimed at stimulating the market for solar heating networks at a regional level. Their plans will take regional conditions and local differences into account. In parallel to this, the international partners will provide know-how to the regions and draw on experiences in pioneering countries such as Denmark.

A kick-off meeting has already taken place in the Thuringian city of Erfurt to fire the starting gun for close cooperation between the different regions of the EU involved in the project. The aim is for each region to learn from the different political frameworks and market conditions in the other regions, and there are enough overlapping issues to work on for the next three years, such as weak legislation, land availability, and funding. Previous SDH programs showed that there was clear interest among market players to hear more about experiences with projects that have been implemented already and that direct contact with other key players was essential for collaboration to succeed. As a result, there are initial plans to organize tours around SDH facilities in order to find ways to share know-how and set up more events. "It will be important to show the politicians and market players in Thuringia what other European regions are doing to not just implement SDH technology but also to meet their environmental protection obligations," underscored Dr. Martin Gude, who heads up the department of Energy and Climate Policy in the Thuringian Ministry for the Environment, Energy, and Natural Conservation. The 4th International SDH Conference has already been lined up by the initiative's partners for September 21-22, this time in Billund in Denmark. Further information on solar heating networks, the SDHp2m program, and the next converence can be found by going to www.solar-district-heating.eu.

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DRAGON STAR Plus Helps Promote Sino-European Collaboration

EU initiative to foster policy dialogue on science and technology

Collaboration between the EU and China is important for the field of science and technology in order to tackle global challenges. A multinational EU project called DRAGON STAR Plus is bringing European and Chinese parties together to provide a platform for fostering international collaboration, to improve information exchange on European and Chinese funding programs, and to facilitate policy dialogue on science and technology. The Steinbeis-Europa-Zentrum is a partner on the program.

Global issues are best tackled together: China's change in strategy to provide more public funding for research and innovation makes the country an important partner in addressing global challenges and this means that it will be essential to work together closely and support one another at an international level. Since early 2015, a number of central European and Chinese research institutions, academic bodies, innovation backers, government ministries, and support agencies have been helping with this process as part of an initiative called DRAGON STAR Plus. Measures include:

- Support for European and Chinese researchers to facilitate collaboration as part of European and Chinese funding programs
- A collaboration platform and a toolkit for policymakers
- Promotion of cooperation between funding agencies to allow them to exchange ideas on key priorities

To promote closer collaboration on technology and innovation, the Steinbeis-Europa-Zentrum is organizing a sino-European collaboration fair in Stuttgart on July 8. The event will revolve around ICT issues with a bearing on connected manufacturing and advanced production technology. The aim is to provide a vehicle for getting to know innovative Chinese organizations, to find out more about the nature of transnational collaboration, and to explore current trends and sino-European ICT collaboration strategies. For more information on the collaboration fair go to www.steinbeis-europa.de/event.1724.html.

The Sino-European DRAGON STAR Plus consortium

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Using Know-How to Retain the Next Generation of Workers

Steinbeis sets up corporate program specializing in adhesive joining technology

Hybrid joining in lightweight construction is considered a key factor and elementary part of the automotive industry. The demands placed on these materials go hand in hand with the challenges facing the engineers in joining these materials with sufficiently effective methods. One technique that is currently making significant advances in the automotive industry is adhesive joining. To meet the demands faced by engineers, SCA Schucker GmbH & Co. KG has been working with the School of Management and Technology at Steinbeis University Berlin on a Master of Engineering. This is tailored to the needs of the company and includes a specialization in adhesive joining technology.

SCA Schucker is well known internationally as a specialist in adhesive systems and dosing technology, offering a variety of premium products, especially in the automotive industry. The company has been part of the Atlas Copco Group since 2011 and has enjoyed accelerated growth as a global player ever since. This has made it all the more important for the company to plan its HR development program in detail to keep pace with the rapid rate of development. To address this aim, SCA Schucker has been working with the School of Management and Technology on a corporate development program that is tailored specifically to company requirements. This provides engineers and business engineers with a chance to study toward a Master of Engineering degree in parallel to their projects at SCA Schucker and this can include a major in adhesive joining technology. "The degree offered by Steinbeis University places a strong emphasis on business practice, and, at the same time, it delivers added value for the students and the company. It was important for us to expand and intensify the knowledge-sharing processes at SCA in the long term and I couldn't have imagined a better partner to work with. Another aim with the specialization is to offer managers on-site training and this will be reflected in future on a technical level in management corridors," explains Olaf Leonhardt, managing director of SCA, who also completed a project competence degree (PCD) at Steinbeis University Berlin (SHB).

Close collaboration with the School of Management and Technology made it possible to react to the specific nature of engineering training in adhesive technology. This field is of particular importance in the Baden-Württemberg region, especially in the automotive sector. SCA Schucker has a training center in Bretten (east of Karlsruhe), which offers an ideal location for providing expert tuition on the business's premises and ensures management has long-term access to specialist technological know-how. SCA will also work with Steinbeis to organize on-site theory modules with a focus on adhesive joining technology. "Being close to Steinbeis University allows us to offer a customized corporate training program that matches the company's requirements. So we're particularly pleased that we're working in partnership with SCA and that our expertise will also be able to play a part in this promising area in the future. The Master of Engineering, with its specialization in adhesive joining technology, is an individually developed product based on the contributions of each cooperation partner. Everyone involved is adding the maximum possible know-how," says Dr. Walter Beck, director of the School of Management and Technology. Working together, Steinbeis and SCA Schucker can now prepare young managers for a safe long-term career in a field that is both exciting and challenging.

