Steinbeis

TRANSFER

The Steinbeis Magazine

Award-Winning Transfer

Feature Topic: 15 years of the Steinbeis Foundation's Transfer Award – Löhn Award
Our prizewinners take a look back

This is the Network Calling!
A look back at the 2018 Steinbeis Day and Steinbeis Night

Turning the Spotlight on Rolling Bearings
Steinbeis experts compare optical and tactile measurement technology

Adding Sound to Wear and Tear Using Acoustic Fingerprints
A new kind of algorithm for monitoring milling processes

04 | 2018

Find an overview of all Steinbeis Enterprises and their services on www.steinbeis.de → network

Dear Readers,

In 1983, Prof. Dr. Dr. h.c. mult. Johann Löhn started building the Steinbeis organization on a foundation of "transfer entrepreneurship." He was put in charge of the Steinbeis Foundation and in 1998 he was also given responsibility for Steinbeis GmbH & Co. KG für Technologietransfer, both enterprises he managed with great success until 2004. Between 1998 and September 2018, he acted as the president of Steinbeis University Berlin. Löhn is an Honorary Trustee of the Steinbeis Foundation and in this capacity a member of the jury of the Steinbeis Foundation Transfer Award – the Löhn Award, which was introduced in 2004 in honor of his achievements.

To contact Johann Löhn, write to johann.loehn@stw.de.

35 years of Steinbeis. I'm delighted that my baby is now an adult and the fundamental values are still in place. Of course, this is also due to the people who have taken on these values and "live" them.

I'd like to leave you with two messages, both based on personal experience – innovation and people. I'll start with innovation. There's a tendency to think in terms of working out where things are now (capturing the current status), then planning where things should be (the required status), and then striding from current to required as if fulfilling a plan. Yet it's the things that happen, the things that threaten losses, change markets, bring about structural change that lead to innovations – or perhaps it's pure chance. I've visited many companies and whenever I have, I've always looked at their history and discovered so many of these changes.

Which brings me on to people. I've met people with a burning passion for an idea. It fuels courage. When trust came on top of this, it was enrichment par excellence. For me, the most important value or asset was always people. Look out for people you can trust and show them that you trust them. That's the only way to achieve things. I can think of numerous examples of few people agreeing to do something and sticking to their agreement, even when things got a bit "rough." The documentation and timelines rarely show what the real reasons were for making a decision. The same applies to critical decisions of a historic dimension. But it would be naive to think there aren't hypocrites, people who suddenly forget what was agreed as soon as a small advantage emerges for them. With people like that, you achieve nothing.

In these times of information technology, it is becoming increasingly difficult to ensure people remain the most important asset and are recognized as such. Legal documents and agreements can be quickly drafted, down to every last detail, without working out who you're actually dealing with. What remains is hope – the hope of a renaissance.

With kind regards,

Johann Löhn

Nano-Topics, Macro-Significance

Work gets underway at the new Nanoanalytics Center at the NMI in Reutlingen

Nanotechnology, and with it analytics, is not only becoming increasingly important to the semiconductor industry, nanoanalytics now play a central role in many fields of life science and material research. Research into minute structures – down to the millionth of a millimeter – is now indispensable not just for the industrial development and processing of new materials, but also for fundamental research. Nanoanalytics make it possible to research detailed textures and enter into the realms of atoms, so it spans several areas of fundamental research, as well as applied science and industrial research. Issues revolving around coatings are currently of major interest, especially in the field of medical technology and composite materials used in lightweight construction. This is where the Natural and Medical Sciences Institute at the University of Tübingen (NMI) in Reutlingen comes in. The NMI has already been working in close collaboration with Steinbeis for many years, and the two parties have now joined forces as part of a technology transfer holding.

The Nanoanalytics Center is based on the RegioWIN campus of the NMI and after a construction period of only three years it is already becoming an important port of call in the region. The center is aimed at innovative companies looking into questions regarding material technology and product concepts. More than 50 firms and research institutions already expressed prior interest in using the Nanoanalytics Center, including many leading corporations in the fields of medical technology, vehicle construction, mechanical engineering, and tool building, as well as a number of SMEs in the area. They all hope to benefit from easy access to this new hi-tech field. The scientific partners of the project include five institutes belonging to the Baden-Wuerttemberg Innovation Alliance (innBW) and the University of Tübingen. Tübingen University has set up a special professorial chair for advanced materials to bolster know-how at the center, and a group of specialists is now actually based at the center.

For many customers, the benefits of the new center are evident, for all kinds of issues. For example, the uppermost layers of atoms have a crucial impact on many material properties such as corrosion and wear. In innovative areas of business like electric vehicles or additive manufacturing, understanding the exact atomic composition below the surface of materials – and not just the surface itself – is of far-reaching significance for how they can be used. All of these kinds of issues require the right analytical tools – like the high-resolution electron microscopes at the NMI, which can help explain the differences in structures and chemistry in fine detail.

