



# TRANSFER

*The Steinbeis Magazine*



## Early Birds: Young and Inspiring Ideas

**Feature Topic: Steinbeis Projects for and with Young People**

**Steinbeis Day 2016**

Pictures and stories from the forum and project exhibition

**The 2016 Steinbeis Evening**

Bestowal of the Steinbeis Foundation Transfer Priz



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## Dear Readers,



Wolfgang Müller is director of two Steinbeis Enterprises, Infothek and Know-How + Transfer, both of which are based in the Steinbeis House in Villingen-Schwenningen. He is also a foundation council member of an inventor award called the Baden-Württemberg Artur Fischer Erfinderpreis.

The German business model is based, among other things, on a training system which is sure to be unique throughout the world. Ensuring people receive thorough training is achieved through a dual education system underpinned by academic education.

Recent studies show that this apprenticeship and training system plays a pivotal role in tackling business complexity, especially when it comes to technical challenges. It is therefore little wonder that the companies that are in the industries hiring large numbers of employees with MINT qualifications – that is mathematics, IT, (natural) science, and technology – engage more in research and develop more innovations. There is a direct correlation between a company's ability to innovate and its access to qualified workers – not just people with a business background but also from the world of science and academia.

But even the best training infrastructure in the world is of no use if there is a dearth of specialists in the very technical professions that are crucial to Germany – key IT jobs, technicians, engineers, traditional metalworking and electronics, full-time specialists. According to a report issued by the Cologne Institute for Economic Research, there was a shortfall of 78,000 specialists in 2016. By 2025, the specialist gap will widen to 135,000. So it's time to do something!

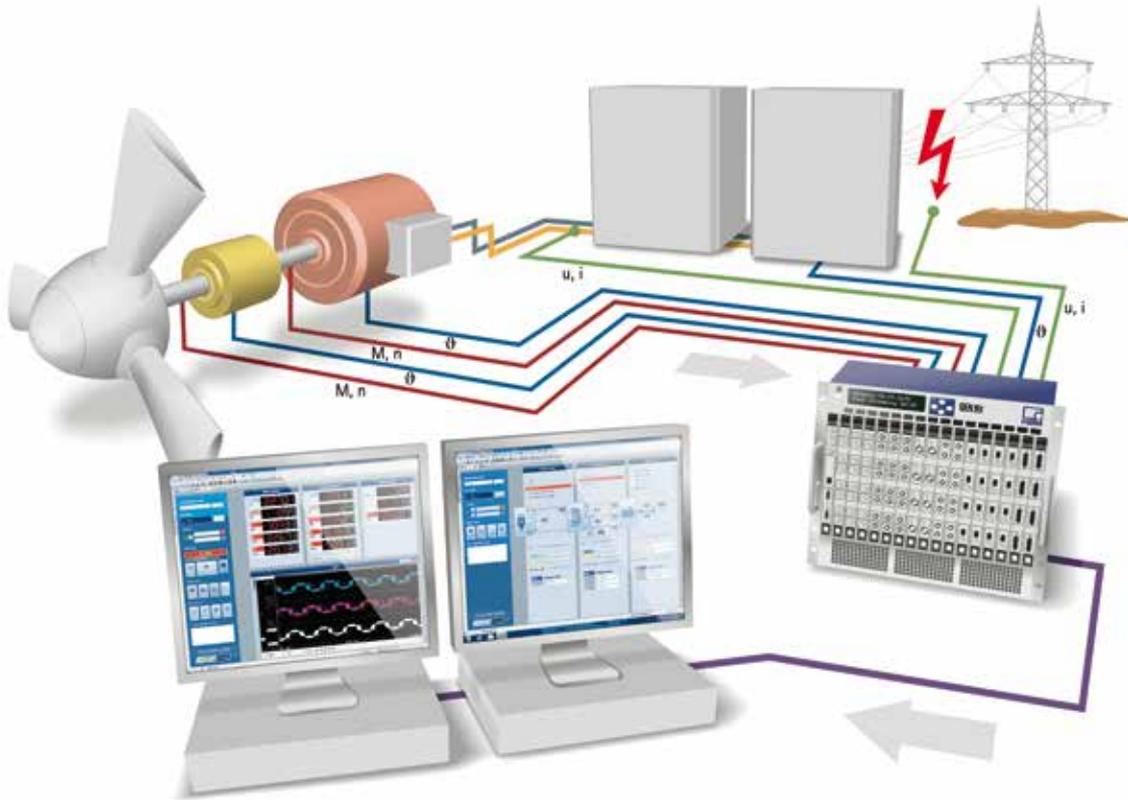
Aside from providing people with specialist training, what we need are initiatives from companies, politics, and society in general. Sports and cultural pursuits have been part of school activities for a long time now, whereas topics such as entrepreneurship, invention, and creativity do not get much attention. The fact that initiatives make sense in these areas can be seen in examples like the Artur Fischer Erfinderpreis (Inventor's Award), the youth startup contest "Jugend gründet", the "mikromakro" program, the knowledge factory "Wissensfabrik Deutschland", the student research centers now established in Baden-Württemberg, and the youth research talent initiative "Jugend forscht".

Aside from offering these initiatives, it is also important to give schools plenty of freedom to experiment. There is no guarantee that teachers will simply invest their free time in projects and feel any sense of commitment to driving things forward or providing schoolchildren with the support they need. This is one area where support from politicians is also needed.

One thing that was aptly demonstrated by this year's Steinbeis Day is that schoolchildren come up with some ingenious ideas and can turn their startup ideas into a reality. The inventiveness, creativity, and the fun young people have with such topics was there for all to see. Steinbeis is involved in this field out of a sense of conviction, but it also knows that it shares a societal responsibility for the future of our country.

I do hope you enjoy reading this latest edition of Transfer magazine and that it inspires some ideas for activities with young people.

Wolfgang Müller



## Calculating Wind Energy with Precision

### Steinbeis team develops mathematical tool for certifying wind turbines

Generating power from renewable energy sources is a key focal point of the energy transition. It presents energy suppliers, grid operators, and turbine manufacturers with major challenges. The growing portion of wind energy flowing into the electricity supply is particularly demanding in terms of engineering, especially if the energy supply has to remain reliable. The Steinbeis Transfer Center called Energy-efficient power electronics for electrical drives and power storage systems, which is based at Aschaffenburg University of Applied Sciences, partnered up with Hottinger Baldwin Messtechnik GmbH to develop a mathematical process that can be used to certify wind turbines.

Manufacturers have a lot of experience with testing individual components in the development of wind turbines. Testing and inspecting a wind turbine as a complete system on the other hand is much more complicated. Not only does system output keep increasing, but the technical guidelines for certification are being drafted in evermore detail.

A precise measuring system is needed to carry out certification on the electrical components of wind turbines in field trials or on system test benches. This has to be based on a powerful mathematical evaluation and adhere to the TR3 technical guidelines published by the German development association for wind energy and other renewable energies (Fördergesellschaft Windenergie und andere Erneuerbare Energien FGW e.V.). Experts working with Prof. Dr.-Ing. Johannes Teigelkötter at the Steinbeis Transfer Center in Aschaffenburg joined forces with their project partners at Hottinger Baldwin Messtechnik to develop and test a mathematical procedure to capture and evaluate the operation of wind turbines at the feed point. Both project partners have been working together successfully for many years: In 2015, they were awarded the Steinbeis Foundations Transfer Award, the Löhn Award, for their transfer project on raw data analysis and precise efficiency measurements for electric drives. Their current project developed out of this previous collaboration.

One of the central challenges of the new collaborative project lies in the calculation of the active and reactive power over time in the currents and voltages at the feed point. To meet this challenge, the project team

optimized a mathematical procedure which can now highly dynamically calculate the symmetrical components from the measured voltage and current paths. The symmetrical components measured in this way are needed to calculate further operational factors in the wind turbine in accordance with defined standards.

The above illustration shows the setup of a wind turbine plant with a wind turbine, transmission, generator, and converter for feeding energy into the power grid. What's more, the system for taking precise measurements and analyzing the turbine is shown with important system outputs. The algorithms for recording the symmetrical components and additional types of analysis for wind turbines were based on this measurement system developed by Hottinger Baldwin Messtechnik.

**Image:** Setup of a wind turbine plant with wind turbine, transmission, generator, and converter along with the measurement system used to measure and analyze the turbine. © Hottinger Baldwin Messtechnik GmbH



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## Feature Topic: Early Birds – Young and Inspiring Ideas

### Insights from Steinbeis experts

The future belongs to young people, we all know that. The Steinbeis experts from the articles that make up this edition's feature topic also unanimously agree that we can expect plenty of new and interesting things in the future. They also know how amazing the ideas of the next generation are and how to support young people with their ideas. Professor Dr. Nils Högsdal, vice-chancellor of innovation and a professor of corporate finance and entrepreneurship at Stuttgart Media University, outlines what universities can do to support young people in recognizing entrepreneurial opportunities and turning them into a reality. Anette Mack from Steinbeis-Europa-Zentrum provides a report on an EU-backed project called Photonics4All, which introduces children and adolescents to the key technology of photonics. Thomas Kilian from the student engineers academy (SIA) at Friedrich Wöhler High School in Singen and Horst Scheu, director of the Steinbeis Transfer Center for Science Technology Education, provide an introduction to a testing process for bike finishes. Professor Dr. Heinz Trasch, director of the Steinbeis Transfer Center Science, Technology & Economy and a member of the jury for the young founders contest "Jugend gründet", talks about his experiences and considers the importance of such competitions in preparing young people for future careers. Jens-Jochen Roth, who is director of the Steinbeis Innovation Center for Logistics and Sustainability (SLN) in Sinsheim, explains the possibilities for training on sustainable development in the field of logistics. Professor Dr. Carsten H. Hahn, director of the Steinbeis Transfer Center for Innovation Engineering & Entrepreneurship // i2e, a professor at Karlsruhe University of Applied Sciences and an employee of SAP, talks about the role of the older generation in helping young people implement their ideas.





models, although there are simple ways to teach that through college education and "Jugend gründet" also does a lot to address these issues.

**Are young people in a position to recognize the opportunities by themselves or do they need help? If they do, what help would that be?**

I think there are lots of areas where help is needed, so people can help themselves. We now know there are structured methods and processes. These include design thinking and the principles of lean startups, including use of the business model canvas. What we need to teach people is how to validate an idea and how it can be developed. I never tell people to forget an idea, instead I get students to go through the validation process step by step with customers and other stakeholders. It's not uncommon for what looks like a useless concept to go through several rounds of iteration and transform into a business concept that can be implemented. Starting a business is now an agile process and if people understand this they can even push ahead with innovations in big companies.

**What can the universities do to provide more help to students and even graduates, so they can take a perceived entrepreneurial opportunity and actually make it happen?**

Actually your previous question already raised an important issue: Even established companies now draw on insights gained in the world of

startups – along the lines of corporate entrepreneurship – and use these to facilitate quick and targeted innovation processes. Our goal at the Media University is to forge links to students at least once during their studies. The idea of this is not to turn everyone into a business founder, but to establish entrepreneurship on a broader base as a key skill. This isn't about the detailed stuff like planning the finances of a startup to go into a business plan, it's about the underlying principles. Students need to know they'll receive all sorts of support from the university. This doesn't just apply to the students, but also to alumni after they've finished their degree. The support is not just about the topics themselves, it's also of a financial nature through a variety of funding options like the Exist startup grants, the "Young Innovators" program, and innovation vouchers. At the same time, it's also important to share new insights along the lines of life-long learning. We've been offering a master's degree since the winter semester in collaboration with the University of Stuttgart on the topic of "Intra- and Entrepreneurship (tech)." This degree can be pursued in parallel to work and running a startup. People can also attend individual modules. There's a classroom-based course in design thinking and business model generation, which has almost established itself as a tradition now. In many cases it earns 6 ECTS credits to go toward a subsequent master's degree. The thing that's still not in place for the future is the right infrastructure based on the example set by American universities, which make it possible for universities to become shareholders in student startups. Maybe something can be done about this in the Steinbeis Network in the future.

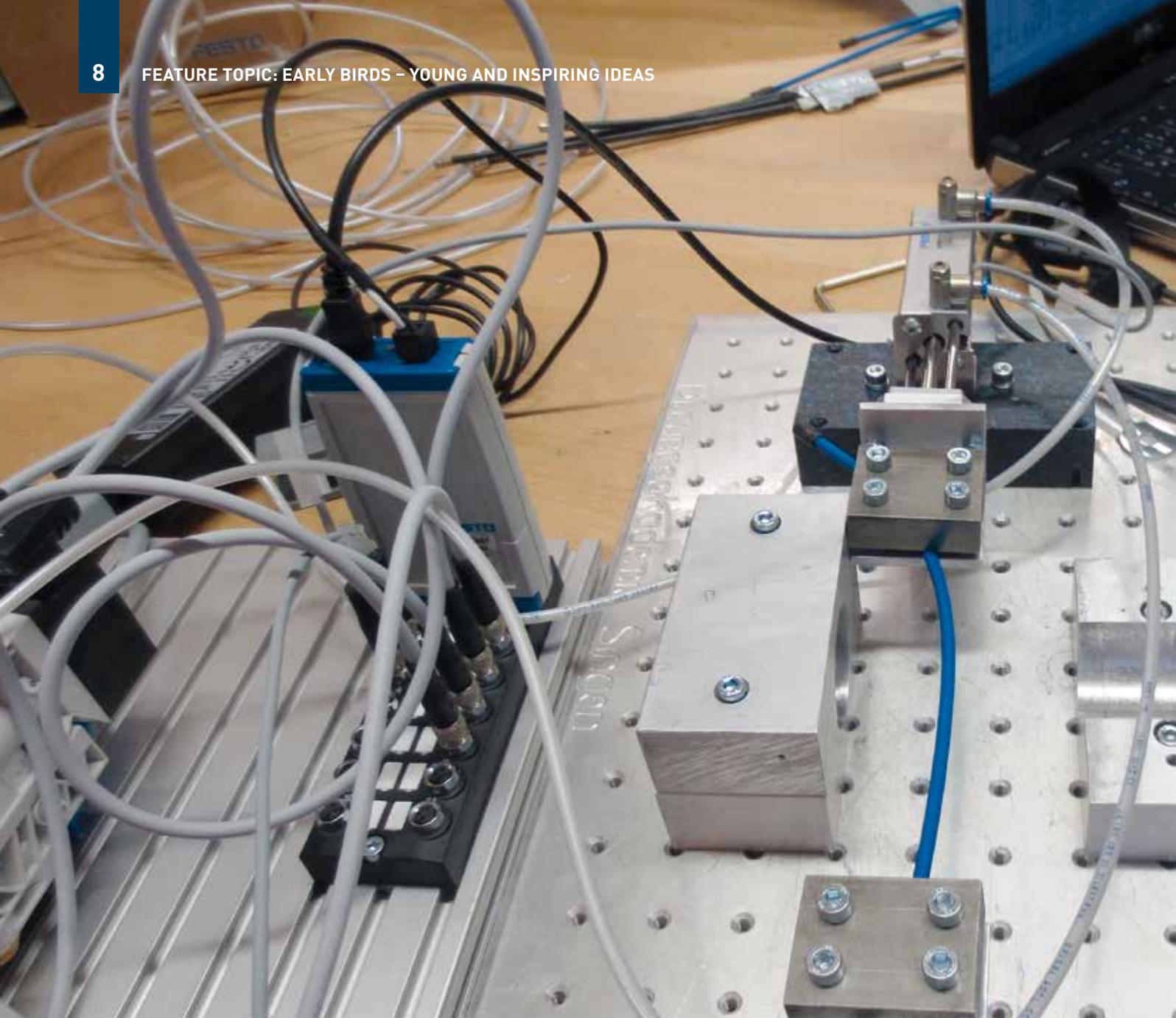
Image: © denisismagilov – Fotolia.com



Prof. Dr. Nils Högsdal is a lecturer in corporate finance and entrepreneurship at Stuttgart Media University. He has been working alongside the university chancellor as a vice-chancellor of innovation since September 2016. His responsibilities include the topics of research and knowledge transfer, startups and entrepreneurship, continuing professional development, and internationalization. His lecturing and research revolve around the field of entrepreneurship with a particular focus on innovation.



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## When the Shine Wears off...

### School team from Singen develops testing process for bike finishes

For about ten years, Friedrich Wöhler High School in Singen has been home to the student engineers academy (Schüler-Ingenieur-Akademie – SIA). Working with local businesses and universities, 10th graders have the chance to get a feel for engineering through various projects. This year's team took a closer look at various paints and finishes and their wear resistance.

Students taking a shop class at Friedrich Wöhler High School spent part of their lessons restoring old bikes. But there often wasn't enough money for expensive paints and finishes, so the students wanted to test whether bike paints bought at the hardware store have a similar quality to the paints used by bike manufacturers. To this end, the team of students at the SIA designed two machines that test coatings for scratch and impact resistance. Their work was sponsored by the Baden-Württemberg Foundation as part of its mikromakro project.

To test paint resistance, the young shop students closely investigated two aspects: one was the ability of the bike frame finish to withstand the impact of gravel, the other was to test its ability to withstand scuffing from the repeated rubbing of components like the brake and pull

cables that run along the side of the bike frame. The team of students developed test procedures for both types of wear and documented observed changes during the test processes. To test impact resistance, the students let a defined quantity of gravel fall onto the frame from a specific height. Automating the release of individual gravel stones proved particularly challenging. Testing the scratch resistance was relatively easy in comparison: two cylinders pulled a cable back and forth across the test coat.

The Steinbeis Transfer Center Science Technology Education supported the project under its director Horst Scheu. As the former principal of Friedrich Wöhler High School in Singen, Scheu played a big part in promoting the SIA. He has consulted and advised students at the SIA since



materials will fare in testing – bikes these days are now also made of things like wood and bamboo. New tests will also be conducted on different types of paints. There are still a few improvements to make on the machine for impact resistance. A group has now formed to tackle this problem.

Image: The scratching test rig



Thomas Kilian



Horst Scheu

he retired from active service at the school. It was also his idea to present the project to the general public at the 2016 Steinbeis Day. And so the student SIA team traveled to Stuttgart in September: with a very promising project idea and a good dose of self-confidence, although several of the team members were quite nervous that morning, primarily because they had never presented the project to this kind of audience before. Once the group was on site in Stuttgart and they had their stand set up, they found the enthusiasm and energy from the other groups presenting projects infectious. "It was a great experience and I think we were all able to take away a lot from being there," said one of the team members. The team from Friedrich Wöhler High School was particularly impressed by the interest and appreciation shown by visitors to the stand – people from the worlds of science, business, and politics were genuinely interested in the information shared at the event.

The next step of the project will be to conduct tests on the prepared bike frames. One interesting question will be how bikes made of renewable

Thomas Kilian is a teacher at Friedrich Wöhler High School in Singen and he supervises the school projects carried out at the student engineers academy (SIA), an alliance involving the school, universities, and businesses, and initiated by the Südwestmetall association. The aim is to awaken an interest for science and engineering at the senior high school level and to give these students the right setting to get to know the field of engineering.

Horst Scheu is the director of the Steinbeis Transfer Center for Science Technology Education. Projects at the Steinbeis Enterprise focus on collaboration between school and science, career planning, motivating young people to get interested in technical topics, investigating technical career fields, the manufacturing of products, planning and conducting project work and internships, dovetailing school activities organized through companies with the curriculum, as well as school development.

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## „You have to arouse children’s curiosity extremely early“

**An interview with Professor Dr. Heinz Trasch, director of the Steinbeis Transfer Center Science, Technology & Economy**

Professor Dr. Heinz Trasch talked to TRANSFER magazine about curiosity in children and how adults can support them. He also told us more about his experiences with the young founders contest “Jugend gründet” and how important such competitions are for the future work of young adults.

**Hello, Professor Trasch – let’s think about the future, but also business and science. It lies in the hands of young people. The task of the older generation is to prepare them for it. Which techniques do you feel work best in this regard and where is there still room for improvement?**

That’s quite a broad question but I’d like to answer it by going into detail. I’m absolutely convinced that you have to arouse children’s curiosity extremely early, because curiosity is one of the driving forces behind new insights. To do this, things and processes have to be questioned in a way that matches the age of the child and you have to root out explanations together. The best place for this is in the family and it should be closely supported by kindergartens, in primary schools and in secondary schools. It’s important to pay close attention to applying what has been learned and to how the different specialist disciplines work together. Knowledge should be seen as a raw material. It only becomes valuable if it’s used properly and applied in the right way. A good way to demonstrate this is to give individuals, or teams or working groups a task to work on as a supervised project. Teamwork in such projects bolsters personal qualities, fosters talent, and strengthens team-playing skills – which in many cases will be absolutely crucial later on in careers. For the tasks that have been set during the project to succeed, you need support from moderators, who don’t just help get things off the ground by outlining the project, but also work alongside as an integrated team member or supervisor, providing tips on how to solve the problem. The people who moderate in this way should be an enthusiastic member of the family, a teacher, or an instructor, because this will certainly have an impact on careers people choose later in life. If you ask me, there are not enough of these kinds of people doing this sort of work out of selflessness, so there’s a lot of room for improvement. One organization approaching this in a really effective way is the Steinbeis Innovation Center for Business Development at Pforzheim University, with its na-

tional online “Jugend gründet” contest. School leavers and apprentices get to develop a business concept they’re interested in with the support of a specialist teacher or instructor. They then have to implement the idea virtually like actual entrepreneurs in a team. It’s a simulated competition but they have to present their idea to a panel of judges and the aim is to inspire investors to back their idea. Because it’s organized as a competition, the teams that enter “Jugend gründet” also learn that not every business concept is a success. Some of the competitors have decided to set up a business after completing their training and this shows that the concept is headed in the right direction. I don’t think we have anywhere near enough methods like this – ways to prepare young people for a career. There’s another project being conducted at the moment to prepare students in the senior grades for work. It was initiated by a medium-sized company called Heinrich Schmid from Reutlingen. Students do vocational training during their last year of high school as part of a combined program. The practical part of their training takes place at the company. People on the project can do an apprenticeship exam in a manual trade six months after finishing high school. The project has been named *Duales Gymnasium* (“Dual High School”) and it just started this year at the Firstwald High School in Kusterdingen.