Image: Olaf Leonhardt, managing director of SCA Schucker GmbH & Co. KG

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Why Shaving off Every Gram is not a Contribution to Solve the Grand Challenge

A call for holistic sustainability and additive manufacturing

Lightweight construction is without question one of the biggest challenges of our time. Not only do weight-saving, highly robust structures enable airplanes, road vehicles, and high-precision tools to reduce energy consumption – which already makes these materials extremely important – but every gram that can be saved in weight is a step toward solving one of the "grand challenges" of our generation: product sustainability. And aside from more altruistic motivations, sustainability measures that are good for products also enable manufacturing enterprises to differentiate themselves in the market by highlighting the environmental, economic, or social features of products.

Nevertheless, looking at the issue on a holistic level in terms of environmental, economic, and social aspects, it is sometimes necessary to put people's delight with shaving off every single gram of weight into the right perspective. Some of the lightweight technologies that everyone is talking about at the moment may need to be scrutinized more closely, especially in terms of the environmental compatibility of the materials they involve or aspects of a more economic nature. Also, one has to wonder which of the technologies that apparently fit in with all aspects of holistic sustainability will actually be ready soon enough to enter general use and make a perceptible contribution to sustainability.

One view is that additive manufacturing (AM) already has major potential. In many ways it could be a highly promisingly step forward in terms of sustainability. AM makes it possible to derive significant potential from lightweight materials. By producing components additively, the technology commonly referred to as 3D printing makes it possible to create material structures that were previously not possible from a manufacturing standpoint. Examples of this: honeycomb structures or homogenous flows within materials with different properties. These involve reducing raw material use to a minimum, thus helping achieve other objectives relating to resource efficiency and, with this, meeting environmental criteria.

There are many facets to AM, which is why it is so revolutionary. It offers ways to completely customize products in a batch size of just one, allowing customers to have their own say (co-creation). Different features can be added, making it possible to create shapes and functions that were previously almost impossible. AM also allows for the production of parts at any time and in any location. This and the other potential benefits offered by AM make it very different from other lightweight technologies; they make it more than just a new production technology across all areas of industry. AM has implications for the entire value chain, in fact it changes it. Also, a whole variety of parts can be produced with a relatively small investment, making it possible to penetrate deeper into markets. The financial viability of additive methods will also improve more and more through continual technology enhancements. All of these factors enable additive manufacturing to contribute to sustainability in economic terms.

AM also has a bearing on the social aspects of sustainability. It is available to a broad population thanks to co-creation between customers and companies. In developing economies with little manufacturing infrastructure, which applies to many parts of Africa, AM can be made available to many sections of the population with only a moderate investment – and without needing big factories or skilled workers. This makes AM more than a technology that is suitable for lightweight construction. Looking at the bigger picture, it has major potential in all areas and this highlights the fact that AM is already hugely important, and it will become even more so in the future. This is the main reason why the Ferdinand Steinbeis Institute at the Steinbeis Foundation is pushing ahead with transfer oriented research into the use of AM in an industrial context.

Steinbeis Swipe! is a regular feature in Transfer Magazine in which an author takes a look at a specific topic and may even take a swipe – left, right, up, or down – along the lines of a critical commentary.

The author of this opinion piece is an MBE student at Steinbeis University Berlin.
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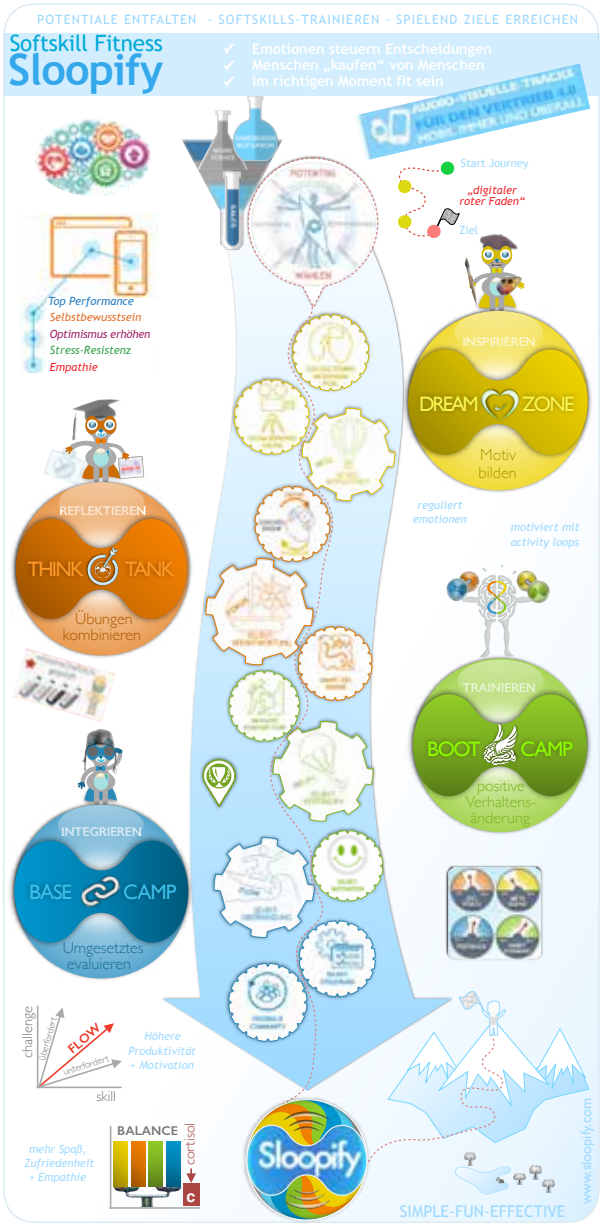

Pioneering Spirit and the Steinbeis Consultation Support Program

The Steinbeis start-up team backs idea behind interactive assistant

What's the best way to help with a promising new business idea that has been thought up by an inventive expert so typical of the pioneering spirit encountered in the south of Germany? If a startup needs the views of people from a variety of angles, it's important to have the support of a professional network to go through the startup plan systematically. This is where the expertise offered by the Steinbeis startup consultants comes in. They helped Markus Krill get an innovative startup idea called Sloopify off the ground. Sloopify is an interactive mobile assistant based on Sales 4.0 principles which links digital content with human-centric solutions.

No two entrepreneurs are the same. Some have an initial inspiration, while others already have a draft business plan up their sleeve. These two starting points could hardly be more different. To deal with this, there is a pool of Steinbeis startup consultants armed with an array of individual solutions, methods, and insights based on their own experience. When founders are laying the tracks for a new business idea, like becoming self-employed, a coach can give them valuable pointers that lighten the load and help focus the mind on the essentials.

One such consultant and coach is Verena Geisel, who advises entrepreneurs and managers to develop their self-management skills. "Everyone perceives and interprets things around them and the things they do according to their own personality templates and experiences. The key is to see the person and their individual differences and appreciate that," explains Geisel, who has been helping Markus Krill as he ventures into being his own boss. Krill is an engineer and marketing specialist who has gained valuable experience in his career until now, not only as a product designer but also as a deputy head of sales. He has been familiar with the challenges of working alongside sales people for years and is examining the impact different demands have on people and their personality, especially in terms of continuing professional development and "life-long learning." He is also seeking answers to these demands among the new tools and applications offered by the internet and digital solutions, especially those that revolve around the human being.

This provided enough questions for Krill to embark on the consultation process. The approach adopted by Geisel is based on a brand of logic called effectuation. Coaching sessions start by lifting ideas from a group of people that keep coming up with new ideas, despite uncertainty: experienced "repeat entrepreneurs." Effectuation works well in areas where causal management logic (set objectives – plan – implement) comes up against a brick wall. This is because it has an excellent ability to integrate insights and resources into the process using iteration loops. The method is used to introduce expert opinions into live processes and this approach was applied to the entire startup support program offered by Steinbeis.

The support Krill received from the Steinbeis Network came from Felicitas Steck, who focused on network management; Mario Buric, who helped with funding; Doris Deichselberger, whose specialty was project management; and Wolfgang Müller, who looked at aspects relating to backing and patents. Felicitas Steck is a strong believer in the effectiveness of stakeholder analysis and network analysis as part of the effectuation method. As the Steinbeis consultant explains, "What 'focusing on' meant was we started with a network analysis and the people Markus Krill knows – anyone who could be helpful with his startup ideas. Forging good partnerships with others, and especially entering into strategic alliances and arrangements with key partners who could relate to his plans, helps reduce uncertainty." Ultimately, the success of a startup is strongly linked to the right partnerships and a good network.

"The first step when it comes to funding is to understand the client's business model and analyze it from a critical standpoint," explains Mario Buric. Finances should never be viewed in isolation or without also considering the business founder. This is because the sources of funding are completely different from founder to founder. The Steinbeis coach high-

lighted classic startup funding options as well as digital alternatives such as crowd funding, crowd investment, crowd lending, and credit platforms.

Doris Deichselberger, who is director of the Steinbeis Consulting Center for Change Management and Business Coaching, worked with the founder to analyze the market and competitive situation regarding the project, with a particular focus on potential clients. The key questions that had to be asked were how Sloopify would stand out in the market and the benefits customers would derive from the platform. Both questions revolved around Krill's main goal of developing a web-based application that would link the world of digital solutions with coaching content, a bit like a virtual coach that would also make sustainable change fun.

One essential element of a successful startup is also understanding the property rights of the competition with respect to brands, designs, registered concepts, and patents. There are also times when a startup's own ideas have to be seen as and implemented as products that could create a temporary market monopoly in the face of third parties. With software it's often crucial to call on the help of third-party experts. Krill was advised on intellectual property rights and funding options by the experts at Infothek, the Steinbeis Transfer Center headed up by Wolfgang Müller.

"As a founder, I see my business idea gradually taking shape and the things they highlight from different angles have also made it possible to identify a few blind spots. Working with the coaches from Steinbeis, who are so experienced, put each piece of the puzzle in place. It's brought me a long way forward – 1 plus 1 was a lot more than 2!" says Krill, summarizing how things went.

His concept regarding how Sloopify actually works has now become much more tangible. Sloopify is like a virtual gym for developing personal attitudes, motivations, and identities, all with the support of a personal assistant who helps you better understand your behavior and emotions, keep practicing, and make adjustments as necessary. In doing so, achieving your goals is also fun. Key know-how needed to work in sales – such as personal perceptions, self-control, motivations, and empathy – is made available to users when they start each exercise, a bit like exercising your muscles on a regular basis. All assistance is provided through the app, which leads users through an animated environment with a clear thread of continuity. The app suggests possible course of action, also giving users handy hints and challenges relating to the current situation. These are matched individually to users based on artificial intelligence. The system draws on so-called activity and feedback loops, which are based on the actual resources and interests of users so that ideas can be synchronized with their goals. The app is also based on scientific data from a variety of areas such as the gaming industry, motivation research, brain research, and selling psychology. The aim of this is to unleash personal potential and involve users in a learning experience that is both innovative and inspirational. Krill's business idea is now more tangible and the business founder is currently looking for investors and development partners from the field of artificial intelligence, neuroscience, motivational psychology, big data, user experience, and gamification.