**You’ve been a judge for the “Jugend gründet” contest since 2004. It’s an online contest for students and apprentices from the whole of Germany. What piqued your interest in the project at the time and why are you still so interested in it?**

As I said, competitions like this are the best possible preparation for a career later on in life and sometimes even for setting up a business. I’ve been enthusiastic about the idea since it got off the ground. We’ve been sponsoring the first prize for the competition since my earlier jobs at Steinbeis. When they present to the judges and you talk to the teams face-to-face, you notice relatively quickly who will go into science or

engineering later on, or maybe into business management after all. The teams start to adopt their own structure in the same way you find them in business. Most of the jobs they adopt lean towards the individual participants. It's precisely this insight that underscores my feeling that the "Jugend gründet" team elected to go in the right direction. This is also reflected by the growing number of participants.

**What do you think the competition is capable of in terms of preparing young people for a future career? What do they get out of it?**

We know from the past that some of the people who enter the competition take an interesting idea and go on to set up their own small business after high school or university. From our discussions with past entrants we've discovered that it was a conscious step because they could build on the things they'd already experienced while taking part in "Jugend gründet". A number of people mentioned that the road to setting up a business no longer seemed so difficult because they'd already practiced writing a business plan, and the conversations with the moderators and the judges had already taught them how to think a business through to completion – and, if necessary, transfer this to other areas. Even if the company didn't work and had to be wound down, the young entrepreneurs didn't see it as a personal failure, instead they re-examined their business concepts, made a few changes, or started out again with another idea. But not everyone who took part in the competition set up their own business. The vast majority gained their first work experience at all sorts of companies. The competition helped them when it came to selecting a profession. The decisions made by the participants to study something scientific, technical, or business-related was often influenced by the preparations they made for the virtual startup and the role-play in the team presentation.

**As a member of the jury, you have direct contact to the team members. How do the young adults benefit from your business experience? And also, what have you learned from them?**

All of the judges bring their own professional experience on board for this competition. This is partly to assess the business concept, the product, the service, or the presentations the teams make, but they also have to give each of the teams feedback, or praise, or even constructive criticism. The feedback rounds are a fixed part of the interim finals and the national final. It's a mixed jury and the judges can share their personal impressions directly with the teams if they want to and highlight any other ways to apply the business concept. They also talk to them about their presentation skills. Every now and again, individual team members have to be singled out for a discussion about their self-confidence. So it's not just the product or service presentations that are talked about, but also the way and manner in which they present. Usually this evolves into a fascinating discussion, which thrives off the questions the team members pose to the judges. The more time you spend as a judge in the intermediate stages and the finals, the better you get to know the individual members of the team and understand their abilities, which can also be hugely beneficial when it comes to giving feedback to the teams or discussions with any of the young individuals. Something that still surprises me time and again is how interesting the ideas are that the teams present during the competition.

**You must have seen some fascinating projects as a member of the jury. Which ones left you with a lasting impression, and why?**

I've been a member of the jury for the competition since 2004, so I've seen lots of interesting projects. They fall into a number of different categories and they often unveil ways to solve all the sorts of little or big problems you encounter every day. Areas that keep coming up in the projects and services include power generation, healthcare, security, nutrition, lifestyle products, but often also systems based on electronic technology – new apps, for solving or simplifying chores or simply making life more pleasant. Out of the many different ways to generate power, piezoelectricity often comes up as an energy source in healthcare and safety, and the target group is usually people affected by some sort of handicap. With nutrition, there are new products like insect meals, but then there are also services that help users with ordering or buying, or lifestyle products that help with a whole variety of leisure activities or hobbies. Actually I don't want to go into individual products or services because I'm surprised again and again at how varied the projects are in the competition. The contest is expanding continuously from one year to the next. The teachers and trainers play a really important role, acting as initiators, sparring partners, or moderators. But I still believe the competition is more about the journey than the destination, so not the project itself. Spending time thinking about setting up a business is what it's really about, even if a number of successful projects we had in the competition have already been registered as an industrial design or patent.

Image: © Sergey Nivens – Fotolia.com



Professor Dr. Heinz Trasch was Chairman of the Steinbeis Foundation Board from 2004 until 2012. He is now director of the Steinbeis Transfer Center for Science, Technology & Economy. His Steinbeis Enterprise offers clients advice on actual business development, knowledge and technology sharing systems, the evaluation of innovation systems and innovative products, expert statements regarding technology trends, and specialist reports.



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## Logistics – Green Shoots in the Economy

### Education in sustainable business development – knowledge and not just action

Progress and change are important waypoints when it comes to the future of shipping services and logistics services. To remain competitive in a market suffering from increasingly tight margins, a key prerequisite for the companies in this industry, and those in the loading segment, is that they have good solutions – ones that are holistic, sustainable, and pave the way for the future. But it is not enough to just think about these solutions, as the Steinbeis Innovation Center for Logistics and Sustainability (SLN) knows all too well. SLN has focused its sights clearly on training for up-and-coming specialists.

The logistics industry is now one of the most important sectors of the economy in the Federal Republic of Germany, second only in economic terms to the automotive industry and health care. Given this, and especially considering how this industry operates in terms of energy efficiency and sustainability, it is clear there is still some work to be done in getting people to think and act sustainably. Against the backdrop of climate change and globalization, it is crucial that energy efficiency and sustainability are given greater priority, especially considering how much real thought is put into these topics in the transportation and logistics industry at the moment. Sustainable thinking should become an established part of business practice in the future; it should be valued and perceived as a matter of course. It will be particularly important for energy efficiency and sustainability to be conveyed to different people in the market in such a way that they not only understand why it's

important, but are also motivated to do something about it. The transportation and logistics sector is dominated by small and medium-sized enterprises, and although they do increasingly think about the environment, in many cases they only do this to meet their customers' requirements. The term commonly used in Germany is "green logistics," even if there is still no widely agreed definition of what that actually means. To make sustainability and energy efficiency a central aspect of business, there are of course also broader issues to consider. So a holistic approach to establishing sustainability and energy efficiency in companies is needed in order to involve and sensitize key players within the business – from apprentices to senior managers. To do this, one needs the right training options. Well-educated specialists are a key asset for any business. Course syllabuses for training to become a specialist in shipping and logistics services do now make reference to the environment,



ecology and environment management, but they make scant reference to how this should be actually delivered through training.

"Things are still the way they used to be in that there is still tremendous potential to move things forward by involving young people in the topics of energy efficiency and sustainability. The first step is to pique their interest and then they need ongoing support," explains Jens-Jochen Roth, director of the Steinbeis Innovation Center for Logistics and Sustainability (SLN) in Sinsheim. "Another important aspect in this respect is that managers-to-be are typically taken on by the companies they did their training with, so they can be sure that the knowledge they acquire can also be used at the company. This is particularly beneficial to the companies."

Action plans have been drafted by the Steinbeis Innovation Center for Logistics and Sustainability based on a holistic approach with the aim of providing schoolchildren, young people, and apprentices the prospect of training in sustainable development, simultaneously fostering an understanding for the issue. Typically this involves a hands-on, live project. Companies in the transportation and logistics industry have been in-

involved in and committed to these projects for several years, as have a number of secondary and vocational schools. The key idea with practical projects is the fundamental motivation to "turn affected parties into involved parties."

Drawing on a variety of training techniques, the aim is to address the specific requirements of those involved. Steinbeis applies a model it calls service learning, which basically allows people to learn through involvement. It is a technique of teaching and learning that is also used with schoolchildren on social projects, bridging gaps between acquiring knowledge and actual involvement. As a result, it is increasingly important to apply the teaching concept away from the classroom. As such, the emphasis is laid on "turning actions into knowledge." Offering a variety of innovative training methods is central to the practical nature of the education projects at SLN. Choosing different approaches to training does justice to the educational expectations not only of the companies, but also those receiving the actual training on sustainable development.

The Steinbeis Innovation Center for Logistics and Sustainability has already completed a variety of successful training programs. On each run of the program, the projects underscored that training on sustainable business development is an important building block for successful and innovative business, not just for those being educated but also for the companies.

Image: An outing to a biomass heating plant in Sinsheim



Jens-Jochen Roth is director of the Steinbeis Innovation Center for Logistics and Sustainability (SLN) in Sinsheim. His Steinbeis Enterprise draws on the specialist know-how of its employees to offer professional assessments and develop made-to-measure solutions to the logistical challenges faced by businesses. The focus lies in companies themselves, with which sustainable concepts are developed in partnership and specific ideas are implemented.



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## „The task of the older generation is to act as motivators or facilitators“

**An interview with Professor Dr. Carsten H. Hahn, director of the Steinbeis Transfer Center for Innovation Engineering & Entrepreneurship // i2e, a professor at Karlsruhe University of Applied Sciences, and an employee of SAP**

Professor Dr. Carsten H. Hahn talks about the tasks that should be fulfilled by the older generation in order to help young people implement their ideas. He also discusses a method used in teaching called 'action learning' and asks what universities should be doing to prepare students for their future careers.

**Hello, Professor Hahn. Your students at Karlsruhe University of Applied Sciences helped a team of school students called CreaBotic to develop a business model for its robot, which was designed to remove plastic litter from the beach. How did they first come together?**

CreaBotic is a project team from a city called Neustadt an der Weinstrasse. It won the German heats of the World Robot Olympiad earlier this year. SAP is one of the main sponsors of the World Robot Olympiad and it offers the groups mentoring from its employees. So I was asked to look after the CreaBotic team. I knew as soon as I started talking to the group and meeting with them that this was no typical "lead user" scenario. Lead user is an innovation term developed by Eric von Hippel at Massachusetts Institute of Technology (MIT) to describe the innovation process for identifying novel products. You sometimes come across inventors who adapt things into new products for their own ends. The highest profile example of a lead user innovation is the mountain bike, that wasn't even invented by bike companies but was dreamed up by individualists instead, who converted normal street bikes into vehicles for off-road use.

I could see the potential in the CreaBotic robot, but I could also see some work was still needed on the business model. How would an innovation like this be marketed? So I asked the students in the business science department to set up a design thinking workshop with the

team from CreaBotic and pull in a few other experts. The outcome is sure to help the team put up a good fight at the world finals of the World Robot Olympiad in Delhi at the end of November, and maybe even win.

**Young people are certainly not short of ideas, as we know from the competitions for young people at school, "Jugend forscht" (young researchers) and "Jugend gründet" (young founders). The question is, what's being done by the older generation to support young people so they succeed with implementation?**

Basically the task of the older generation is to act as motivators or facilitators. What I mean by this is that the younger generation is rarely in a position to grasp the initiative themselves. Again, CreaBotic is a perfect example of this. Sergei Buragin is a highly ambitious teacher in Neustadt and he took on this task. It's thanks to him that the group keeps getting spurred on by new ideas, making such inventions as the robot happen by working together over many long hours. Incidentally, this team has already been involved in similar initiatives in the past. It already had its own exhibition booth at gamescom, the unique international trade show for games in Cologne.

**You integrate a method called action learning into your teaching at Karlsruhe University of Applied Sciences. How does this benefit the students?**



My lecturing has often involved visits to MIT in Cambridge (Massachusetts), where I've run so-called hackathons with the MBA students at the Sloan School of Management – by the way, that's the origin of the word hacker. Hackathons are used as an instrument for teams to tackle a particular challenge, which they have to solve quickly, usually within two or three days. It's not uncommon for them to work on the hackathon day and night. It's important to MIT that the task the students work on is actually based on a real business scenario. MIT calls this approach action learning. It's a method that allows students to learn from real issues as they solve them. It's also an approach I'd like to establish at Karlsruhe University of Applied Sciences, though I'd like to go one step further, so that we're not just pulling in real problems from business. I'd like to teach the students entrepreneurship by involving them in a startup situation. It would allow them to work on holistic, new, innovative business models with people from SMEs, based on research findings.

We successfully submitted the idea in response to a request for proposals issued by the Ministry for Science and the Arts in Stuttgart. We'll now be provided with resources to go toward staff and facilities over the next three years so that we can establish the action learning method on an interdisciplinary level. So it'll span different departments at the university. One thing worth highlighting is that we're already involved in highly constructive talks with Steinbeis on ways for the Steinbeis House in Karlsruhe to provide support in the form of co-working space. The project will run for three years and the aim is to bring SMEs on board after the funding period so that the method can be kept going in the long term.

**One of the jobs of universities is to ensure young people are in good shape for the future. What methods do you think work best**

### **in doing this and what challenges do we face, given the current backdrop of digitalization?**

The first thing I have to say is that the young people I've got to know during my time at the university have tremendous creative potential. But even then it's essential to tap into this potential. The way I see it, creativity is one of the most important characteristics of entrepreneurial undertaking. So we have to use techniques that play to this potential. Ten years ago, my work with SAP allowed me to get to know a method from Silicon Valley. Our founder, Hasso Plattner, discovered a method called design thinking, which is how Apple goes about product development for famous products like the iPhone and iPad. He adapted it to the world of software and brought it back to Europe. Design thinking has become established as a creative technique in research and business in recent years and it's not just used for products and software, it can also be applied to processes and strategies. We haven't just got the design thinking method working as part of the curriculum at the university, we've also redeveloped it and are using it to come up with innovative business models. The response from the students has been highly positive. Digital technology is a challenge to all creative millennials to exploit their full potential. This is a generation that has grown up with digital media, so it has a completely different take on digital solutions. By bringing this together with the creative technique of design thinking, we can train outstanding new resources for future employers, especially SMEs.

Image: © Prof. Dr. Carsten H. Hahn



**Professor Dr. Carsten H. Hahn** is a professor at Karlsruhe University of Applied Sciences, an employee of SAP SE, and director of the Steinbeis Transfer Center for Innovation Engineering & Entrepreneurship // i2e. The Steinbeis Enterprise mainly works in the areas of methods and solutions that boost innovation at companies, the impact of new technologies on business models, and platforms for technology- and data-driven innovation and eco-systems.



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## Light is so Illuminating!

### Children and adolescents get to know a key technology: photonics

Why is the sky blue? Why do people have shadows? Children and young adults are being given a chance to explore the answers to these and many other questions as part of an EU Outreach project called Photonics4All. The idea is to get to know the fascinating world of light. Steinbeis-Europa-Zentrum (SEZ) and project partners from nine countries have been organizing children's universities in Baden-Württemberg, Austria, Sweden, and the UK.

Photonics are considered one of the most important new industries of the future and is a key technology in Europe. To make the technical uses of light more accessible to a broader audience – especially children, young adults, startups, and SMEs – an alliance has been formed as part of an EU project called Photonics4All under the patronage of SEZ. The project spans 10 partner organizations in nine European countries. The partners in Germany are OptecNet Germany and Photonics Baden-Württemberg. To add appeal to the technological capabilities of photonics for the younger audience, the project teams wrote a quiz, shot a video, and created an app.

The video was produced especially for the target group of children and adolescents to pique their curiosity and raise interest. 2015 was the International Year of Light and SEZ and its partners were already involved in a variety of events revolving around the topic, also organizing special activities such as two children's universities, the first ever "Photonics Boot Camp" in Vienna, and an exhibition at the 2015 ICT Convention in Lisbon. A first photonics science slam was attended by around 100 young adults at the Baden-Württemberg Foundation in Stuttgart. Further science slams were also organized as national events by the project partner OptecNet Germany, one of its members Photonik BW, and the Baden-Württemberg Foundation. In January 2016, a quiz was launched, plus an app that leads children and young people through the world of light. The Photonics Explorer toolkit of EYEST vzw was used at six different children's universities in four countries as well as in 35 teacher training workshops. The target group of the toolkits was children aged between 7 and 15.

In the summer of 2015, some 250 children attended the children's university at Karlsruhe Institute of Technology (KIT). During the event, they learned about the origins of light and the theory behind light, also discovering how to measure light, how to make your own spectrometer, how people perceive colors, and how shadows are created. SEZ helped organize the children's university in Karlsruhe for a second time in August 2016, staging a two-day photonic booth at the event that again turned the spotlight on light technology. Apart from showing children how to make a "spectrometer to go," there was also a chance to see a Galileo telescope, make optical gratings, and participate in experiments into light transmission, the speed of light, and light filtering. More children's universities were organized in Austria in 2015 and 2016, and they also took place in Sweden and the UK in 2016. In England, a campaign was launched in Southampton with the support of 30 schools to coincide

with the International Year of Light. This allowed entire classes to get involved in experiments. In total, about 3,800 children took part in Photonics4All children's university. There were also 35 one-day training sessions for teachers in the UK, Italy, the Netherlands, Austria, and Slovakia, with the aim of heightening awareness for photonics. Participants were made familiar with the teaching materials and provided with plenty of inspiration for their own lessons.

The results of an evaluation of all events and activities were interesting. A variety of respondents were questioned about the things they had learned, what was new to them, and how they felt about topics like physics and science. It was found that experiments and workshops had made people feel more positive about physics and photonics. When asked, "Would you recommend to your child/a friend that they study physics?" after attending an event, respondents were significantly more likely to answer "Yes." The project and the public activities were thus considered an all-round success!

**Image:** Children experimenting with the properties of light at a children's university in Karlsruhe in 2016.



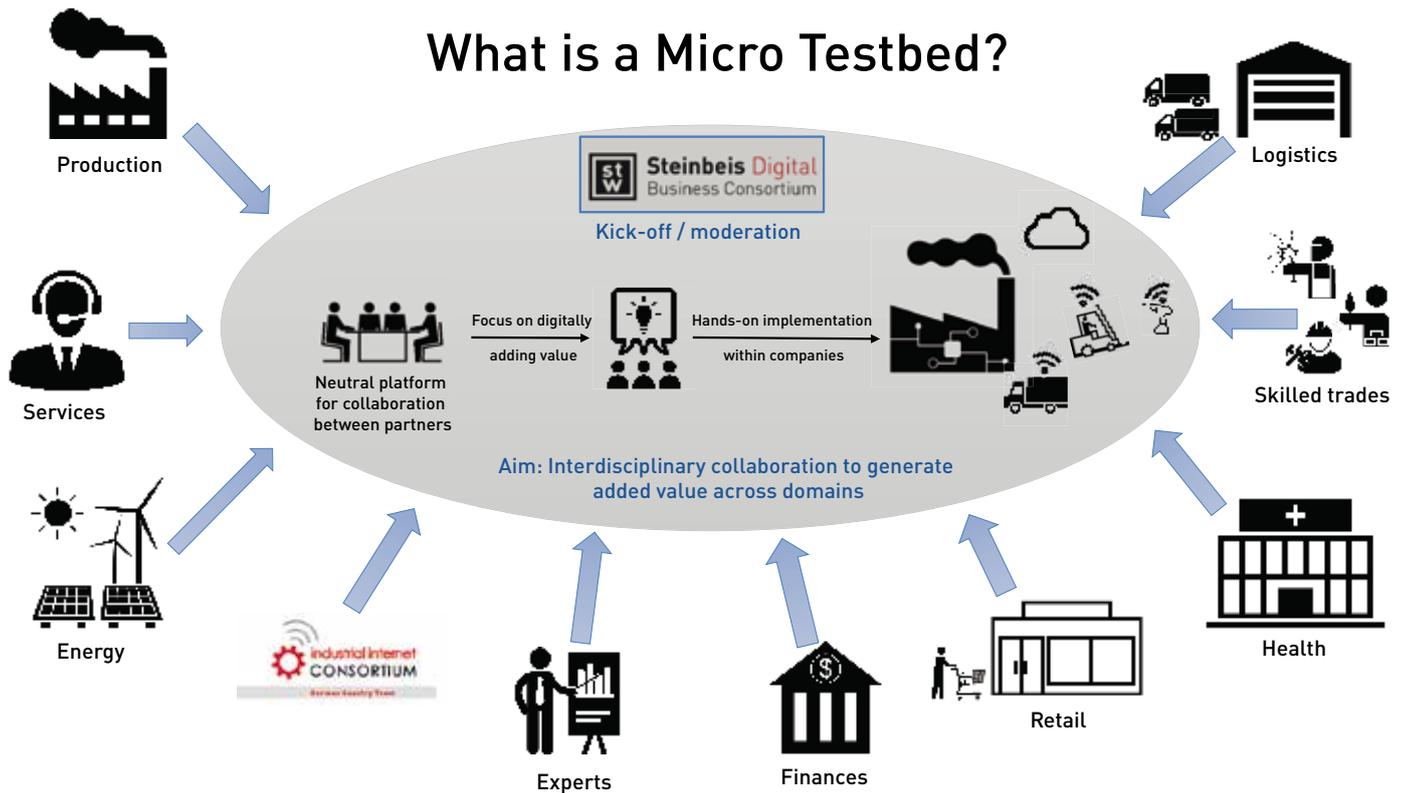
Anette Mack is senior manager of public relations at Steinbeis-Europa-Zentrum (SEZ) in Stuttgart. SEZ is a Steinbeis Enterprise that was founded in 1990 with the remit of paving the way for small and medium-sized enterprises to approach authorities in Brussels and thus make it easier to apply for EU research funding. A member of the Steinbeis Network and a partner

in the Enterprise Europe Network, the SEZ builds bridges across Europe to support companies, research bodies, universities, politicians, and public administrators.



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## What is a Micro Testbed?



## Just Test<sub>(bed)</sub> IT: Successfully Creating Added Value

### Steinbeis Engineering Day 2017

Testbeds are the industry term for experimental platforms where companies from different sectors can work together to add value and network in a way that has never been seen before. Based on this concept, Steinbeis has developed a format for small and medium-sized enterprises (SMEs), particularly those involved in retail, the manual trades, and manufacturing business: Micro Testbeds. The 4th Steinbeis Engineering Day will ask how they can be successfully introduced in practice. The event is scheduled for April 5, 2017 and will be held at the Haus der Wirtschaft (house of commerce) in Stuttgart.

Internet based networking and platform-oriented ecosystems are already massively changing classic value chain structures. We're seeing established borders between sectors of industry break down. On the one hand, this grants new market participants entry to established sectors. On the other, it opens up great opportunities, particularly for SMEs, allowing them to participate in value creation in new market segments. As a result, testbeds arose on the international stage, allowing companies to work across sectors in collaborative partnerships. These have allowed them to experiment on value chain scenarios together in real company environments in ways that were previously not possible. The result: interdisciplinary collaboration, drawing on existing technology to create new products and services with a bearing on digitalization and networking. These testbeds have worked very well in industrial contexts – but they are geared toward the conditions encountered in large companies. Adjustments have to be made for SMEs, especially to take into account SME success factors, as well as the things that sometimes limit them. The Micro Testbeds take these criteria into account, forming the basis of the first initiatives.