Image: © Markus Krill

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A Strong Foundation for Focusing the Strategy on the Future

Steinbeis financial results 2015

The know-how possessed by Steinbeis and its ability to foster knowledge and technology transfer are reflected in the financial results for 2015. In total, 1,038 Steinbeis Enterprises acted as powerful partners to industry, universities, and research institutions in the year under review. Of these, 85 enterprises were new to the Steinbeis Network. More than 6,000 dedicated workers – 1,759 direct employees, 3,612 freelance workers, and 730 professors – enabled the Network to achieve sales of €146.1 million.

"These are good results but they only partly reflect the success and reach of the Steinbeis Network," emphasize the Steinbeis Foundation Board members Michael Auer and Manfred Mattulat in an interview with TRANSFER magazine. "The other aspect is the success of our customers and our Network partners, which was achieved thanks to working with Steinbeis. This overall success is a strong foundation for the strategic orientation of the Steinbeis organization, and a key prerequisite for this success is independent transfer entrepreneurship under a central Steinbeis umbrella. The value this adds is pivotal to this strategic orientation."

In a meeting of the Board of Trustees held in April, the two Foundation Board members were re-appointed for a further five years, effective 2017.

Image: The Steinbeis Board team, Manfred Mattulat and Prof. Dr. Michael Auer

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Training with a Focus on the Big Picture

Sustainable training programs in the transport and logistics sector

What is the best way to equip instructors and apprentices in the transport and logistics sector with the right qualifications, also taking environmental and social influences into account, despite the commercial nature of their work? This is the key issue being examined as part of a business project with the somewhat wordy title "Proactive Training of Vocational Training Personnel through the Dynamically Oriented Development, Testing, and Dispersal of Sustainable Training Exercises in Dual Education (Pro-DEENLA – Haulage and Logistics)." The idea of the project is to provide instructors and students with the right training and make sustainability a more established and permanent feature of dual education programs. The scheme has been given three years' backing from the Federal Institute for Vocational Education and Training in Bonn (BIBB). The Sinsheim-based Steinbeis Innovation Center for Logistics and Sustainability is working as a project partner on the program, as is the Business Education Unit at Leuphana Universitay of Lüneburg.

"We're delighted with this first partnership project. It brings together two parties who are an ideal fit in terms of specialist knowledge and teaching know-how," explains Jens-Jochen Roth, director of the Steinbeis Center in Sinsheim. Prof. Dr. Andreas Fischer at Leuphana University of Lüneburg feels that the key task of the project will be to engender a constructive approach toward contradictions and lay foundations for sustainability in a commercial setting: "When it's about establishing the concept of sustainability in training, with a long-term focus on commercial and business aspects, the contradictory nature of possible decision-making has to be seen as a foundation for commercial activity at a local level, at the actual place of work."

The two project managers are not the only ones who understand why logistics is one of the most important areas of the economy in Germany. It currently ranks third behind the automotive sector and the healthcare industry. Despite this, sustainability is not given much thought in education in the industry, even though the programs that do offer training on sustainable development confirm that there are a number of areas in the industry where companies can think and, as a result, act sustainably. This is ignoring the fact that climate change and the transition to renewables mean it is now essential to place more emphasis on sustainability than is currently the case in the transport and logistics sector.

Sustainable planning and action will need to be more of a permanent feature in the future, such that it is practically taken for granted and considered self-evident. It will be particularly important to keep playing up sustainability so that key players not only develop an understanding for the issues, but also start basing plans and activities on the concept. This is why providing the right training will be so important, especially in this area of the economy.

The state-backed project aims to reach out to apprentices working in industry and offer training to the people who actually provide the vocational instruction in business. The concept has been planned to ensure that the program taps into the know-how of all key players in order to bolster sustainable development across the board. The program should also help sensitize future logistics specialists to sustainability issues. By drawing on a variety of training methods, the aim is to contribute as much as possible to the long-term development of employees and do justice to the real needs of business. The team will develop, test, and then implement a "teach-learn" approach revolving around training exercises, not just in the classroom or "in a black box" but also by working with instructors and apprentices in the ttransport and logistics sector. In a nutshell, the instructors will be actively involved in planning the training exercises so that they establish the informal and formal processes it requires to gear vocational training to sustainable development in haulage and logistics services.

The training exercises are being developed by both partners involved in the project, looking first at existing methods, the requirements, and needs of the transport and logistics sector, and the latest scientific insights into training at the workplace. To do this, they are designing an individually adaptable training process that can be updated and matched to the workplace and will focus strongly on developing new skills. The topics covered relate strongly to current developments, are closely related to people's everyday work, and follow a systematic methodology. All of the training exercises revolve around personal experiences and actual problems. The participants control the process themselves, which is individualized and based on interaction and participation. The aim is to foster and encourage people to understand themselves, including their own aptitudes and personal thoughts. It can be a demanding process but as such it is acceptable, and, if anything, students are even "expected" to find it acceptable. It does allow for individual learning styles and preferences, and it opens students' eyes to their own strengths and weaknesses when learning. As for the content, the training exercises place an emphasis on open (learning) processes, mutual influences, the dynamics of systems, susceptibility to failure, and the likelihood of making errors, thus encouraging people to be more organized.

At first, ten small and medium-sized transportation and logistics enterprises plus one firm belonging to a large corporation will take part in the project. The companies are headquartered in six different states of Germany and their industry associations will also be involved. Over the course of the project, 24 complex training exercises will be developed and given to the apprentices as well as their trainers and instructors. The exercises fall into the categories of fundamental exercises, connected exercises and extended exercises, each taking a different approach to sustainable learning. Jens-Jochen Roth hopes to be able to transfer the lessons learned to other businesses and professions.

Core components of Pro-DEENLA

1. Development of training exercises including materials required to test concepts and implement them in a practical setting with the support of business.
2. Training and involvement of instructors on three levels, with measures dovetailing with one another:
   a) Training exercises, which are suitable for conducting vocational training on sustainable development as part of occupational training activities.
   b) One-off workshops for key players from the transportation and logistics industry as part of employee training.
   c) Regional workshops to provide staff training to people involved in local projects.
3. The training exercises will be continuously extended and built upon based on occupational training guidelines for commercial officers working in haulage and logistics services.
4. The aim of the training exercises is to promote cognitive aptitude, personal capabilities, social disposition, and other abilities that enable people to focus more strong on sustainability in their work.

As well as backing Pro-DEENLA, the BIBB will also be supporting other projects that pursue the same goal of systematically integrating work-based skills and sustainability know-how into vocational training. As such, Pro-DEENLA is carrying out pioneering work in the transport and logistics sector.

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Researching
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Image: pixabay

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Conquering Chaos with Ingenuity: Why Standardization is a Necessity

SHB student establishes a standard consulting approach to introducing management systems

Quality management is a hot topic in modern business, especially given ISO certification requirements. Many companies now understand how important it is to introduce quality management systems and have these certified. QMH Consulting GmbH advises clients on setting up quality management systems and having these audited. The question is, whether there is a way to standardize how firms introduce such management systems. In fact, does it even make sense to use a standard approach? These were questions that Daniela Niermann posed as part of a project she carried out for her studies on the Executive Bachelor of Arts in Business Administration program at the School of Management and Technology (SMT), which is part of Steinbeis University Berlin. Her project was carried out on behalf of QMH Consulting GmbH.

QMH Consulting has a team of ten full-time employees with access to a pool of consultants spanning 20 network partners in the fields of consulting, auditing, and training. The company is specialized in providing consulting services for setting up and certifying quality management systems under ISO standard 9001 and ISO TS 16949. It also supports customers with the implementation of core tool methods and QM in adherence to VDA and AIAG methods. But without a standard approach to its projects, before every assignment QMH Consulting found it challenging preparing offers and projects, and there were no processes in place to leverage synergies.

Of course no two companies are the same, so any standard approach would have to provide enough leeway to still remain flexible and make changes to adapt to specific situations and requirements. As part of her bachelor's degree, Daniela Niermann first analyzed whether a standardized approach to implementing a quality management system makes sense in the first place. Based on this, she developed a standard process for a consulting project revolving around the introduction of ISO standard 9001.

Standard methods bring a number of benefits to the consulting company. On the one hand, it can make allowances for the differences between consultants and project managers in terms of personal aptitudes. It can then still offer uniform quality and project delivery. On the other hand, using standard briefing procedures – even as early as the first meeting with clients – makes it possible to address all issues that are pertinent to submitting the right offer and planning the project. This reduces the time invested in initial internal processes. These routines used to be extremely time-intensive, but they could not be invoiced to clients so this had to be borne by QMH Consulting. By standardizing briefing sessions and establishing standard procedures, it is now possible to agree clearly who is responsible for what – and this also improves sign-offs during each stage of the project. At the same time, it helps with the flow of communication within the team.

Another benefit of standard procedures when introducing a management system is that facts are more comparable and consulting projects are more transparent. Even if there are differences between individual client companies, the people involved take "lessons learned" with them after completion of each project. This makes it possible to build on any insights gained from consulting projects, in order to improve business processes and keep developing them. Individual employees also learn from these insights and keep developing. Despite this, for QMH Consulting the most important added value gained from a standard process is that synergies can be leveraged and continual improvements in quality can be handed on to the customer – independent of the managers or consultants who worked on their project. This also helps build on the corporate identity of QMH Consulting.

To carry out her project, Daniela Niermann based her methodology on the Berlin Model. This takes a step-by-step approach to introducing a management system and the advantage of this is that it can be applied to the introduction of a variety of management systems. A standard briefing procedure and a checklist, which was developed by Niermann as part of her bachelor thesis for introducing ISO standard 9001, can also be used as the starting point for introducing the ISO automotive standard TS 16949 or the ISO environmental management standard 14001. This provides a toolkit for the client to use with the support of the QMH consultant. By using the Berlin Model, QMH Consulting can now introduce a number of quality management systems to a company as part of the same project. This allows QMH Consulting to draw on the benefits of standard procedures on a number of fronts at the same time. It also lays foundations for more systematic work.

Image: © shutterstock.de/Micha_h

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Digital Technology Doesn't Change Much – Just Everything!

Steinbeis holds afterwork events in Munich and Berlin

Digital solutions are no longer a vision of the future or an abstract macro-trend, they're here, and here to stay. They are changing the world as we know it. What is new, is how radical this change is becoming and its sheer velocity. Small fry can suddenly be the biggest fish in the pond and throw established industries out of kilter. This trend was the focal topic of a series of afterwork events for specialist managers, business people, and anyone else interested in these issues. The events were organized by the Steinbeis School of Management and Innovation (Steinbeis-SMI) as part of a Steinbeis Network program in Munich and Berlin.

Around 140 decision-makers and visionary thinkers involved in management, HR, leadership, and the world of digital technology attended the events, once in Munich on April 13, and once in Berlin on May 10. The thought-provoking title of the afterwork events was "DIGITAL CHANGES nothing. Only everything!" They were staged in the Steinbeis-SMI building to provide plenty of space to discuss ways to actively manage digital transformation and the best ways to use digital technology at companies.

There were also key-note speeches focusing on whether digital technology can change entire markets and sectors of industry, as well as ways for companies to deliberately and systematically cope with digitalization. Alissia Iljaitsch, who is a digital innovation strategist, drew on a variety of projects in business that were striking examples of how innovation can be successfully promoted in companies. Her speech placed particular emphasis on virtual reality examples, underpinned by issues regarding how companies deal with disruptive technology within their own organization.