The Ferdinand Steinbeis Institute and the Steinbeis Digital Business Consortium will present the methods followed for the Micro Testbeds at

the 2017 Steinbeis Engineering Day. To do this, they will showcase actual examples from practice. The aim is to give the audience the chance to join a Micro Testbed and thus get actively involved in digitalization and networking.

Image: © FSTI 2016

For further information and to register online, please visit: [www.steinbeis-engineering-tag.de](http://www.steinbeis-engineering-tag.de).



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## How American Startups Motivate Others to Start their own Company

### The winning team of Jugend gründet travels to Silicon Valley

Intense discussions about founding a business and the risks and opportunities startups face were a big part of the latest Steinbeis-sponsored trip to Silicon Valley. The winning team of the "Jugend gründet" competition traveled to the US at the end of October. Caroline Vandersee, Simon Baro, Adrian Feisst, Leonard Jöst, Jonas Madlinger, and Jeremia Schmitt from Achern High School won the trip as the grand prize of the national "Jugend gründet" 2015/16 contest – a competition organized by the Steinbeis Innovation Center for Business Development at Pforzheim University. The group developed a tent called *IndepenTent* for their fictitious company *Colorgy*. The tent is equipped with embedded dyed cells, which generate power, making it an independent energy supplier.

In Silicon Valley, the young team of founders were accompanied by contest juror Prof. Dr. Nils Högsdal and teacher Wolfram Ehm and got the chance to meet a string of startups, giving them substantial insights into the startup scene there. It was quite impressive, especially considering no other place in the world is home to so many startup companies. Many of them – like Google and Facebook – have even become global giants.

In the meetings, startup founders like Björn Herrmann – winner of the "Jugend gründet" competition from 2005 – had a chance to elucidate the path they took in founding their business. Herrmann emphasized how much the contest motivated him to become an entrepreneur, laying the foundation stone for his journey as a business founder. Another key point the startup founders told the high school students was that failure is all part of the experience. "But it's no reason to give up. It should be just the motivation you need to try again," the founders summarized in unison. All of them founded further startups with new ideas, with which they have become successful today. The group from Achern also discov-

ered that the conditions in Silicon Valley are highly advantageous for startups. They get support from investors and it is extremely useful having access to facilities like the Plug And Play Techcenter. The center makes office space available to founders at preferential rates and facilitates access to investors or business partners. Numerous German companies also use this platform to contact American startups. Founder and startup mentor Oliver Hanisch spelled out the ecosystem that is Silicon Valley: This isn't just a place with lots of startups, it's more about a specific mindset here. Many young people come here hoping to find success as entrepreneurs. The decisive factors here are speed and being open to continually re-evaluate one's own ideas. It is also customary for those who have made it in business to channel something back to those who are just setting out – be it in the shape of consulting or capital. Competition is seen here as more of a challenge than a threat.

All of the people who talked to the *Colorgy* team were very interested in the business concept devised by the "Jugend gründet" winners. This en-



couraged them to keep working on the idea. Of course the fringe events of the one-week trip to the US were also exciting and gave the travelers plenty of insights into the economy and history of California. At the Volkswagen Design Center, the group discovered interesting background information on the development and design of a car. They also had the chance to see driverless Google cars in actual traffic. During their visit to the Google campus, it became clear to them how what was once a startup grew to become a global titan. At the Intel museum, the students saw the historical development of the processor. A tour through Stanford University showed them the course programs on offer. It was pointed out that many startups grew out of university projects. The Institute of Design at Stanford plays an important role in this respect. It was established by SAP founder, Hasso Plattner, and the team got to swing by for a visit.

Of course the group also went to San Francisco where they enjoyed a ride on the famous cable cars, visited the prison island of Alcatraz, and got to ride across the Golden Gate Bridge. On their way down to Los Angeles, the group toured Hearst Castle, the former private residence of media mogul William Hearst, who was the first to start so-called yellow journalism back in the early 20th century. Visits to the beaches in Malibu and Santa Monica and a stroll down the Walk of Fame rounded off what was an eventful week, but the students learned and experienced so much.



For more information about this trip visit the team VLOG:  
[https://www.youtube.com/watch?v=tf0GleD\\_ql](https://www.youtube.com/watch?v=tf0GleD_ql)



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## Steinbeis Day 2016: Young People with New Ideas Offering Plenty of Potential

**Steinbeis forum brings students, apprentices, “Steinbeisers,” and the business community together at its interactive forum.**

“Without Alexander Graham Bell there’d be no microphones. Without Paul Gottlieb Nipkow there’d be no TV. Without Ferdinand von Steinbeis...” Moderator Marcel Wagner painted a memorable picture of the central topic at this year’s Steinbeis Day: Take people with ideas or people who make ideas happen and bring them together as early as possible. A number of student teams joined in the action at the Steinbeis House for Management and Technology (in the Stuttgart district of Plieningen). Their goal: to present their inventive ideas, concepts that had already attracted attention in youth startup contests like “Jugend gründet” or the Artur Fischer Inventor Award. Around 500 visitors joined them to listen and talk to the young entrepreneurs and inventors.

There was plenty happening at the Steinbeis Day this year in the Steinbeis House for Management and Technology. Twelve young teams came from all corners of Germany to present their ideas, leaving the classroom for a day to savor the atmosphere of real business and entrepreneurship. One thing they all demonstrated is that their technical concepts have passion running through every wire. The same applies to their potential startups, which the students have been working on – through a number of virtual ups and downs – for the entire school year as part of the national “Jugend gründet” contest. The audience got to hear what drives this commitment at a Steinbeis forum called “Early Birds – Enthusiasm is a Reality. Young Ideas with Plenty of Potential.” The discussion was set up as an interactive, multimedia event that spanned the generations. It was moderated by Tina Kraus, Marcel Wagner, and Dr. Marlene Gottwald. The event took place on all floors of the Steinbeis building to allow guests, young and more experienced, to come at topics from different angles – from creative ideas and promoting creativity in business and politics to the role of technology and visions of the future. Two school

teams from Baden-Württemberg also joined the session live via Skype from Schubart High School in Aalen and Spaichingen High School.

The creativity and diversity of the ideas thought up by the young teams were as inspiring to the participants of the discussion sessions as they were to the audience. Just one example of the potential held by young inventors’ ideas was shown to the forum by Yannick Teubert. A former student at Fürstenberg High School in Donaueschingen and a contestant for the Artur Fischer Inventor Award, Teubert has been conducting experiments with his classmates and his project partner David Ohnmacht on a vertical wind turbine, or as they call it: the Savonius Rotor. Using evolved algorithms, the inventors have developed a variation on standard blade shapes that is now capable of improving efficiency by between 20 and 60% compared to current technology. Both project partners were at the event with their idea and it wasn’t long before they were talking with the experts. There was also a treasure trove of ideas on display from the other exhibitors, for example: the Securi SOS wristband from YourHelp, which combines the functions of a fitness wearable and a distress wristband.



When asked which support makes sense for young inventors and entrepreneurs, and what can be done to improve how ideas are backed, just like the students, the representatives of industry, science, and politics outlined some specific ideas in the discussion forum. Yannick Teubert and Moritz Wetzel underscored how valuable the support was for their school, as well as being given enough creative freedom. Wetzel is a student at Spaichingen High School and won the Artur Fischer Inventor Award in 2015. He invented a warning system for cars driving on the wrong side of the highway. Not only does it make drivers aware of their mistake, it also warns other drivers, the police, and radio stations. According to Moritz, another important aspect for subsequent entrepreneurship was working alliances with respect to research and invention. Working with others provides students with ways to realize their own ideas, simultaneously promoting social skills. Moritz works for his parents' firm as a junior production engineer in energy and building technology. There was another point that came across strongly when technology enthusiasts at schools joined the session via Skype. The high schools in Aalen and Spaichingen presented projects they are working on, showing that when committed students and teachers work beyond the scope of normal school days, they provide a backbone for young researchers to pursue their ideas and not lose their curiosity for research. The businessman Claus Paal, president of the chamber of commerce (IHK) and member of both the regional state parliament of Baden-Württemberg and the Steinbeis Board of Trustees, described exchange with the up-and-coming generation as extremely important.





However, to encourage young people to implement their ideas, a "culture of failure" is also necessary. "If people enter into a risk for society, they must be granted permission for the idea to fail," demanded Paal. In return, he is doing what he can to improve the conditions encountered by young entrepreneurs and inventors by setting up networks of business founders. These should also include managers experienced with sharing ideas to work alongside the next generation.

Prof. Dr. Carsten H. Hahn, director of the Steinbeis Transfer Center for Innovation Engineering & Entrepreneurship // i2e and a professor at Karlsruhe University of Applied Sciences, talked about a kind of mentoring program for young people and students, which is supported by the IT company SAP. As part of the World Robot Olympiad, the company supports and sponsors teams with its own know-how. One example is the winner of the German final, a team called CreaBotic with a robot named Beach Cleaner Noo-Noo that picks up plastic on the beach and in shallow water. The team impressed the audience with a prototype that gave a live demonstration at the Steinbeis Day. According to Prof. Hahn, it's extremely important to "think network" when developing products. An idea can often provide inspiration for something else and evolve, especially if other people come on board with the right complementary skills. Hahn called for international networks to be set up that span different institutions in order to promote young people with their creative ideas.

Prof. Dr. Barbara Burkhardt-Reich, director of the Steinbeis Transfer Center for Business Development at Pforzheim University, not only believes that the state government should provide more support to the national "Jugend gründet" contest, she also called for teacher training to be introduced to integrate "Jugend gründet" into the school curriculum. Burkhardt-Reich said the onus is on companies and politicians to enter into more serious discussion with young people and that they should ask them about issues relating to the future. Representing the team that won this year's "Jugend gründet", Caroline Vandersee, a student at Achern High School, showed how her team has developed a tent that provides accommodation on vacation and supplies electricity in one. The team's two-man tent fits into a backpack and uses dye cells to produce electricity for personal use. The winners are now reaping the reward not just for their idea, but also for the successful way they managed their startup over the last year. The students were taken on a trip to Silicon Valley during their fall break. The visit was sponsored by Steinbeis (see report on p16-17). The creative teams in the "Jugend gründet" contest are a mirror to the zeitgeist of tomorrow, according to Burkhardt-Reich: "You'll be surprised by the solutions they come up with!" As far as the next generation is concerned, however, dialogue between old and young is often a bit complicated. Yannick Teubert explained that, in his experience, businesspeople are mostly (too) convinced of their own opinion and tend to stymie fresh or new ideas. Eleftherios Hatzioannou, founder and manager of smoope GmbH, reassured the young generation that such opinions should be absorbed but this should not unsettle them with their intentions and they should not give up.



Hatzioannou said that his wish for the future would be that Germany become a land of inventive geeks and go-getters. For this to happen, younger people's curiosity has to be aroused while they're still at school and mentoring programs could bring young people together with established companies. For an idea to succeed, the experience of the older generations is worth its weight in gold. Claus Paal added that it's important to show the younger generations that taking risks and inventing things is worth it and will be rewarded by society. According to Carsten H. Hahn, existing ideas should not only be moved forward, different stakeholders need to be brought together, especially with new ideas at SMEs, in order to create something different.

The young inventors and entrepreneurs also had strong visions for the future. Moritz Wetzel said he would like big companies to approach more young inventors and help them work on their ideas. Moritz Brenner suggested that more information sharing events be organized, saying that working groups at schools should be supported and more should be done to gain broader acceptance in society when things fail. It was clear from the products and business models that were presented by the young people involved in the discussion that they are already pointing to the way forward. They all proved that their ideas have a contribution to make to the advancement of society. The fact that it's worth supporting these ideas was summarized succinctly by the moderator of the forum: "You're never too young to have a good idea and you're never too old to help young people with an idea!"

### Speakers at the Steinbeis Forum

- **Moritz Brenner**  
Production Engineer for Energy and Building Technology  
Brenner GmbH
- **Prof. Dr. Barbara Burkhardt-Reich**  
Director of the Steinbeis Transfer Center Business Development  
University of Pforzheim
- **Prof. Dr. Carsten H. Hahn**  
Professor at Karlsruhe University of Applied Sciences  
Director of the Steinbeis Transfer Center Innovation Engineering  
& Entrepreneurship // i2e
- **Eleftherios Hatzioannou**  
Manager, smoope GmbH
- **Claus Paal, MdL**  
Entrepreneur, Economic Policy Spokesman of the Baden-Württemberg CDU parliamentary group
- **Yannick Teubert**  
Competitor for the Artur Fischer Inventor Award 2015  
Former student at Fürstenberg High School, Donaueschingen
- **Caroline Vandersee**  
Winner of the nationwide final of "Jugend gründet" 2016  
Student at Achern High School
- **Moritz Wetzel**  
Winner of the Artur Fischer Inventor Award 2015  
Student at Spaichingen High School

### Schools connected through live video link

- Schubart High School, Aalen
- Spaichingen High School

### Moderators

- **Tina Kraus**  
SWR
- **Marcel Wagner**  
BR, hr, n-tv
- **Dr. Marlene Gottwald**  
Steinbeis

To view German excerpts from the Steinbeis Forum and see how the day went, go to [www.steinbeis-tag.de](http://www.steinbeis-tag.de) and click on the Media Library. New date for next year's schedule: Steinbeis Day 2017 will take place on Friday, September 29, 2017.



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### A closer look at coatings

When the shine wears off: Do expensive bike finishes really withstand damage better than low-cost coatings? Lukas Dinkeldein, Florian Kornmaier, Jan Matrusch, Manuel Reichelt, Kim Marenski, and Alexander Bourk posed that question. The team of students from the student engineers academy (Schüler-Ingenieur-Akademie – SIA) at Friedrich Wöhler High School in Singen tested bike paints for wear resistance.

## An overview of our project teams



### Recycling for solar modules

Turning old into new: Jascha Mähler and Jonas Mötzing, students at the Blumensteinschule School (IGS) in Obersuhl, ran an enterprise called JM<sup>2</sup> Solar Panel Logistics Et Recycling offering recycling for worn-out solar modules. The allround service was offered for one year for the "Jugend gründet" contest.



### Solomat perfects sun protection

"Sollotion is your Solution" according to Michael Linke and Julian Bergmann (Dreieichschule School in Langen): Their "Jugend gründet" company sells Solomat, which determines the right sun protection factor (SPF) for sunbathers and sprays them down with the product – automatically avoiding the swimsuit.



### Warning system for drivers going the wrong way on roads

A small box with an amazing ability: Moritz Wetzel High School (Spai-chingen) has developed a system that doesn't just warn drivers when they have gone the wrong way down a highway, but also warns other drivers and the police and radio stations (traffic reports). The invention was awarded the Artur Fischer Inventor Award 2015.



### Mountain rescue 4.0: clever harnesses for rescue dogs

When mountain rescue is called for: Larissa Schnee and Lea Wenzel from Schubart High School in Aalen developed a harness for rescue dogs with an integrated data logging element and GPS component. It's an invaluable helper for mountain rescue and those who have had an accident in the mountains.

Technology.Transfer.Application. TRANSFER 04|2016



### Tent and energy supplier in one

Roll on vacation time: The "Jugend gründet" team Colorgy (Simon Baro, Leonard Jöst, Jeremia Schmitt, Jonas Madlinger, Caroline Vandersee, and Adrian Feisst from Achern High School) developed a tent for two that fits in a backpack and generates energy with embedded dyed cells. The jury was impressed with the idea: Colorgy took first place in the 2016 national finals!



### YourHelp – help when you need it most

Reliable help in an emergency: Feline Arndt, Sarah Friesen, Katrina Frost, and Roxane Dolff are in an apprentice team at Volkswagen in Wolfsburg. They worked with the company to develop a wristband for "Jugend gründet", which records the wearer's pulse and emits a signal if something seems irregular. If the wearer doesn't react, it places an emergency call and broadcasts GPS coordinates.



### CreaBotic puts up a fight against beach litter

A robot that rids beaches of litter: Florian Gilges (Nikolaus von Weis High School in Speyer) and Jan-David Johann (Leibniz High School in Neustadt an der Weinstrasse) presented a prototype for a hovercraft robot designed to collect and analyze various types of litter found on beaches.



### Energizing the race track

Flexing muscles to create power: A bike with a turbo trainer and a retrofitted crank flashlight drive the cars on a slot car track. The people behind the race track idea in its advanced stage are Max Augsten, Daniel Beck, Raphael Berauer, Marcel Braun, and Dominik Christiansen from the Ludwig Uhland School in Heimsheim. It was clear the idea has potential based on the recognition received as part of the Artur Fischer Inventor Award.



### Turnaround Candy: sophistication without a candy factory

Tom Niklas Pohlmann, Henri Dümpelmann, and Yannik Berndt developed a new generation of chewing gum at the Benediktiner High School in Meschede as part of the "Jugend gründet" competition: sustainable production and biodegradable, they make their gum without needing petroleum.



### A rotor for wind turbines

Survival of the fastest: David Ohnmacht and Yannick Teubert (former students at Fürstenberg High School in Donaueschingen) have developed a new shape for rotor blades based on evolutionary algorithms, which increases the effectiveness of conventional Savonius rotors by up to 60%. The development received an honor as part of the Artur Fischer Inventor Award.



### Vehicle with a view

A good grip on things: Nikolas Braun, Silvan Laidler, and Marla Laidler came up with the idea of a vehicle with a gripper arm and Mecanum wheels at the Max Planck High School in Heidenheim. It's controlled via Bluetooth and a smartphone app, allowing it to move forward and sideways without a turning radius.



## The 2016 Steinbeis Evening

### The Steinbeis Foundation Transfer Prize – Lohn Award – goes to Prof. Dipl.-Ing. Karl Schekulin

Whereas this year's Steinbeis Day revolved around the early bird ideas of the young generation at the Steinbeis House for Management and Technology, as is the tradition, the evening in Stuttgart's Liederhalle convention center formed the closing ceremony for the day, the highlight of which was the bestowal of the Lohn Award (the Steinbeis Foundation Transfer Award). The Steinbeis Foundation invited more than 500 guests to Stuttgart for the event.

The evening started with a different award. In times of global transformation, which often has a direct impact on business, loyalty to one and the same company for a long time is something of a rarity. All the more reason to thank colleagues and fellow employees who have now been working for the Steinbeis Network for 20 and in some cases 30 years. Members of the Steinbeis board Prof. Dr. Michael Auer and Manfred Mattulat personally thanked eleven of the more than 40 people celebrating a big anniversary with Steinbeis this year.

The Transfer Prize has been awarded since 2004 in recognition of outstanding projects and service in the field of competitive knowledge sharing and technology transfer. This year, Prof. Dipl.-Ing. Karl Schekulin, director of the Reutlingen-based Steinbeis Transfer Center for Pro-

cess Development, was recognized for his outstanding life-long contributions to knowledge sharing and technology transfer on behalf of the Steinbeis Network, and he was awarded a special prize under the transfer prize.

Karl Schekulin embarked on his career as an engineer in process development at Daimler-Benz in Stuttgart. After holding a number of positions in Germany and abroad, in 1977 he was appointed a professor for design theory at what was then FH Reutlingen (a university of applied science) and is now known simply as Reutlingen University. Shortly afterwards he started working on a part-time basis for Steinbeis, initially for the former technical consulting service TBD at FH Reutlingen before founding his own Steinbeis Transfer Center for Erosive Production Pro-



cesses in 1986 (now the Steinbeis Transfer Center for Process Development). Schekulin has developed a number of new production processes at his Steinbeis Transfer Center, spanning a variety of industrial applications. One example is the 5-axis CNC sink erosion method, which in the meantime has become standard practice throughout the world. Another is pulsed electrochemical reduction using timed direct current. Schekulin has worked intensively in the field of beam cutting with a particular focus on the development of innovative laser processing methods, such as dispersion, which can be used to introduce diamond and hard metal parts into unmelted surfaces. He has published numerous scientific papers, underscoring his thirst for innovation. What was often dismissed as fiddling around in the lab sometimes led to premium quality processed parts for the aerospace industry. In fact, aviation is also one of Schekulin's passions, so much so that he fulfilled his dream of getting his pilot's license and still flies regularly today. Even since retiring from Reutlingen University 15 years ago, Schekulin has continued to invest his energy, enthusiasm, creative inventiveness, and his instinct for innovation in a variety of Steinbeis projects. Steinbeis thanked Professor

Schekulin for more than three successful decades with Steinbeis with this year's special prize.

As in previous years, dancing progressed throughout the evening as the official program drew to a close, accompanied this time by the Silvio Dalla Brida Band, which kept the dance floor full until the early hours. For those less inclined to let loose on the dance floor, it was a good opportunity to catch up with old contacts and get to know other Steinbeis experts and customers. Another date for the planner: The next Steinbeis Evening will take place on September 29, 2017.

**Image, left:** The judges and award winner of this year's Transfer Prize: Manfred Mattulat, Dr.-Ing. Leonhard Vilser, Prof. Karl Schekulin, Prof. Dr. Dr. h.c. mult. Johann Lönn and Prof. Dr. Michael Auer.

**Image, top right:** Honoring colleagues for major work anniversaries



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# Steinbeis

## „Digital transformation and the challenges it poses are an opportunity for SMEs“

An interview with Michael Köhnlein and Peter Wittmann from the Steinbeis Digital Business Consortium

Michael Köhnlein and Peter Wittmann from the Steinbeis Digital Business Consortium explain how important digital solutions and networks are for companies, and how Steinbeis can help with the planning of change processes.

**Hello, Mr. Köhnlein; hello, Mr. Wittmann – the Steinbeis Digital Business Consortium was founded in October 2016. What are the goals of your Steinbeis Enterprise?**

Michael Köhnlein: The digitalization of business processes is part of the fourth industrial revolution, but it's much more than just a term like Industry 4.0. It doesn't just change the production process, it affects the entire value chain. The Steinbeis Digital Business Consortium deals closely with this transformation, with an emphasis on enhancing the commercial viability of companies in manufacturing, the manual trades, retail, and services. Steinbeis Digital sees itself as a vehicle, offering the implementation skills that are needed for the challenges brought on by digital business processes. We kick-start digital transformation within companies, providing support to make sure there's a sufficient basis of trust to form alliances, consortia, or both. We use the expertise of the Steinbeis Network, plus people with the right knowledge outside the organization working in a broad variety of areas of scientific know-how. The aim is to offer the know-

how required to solve problems. This makes us a platform of digital transformation.

**You played a pivotal role in developing the concept behind the Steinbeis Digital Business Consortium. What opportunities, but also what challenges, does it present for Steinbeis?**

Peter Wittmann: We know from our work with the Ferdinand Steinbeis Institute, especially with its director, Prof. Dr. Heiner Lasi, that big companies are looking closely at the market changes being brought about by digital technology, and that they're also looking into specific solutions to address these changes. Small and medium-sized companies are different – they generally don't have the required resources to cope with digital transformation themselves, which is where we come in. We offer Steinbeis Digital as a means to provide them with a platform and the required basis of trust to collaborate with others across multiple companies. The challenge for Steinbeis is to get companies that are frequently technology-driven to come together within the Steinbeis Net-

# Digital



work and form knowledge-sharing networks and project teams in order to offer solutions to clients that precisely match their needs.

**Modern business would be inconceivable now without digital solutions and networks. What impact do you think this has on knowledge sharing and technology transfer?**

Köhnlein: There are now more than 1,000 Steinbeis Enterprises actively involved in the network and Steinbeis has played a successful role in shaping technology transfer between companies over the last 30 years. The focus has essentially been on improving how problems are solved by technology, or innovations, or both. Digital solutions are also a new challenge for Steinbeis. Not only do individual processes need to be improved with respect to the details, but there's also the issue that the entire value chain is changing inside companies. There is still demand for the know-how of individual specialists at Steinbeis, but what's needed is a well organized network that delivers the right partner with the right skills for customers, so they can be offered the end-to-end solutions they need from a single source. Knowledge sharing and technology transfer along the lines used until now – on a piecemeal basis – is increasingly being expanded through partnerships, both inside and outside Steinbeis.

**The demand for services related to digital solutions and networking will rise sharply in the near future, as will the number of service providers. What advantages does the Steinbeis Digital Business Consortium have over other providers? In which direction will things need to go in the future?**

Wittmann: Thanks to our close ties with the Ferdinand Steinbeis Institute, Steinbeis Digital can add to the actual delivery of a project extremely quickly by contributing just the right scientific insights. We have access to our own source of know-how. And by operating as a network that spans different industries, projects, and consortia, it's easier to pick up on digital technology trends and offer the right solutions. Our goal is to pull together as many companies as possible from inside and outside the Steinbeis Network, to bring them under the umbrella of the Steinbeis Digital Business Consortium, and to form alliances that would be fixed in terms of the time scale or scope of a given project. Digital transformation and the challenges it poses are an opportunity for SMEs and we want to shape this positively through our portfolio of services.

Image: © iStockphoto.com/Сергей Хакимуллин



**Michael Köhnlein**



**Peter Wittmann**

Michael Köhnlein and Peter Wittmann are managing partners of the Steinbeis Digital Business Consortium, which is headed up by Ralf Lauterwasser. A Steinbeis Enterprise, the consortium offers its clients services revolving around the initiation and coordination of alliances relating to the development and delivery of digitalization strategies in manufacturing, retail, the manual trades, and the service industry, as well as the analysis of value chain processes, the development of business models, and the setting up of SME alliances in order to cope with digital transformation ("micro-testbeds").



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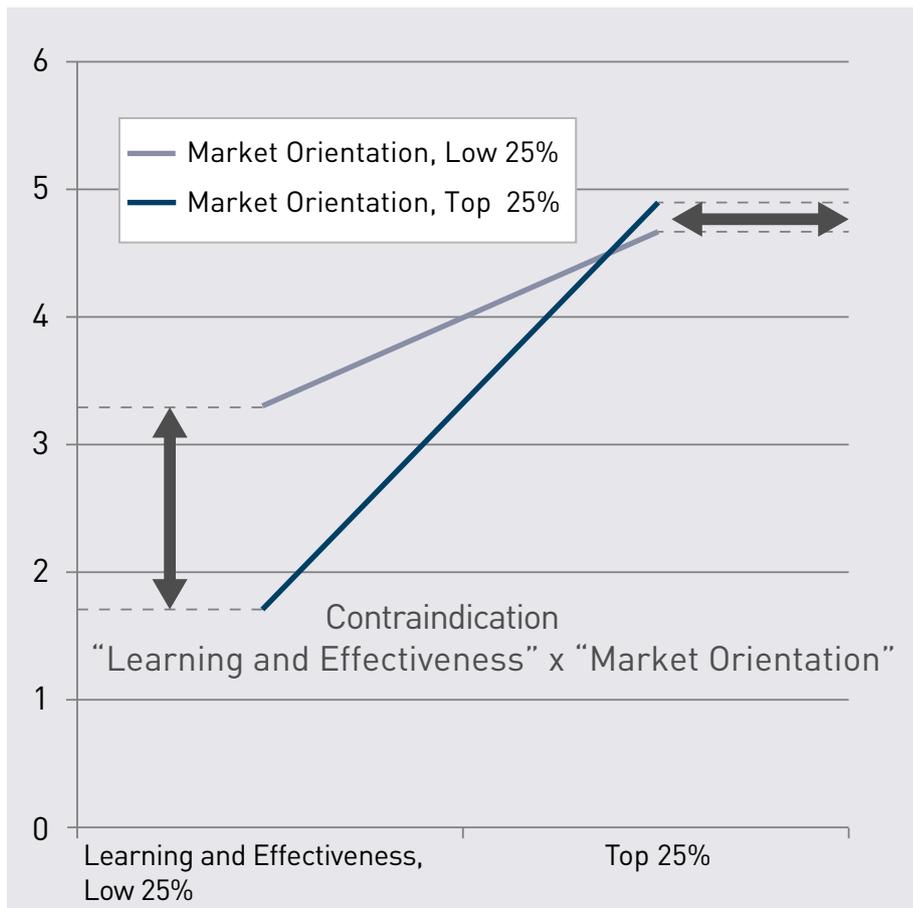
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Well above average

Average

Well below average

Innovation success

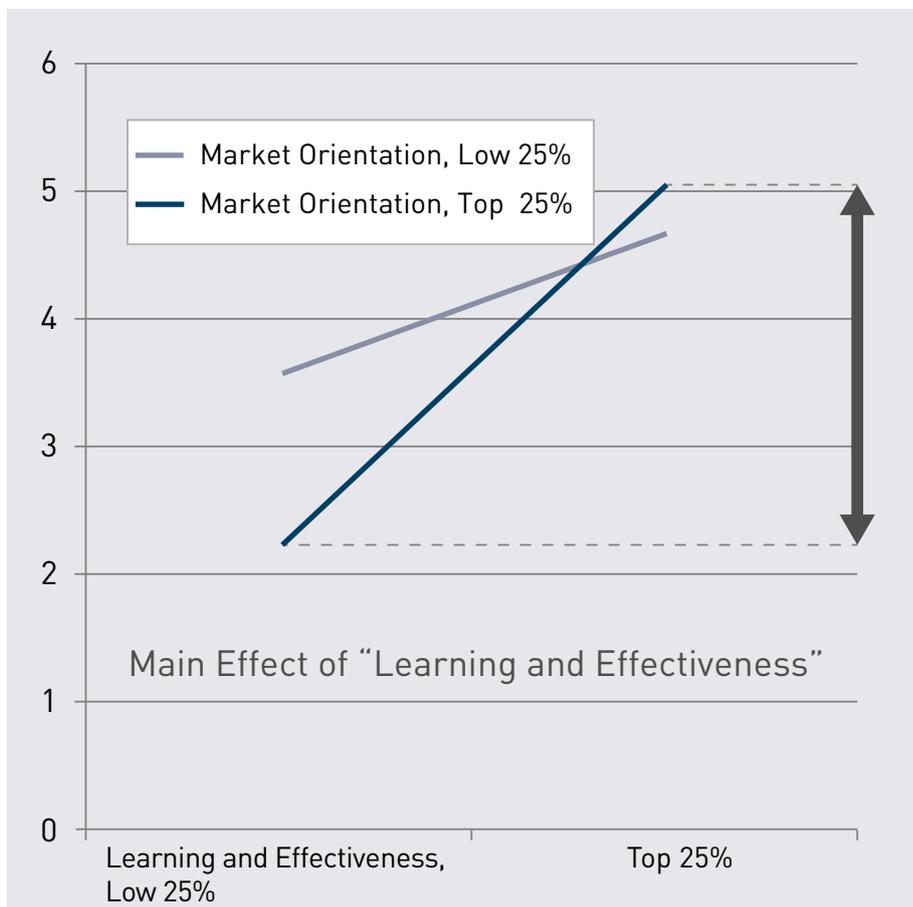


Well above average

Average

Well below average

Overall success



# Making Specific Use of Diversity within a Company

## Steinbeis team gets involved in a research project on diversity management

It's not just demographic or societal changes that are forcing German companies to rethink things, many companies are also actively involved in integrating jobseekers from around Europe or refugees from non-European countries. Diversity management is becoming increasingly important as a tool for specifically dealing with diversity within companies in a way that makes sense in commercial terms. It can no longer be reduced to buzzwords like equal opportunity and political correctness. As part of a project funded by the Federal Ministry for Research, the Steinbeis Transfer Institute zeb/business.school (based at Steinbeis University Berlin) partnered up with teams from the University of Oldenburg and the Frankfurt School of Finance & Management to investigate how companies are dealing with diversity – and which kinds of diversity management promote business success.

The research conducted by the Steinbeis experts and the many examples of companies that have been successful show how significant differences can be recognized and used profitably. They also show that companies don't automatically become more creative or more innovative just because there is "more diversity." Rather, businesses with a company culture geared to creativity and innovation are more adept at integrating and making use of skills and competences than less agile organizations.

In a first step, the project team carried out in-depth interviews with employees from six companies and supervised innovation projects over the course of several months. The results were used to design structured surveys and interviews. More than 600 people were then interviewed. All participating companies were asked to estimate their innovation and business success compared to their own set goals and compared to the competition. An index was calculated based on this, once for overall success and once for innovation success.

The companies surveyed implemented diversity management in one of three ways:

1. Anti-discrimination: diversity management attempted to avoid discrimination (e.g., through quota legislation) as outlined in the General Equal Treatment Act.
2. Market orientation: diversity management leveraged diversity and the cultural backgrounds of employees as a way of attracting customers and applicants.
3. Learning and effectiveness: diversity management was used to pinpoint development opportunities within the company for a wide variety of differences (e.g., age, gender, but also skills).

Diversity management only contributes to the success of a company if the company actively taps into diversity, not when its efforts are simply based on avoiding discrimination. Highlighting minorities suffering from discrimination or categorizing people as belonging to the dominant majority often leads to a whole host of individual measures being introduced that companies and their employees deem ineffective or even condescending. Programs designed to promote specific women in leadership roles and the IT 50+ campaign are classic examples of this. Inclusion presupposes that there will be many minorities and majorities, and that this has to create an organization which offers advantages for everyone. Part-time managers as part of a job sharing arrangement promotes women but also benefits many men, and teams spanning different age groups in software development lead to faster development and more marketable products.

Lawmakers do provide a framework through things like the General Equal Treatment Act, but it's not a guideline for drafting lists of actions in order to succeed in management. Of course no one should be discriminated against based on their gender, age, potential disability, religion, or sexual orientation. But a company can really only make use of differences in culture, experience, and skills if it recognizes them and develops them in a way that they can be put to good use. Examples of this include integrating language courses into the work day, establishing tandem teams with various levels of experience for learning, and creating image campaigns that highlight differences.

Diversity management should not be reduced to fixed characteristics, but should be used to identify and develop as many differences as possible: hobbies, language skills, experience with family life and care options, and the physical abilities of its employees can be very useful for a company. In this way, diversity management becomes an important part of knowledge and competence management within a company.

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**Image:** The correlation between types of diversity management, grouping innovation success with overall success (Low 25% and Top 25% of companies)



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## Room for Innovation – Change makes Progress Possible

**Steinbeis helps medium-sized enterprise with the ISO 9001 certification process**

Graf-Syteco GmbH & Co. KG, a traditional company from the Baden-Württemberg city of Tuningen, has been an expert in operation and control technology for more than 30 years. It places particular focus on automation, a company philosophy that has been successful in fuelling growth and innovation. To lay the right foundations for further expansion and keep up the momentum, the company methodically implemented new structures and systems during the last year with the aim of focusing more strictly on process optimization. The underlying idea was to gain certification under DIN standard ISO 9001:2015. The medium-sized enterprise was helped to prepare for certification by the experts at the Gosheim based Steinbeis Transfer Center TQI Innovation Center.

Graf-Syteco serves clients in construction and agricultural machinery. It also produces operation and control systems for fire departments and maritime use. To get its process underway and fire the starting shot for the company's new "culture of improvement," Graf-Syteco started by approaching the European EQ ZERT institute in 2015 to work alongside it as a certification partner.

The auditing officer, Elisabeth Mehl, conducted a preliminary audit to look into existing certification processes, interviewing employees to gain an impression of the specific nature of internal procedures and organizational structures at the company. It became clear that there were already a number of weaknesses, which, unnoticed by some, regularly kept things from running smoothly. On the positive side, Mehl was surprised to find that the management structures had been carefully agreed, there was a clear organizational chart, and the business plan drafted by the managing director Jürgen E. Müller and his management colleagues for 2016/2017 was well prepared.

Mehl felt motivated enough by what she had ascertained to go ahead with certification at the company and she was successful in her endeavors. The managing director, Müller, understood the challenges involved but also saw the benefits and subsequently decided to go full steam ahead with a project dubbed "Graf-Syteco Goes ISO." The quality management officer, Bianca Benne, was made responsible for managing the project and supervised measures as they were implemented, coordinating any outstanding tasks and documenting each stage according to prevailing standards.

To cope with the many complex challenges and hurdles encountered during the project, and to add professional support and advice to the equation, the Steinbeis Transfer Center expert Petra Ohlhauser from the TQI Innovation Center in Gosheim was brought on board. Working in close collaboration with the company and its employees, Ohlhauser organized regular visits and workshops for the project. This ensured that everything was carried out as required, not just efficiently but also within the stipulated timeframes. One exciting aspect of working individually with the people at Graf-Syteco was the number of times they discovered new things and "the penny dropped," especially when people could interact directly and talk openly about their experiences and work practices. Often, simply by reducing things to individual, rudimentary steps, it became clear what the underlying ideas were and how logical correlations make the difference in a work process.

Some of the things that need to be in place for processes to work smoothly are that documentation has to be accurate, procedures have to be captured, and reliable catalogs of measures have to be in place. One easy way to start with this is to simply grab a pencil and sketch things on a piece of paper, and sometimes that is exactly what happened with the people at the company. The resulting sketches provided a basis for systematically planning new processes and documenting recurring processes. By carefully collating, analyzing, documenting, and evaluating data, facts, and processes used in different parts of the business, quality management officer Benne walked through every required change and improvement step by step. The top priority throughout was to ensure measures were understandable and sustainable. In keeping with the idea that processes are often more important than the ultimate

goal, going through measures was sometimes like an internal cleansing process, like "cleaning out the closet" and not just about gaining certification. Nonetheless, to the outside, it is a visible step and a reflection of how things work within the company.

Processes dovetail with one another like cogs, making it possible to organize a business like an agile, well-functioning machine. But it takes discipline and the willingness to question what one is doing and practices that may sometimes have become entrenched over time. Getting it right takes the required dose of motivation to take on new ideas and apply them in the long term. To round off several months of detailed coaching sessions and prepare everybody in the best possible way for the impending certification audit, Petra Ohlhauser questioned people and took random samples to see how the measures were working in practice in different parts of the business.

The big day arrived in June 2016 and Graf-Syteco once again went to the factory gates to welcome the official auditor from EQ ZERT, Elisabeth Mehl. Although everyone was quite nervous, they did a great job of answering all of the questions and giving a respectable presentation of the results. Mehl was impressed by the extent to which changes had already been implemented and the progress that had already been made in all areas within such a short timeframe. The company, its employees, and all internal systems and processes were put through their paces for the audit and particular credit was due to Benne for going beyond the call of duty and investing endless energy in the project, which ultimately ended in the company successfully gaining certification.

"I'm proud of my workers – it was their openness, their willingness, and their motivation that was so decisive in moving forward with the development and improvement process. It's essentially a joint honor we've earned, something we mastered together on the last stage of successfully gaining ISO certification," says managing director Jürgen E. Müller. Commitment to the team, with everyone focusing on making their own contribution and playing their part in keeping things moving forward as a whole – in a nutshell, that's the key to success for Graf-Syteco. Change first happens in the head – it's the realization that experience and a positive outlook pave the way for progress and improvement. Graf-Syteco is now strongly positioned as a company and is enjoying good growth. It has taken things to a new level as an organization and this will help provide the room it needs to innovate in the future. Now nothing should stop the company taking on any kind of new challenge!

Image: © Graf-Syteco GmbH & Co. KG

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### Premiere for latest ECC Research Software Module Tool now also makes it possible to conduct studies

A software module called ECC Research made its premiere at this year's Steinbeis day, with visitors from the Steinbeis Network invited to a workshop to take a first look at the latest extension to the Steinbeis Enterprise Competence Check® (ECC). The ECC is used by consultants, companies, and lecturers as an analysis tool and it can also be used to carry out empirical research into large samples.

Large volumes of data can be captured with the software, typically descriptive statistics outlining the structural details of a company, and this data can be compared to individual skills indicators, also collating them into different groups. For example, regional differences in companies' skills profiles can be examined or the specific nature of skills profiles broken down by sector of industry, turnover category, or company size. This expands the evaluation possibilities of the ECC to include new options, e.g., to identify skills in individual regions or industry, to map these systematically, and to analyze differences. It is also possible to examine factors relating to the specific emphasis of a competence profile for large or small companies, for firms with higher or lower turnover, or for new or established companies.

ECC Research is easy and intuitive to use, so it will also be interesting for users not so familiar with research techniques because it allows them to quickly carry out evaluations and analyses without complexity, despite being robust in terms of methodology and content. Not only can ECC Research be used by consultants in their work, but also by people working in economic development who can conduct studies and make assessments.

### The Risk of Bankruptcy: Liability and Risk of Penalty A look back at the 23rd Steinbeis Consulting Forum

A consulting session reveals that a company has liquidity gaps that could threaten its very survival – gaps that probably cannot be closed. Suddenly, the client and the consultant find themselves confronted by potential liability and penalty risks. What are the options and opportunities open to consultants and their customers in such situations? This was the central question posed at the 23rd consulting forum for Steinbeis directors and project managers. The forum took place in Stuttgart last November.

The speaker at the forum was Jürgen Cramer, project manager at the Steinbeis Consulting Center Business Start-Up and director at Management Consulting Cramer (MCC). Cramer has 35 years of experience in manufacturing and real estate, from startups to company restructuring and financial recovery.

Talking alongside the attorneys Alexander Kästle and Dr. iur. Steffen Hattler, the co-managing directors of the leading law firm Hirt + Teufel, he turned what sounds like a dry topic into a lively and interactive session. There was also plenty of story-telling and sharing of thoughts from the audience, resulting in many questions being answered plus a whole string of practical tips for consultants' own work.



Access to the ECC Research application is provided during a one-day training session. The training course is free for members of the Steinbeis Network. Courses cover the underlying fundamentals of the system, how the software works, different types of analysis, and how they function.

To register for training and choose a training date, go to <http://steinbeis-ukc.de/schulung>.



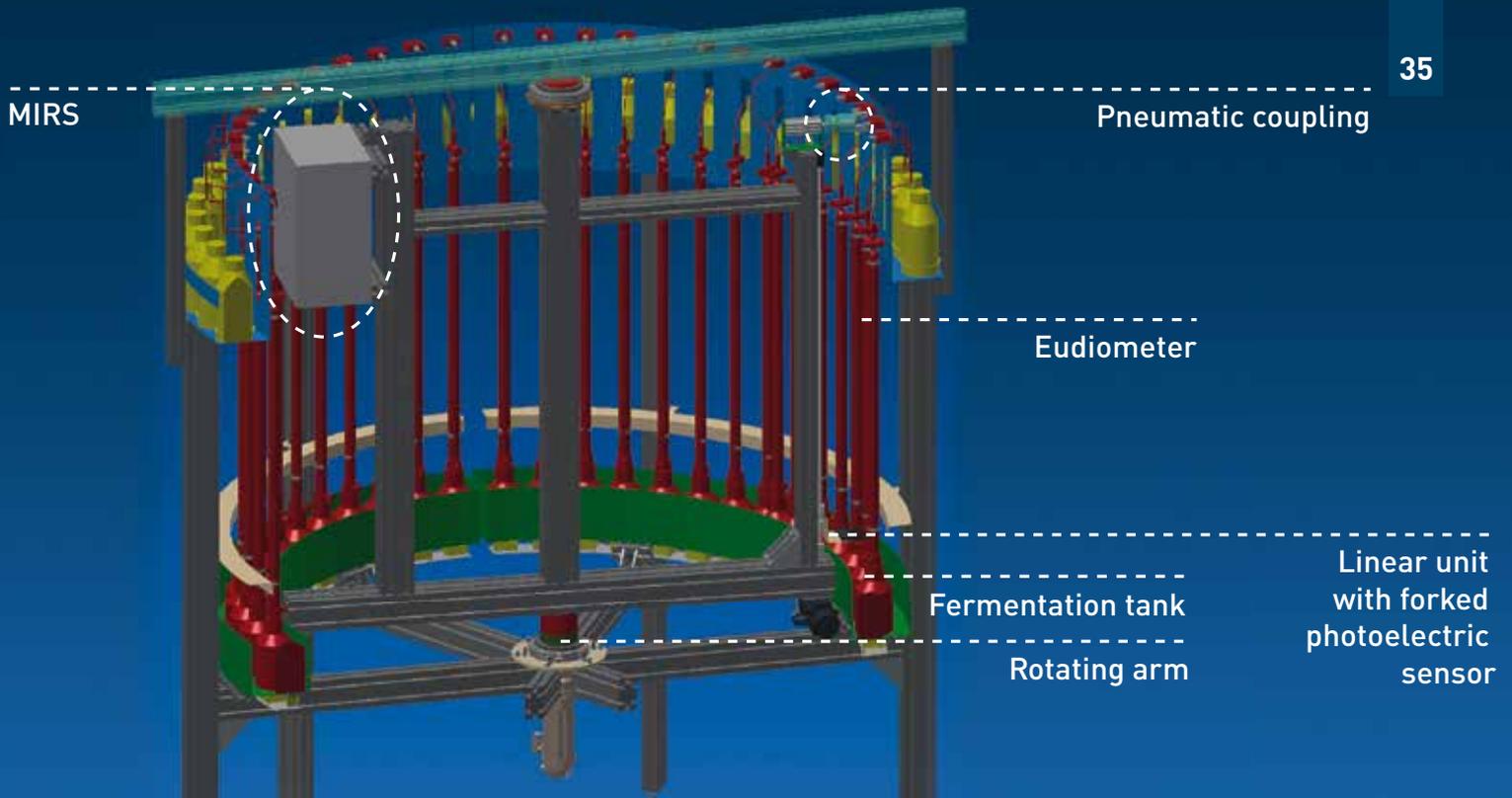
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The audience at the 23rd Consulting Forum



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## Keeping Tabs on Biogas Yields

### Steinbeis develops biomass carousel as part of ZIM project

When biomass ferments, it produces biogas. Until now, determining biogas yields resulting from fermentation has involved a great deal of manual effort and time. Biogas yields were ascertained by hand using batch tests under VDI 4630 guidelines and DIN standard 38414-8. The Steinbeis Innovation Center for System Solutions in Measuring and Automation Technology has been working with the ATRES Group from the Bavarian city of Freising as part of a ZIM project to co-develop a biomass carousel for automatically measuring biogas yields.