At the event in Munich, Oliver Kempkens, CEO of ITMP Deutschland GmbH, outlined why digitalization is not limited to certain industries. It places strong demands on the organizational structures of all businesses and requires them to engage in "corporate renovation." At the Berlin event, Prof. Dr. Andreas Aulinger, professor of organizational management at Steinbeis University Berlin showed how connected manufacturing (or Industry 4.0) needs an Organization 4.0, also examining the consequences this has for how people deal with power, planning, and learning within organizations.

Both afterwork events were moderated by Carsten Rasner, director of the Steinbeis School of Management and Innovation. After the speeches, the guests had the chance to mingle and talk with others. This was an ideal opportunity not just to go through their own questions with the speakers, but also to get a hands-on feel of virtual reality, thanks to a VR headset brought to the event by Alissia Iljaitsch.

The Steinbeis School of Management and Innovation has been inviting managers and technical specialists to Steinbeis Network afterwork events since the fall of 2015 under the banner Insights + Innovation@ Steinbeis-SMI. The idea is to explore the topics of HR + Leadership, Management + Innovation, and Digital Media + Marketing.

The Steinbeis School of Management and Innovation

Steinbeis-SMI is a business school of management, innovation, and leadership at Steinbeis University Berlin. It offers part-time management studies for specialists and managers in Berlin, Munich, Frankfurt, and Stuttgart. Steinbeis-SMI has a strong focus on fast-moving, competitive markets marked by rapid change and the pressure to innovate. This has allowed the school to establish a strong presence in marketing, the media industry, and creative organizations. Steinbeis-SMI works in collaboration with selected partners and sponsors in science and industry to provide its students with an education that is both innovative and entrepreneurial in outlook. Its up-to-the-minute curriculum is underpinned by a consistent focus on business practice, the very latest scientific methods, and a business project integrated into studies, keeping a finger on the pulse of trends.

Information about upcoming topics and events is available at www.steinbeis-smi.de/afterwork or by writing to afterwork@steinbeis-smi.de.

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Materials Researcher Honored with International Award

Prof. Dr.-Ing. Frank Mücklich bestowed Henry Clifton Sorby Award

The Steinbeis entrepreneur Prof. Dr.-Ing. Frank Mücklich has been honored with this year's Henry Clifton Sorby Award, an international recognition for outstanding lifetime achievements. The award is bestowed every year by the International Metallographic Society (IMS) to recognize scientists for many years of dedication to metallurgy and metallography research and teaching. It is also a reflection of their international recognition and acknowledgment.

Frank Mücklich holds the chair for functional materials at the University of Saarland and is director of the Materials Engineering Center Saarland (MECS), which is a Steinbeis Research Center. His works involves high-performance functional materials and the development of new functional materials with an emphasis on extreme electrical loads, contacting materials used in electric switch systems, and customized nano-composites. His areas of expertise also include the technical functionalization of surfaces based on micro and nanostructuring, especially with material surfaces and thin layers. This is achieved through laser structuring, laser interference metallurgy, and ion beam technology. Mücklich has developed new methods for analyzing and simulating complex material structures in 2D and 3D for conducting quantitative image analysis and atom probe tomography.

Prof. Mücklich is also the holder of the Alfried Krupp Prize and the Roland Mitsche Award from the Austrian trade association NE-Metallurgie Österreich. In 2012 Mücklich, his Steinbeis colleagues, and Atotech Deutschland GmbH were awarded the Steinbeis Foundation's transfer prize – The Löhn Award. Prof. Mücklich will be presented with the Henry Clifton Sorby Award at the IMS Awards Banquet on July 27, in Columbus (Ohio).

Image: Prof. Dr.-Ing. Frank Mücklich

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All Good Things Come in Threes

Official opening of the Steinbeis House in Villingen-Schwenningen

In mediaeval times, there were legends of a philosopher's stone, which it was believed would allow people to turn base metals into gold or silver. The philosopher's stone was even considered an elixir of life. This idea is being used as an analogy by the Steinbeis experts at Infothek in Villingen-Schwenningen: One never knows for sure whether an idea can be turned to gold or silver, or whether any use will come of it – it's not always obvious in advance. The Steinbeis team has witnessed this with many products, and this even applies to the inventors and business startups they have consulted, supported, and supervised over the years. Then, in April, the team had three reasons to celebrate, all in the same month.

Despite the inclement weather, a large number of partners and clients of Steinbeis Infothek came to celebrate the opening of the new Steinbeis House, its innovative gardens, and a presentation of the innovation museum. What is special about the museum is that all of the exhibits are the result of projects the consultants have worked on over the past 30 years or so. They are now an integral part of the building's interior decoration and can be found in the cafeteria area, the stairwell, and the offices. Each is labeled with a QR code to provide more details of the ingenious idea behind the product. The Steinbeis team is now housed in a striking new location on the edge of the old town of Villingen, having moved there from the former offices in 63 Gerberstrasse. Now visitors and clients are welcomed by a building sporting the name Steinbeis House. "We at Steinbeis are proud to work with all kinds of people on their innovations, from part-time inventors to global players. We support the process in a number of ways because the goal of any idea is to become a long-term success in the market. To make this possible, we advise them on everything from registering patents to market analysis and product launches. We sometimes take a critical angle because our stated aim is to minimize the risk for our customers," said the host for the day, Wolfgang Müller, outlining his team's main purpose.

Image: The opening of the Steinbeis House in Villingen-Schwenningen with the director of the Steinbeis Center, Wolfgang Müller, talking to Prof. Dr. Michael Auer (Board Chairman, Steinbeis Foundation)

Exhibits at the Innovation Museum can be viewed during the opening hours of the cafeteria on the ground floor of the Steinbeis House.