Batch tests are used to assess the anaerobic degradability, the rate of degrading, and the degradability properties of organic liquids and solids, also testing for the quality and quantity of specific biogas yields. The results of tests are used for planning, monitoring, and documenting yields for third parties such as government departments who issue authorizations.

The team of experts working on the ZIM project developed an automatic measurement system in the form of a carousel. The device can hold up to 48 fermentation vials making it possible to measure the biogas production of biomass. The specialists at the Steinbeis Innovation Center for System Solutions in Measuring and Automation Technology were responsible for the design and engineering aspects of the project as well as the automation components.

Measurements are taken automatically by filling fermentation vials with biomass and heating them in a basin of water. An eudiometer (a device that measures gas volume) is connected to each vial with a glass tube for capturing emitted biogas. At the center of the carousel is a rotating arm with a volume measurement device and a medium infrared spectrometer (MIRS) for assessing gas properties. The volume measurement device consists of a forked photoelectric sensor and a linear unit. After each measurement, it travels to the next position (eudiometer). The MIRS can measure gas quality for biogas volumes of 150ml and higher. It is connected to each eudiometer by an airtight pneumatic coupling. The unit makes it possible to determine concentrations of carbon dioxide and methane in biogas and all 48 vials can be checked once every eight hours. The current 48-vial prototype is 2.15 meters in diam-

eter and 2.5 meters high. The project team can also design smaller carousels.

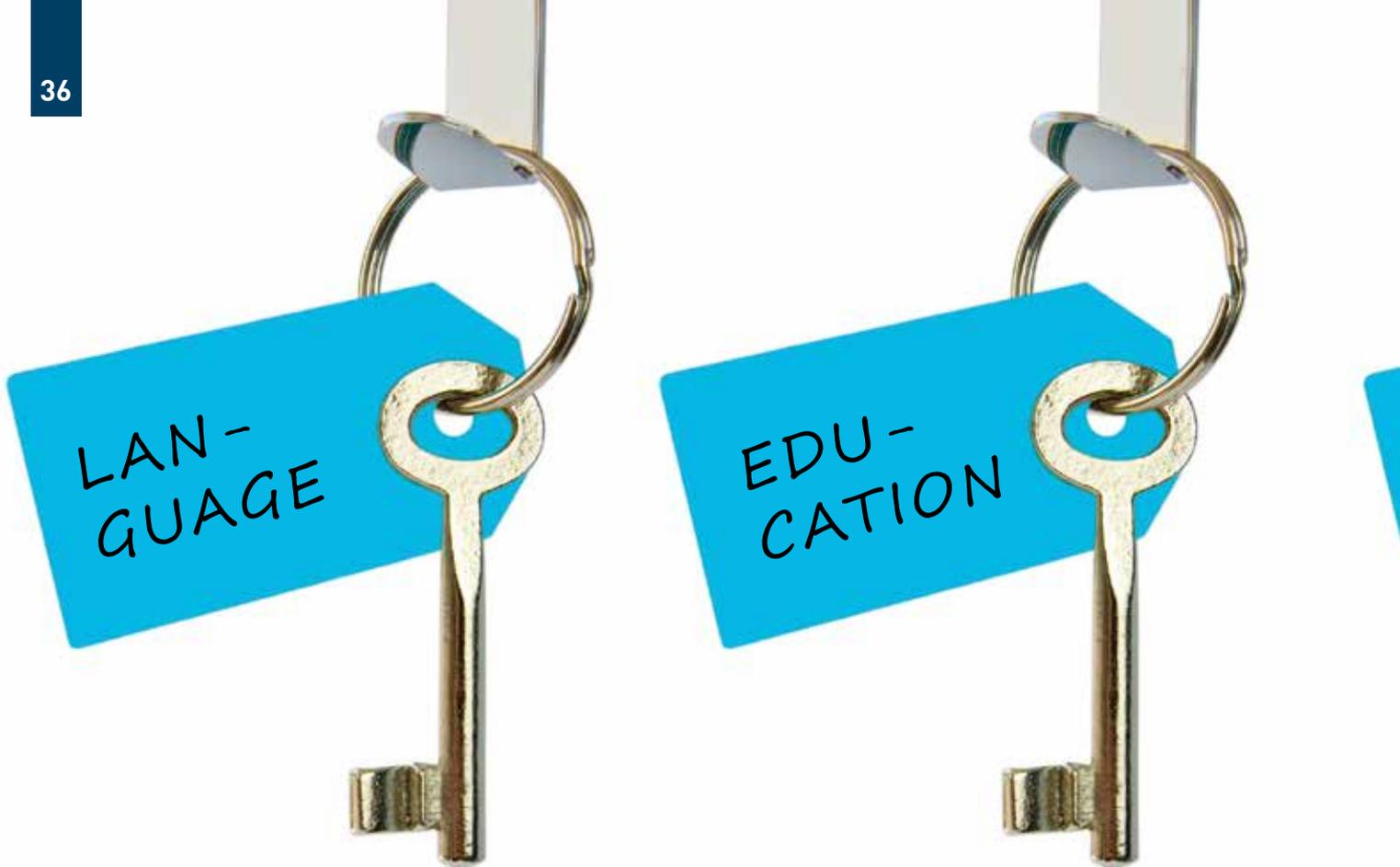


The Central Innovation Programme for SMEs

Image: CAD model of a biomass carousel

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## How to Make Integration Work

### Steinbeis University Berlin helps refugees get a foot in the door on the German employment market

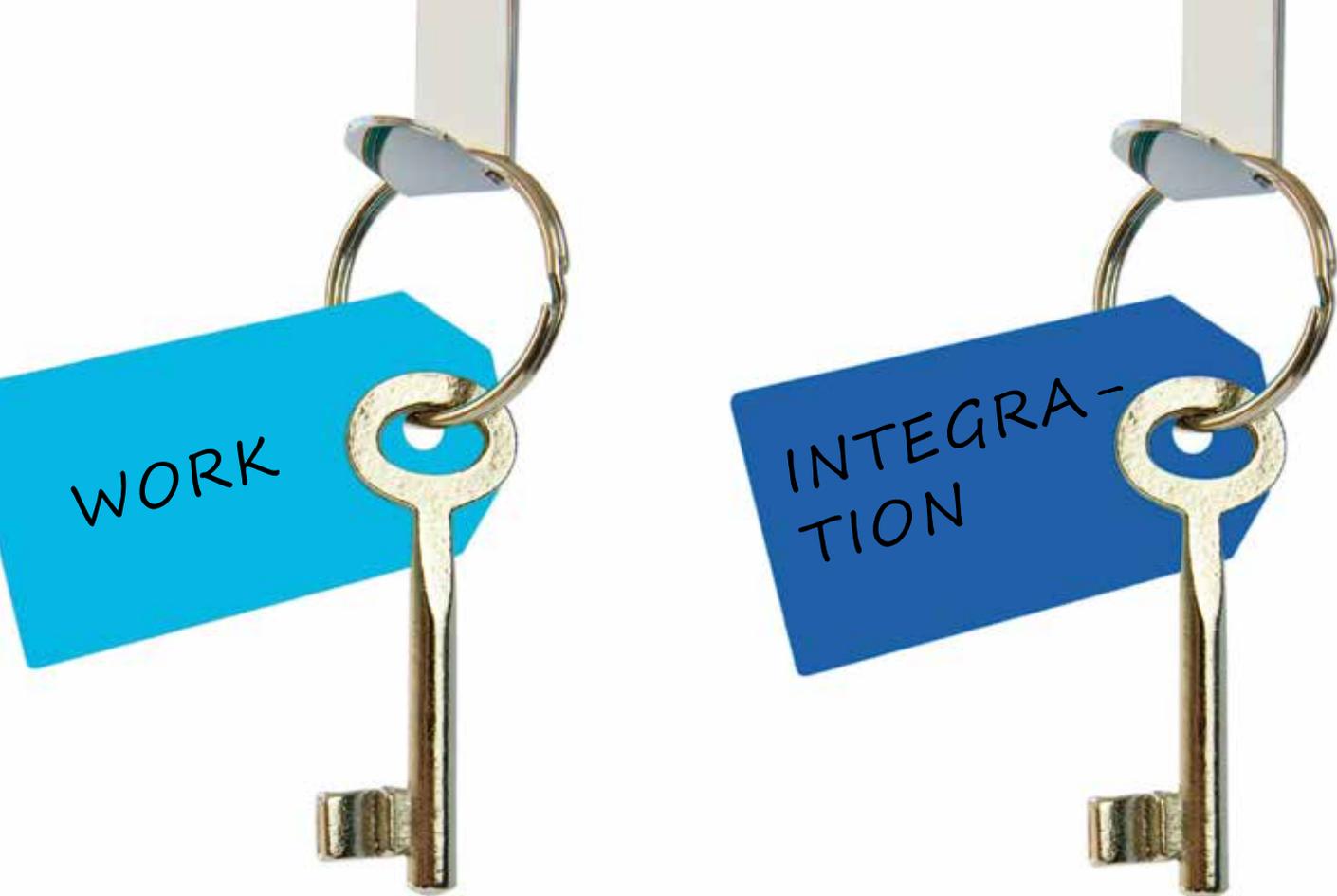
There has been very slow progress in integrating refugees into the employment market, even for those who come to Germany with a university degree. Refugee jobseekers face a number of difficulties, including gaining recognition for their studies, red tape, and a lack of language skills. But at the same time, there is strong demand in the economy for qualified workers, especially in the field of IT and the supply markets. To make it easy for both stakeholders – refugees and companies – to reach out to one another, two initiatives have been launched through the School of International Business and Entrepreneurship (SIBE), which is part of Steinbeis University Berlin. SIBE itself has introduced a program targeted at refugees sponsored by companies, while one of its alumni, Oliver Queck, has founded a company that will also help refugees by lining up contacts with business.

The degree program launched by SIBE is called Perspectives and it is aimed at refugees who have come to Germany with a previous university qualification. The students take online courses called SIBE Management while working full-time for a company. The program was set up as part of a collaboration between SIBE and the LVI (the Association of Industry in Baden-Württemberg), as well as the local authority in the city of Böblingen. Refugees are also approached through voluntary organizations and job agencies.

The model was introduced at a recent press conference given by representatives of all three project partners. "This initiative is a major opportunity, not just for the local district but also for refugees, who are being offered new prospects through these practice-based studies," explained Roland Bernhard, the district chief executive of Böblingen. "Over the course of 24 months, things run in parallel that would otherwise take years: a degree ending in a German qualification, educational achievement, practical and vocational experience, plus a sufficient grasp of German to go about everyday work in the medium and long term." Professor Dr. Dr. h.c. Werner G. Faix, managing director of SIBE in Herren-

berg, added: "Through us, students can take up the reins where they had to break off in their country of origin, so they can build on a first degree from their home country, complete our project skills degree in collaboration with a partner company, and gather a master's qualification in management." Wolfgang Wolf, LVI managing director explains: "The project is of extremely high socio-economic importance and it adds value. After completing their degree, it's a big opportunity for students to gain a foothold in the employment market and become integrated on a variety of fronts."

Apart from doing management courses, the students undergo intensive German language training and are taught soft skills. University staff are also available to coach the students, provide them with pointers, organize study groups, and, if required, offer individual support. All seminars are offered in English and conducted online. Refugees with a previous academic qualification in any field are eligible to apply, as long as they have a strong command of English. The companies take on the students as interns, who receive a monthly salary of at least € 1300 per month. The companies also meet the tuition fees of € 40 per month.



The business founder and SIBE alumnus Oliver Queck also helps refugees forge contacts with industry, although in his case it does not matter how much previous education they have – they can be completely untrained or be an academic with a Ph.D. The 35-year-old launched his social start-up last year under the name JobKraftwerk. Queck graduated from SIBE in 2010 and it was during his studies that he worked as a business consultant before switching to a large company where, among other things, he acted as a business mentor and supervised a student at SIBE. He also upheld his other ties with the business school, for which he still works as a project supervisor. He had been toying with his dream of becoming self-employed for a long time so when he struck upon the idea of starting up JobKraftwerk, which essentially also helps address a key social challenge, he was full of enthusiasm and started up the social venture with two colleagues. Queck is convinced that every refugee has hidden strengths that are needed in the German and European employment market. By drawing on business startup knowledge acquired during his studies, Queck developed a business model before joining forces with his colleagues to quickly set his ideas in motion as part of a pilot project in the district of Reutlingen. The aim was to test his model under actual business conditions. To establish communication channels, JobKraftwerk collaborates closely with local communities. Refugees can set up a standard resume online using a smartphone, outlining their strengths in their mother tongue. Volunteers then go through the profiles to ensure resumes meet the right standards. Companies then use the JobKraftwerk website to find candidates with the right profile before inviting refugees directly to an interview. The company also provides help to companies, for example with work permits. The project is

being funded by the local authorities, who save tremendous resources by using the service. There are also sponsors from industry. Unlike the SIBE model, refugees identified for a company do not have to take part in the degree program.

The SIBE degree places a strong emphasis on entrepreneurship, so it was good preparation for Queck to enter the world of business startups. His project also benefitted from personal exchange through the networks he forged at the university. It is interesting that SIBE and the startup founded by one of its alumni are not actually competing as “refugee intermediaries,” instead they are already discussing ways to collaborate on the same objectives.

Image: © Tatjana Balzer – Fotolia.com



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## When Personal Development Grinds to a Halt

**Steinbeis Consulting Center helps with change initiatives by providing a transformation map**

If you want to set up a business, you need to make changes. But at some point the company is set up and things settle down at home, too. Then for many, at some point the change processes grind to a halt. People start to settle in and get comfortable and more often than not, they only make new changes if something starts to feel wrong. A new instrument is now available that helps firms introduce continual development processes that are quick and easy to use: the Transformation Map. Dr. Lars Öhler, director of the Steinbeis Consulting Center for Entrepreneur Excellence, frequently uses it for his projects.

Franziska M had been self-employed for years and was a successful communications specialist and provider of systemic business coaching services. She wanted to move forward, both on a professional and a personal level. Franziska had a good idea of the direction she would like her life to go in, but somehow she couldn't quite translate her ideas into everyday actions. Things were in a rut, stuck at the current planning stage. Well what was wrong with that? Business was flourishing. But as a mentor of managers herself, Franziska knew it was not enough to just let a company develop as it is. So for once, she needed advice herself.

In many cases, entrepreneurs only go back to the drawing board when their startup is no longer meeting their expectations, or those of others. But when it comes to things at home, issues simply get sidelined. "I don't have time to think about that as well. The most important thing is the business; that's what pays the bills" – this is a common thought, but if you want the company to move forward, you have to move forward yourself. This is because work is just one of several areas in life. Entrepreneurs are also parents, partners, members of a family, friends, and so on. And each part of your life is intrinsically linked to all others. As a result, any area of life has an impact on all the others.

"With a development process, the challenge is to take responsibility again for all areas of your life and not just the company. The only question is, how," explains Öhler. It's not easy making a "continual development process" a fixed part of your everyday life. In fact, few manage to do it properly. It was this that motivated the Steinbeis expert to develop

instruments that can be used to set achievable goals in a way that the goals you select feel more enjoyable to you and less daunting.

One important tool is the Transformation Map. It can be used by clients to examine personal values, because even the most appealing goals will remain unfulfilled if they are irreconcilable with your own values. By using one element called the resource cloud, important personal values, feelings, and needs can be identified along with their specific importance. For example, Franziska's values were Independence, Tolerance, and Authenticity. These personal values have to be the yardstick for all of her goals.

The next step in the development journey for Franziska was to define areas of her life where change needed to happen. She decided her goals should be set in Vocation, Spirituality and Physical Wellbeing. The next part involves making goals understandable, so a key question that is posed is "What do I want to achieve?" For Franziska's Vocation area, that translated into: effective time at work, coaching skills that fuel personal growth, joy and fulfillment, a good income.

The object of change is now put through quality checks by asking a question: Does my goal support my personal values? To do this, goals are compared and contrasted with each individual value. If a goal works well with less than two values, it is not deemed suitable for the personal values overall. The next step is to transform the understandable goals into specific targets that need to be achieved. Again, focusing just on the area of Vocation, for Franziska, this meant:

## 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 in all fields of technology and management – and this network continues to expand. For an overview of our most recently founded enterprises, go to [www.steinbeis.de/en/news](http://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](http://www.steinbeis.de)



More on recently founded enterprises in the network can be found at <https://twitter.com/SteinbeisGlobal>

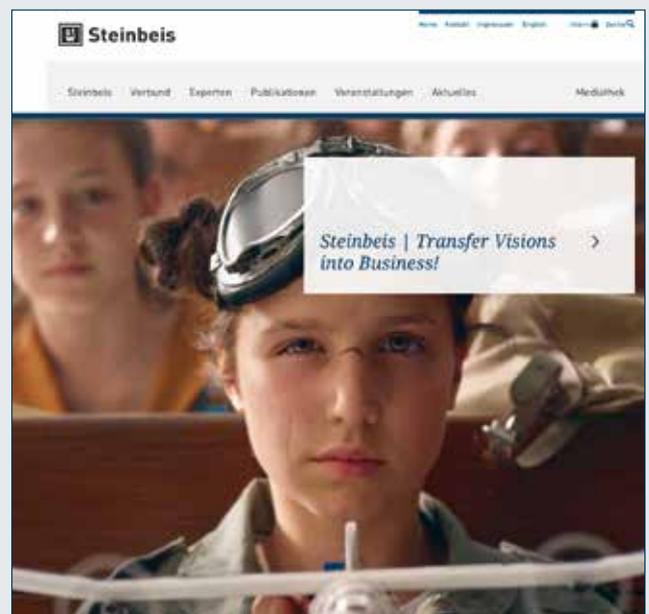
- Effective working hours: three work days per week as a business coach, two as an entrepreneur
- Coaching skills that fuel personal growth: investing half an hour in myself five times per week; a new, instilled format per month
- Good income: 5,000 euros earned as an entrepreneur per month after taxes

The next stage is to establish a starting point for achieving these goals. The question here is: What have I done today that helps with my goal? Franziska took the status quo and entered this into a table as her starting point, allowing her to see at a glance how far she was on the journey to achieving her goals. She regularly entered her achievements into this table, plus things she had failed to achieve. This kept her time investment to a minimum, thus lowering any barriers that needed to be overcome to make a change. The same approach can be taken to defining and working through any other possible goals. Following the project, Franziska now uses her Transformation Map by herself. She has already made one adjustment to her personal values and has traveled a long way on her journey. As she has passed each milestone, she has set new targets. Franziska M was won over by the concept: "I've finally found a tool that helps me develop as a person and is really easy to integrate into my everyday life."

Image: © fotolia.de/Robert Kneschke



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ip4sme.pnt-grp.net

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you a SME with Patents?

Are you an IPR Professional?

ip4sme Questions of SMEs without Patent

- What is Intellectual Property (IP)?
- Where do I get appropriate training?
- How can I find a solution on my technical problem?
- Why should I go for IPR?
- What are the benefits of going for IPR?
- What are the drawbacks of going for IPR?
- How do I get funding for patent application?
- Do I infringe?
- What do I do when I know that I'm infringing?
- Should I get IP-protection in my idea?
- Which IPR is appropriate to my invention/idea?
- Where do I get basic information?
- Where do I get basic timeline information?
- Where do I get basic costs information?
- How can I find the patent of my competitor?

ip4sme Knowledge Base

- SMEs without Patent
- SMEs with Patents
- Register as IPR Expert

ip4sme Tools

- Valuate Patent
- Find Licencee
- Trade Patent
- Locate IPR Expert
  - by Country
  - by Technical Field

ip4sme Forum

- Top Level
  - Index
  - Recent Topics
  - Search

Full-Arg translation system by Fabrika

## Steinbeis Guides SMEs Through the Patent Jungle

### IP4SME – an online platform for evaluating and applying intellectual property rights for SMEs

The experts at Know-How + Transfer, a Steinbeis Innovation Center in Villingen-Schwenningen, have set up an international website to provide small and medium-sized enterprises (SMEs) with practical support with managing intellectual property (IP), especially with respect to small businesses. The platform gives users access to all key information relating to commercial property rights, not just in Germany but throughout the world.

Globalization and digitalization are opening the door to a highly promising future for companies in all kinds of industries. Entering new markets is not just an opportunity to expand, but also to optimize product offerings. But to get it right, SMEs are often forced to follow the strategies of big companies, despite comparatively limited resources. To operate in global markets, commercial property rights – or more specifically patents and registered designs – are crucial, not just to protect a company's own technology from copycats, but also to ensure the rights of third parties are not infringed upon in other countries.