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Knowing Everything is Everything

A review of the Steinbeis symposium on security in business

Security first, risk last – this was the central thought behind the fifth symposium on security in business held in Villingen-Schwenningen in June. The event was organized by the Steinbeis Innovation Center Know-How+Transfer.

The event was particularly important for local companies: "Lots of firms in the Black Forest and Baar region are among the leaders in their industry, so unauthorized parties are often interested in illegally getting their hands on sensitive information," explains Wolfgang Müller, who heads up the Steinbeis team in Villingen. Müller believes that many people in industry are completely unaware of the risks companies are exposed to when their business processes convert to digital technology, and given the increasingly global nature of business relationships, things are more complex than they have ever been. To combat this knowledge gap, Steinbeis invited highly qualified experts to the event.

In a speech by Dr. Julia Victoria Pörschke (Baden-Württemberg State Office for Data Protection), she asked the question: "Business, Transparency, and Europe – What Changes are SMEs about to Witness?" Pörschke talked about the challenges posed by international data protection law, focusing on the data protection legislation that came into force at the EU level in May. This will lead to a binding harmonization of regulations and what it will mean for SMEs is that their processes will need to be adjusted to these new regulations. Pörschke explained that it is highly likely that this will fuel a rise in expenditures and administration costs, despite the fact that there is no guarantee that those affected by the harmonization will be able to enjoy any degree of legal certainty. The only thing that is certain is that anyone breaching the new laws can expect to face hefty fines.

Threats of a different nature were looked at in a talk on "Attacks from the Internet – Types of Culprits and their Approaches" given by Prof. Dr. Dirk Koschützki (Steinbeis Transfer Center for Cyber and Information Security). Koschützki described the methods and intentions of different groups of perpetrators. This also made it clear that innocuous employees and a careless attitude at work can also result in major damage. Koschützki did nothing to conceal the truth about the often significant cost of minimizing risk.

The issue of risk was also covered by Elliot Papageorgiou (Rouse & Co. International LLP, China) in a speech entitled "Made in China and the 13th Five-Year Plan – The Importance of Chinese Strategies for German SMEs." European companies face major challenges due to unprecedented developments in China. The chances of international companies succeeding in China are under major threat after implementation of intellectual property measures and competitive advantages given to "domestic champions" as a result of local protectionism. Papageorgiou advises companies looking to do business in China on a regular basis to identify potential security gaps beforehand, along with solutions for dealing with these gaps, which it is imperative to implement. Firms have no choice but to regularly monitor patents, the competition, and technology in order to establish a robust base of information.

Marina Rossi, from the Steinbeis project partner Jülich, provided information on state funding programs for innovative enterprises. In a speech entitled "WIPANO – Knowledge and Technology Transfer through Patents and Standard," Rossi outlined the principles of the funding program, which can provide financing worth up to €16,575 depending on the anticipated success of an innovation. To qualify, people applying for funding must not have registered any property rights in the last five years and they must apply for the project in advance. Rossi underscored the fact that state programs make a significant contribution to the security of private enterprises with a positive influence on how intellectual property is managed.

"As in all areas of business and society, it's about improvement, progress, and vision," concludes Wolfgang Müller, who predicts a rocky ride for companies that are not sufficiently informed about security issues. His view is that the consequences of security breaches can be cataclysmic, with "the threat of competitive setbacks, and these can have a negative impact on the market shares of companies. In the worst case scenario, it will even eventually threaten their very existence." The audience and speakers used the opportunity after the speeches to network, discuss further topics, and explore other issues relating to security in business.

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Alternative Assessment Methods in Light of International Real Estate Market Structures

Luise Wohlhage

2016 | Paperback, B/W | 166 pages, German
ISBN 978-3-95663-084-2

About the author

Luise Wohlhage studied economics at the University of Freiburg and the University of Bologna in Italy. After completing her studies in 2011, she was a research assistant at the VWA Business School at Steinbeis University Berlin and worked as a consultant for DIA Consulting AG in Freiburg. In 2013, Wohlhage completed a diploma in expert auditing at the German Real Estate Academy in Freiburg. This paper was written by Wohlhage in 2015 for her political sciences doctorate (Dr. rer. pol.), which she obtained from the University of Freiburg.

Cash and Home-Building Riester Provisions as an Instrument of State Pension Support

Thomas Ferdinand

2016 | Paperback, B&W | 495 pages, German
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About the author

Thomas Ferdinand studied business science at the Wilhelmshaven University of Applied Sciences from 1998 to 2001. Between 2008 and 2010 he completed an MBA in Estate Planning at the University of Freiburg. Ferdinand has worked in a variety of roles in industry since 2002, primarily focusing on the German Riester retirement plan. He currently works as a trainer and consultant on business processes related to Riester retirement plans, with an emphasis on pension plan providers and the central benefits agency ZfA. Ferdinand gained his doctorate at Steinbeis University Berlin in 2016.

Best Practice in Technology Transfer in Baden-Württemberg. Examples of Successful Transfer Systems.

BIOPRO Baden-Württemberg GmbH, Steinbeis Foundation (ed.)

2016 | Paperback, color | 101 pages, German
ISBN 978-3-95663-034-7 (print)
ISBN 978-3-95663-097-2 (digital)

About the project

This omnibus publication was released by BIOPRO Baden-Württemberg and Steinbeis to convey the diversity of successful transfer mechanisms in the state, and to explore the opportunities for key players to focus on synergies and coordinate and exchange views systematically. It outlines the varied nature of transfer in Baden-Württemberg, with specific methods and approaches that offer a template for networking. Its aim is to contribute to a positive climate of innovation and knowledge sharing, and engender a culture that makes use of know-how to the benefit of industry.