As part of a project called IP4SME (intellectual property for small and medium-sized enterprises), an innovative online platform has been set up as a kind of one-stop shop, which provides all required information

and services relating to commercial property rights. It was designed to reflect the kinds of issues encountered in international markets, acting as a web-based information forum to provide mainly small and medium-sized enterprises with reliable business information on any stage of the innovation or rights usage process. With intellectual property rights (IPR), this is typically information that was previously only available to big companies with big budgets. The platform has been set up in partnership with organizations in Amsterdam, Stuttgart, Ankara, and Athens. IP4SME provides a variety of tools for IPR evaluation, providing invaluable know-how through a network of IP experts.

The tools should prove particularly useful for SMEs in overcoming hitherto insurmountable obstacles. Within minutes, a fully automatic patent

evaluation service gives patent holders a monetary value, providing immediate insights into the potential added value of a variety of IPRs. The collaborative network set up for the IP4SME project has proven particularly helpful in this respect, largely due to the contribution made by Lighthouse IP, which has subsidiaries in Amsterdam, New York, and Chengdu, and is a global leader in property rights information. Its service pulls together its own in-house data records from information spanning over 100 patent offices. Thanks to a specially programmed licensing matching engine, it is possible to automatically connect the parties that register and own property rights with potential licensees. Compared to previous systems, this is a highly novel approach and this is reflected specifically in the enhanced efficiency of procedures, especially when it comes to rights usage and the amount of time and money invested in the process.

The nature of globalization is dictated by the challenges faced and these are reflected in another way in this revolutionary new service: one of the core competences offered by Lighthouse IP is the high quality of its translations of Chinese patent documents. This is an absolute must, so it is an integrated part of the IP4SME platform, much to the benefit of users. Companies that fail to pick up on the exponential rise in Asian patents in the European and US markets will lose market share, become less competitive, and even risk going out of business.

This reality was taken into account when designing the new system, so the different parties involved in IP4SME aim to bolster the ties between Europe and the United States. The project is making it much easier to get in touch with all kinds of international experts. Now patent marketing agencies, IP headhunters, translation agencies, patent attorneys, and other key players can be approached; users can contact exactly the right person. For example, the special software helps firms identify patent attorneys considered leading experts in certain fields of technology based on different categories. This is of obvious benefit to users. Based on past registrations, users can see which law firms already possess a wealth of knowledge regarding a certain type of technology or the state of developments, so naturally it will be in a position to provide particularly professional advice and directly address key issues.

There is another aspect regarding the platform that is extremely important for potential users: It allows for use of a tool provided by the InTra-CoM Group, which automatically assesses patents and comes up with a monetary value. This also makes things significantly easier for companies involved in the innovation process. The software package works with a variety of parameters using a technique based on recognized scientific methods. As such, it's easy to quickly identify and evaluate patents, patent families, and patent registrations.

Having the Steinbeis experts in Villingen-Schwenningen involved, who have been working in the field of copyright protection for over 20 years, helps maximize IP know-how through an e-learning tool. The Steinbeis specialists have experience with a variety of projects revolving around innovation management, not only with private companies but also as a catalyst for state organizations in areas relating to funding and backing, training and continuing professional development, IPR management, and a variety of utilization scenarios. As such, they add considerable expertise to the IP4SME initiative and this manifests itself specifically in

the running of web-based training for SMEs, thus helping the different parties gain a significant advantage over competitors who have no such access to detailed information.

For the next part of the project, the team plans to launch a patent exchange forum to bring together rights owners with buyers or licensees, who will also be given support with rights exploitation. The project offers major potential for companies to innovate and although some things take time, in the meantime, one thing that's certain is that involving different parties in the planning and design of the IP4SME concept is adding significant value. For SMEs operating in sectors of industry marked by strong innovation, it is an excellent solution that is in tune with modern requirements. The analytical approach adopted is totally in keeping with the underlying principles of the Steinbeis slogan: Technology.Transfer.Application.

To mark official announcements regarding the project, the team at the Steinbeis Innovation Center will be organizing three conventions in partnership with the other parties in the project consortium. The opening convention will take place in March 2017 in the Steinbeis House in Stuttgart and there will be two further events in April 2017 in Chengdu and in June 2017 in New York.

Image: The IP4SME website



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## Ensuring safety of modern fiber-nanomaterials

### Steinbeis R-Tech is a partner of EU-funded project called BIO4SELF

In 2016, the EU launched a Horizon 2020 project called BIO4SELF with the aim of developing self-reinforced polylactic acid (PLA) composites able to offer superior mechanical performance compared to current self-reinforced polypropylene (PP). Steinbeis Advanced Risk Technologies (R-Tech) contributes to environmental footprint (life cycle assessment), life cycle costs, safety standards, and risk analysis. BIO4SELF (short for "biobased, self-functionalized, self-reinforced composite materials based on high performance nanofibrillar PLA fibers") is receiving € 7 million of backing and involves 16 partners from science, applied research, and industry.

The aim of BIO4SELF is to identify fully biobased, self-reinforced polymer composites (SRPC). Two types of PLAs are needed to make SRPCs: ones with a low melting temperature to provide a basic scaffold and ones with an ultra-high stiffness and high melting temperature to form fiber composites. The task of producing PLA fiber materials with self-functionalization involves several stages, making odor-reduced PLA, hydrolytically stable PLA, self-healing PLA, and self-sensing PLA.

Aside from the technical tasks of working on these developments, Steinbeis R-Tech has been laying down initial safety guidelines to establish safety requirements and the terms of use for the new kind of nanomaterials. The aim with the first draft of the document will be to heighten awareness among the project partners for so-called safety-by-design methods. This approach is also important for the ongoing development of existing guidelines and how they are applied in practice, subsequent to the European CWA 16649:2013 standards documentation on the management of new technology risks (the document convened by Steinbeis R-Tech). The second edition will focus on a variety of industrial applications involving the outlined methodologies with the aim of helping end-users.

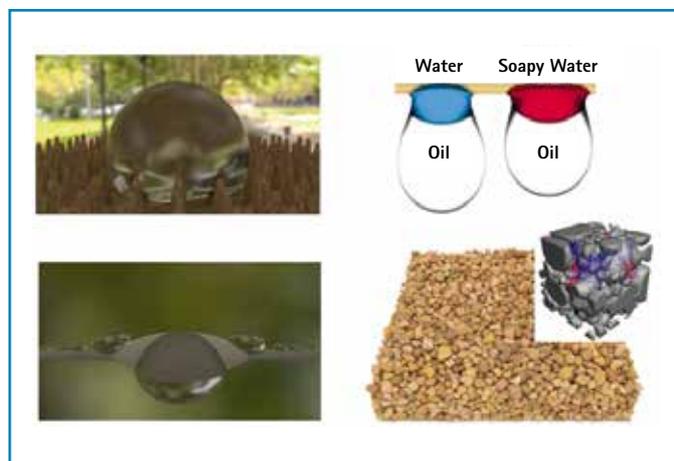


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## Fluids on Structured Surfaces and in Porous Structures

### Steinbeis experts develop simulation software

Wetting and fluid spread on structured surfaces and in cellular porous media play a central role in a wide spectrum of applications used for a variety of different materials. A new software package developed at the Karlsruhe University of Applied Sciences called Pace3D makes it possible to simulate the angle of contact of liquid droplets on complex surfaces. Computer simulations using Pace3D are now available through the Steinbeis Transfer Center for Material Simulation and Process Optimization.



The wetting of a droplet on a rough surface (top left), simulation of two immiscible droplets (top right), condensation of water droplets on fibers (bottom left), a computer model of a granular sand structure for simulating single- and multiple-phase flow (bottom right).

There are numerous areas where fluid spread is encountered, ranging from the lotus effect on surfaces with rough nanostructures or microstructures to fluids penetrating construction materials as a precursor of corrosion and condensation, or evaporation on textile fibers when extracting water.

The models used at the Karlsruhe University of Applied Sciences for Pace3D are based on the principles of energy minimization and they are powerful enough to capture the 3D topology and spreading properties of several immiscible fluids, even taking the properties of specific substances into account. The physical properties of fluids and supporting structures form part of the modeling and make it possible to analyze the processes behind the angle of contact on a variety of treated surfaces.

The simulations allow researchers to investigate how wetting is influenced by surface properties, the geometric alignment of structures, and components. They can also systematically examine capillary forces. As part of the funding project with the partners in industry, the experts from Karlsruhe have successfully used Pace3D to predict condensation and evaporation rates, to determine anisotropic permeability properties, to ascertain volumes of liquid, and to determine liquid advance in channels, cracks, and structures with pores.



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Co-FACTOR roadmapping workshop with experts from industry and research, organized and coordinated by SEZ.

## Communication Platform Revolving Around Smart Components

### SEZ coordinates international network

Smart industrial components refer to elements, modules, and tools that enable the digitalization of manufacturing processes, as captured by the term used frequently in Germany: Industry 4.0. Key features of such components include their connectivity and communication, the ability to autonomously adjust their actions by analyzing and monitoring data, optimization, and independent learning. Such components are currently being researched with intensity and developed both nationally and internationally.

What's still missing at the moment is a proper overview. The stage of development varies massively, as does the extent to which products are ready to use. There's also no proper network out there for key players involved in this area. To take on these challenges, Steinbeis-Europa-Zentrum (SEZ) set up a European communications platform in 2015 to specifically address the topic of smart components.

With the aim of promoting technical exchange throughout the network and to accelerate the use of research results throughout the manufacturing sector, SEZ is networking a core group of six live EU research projects (I-Ramp3, ReBorn, SelSus, T-Rex, INTEFIX, and Power-OM). The projects fall under the framework of an EU project called Co-FACTOR. In the spirit of the Industry 4.0 movement, the six projects focus on the area of progressive, intelligent manufacturing and on technologies that open the door to this: smart components. The project partners come from Germany, the UK, Spain, and Portugal.

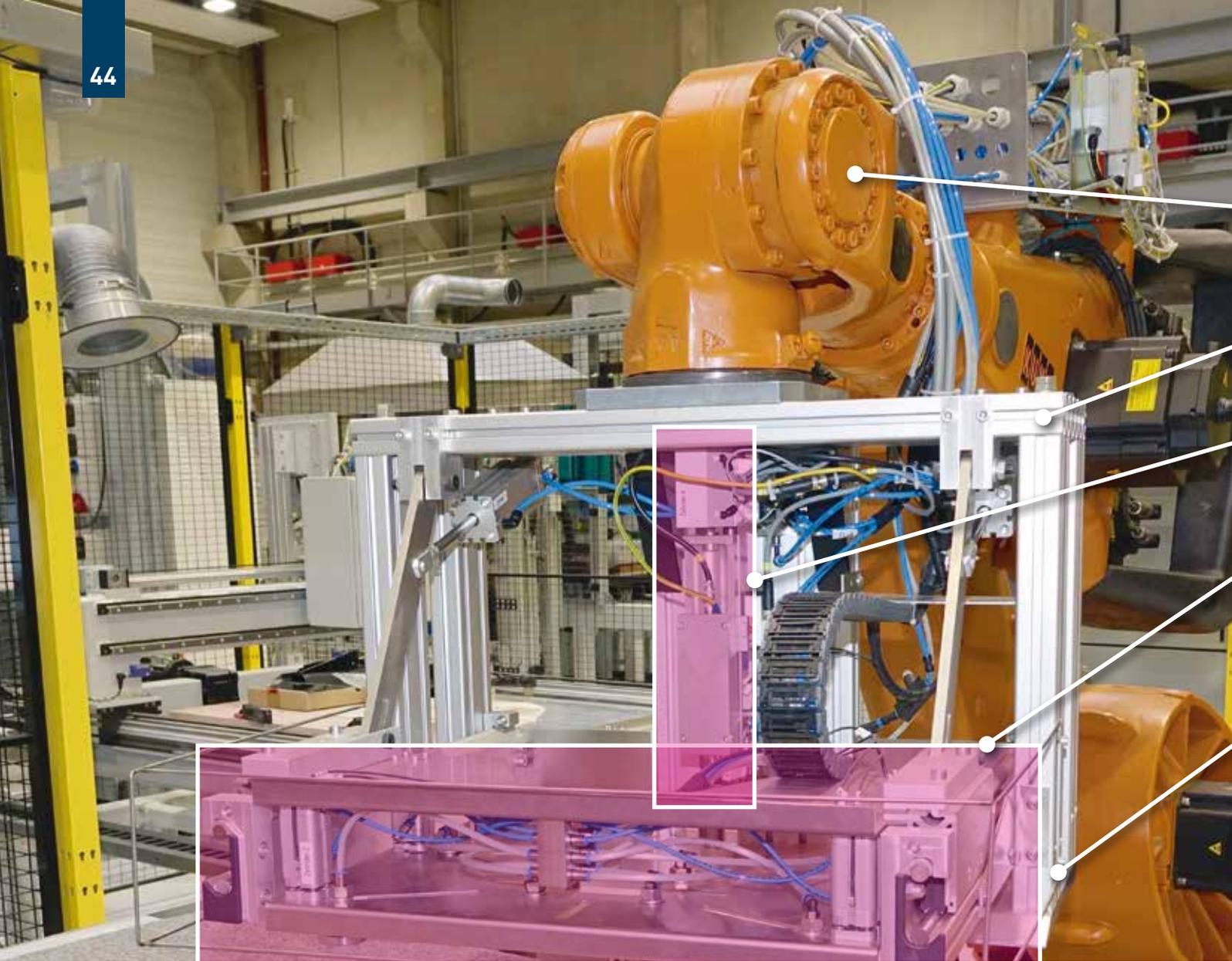
As the coordinator of the EU Co-FACTOR project, SEZ held a roadmapping workshop in Brussels in October 2016. At the workshop, experts looked at R&D priorities and the benchmarking of smart industrial components. The workshop was an opportunity for specialists from the processing and manufacturing sectors to meet up with IT and digital technology experts, researchers, engineering and business consultants, plus a variety of European experts from trade associations and politics. Together, they identified priorities and key topics for research and were able to provide feedback on this to the European commission, especially with respect to research trends and funding priorities. What's more, the workshop looked at and discussed the most prevalent non-technological and socio-economic factors that are currently influencing the further development of smart components. The results of the workshop will be published in two green papers, which will be available on the website.



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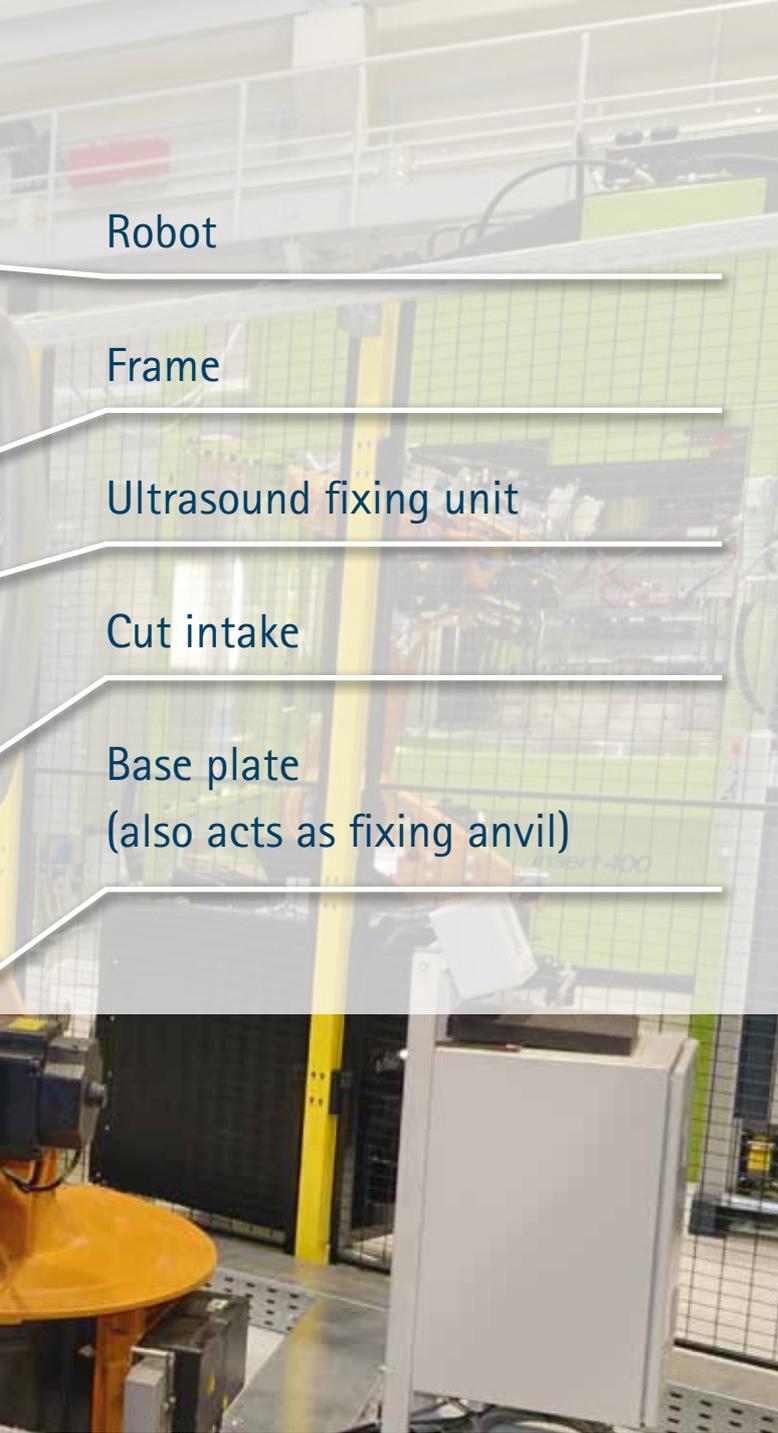
## Smart Stacking – a Handling System for Quickly Producing Laminates

**Steinbeis acts as research partner on the processing of preformed thermoplastic materials**

Developing production processes for modern composite components that work well with lightweight materials is becoming more and more important in business – not just for environmental reasons, but also because of political factors. To do this, new kinds of production technology have to be tested and then continuously developed not only so they are ready for serial production, but also so that modern lightweight materials can be used economically in high volume manufacturing. One particularly promising method is to use thermoplastic-based fiber-reinforced composites (FRCs). Compared to thermoset materials, these can be processed much more quickly and they make it less of an effort working with finished materials and semi-finished parts. To accelerate processing times, the mechanical engineering specialist S&F has been working with the Steinbeis Innovation Center for Automation in Lightweight Construction Processes (ALP) and the professorial chair for structural lightweight design and polymer processes at Chemnitz University of Technology (TU Chemnitz) on the development of a new kind of handling system. Their aim: to develop a system that makes up individual, semi-finished, thermoplastic cuts into a layered structure. This should take place directly with a mechanical gripper and the resulting laminate should be capable to bearing large loads and should be fixed.

Pre-impregnated semi-finished thermoplastics with continuous filament fiber reinforcement – so-called pre-pregs – are simple to transport in rolls, which are delivered by the meter. They can be used directly in production processes and adapted to individual parts, usually coming in individual sheets for layering into laminates. The direction of fibers is matched to each part during stacking before the components are pre-heated and processed into high-performance composite parts. Ther-

moplastic processing involves high volume methods such as cold pressing and injection molding. The semi-finished fiber composites are laid together in tools to make complete parts. Injection molding is particularly suitable for producing complex fiber composite parts, using partial continuous filament fiber reinforcement. Overseen by the professorial chair for structural lightweight design and polymer processes, the MERGE center at TU Chemnitz is currently involved in fundamental re-



Robot

Frame

Ultrasound fixing unit

Cut intake

Base plate  
(also acts as fixing anvil)

search in this area. The technologies involved in these processes are key drivers of lightweight construction developments, bringing together highly automated processes and high volume manufacturing. As a result, these technologies are found in many different areas and undergo continual redevelopment.

The research being carried out by S&F and the Steinbeis Innovation Center for Automation in Lightweight Construction Processes is part of a state-funded ZIM project. The main focus of the project is the chain of events between the cutting of individual layers and the pre-heating required during final processing. The aim of both project partners was to shorten the time-consuming handling of components between the cutting of individual layers and finished laminate composition. Previously, each individual cut had to be lifted off the cutting board, turned to exactly the right angle, and temporarily lined-up before all individual layers could finally be brought together from their respective position. With the new process, there is no longer any need to put individual cuts to one side, so there are no more special movements with a complex robot gripper grabbing parts, stacking them, and holding them in posi-

tion during cutting. The project partners built a gripper prototype for semi-finished parts up to 650mm long and 300mm wide. The experts decided to create a linear system that moves to one side of the gripper, picks up each individual layer with a suction element, lifts it, and feeds it back into the gripper, where the layer is ultimately placed on the stack. Once all layers are in the right position, they are joined at fixed points using an integrated 35 kHz ultrasonic welding system.

The research focused on developing suitable ultrasonic parameters and sonotrode points to ensure parts were fixed securely without damaging the fiber reinforcement in the semi-finished parts. It also looked at developing a suitable gripping system and arranging the construction of each of the functional parts in an appropriate configuration. The results of the research project speak for themselves: Depending on the number of layers required, the new technology can cut the processing time needed to go from original cuts to a prepared semi-finished stack in half. This significantly reduces process time and enhances profitability in production.