Out-Patient Neurological Post-Operative Care: Why?

Horst Gerhard, Matthias Suchanek, Oliver Gondolatsch (ed.)

2016 | Paperback, B&W | 152 pages, German
ISBN 978-3-95663-073-6

About the editors

Prof. PD Dr. med. Horst Gerhard is a professor for public health at Steinbeis University Berlin. Dr. med. Matthias Suchanek is chief resident of neurology at the Katholisches Klinikum (Catholic clinic) in Essen and the Philippus Foundation, and chairman of the North Rhine-Westphalia Aphasia Center (AZN). Dipl.-Kaufmann Oliver Gondolatsch is head of marketing and communications at the Katholisches Klinikum in Essen.

A Quality Guarantee for Logo Designs?

Felicitas Knapp

2016 | Paperback, color | 108 pages, German
ISBN 978-3-95663-085-9

About the author

Felicitas Knapp studied journalism and public relations at the Westphalian University of Applied Sciences. This paper earned her a bachelor of arts in 2012. It was also honored with the 2012 Westphalian University of Applied Sciences Degree Prize by the German Institute of Journalism and Public Relations. Knapp has been a working student in graphic design and typesetting at Steinbeis-Edition since 2014 and is currently completing a master's degree in electronic media with a focus on corporate communications at Stuttgart Media University.

Comparative Competence Analysis and Strategic Competence Development

Steinbeis Foundation (ed.)
Michael Ortiz, Marlene Gottwald

2016 | Paperback, color | 159 pages, German
ISBN 978-3-95663-083-5

About the study

The authors based this study on the Steinbeis Company Competence Check to examine the skills profiles of companies founded by young entrepreneurs in Baden-Württemberg. Their focus lay in the specific strengths and challenges revealed by competence patterns in key areas relating to digital transformation, specialist staff retention, staff training, and reconciling family interests with work.

The 2016 Steinbeis Consulting Day Proceedings

Steinbeis Foundation (ed.)

2016 | Paperback, color | 93 pages, German
ISBN 978-3-95663-096-5

About the event

Entire areas of the economy are shifting to digital technology, with more and more technology convergence in key areas and an increasing level of interconnectivity between markets and business activity. These present a major challenge for firms in the modern economy, especially in how they run their businesses. This year's Steinbeis Consulting Day looked at "Company 4.0" from a variety of angles on June 29, 2016 in the Stuttgart House of Commerce.

Business Mediation – Conflict in Companies and Organizations

Gernoth Barth, Bernhard Böhm, Jonathan Barth (ed.)

2016 | Paperback, color | 206 pages, German
ISBN 978-3-95663-095-8

About the editors

This publication is the second part of a series of articles in the German specialist magazine Mediation. The editors of the series, associate professor Dr. habil. Gernot Barth and the attorney Bernhard Böhm (Master of Mediation), are directors of the Steinbeis Consulting Center called Mediation of Business. In this latest publication, authors examine a structured approach toward conflict in companies, not only looking at key requirements and the issues facing companies, but also the responsibilities invested in the mediator. This underscores how essential efficient conflict management is for the competitiveness of a business and the success of its change processes. The articles are vivid and clear with a strong focus on business practice.

Narcissism –

Everything Revolves around The Ego

Gernot Barth, Bernhard Böhm (ed.)

2016 | Stapled, color | 68 pages, German
In Mediation 2016/02 | ISSN 2366-2336

About the editors

Associate professor Dr. habil. Gernot Barth is director of IKOME® (the Institute of Communication and Mediation), the Steinbeis Consulting Center called Mediation of Business, and the Academy for Social Aspects and Law (a Steinbeis Transfer Institute at Steinbeis University Berlin). The focal topic of his work is mediation, especially within and between companies. Bernhard Böhm is a qualified attorney, master of mediation, and co-director of Mediation of Business, the Steinbeis Consulting Center. He is also head of the state-approved office of Steinbeis Consulting Centers (Steinbeis Beratungszentren GmbH). Additionally, he shares responsibility for a variety of domestic and European mediation projects involving cross-border mediation.

Transnational Work Migration and the Employment of Central and Eastern European Nursing Staff

René Schmoll | Heinrich Hanika (ed.)

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About the editors and the author

Professor Dr. iur. Heinrich Hanika is an institute director and lecturer at Steinbeis University Berlin, a visiting professor at Semmelweis University in Budapest, and a professor of law in the European Union and commercial law at the University of Applied Sciences Ludwigshafen am Rhein. His main interests lie in European, nursing, and business law and he is involved in integrated research and lecturing for degrees related to health care, medicine, and management. René Schmoll is a master's student enrolled in the International Human Resource Management degree at the University of Applied Sciences Ludwigshafen am Rhein, where he also gained a bachelor's degree in Controlling, Management & Information. Schmoll has also gained international experience as an Erasmus student at the University of Economics in Bratislava and the University of Maribor. He has worked closely with senior executives at a number of SMEs in Germany and abroad, and has worked as a student consultant for a Top 30 company on the German stock exchange.

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Steinbeis is an international service provider in entrepreneurial knowledge and technology transfer. The Steinbeis Transfer Network is made up of about 1,000 enterprises. Specialized in chosen areas, Steinbeis Enterprises' portfolio of services covers research and development; consulting and expert reports as well as training and employee development for every sector of technology and management. Steinbeis Enterprises are frequently based at research institutions, especially universities, which are constituting the Network's primary sources of expertise. The Steinbeis Network comprises around 6,000 experts committed to practical transfer between academia and industry. Founded in 1971, the Steinbeis-Stiftung is the umbrella organization of the Steinbeis Transfer Network. It is headquartered in Stuttgart, Germany.

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