#### Steinbeis Innovation Center Automation in Lightweight Construction Processes (ALP)

##### Services

- Automation concepts for lightweight construction processes
- Research project coordination
- Contract planning for handling technology and special purpose machinery
- Prototypes for use with automation concepts

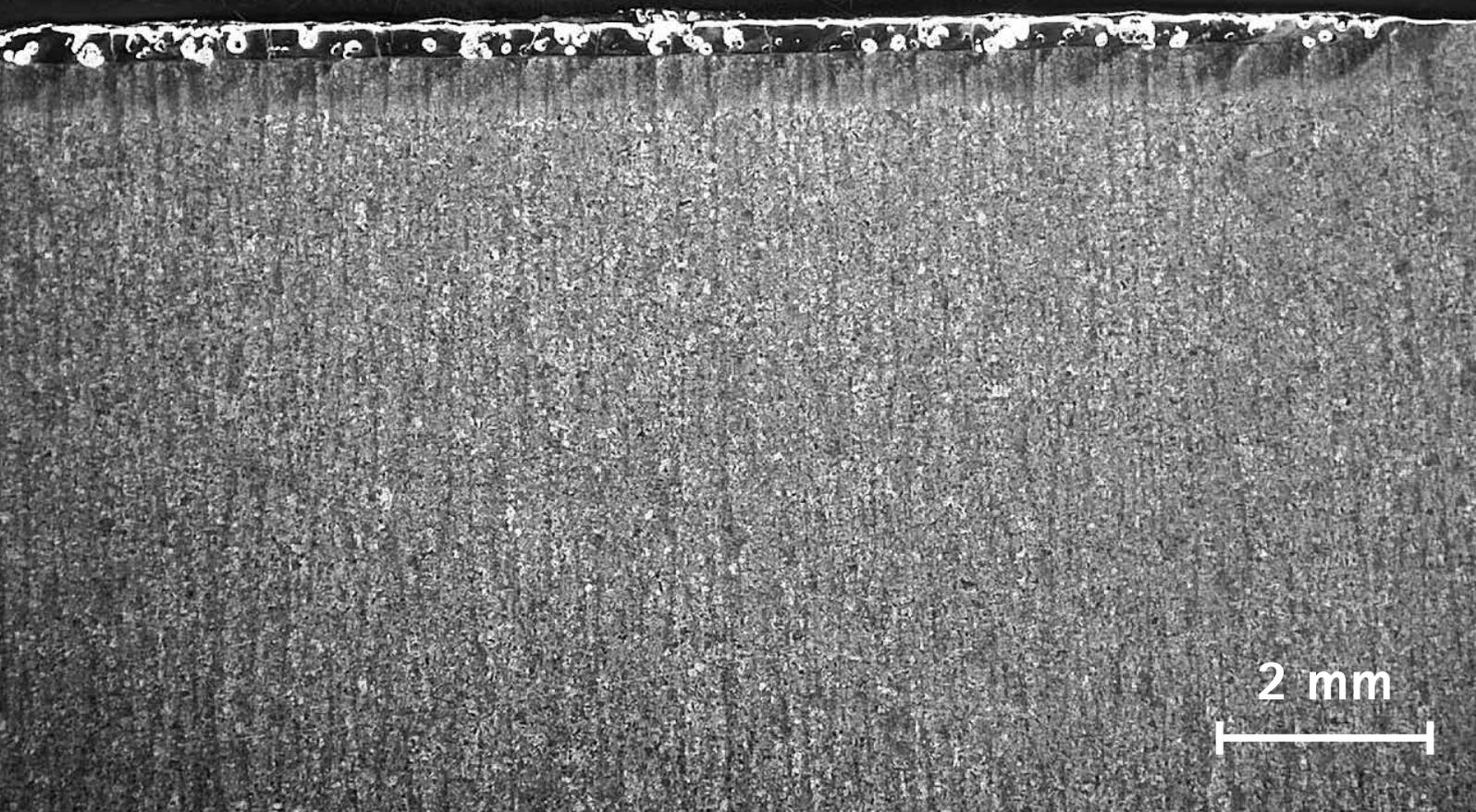
##### Key areas

- Manufacture of pliable semi-finished products
- Handling of complex fiber-reinforced structures and preforms
- Gripping systems for handover to lightweight construction processes
- Interlinking of processes for automated production of lightweight construction components
- Special purpose machinery and fixtures for process automation

**Image:** The gripper developed by the research team; demonstration equipment



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2 mm

## Using Coatings to add Pressure

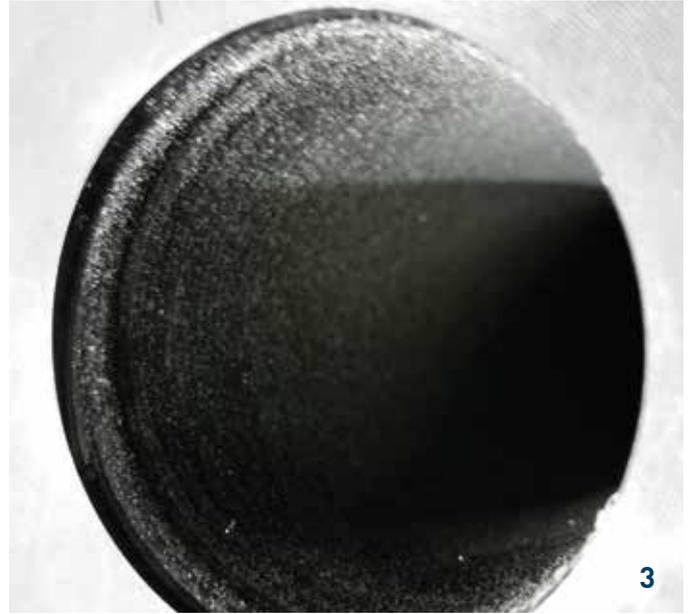
**Steinbeis works with manufacturing partner to develop rough surfaces on extrusion bushes**

Extruders are devices used to pass solid, viscous, and liquid materials through tubes based on a coil principle. The materials are pushed through different temperature zones under high pressure, causing them to change from a solid state to a viscoelastic or thermoplastic state. The device used to convey the material is like a coil running down the inside of a cylinder. Depending on the material properties and the processing parameters, the feed section comes in different forms, with the main types being a smooth-bore extruder and a grooved feed extruder. As part of a research project, the Steinbeis Innovation Center for Intelligent Functional Materials, Welding and Joining Techniques, and Implementation decided it was time to optimize the technically more simple and less expensive smooth-bore extruder option to deliver more pressure.

Smooth-bore extruders are used to move materials, or actually drag them, between forward-moving coils. The inner surfaces of the cylinders are smoothed in a honing process to minimize friction between the coil surfaces and the cylinder. This can impede movement, however, due to material slippage. This limits the efficiency of material movement, and, as a result, there is a limit to the amount of pressure that can be exerted in the section just before the material comes out. The problem is that sometimes an extrusion job needs more pressure where the material exits, so an extruder has to be used with grooved bushes. This has grooves on internal surfaces of the cylinder in the feed section that the material passes through. To work properly, more pressure may be needed, but by doing this it becomes possible to move materials that are more resistant to pressure and this improves flow. Because extruders with grooved bush cylinders are complex in technical terms, they require more energy and are expensive to purchase, so plastics processors prefer to use the more simple smooth-

bore extruders. The Steinbeis experts believed that for many extrusion tasks, a half-way house technology would probably be the best solution.

This was reason enough for the experts at the Dresden-based Steinbeis Innovation Center for Intelligent Functional Materials, Welding and Joining Techniques, and Implementation to embark on an optimization research project. The approach they adopted was to "roughen up" the inner surfaces of the cylinder in the smooth-bore extruder using a special coating. Working in collaboration with their research partner, Arenz GmbH from Meckenheim, they first investigated different technical approaches for the coating process. These different coating techniques led them to a variety of coating systems which could be adjusted by adapting processing parameters and the combination of powders used. The resulting coating systems were then tested, looking at coating properties, different degrees of roughness, and wear resistance.



To analyze parts welded to the extruders, the researchers at the Steinbeis Center also used 3D technology to provide images of the surfaces. Analyzing the surfaces subsequently made it possible to determine and compare the number of tungsten carbide particles exposed on surfaces. By examining the coatings added to the surfaces, it was possible to demonstrate that small particles of tungsten carbide were ideal for optimizing properties as required. It was important that there were not too many exposed particles to minimize the degree of mechanical wear in the coils. The best substance was found to be hardened tungsten carbide measuring between 63 and 170  $\mu\text{m}$ .

The research partners built on these results by optimizing the coating systems and the corresponding coating processes. Using laser dispersion, they created a uniform rough layer that worked a bit like sandpaper and improved the performance of the extruder. Compared to the smooth-bore extruders previously in use, adding coatings meant there was less tendency for materials to wear.

After comparing the newly developed Tribop bushes with existing technology, the researchers were able to confirm that the project had addressed key parameters. Compared to smooth-bore bushes, the Tribop extruders raise throughput to 154%. The exit pressure with the Tribop bushes is also higher at 112%, confirmation that there is reduced material backflow. The Tribop bushes have a higher driving power and electricity consumption than with the smooth-bore bushes. In contrast to the grooved bushes, the required power reduces to 71%. It was clear from evaluations that by using the Tribop bushes, it is now possible to extend the capabilities of the smooth-bore extrusion machines. For Arenz, this opens the door to offering customers other innovative products positioned between smooth-bore extruders and grooved bush extruders.

**Image 1:** Experimental coating using laser dispersion on a flat surface

**Image 2:** View of the feed section with grooves

**Image 3:** View of the feed section on the Tribop extruder. The surface has been modified using laser dispersion.

#### Steinbeis Innovation Center for Intelligent Functional Materials, Welding and Joining Techniques, and Implementation

Applied research, development, design, and implementation

- Materials: intelligent materials for lightweight construction, particle/fiber-reinforced composites, memory alloys (smart materials), application of nano technologies
- Joining:
  - Arc welding techniques
  - Mechanical joining techniques
  - Hybrid joining techniques
  - Resistance welding techniques
  - HFI welding techniques
  - Mixture bonding
  - Manual, robotic MIG/MAG/WIG welding torches
  - Welding technology equipment
- Components: holistic design of joined components, calculations, numerical simulation of functional materials, joining connections, expert reports on failures and damage in joined component designs
- Implementation: market analysis of state-of-the-art lightweight construction materials, joining techniques, applications, pre-sales, marketing, staff recruitment
- Energy audits acc. to DIN standard 16 247



Dr.-Ing. habil. Khaled Alaluss, Daniel Hübschmann,

Prof. Dr.-Ing. Gunnar Bürkner

Steinbeis Innovation Center Intelligent Functional Materials, Welding and Joining Techniques, Implementation (Dresden)

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## Life Phases and Competence-based Career Path Planning

### Steinbeis Transfer Institute certifies further education for employability project

Since January 2014, the machine tool producer and laser specialist Trumpf has been working on a concept to promote career planning based on life phases. The idea is to promote the health and performance of its service technicians over the long term, thus ensuring the employability of its older, more experienced employees. The human resources department plans to go about this by developing a life phase-oriented concept for planning career paths. The Steinbeis Transfer Institute competence institute unisono (kiu), which is based at Steinbeis University Berlin, is supporting Trumpf with its concept by providing continuing professional development (CPD) to service technicians as an alternative to manual experience in the field.

Fit for Service (F4S) is part of a project initiated by the Federal Ministry for Education and Research. Its project, EPO-KAD, focuses on rounding off the potential of older employees through competence management based on the employee's life stage and designing special work processes as part of delivering industrial services. Within the scope of F4S, the human resources development department at Trumpf is concentrating on the job-related maturity phases of its employees. In this phase, older, more experienced field service technicians should be given career options involving less manual tasks. The primary aim lies in reducing the physical activities involved while simultaneously offering more alternatives to engage in other types of demanding tasks – jobs that make good use of the many years of experience offered by the service technicians. So these older employees could, for example, be more involved in the practical training of younger colleagues or serve as trainers for customers. At the same time, this could potentially counteract the risk of employees leaving their job unnecessarily early, which would spell a loss of knowledge and skills for the company.

Trumpf has planned various measures for its service technicians as part of their training for new roles. The company recently instituted a certified CPD program. Its training program to become a "Competence ServicesConsultant" has been certified by the Steinbeis Transfer Institute kiu based at Steinbeis University Berlin. It was developed in cooperation with the SteginkGroup Academy. This innovative concept was designed to meet the needs of life stage-oriented CPD in medium-sized and large manufacturing companies. At Trumpf, it is aimed at specialists currently employed by the company.

The tasks and responsibilities of service technicians in machinery and plant engineering are very diverse. Maintenance, repair, assembly, and ramp-ups entail a broad variety of tasks. In addition, there are new learn-on-the-job techniques and IT is used heavily in some areas, where everything is about communication and providing advice on applications and machines. In some cases, older, more experienced employees in the service department have limited experience with these IT-based work and instruction methods. The training course to become a certified "Competence ServicesConsultant" (SHB) is modular, teaching service technicians various aspects of interpersonal communication and consulting. They learn how to ask just the right questions to understand

customer needs and how to organize, plan, and professionally implement their own specialist training and customer training sessions.

"We started the first module of our certified training program in June. We employ various didactic methods to address the respective topic areas. Between face-to-face sessions, participants are invited to join us in our virtual classroom to ask any questions they may have and provide them with ideas for a follow-up phase," explains Henriett Stegink, initiator and managing director of the SteginkGroup Academy. She then adds: "Previous course events in Schwäbisch Gmünd were very successful and they were based on the three pillars of our teaching method: understand, use, evaluate. What I find particularly special about this advanced training is that the course participants network amongst themselves and learn from one another. Just minutes after the first lesson began, there was lively interaction and there was lots of discussion in the breaks." The course participants also described the training sessions as a success: "The modules really helped me move forward. I was happy to use the opportunity to get constructive feedback after the various exercises," says Marcus Haug, specialist trainer at Trumpf Werkzeugmaschinen GmbH + Co. KG. Gerd Duffke, program manager for HR development in specialist projects at Trumpf GmbH + Co. KG, sees the training course as an important supplement and an enrichment to existing training courses, and he thinks the certification through Steinbeis University Berlin is first rate. The project has been nominated for the German training award, Bildungspreis 2017. Further training courses for service technicians are planned for the coming year and beyond. This first round of training will serve as a reference and basis for further quality improvements.



Peter Schust

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Henriett Stegink | SteginkGroup Academy

Gerd Duffke | Trumpf GmbH + Co. KG



*"The 2015 Meeting Place for Business event allowed us to meet lots of interesting new people and forge networks with former students, some of them going back many years. For us, it wasn't so much the technical conversation we found interesting but just being able to touch base again with the students and talk about their degree at the business school. It was also interesting to see the areas the students have now branched off into: from manufacturing to retail, patient care, services, and then us in a manual trade – everything was covered. We're look forward to going back again in 2017!" Kathrin Hinz (Facility Service Team Kathrin Hinz e. K., Dormettingen)*



*"I visited the event for the first time in 2015 and the booth was quite small, but it was a success and it was really well organized. I was actually surprised by how many rewarding and really interesting conversations took place at my booth. I hadn't actually expected that but my booth was in an ideal position next to a plastics processing firm called Josef Frech GmbH & Co. KG, which makes molds and tools. The CEO, Gerhard Frech, is an alumni of the business school – it really complemented what we do and it was good to exchange notes!" Ursula Nagel (Grässlin Süd GmbH, Villingen-Schwenningen)*

## A Meeting Place for Business: Networking at Alb-Schwarzwald Business School

**Networking trade show takes place for third time in Rottweil**

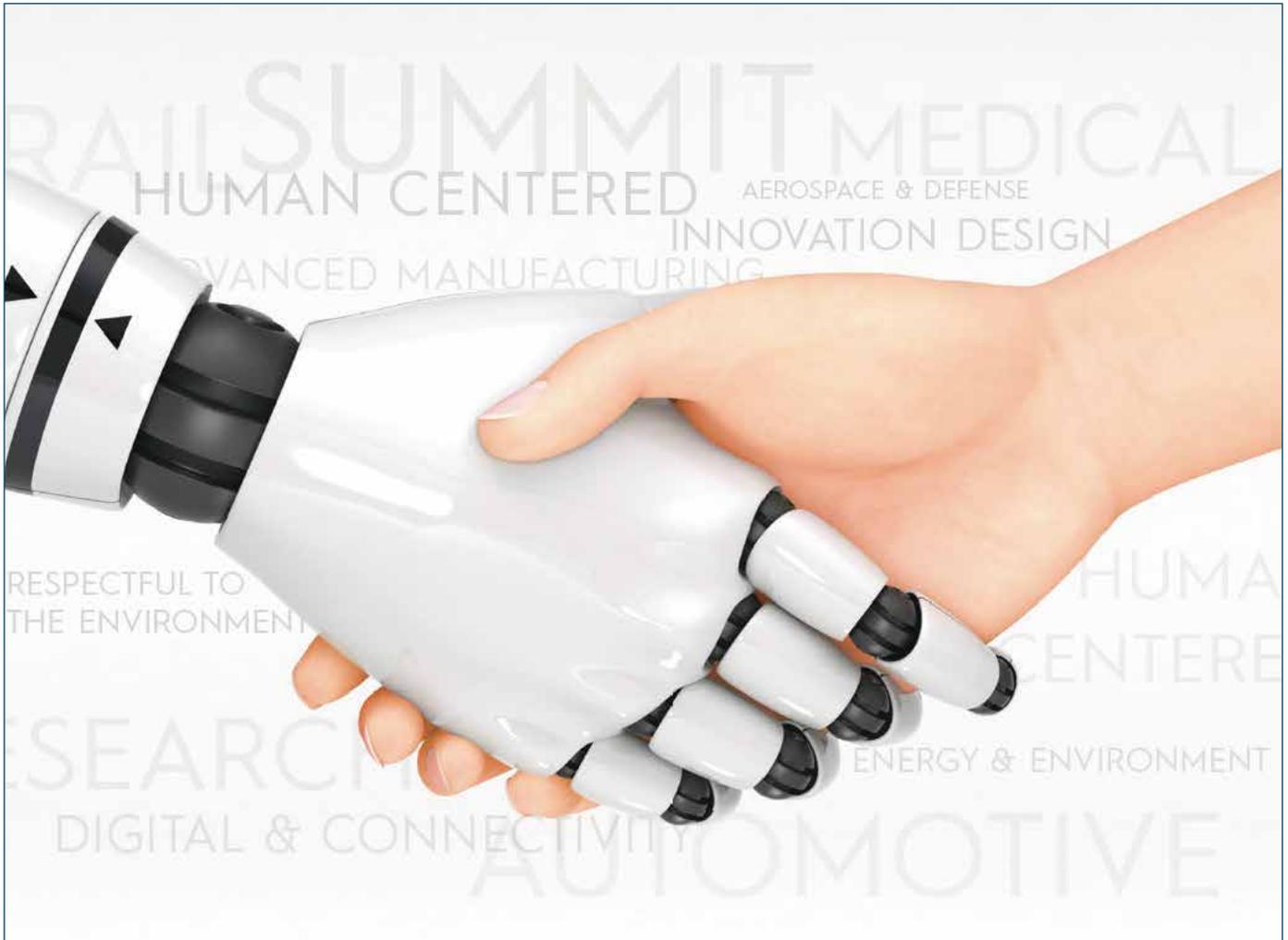
Lots of people say they want to innovate, but let's be honest: how many of us really do innovate? No company that sits in a corner twiddling its thumbs will ever innovate. Alb-Schwarzwald Business School, which is part of Steinbeis University Berlin, can call itself innovative. So can some of the companies with specialists and managers studying at the business school in Rottweil. So what's better than to bring everyone together at a small but excellent trade show established to motivate participants to engage in informal conversation. And what can be more satisfying than taking in the most amazing ideas that pop up in all kinds of fields. It is now the third time that Alb-Schwarzwald Business School is organizing the Meeting Place for Business event, which will take place next time on Saturday, March 25, 2017 in the town hall in Rottweil. Open sesame – time for people to network in all areas of industry!

More than 60 companies and organizations will be exhibiting and presenting their latest products at the trade show. There will also be a program of specialist events to coincide with the show, including a visit from Dr. Klaus Doppler, a leading author in the field of change management. The experts welcome all kinds of visitors to the talks and encourage everyone to share their own experiences. The topics that will be covered include compliance, data security, patents, future prospects in international markets, consumer trends in Asia, funding programs for innovation, and lots more. Guests from all areas are welcome to attend the event, which is free.

For the latest information on the trade show, go to [www.treffpunkt-wirtschaft.com](http://www.treffpunkt-wirtschaft.com) where there is also an overview of exhibitors, details of the talks, and the option to register online.



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## InnovationQuality Summit 2017

### Event combines conference program and meeting platform

From May 9–11, 2017, Steinbeis, the aerospace forum Luft- und Raumfahrt Baden-Württemberg (LRBW), the Fraunhofer Institute for Industrial Engineering (IAO), and the National Industrial Association of Baden-Württemberg (LVI) are hosting the InnovationQuality Summit (IQS) at the house of commerce (Haus der Wirtschaft) in Stuttgart. The platform for innovation offers a first-rate conference as well as a chance to meet experts and companies working in innovation and quality. The focus of the IQS lies in current innovation developments in the industry sectors of aerospace, automotive, railway, medical engineering, energy, and 3D printing applications.

19.5 billion euros are invested in research and development in Baden-Württemberg each year. That represents 5% of the gross domestic product and thus more than the 3% stipulated by the EU. And the percentage of people working in research and development in Baden-Württemberg is also higher than in any other region in Europe. Large corporations – leading innovative companies – are headquartered here and they are supported in their research by a network of SMEs, universities, and research facilities. The IQS looks at the question of how innovation and quality can be maintained or enhanced in these companies.

The first conference day (May 9) will focus on many specialist topics in the area of innovation and quality:

- Innovation and quality from an international perspective
- Risk management and innovation
- Horizon 2020: Future opportunities and challenges
- Modern travel solutions: High-level innovations combined with sophisticated technologies
- Industrial innovation and state supervision
- How is innovation financed?
- Advanced management methods/advanced innovation management
- The quality of innovation: points of differentiation

The two subsequent days (May 10 and 11) will be set aside for one-on-one meetings with suppliers and buyers. There will also be a workshop program for companies at the event. The face-to-face meetings can be planned in advance through an online catalog.

For further information and to register online, go to: [www.iq-summit.com](http://www.iq-summit.com).



Andrea Reinwart

Advanced Business Events/BCI Aerospace (Boulogne-Billancourt/France)  
[areinwart@advbe.com](mailto:areinwart@advbe.com) | [www.advbe.com/en](http://www.advbe.com/en)

## Prof. Dr.-Ing. habil. Prof. h. c. Eberhard Kallenbach

### Obituary

Steinbeis mourns the loss of Prof. Dr.-Ing. habil. Prof. h. c. Eberhard Kallenbach, who passed away in October after a long illness. He founded the Steinbeis Transfer Center for Mechatronics at the Technical University in Ilmenau, where he served as director for many years. The center was one of the first to be established in former East Germany after reunification. Eberhard Kallenbach didn't just bridge the gap between science and business there. Through his transfer projects and dedication to research and teaching, he also made a significant contribution to integration between East and West and to regional economic development.

Eberhard Kallenbach studied theoretical electrical engineering at the Technical University in Ilmenau and remained there for the whole of his academic career. Until 2000, he was a regular university professor and head of the institute for microsystem engineering, mechatronics, and mechanics. The Steinbeis Transfer Center he founded in 1992 focused primarily on electrical drive components, especially engineered electromechanical drives and electronics technology as well as magnetic technology. In 2010, projects at the center led to the founding of Steinbeis Mechatronik GmbH.

The first Steinbeis House in Ilmenau was established in 2005 following an initiative of Eberhard Kallenbach, and it is now home to several Steinbeis Enterprises. It is not only a testament to the many successful transfer projects that have been carried out there, it also symbolizes Eberhard Kallenbach's dedication. With it, he opened the door to a different future for well-trained young people in his region, and, as an entrepreneur, he assumed responsibility for people's social welfare. One example of this is when he supported the founding of Steinbeis innomas GmbH, a spin-off of his Steinbeis Transfer Center.

With Eberhard Kallenbach's passing, Steinbeis has lost a committed colleague who embodied the traditional values of an entrepreneur with his



modesty, patience, and his sense of responsibility for his employees. His exceptional work with technology transfer and his dedication to Steinbeis was honored by the foundation in 2004 and 2008 with the Steinbeis Foundation's Transfer Award, the Lohn Award. We will deeply miss the trustworthy and reliable collaboration with Eberhard Kallenbach. Our thoughts go out to his family and loved ones.

Prof. Dr. Michael Auer | Manfred Mattulat  
Steinbeis Foundation Board of Directors

Image: Prof. Dr.-Ing. habil. Prof. h. c. Eberhard Kallenbach (1935-2016)



Steinbeis Foundation (Stuttgart)  
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## Starting shot for the 2017 Baden- Württemberg Competence Award

### Now accepting applications

The ability to innovate and high standards in companies are all a part of the global competitive edge held by the Baden-Württemberg economy. The Baden-Württemberg Competence Award honors outstanding contributions and achievements and provides an incentive to tap into further innovation and quality potential. The award, which will be bestowed for the tenth time in 2017, is an initiative of P. E. Schall GmbH & Co. KG and the TQU GROUP, an enterprise from the Steinbeis Network.

The award is presented each year as part of the Control trade show, a specialist fair for quality assurance held in Stuttgart. The Steinbeis Foundation sponsors the award. The next award ceremony will take place on May 9, 2017. Companies and organizations based in



Baden-Württemberg are invited to apply for the award by February 6.

The award requirements are demanding: a strong entrepreneurial drive and innovative spirit alone won't cut it. Instead, the award is bestowed each year on companies that successfully bridge the gap between innovation and quality, have integrated this into their daily operations, and can show evidence of outstanding results.

For further information on how to apply, go to: [www.kompetenzpreis-bw.de](http://www.kompetenzpreis-bw.de)



Ulla Bläsing  
Office for the Competence Award for Innovation and Quality  
in Baden-Württemberg (Ulm)  
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**Overview (version Nov 2016)**

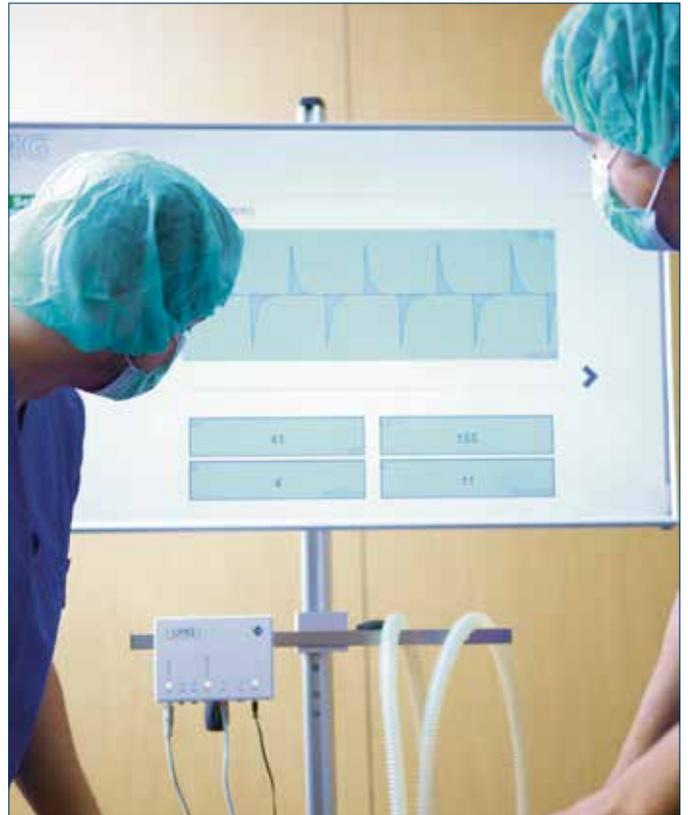
**Tuesday, March 7, 2017, 6:30 p.m.**

Pre-event get-together

**Wednesday, March 8, 2017, 9:00 a.m.: Discussion Forum**

**Keynote speech: Digitalization – Opportunities and Threats**  
Dr. Eberhard A. Veit, Director, 4.0-Veit Unternehmung VEIT GbR, Göppingen

- **Requirements Engineering: If Writing is Valuable, Questioning must be Gold – The Role of Humans as a Key Success Factor**  
Markus Uttikal, Director, TZM GmbH, Göppingen
- **Session on Manufacturing**  
**The Myth of Human Error – Success Stemming from Intuitive Operation**  
Florian Mack, Success Designer, Design Tech, Ammerbruch  
**Factors Dictating the Success of IoT Strategies**  
Larry Terwey, C&E Global Blackbelt SSP, Microsoft Corporation  
**Expert Interview: On the Road to Success with UX**  
Bernd Gerhardt, Director, Jakob Gerhardt GmbH automated selling devices, Nürtingen  
Nick Herrmannsdörfer, Usability Engineer, TZM GmbH, Göppingen
- **Session on Automotive Technology**  
**The Future Challenges of Vehicle Electronics**  
Lorenz Slansky, Daimler AG, Sindelfingen  
**Virtual Integration (working title)**  
Markus Hemprich, responsible for modeling and software for car interiors, Daimler AG, Sindelfingen  
**Functional Software Testing – Systematic Ways to Verify and Validate Integrated Software**  
Michael Hall, Senior Manager of Software Validation, Thorsten Geiselhart, Senior Expert in Testing and Processes, Marquardt GmbH, Rietheim-Weilheim  
**How to Fit Testing Equipment with 312 Control Devices into an Elevator Measuring 3.25 m<sup>2</sup> and 13 m<sup>3</sup>?**  
Peter Heidenwag, Director, Brinkmeyer & Partner Engineering, Schwaikheim  
Christoph Königs, Head of Embedded Systems, TZM GmbH, Göppingen
- **Session on Medical Technology**  
**Outsourcing Connectivity – Advantages, Feasibility, Innovation**  
Oliver Drexler, Head of Medical Solutions, TZM GmbH, Göppingen  
**Distributed Alarm Systems in Practice – Challenges and Solutions (working title)**  
Heribert Schäfer, Product Manager, Life Care Solutions, GE Healthcare



### The Software Engineering Discussion Forum TZM and Hanser organizing convention in Göppingen

TZM and Carl Hanser publishing are inviting people to a “Software Engineering Discussion Forum – Technology, Methods, Best Practice” on the Göppingen campus of Esslingen University of Applied Sciences on March 8, 2017. The event is part of jubilee celebrations at the TZM marking 25 successful years in business.

The forum actually kicks off the evening before (March 7) with a general get-together. Live music in the relaxing atmosphere of a snack bar will set the right tone for casual conversation. The after-dinner speeches will be given by Edgar Grundstein (managing director of TZM) and Prof. Dr. Jürgen van der List (former director at TZM).

The specialist forum itself will take place the next day. It will include three sessions that revolve around automotive technology (with a focus on software quality and testing automation), manufacturing (with a focus on user experience and the IoT), and medical technology (with a focus on system networks and connectivity). The advisory board is made up of leading figures, underscoring the quality of the line-up. A keynote speech will be given by Dr. Eberhard A. Veit (former chairman of the management board at Festo AG & Co. KG).

For a detailed schedule and to register, please go to: [www.softeng-forum.de](http://www.softeng-forum.de).



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## A Visionary Excursion

**Steinbeis co-organizes trip to the Vision trade show in Stuttgart for schoolchildren and college students**

It's never too early to reach out to the next generation of managers and specialists. It was this thought that motivated six organizations to set up a trip to the Vision trade show in Stuttgart: the Ilmenau-based Steinbeis Quality Assurance and Image Processing Enterprise (SQB GmbH); Vision & Control GmbH from Suhl; the Ilmenau-based image processing company TechnoTeam Bildverarbeitung GmbH; GBS mbH, also from Ilmenau, which is a specialist in image signal processing; the department of quality assurance and industrial image processing at Ilmenau University of Technology; and the trade fair organizer itself, Messe Stuttgart. Together, they made it possible for a group of schoolchildren and students from Thuringia to visit the world's leading fair for industrial image processing.

Image sensors, optical systems, and processing algorithms are not just the kind of technology you find in SLR cameras, they are also needed in manufacturing along with the right software for things like spotting errors during live production. To discover how and explore the latest technology first-hand, a group of more than 60 schoolchildren and students went on a day trip to the Vision trade show on November 9, 2016. The sponsors organized everything from bus transportation to Stuttgart to free entrance tickets, lunch, and guided tours in small groups. The idea was to provide the group with insights to the world of industrial image processing.

The overall goal of the trip was to allow everyone to forge new contacts – not just the group of schoolchildren and students, but also any com-

panies looking for potential recruits. Summing up the trip, Max Bunge, a student at Carl Zeiss High School in Jena, said: "I was totally taken aback by the number of ways image processing is used in industry. It makes you really want to get involved and develop those kinds of high-tech devices yourself. So I also hung around at lots of booths and tried to get in contact with the companies. Most of them were really open and told me about the job prospects at their company."

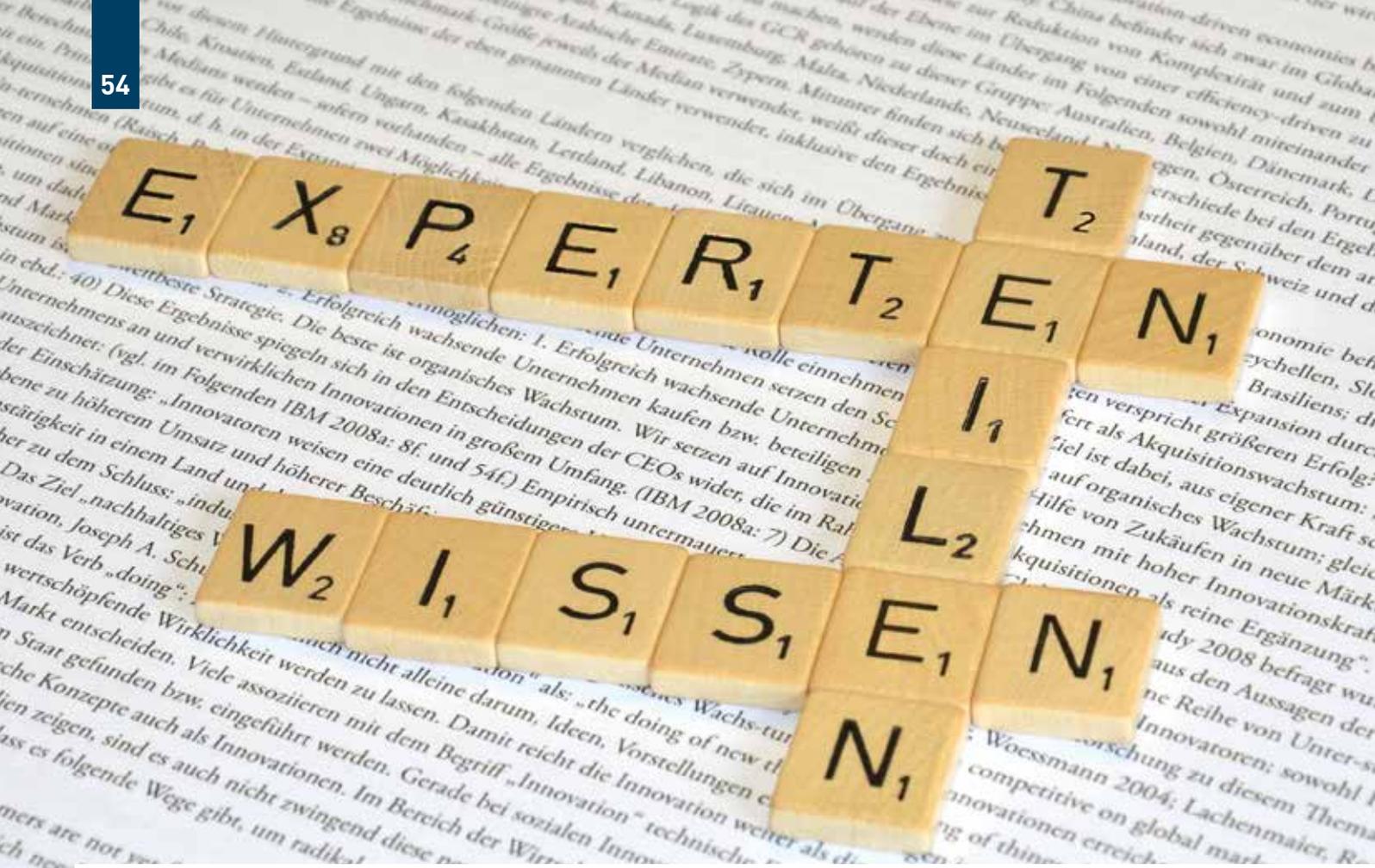
There was plenty of positive feedback for the team of organizers on the trip back home. Here too, lots of new contacts were made between the group of students and the companies on the trip. "As organizers, it certainly met our expectations. It made a great contribution toward reaching out to young people in Thuringia," says Steffen Lübbecke, managing director of SBQ GmbH, drawing an extremely positive line under the trip. So it looks like this will not be the last trip of its kind for young enthusiasts!

Image: © Messe Stuttgart



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Carl Zeiss High School (Jena)



## Experts.Knowledge.Sharing.

### New releases from Steinbeis-Edition

Steinbeis-Edition, the publishing arm of the Steinbeis Foundation, regularly publishes works reflecting the scope of the Steinbeis Network's expertise. All titles can easily be ordered via our online shop at: [www.steinbeis-edition.de](http://www.steinbeis-edition.de)



#### The Steinbeis Entrepreneur Forum Networking platform for SMEs Conference proceedings

2016 | paperback, b&w | 48 pages, German  
ISBN 978-3-95663-098-9

#### About the event

The central theme for the fourth Steinbeis Entrepreneur Forum held in June 2016 was innovation and digitalization, looking at opportunities for SMEs. The event was a chance for Steinbeis experts and their partners to look at issues from a theoretical standpoint and explore how things work in practice.

A large number of guests received new insights and heard a variety of thought-provoking ideas on recent trends, also as part of round-table discussions examining individual questions posed to the speakers. The volume of proceedings contains summaries of the talks given at the Steinbeis Entrepreneur Forum, current topics from the field of process and change management, and different ways to share and apply skills.



#### Black Sheep – Outcasts and not Lateral Thinkers? Gernot Barth, Bernhard Böhm (ed.)

2016 | stapled, color | 76 pages, German  
Published in: Die Mediation 2016/03 | 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 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 the Steinbeis Consulting Center Mediation of Business. 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.



### The Tendency of Small and Medium-Sized Enterprises to Externalize Financial Accounting

**Tobias Albrecht**

2016 | paperback, b&w | 260 pages, German  
ISBN 978-3-95663-089-7

#### About the author

Tobias Albrecht studied business and management at Heilbronn University. He then went on to earn an MBA in Entrepreneurship at the University of Louisville in Kentucky. He completed his doctorate through Steinbeis University Berlin in 2014.



### The money is there – so where are the ideas to go with it? The Steinbeis Financing Arena

2016 | stapled, color | 36 pages, German  
ISBN 978-3-95663-099-6

#### About the event

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 event, which was organized by Steinbeis, L-Bank, and Bürgschaftsbank Baden-Württemberg, clearly met the right criteria for many and a good 200 people turned up at the Stuttgart Hospitalhof. The booklet provides a summary of the day with images and quotations from people at the event.



### The Future of Corporate Publishing

**Felicitas Knapp**

2016 | paperback, b&w | 75 pages, German  
ISBN 978-3-95663-108-5

#### About the author

Felicitas Knapp studied journalism and public relations at the Westphalian University of Applied Sciences. After a period of working as a student in public relations, she completed a degree in electronic media with a focus on corporate communications at Stuttgart Media University. This paper was part of her thesis while she was studying towards a Master of Arts in 2016. Knapp has been a working student in graphic design and typesetting at Steinbeis-Edition since 2014. Her latest project, Formkavalier, is a first step toward self-employment.



### Capacity Planning and Control Credit Cooperatives

**Michael Steinmüller**

2016 | paperback, b&w | 423 pages, German  
ISBN 978-3-95663-107-8

#### About the author

A banking clerk by trade, Michael Steinmüller studied business at the OTH (East Bavarian University of Applied Sciences) in Regensburg before earning his master's degree in Banking & Finance. He obtained this degree from the WHL School of Business and Economics while also working on the side. Steinmüller is the managing shareholder of Banking & Business Consulting GmbH, which specializes in banking, insurance, and related IT suppliers. In parallel to this role, he completed a Ph.D. at Steinbeis University Berlin in 2016.



### Scientific Working Methods. Compact. Understandable. Explained.

**Marco Wölfle, Luise Wohlhage, Stephanie Zwick**

2016 | paperback, b&w | 54 pages, German  
ISBN 978-3-95663-104-7

#### About the authors

Prof. Dr. Marco Wölfle is a scientific coordinator at the Steinbeis Transfer Institute of Applied Statistics and Political Economy, the Center for Real Estate Studies, VWA Business School, and the Center for Economics and Administrative Studies (WVZ). As a lecturer, his work focuses on quantitative and qualitative methods of research, economics, the financial markets, and business accounting.

Dr. Luise Wohlhage has been a research assistant at the VWA Business School at Steinbeis University Berlin since 2011 and works as a consultant and qualified expert at DIA Consulting AG in Freiburg. She earned her doctorate in 2015 from the University of Freiburg. Her research activities revolve around the field of international assessment methods.

Stephanie Zwick, B.A., works as a scientific administration assistant at the Center for Real Estate Studies (CRES) in Freiburg. One of her main responsibilities lies in overseeing degree program applicants, students, and alumni. Zwick earned a bachelor's degree from one of the institutes at Steinbeis University Berlin, while also working on the side.



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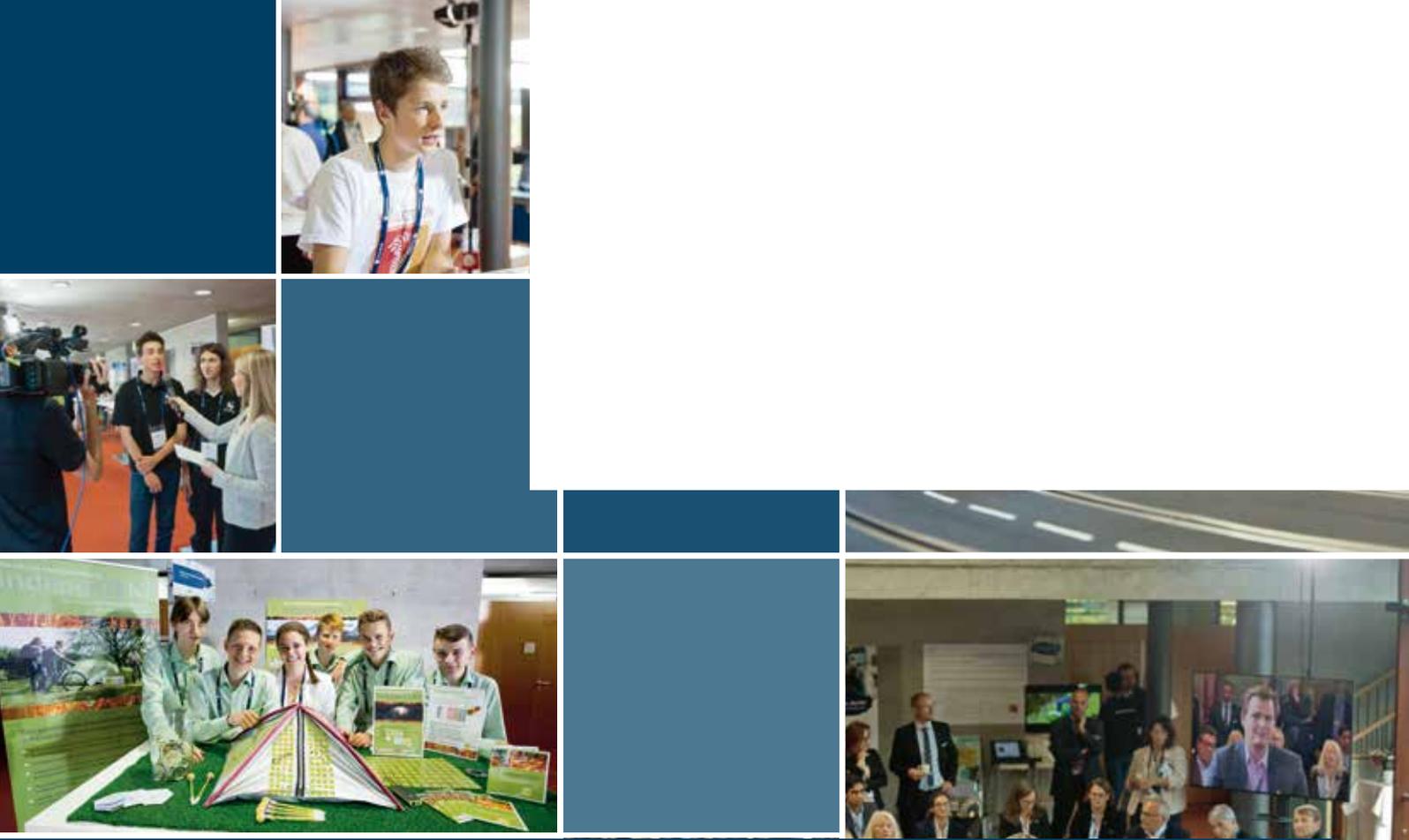
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Steinbeis-Stiftung

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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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