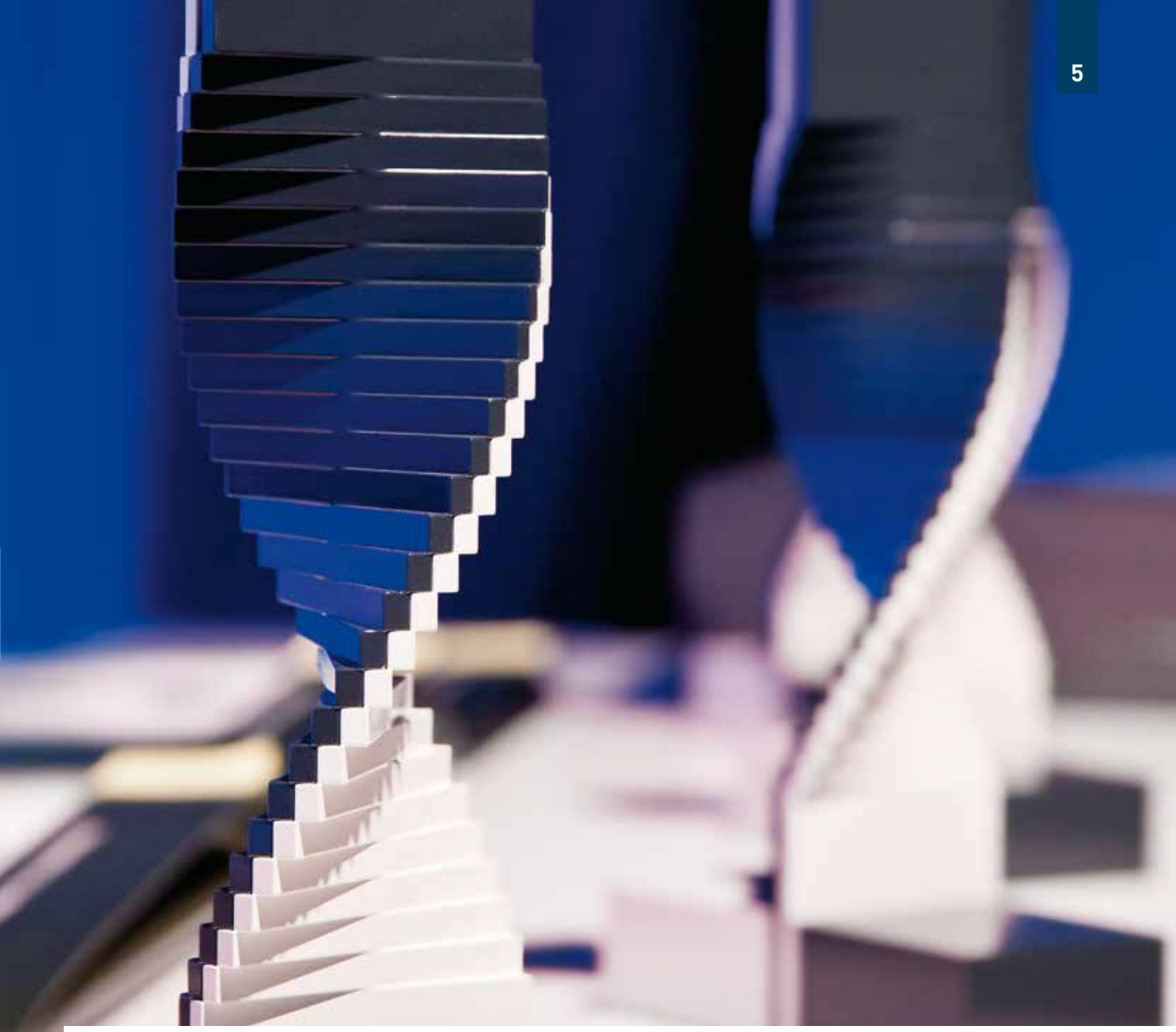
Perfect examples that they will be keen to highlight at the new center are therefore two transmission electron microscopes. These can be used to analyze and study structures down to single atoms and determine atomic and chemical composition. The high-end instruments place the NMI in the top league of institutes with the best analytical electron microscopes in the world. For example, they simplify examining atoms from a distance of only 79 picometers. For reference, the atomic diameter of hydrogen is 100 picometers. They also make it possible to quantify the material morphology and composition through elemental analysis using an energy-dispersive X-ray detector.

Aside from the investment in microscopes, a significant proportion of funding is being used for essential sample preparation. A number of methods have been brought in and set up to prepare a whole host of different materials without artefacts, including biological specimens. The Nanoanalytics Center opens the door to some amazing possibilities, and the team at the center is in the starting blocks and preparing to answer all kinds of questions. The facilities were made possible thanks to funding through the European Regional Development Fund (ERDF) and backing from the state of Baden-Wuerttemberg (Ministry for Economic Affairs).

RegioWIN

Image: © Christoph Alt photography, Fulda

Dr. Stefan Raible
Natural and Medical Sciences Institute at the University of Tübingen (NMI) (Reutlingen)
NanoZ@nmi.de | www.nmi.de/en/center-for-nanoscience



Feature Topic: 15 years of the Steinbeis Foundation's Transfer Award – Löhn Award

A look back (and forward) at winners and their projects

The Steinbeis Foundation Transfer Award – the Löhn Award was initiated and first bestowed by the Steinbeis Foundation in September 2004 in acknowledgement of the outstanding achievements of Prof. Dr. Dr. h. c. mult. Johann Löhn. The prize is awarded in recognition of outstandingly successful projects in the competitive field of knowledge and technology transfer. The success of a project is measured by the quality of the actual transfer process, reflected in the commercial benefit a project delivers to all involved partners. Aside from honoring transfer projects, recognition is also given in the form of special awards to honor initiatives, services, and achievements that meet the criteria laid down for the transfer process, transfer potential, and transfer success. The winners of awards receive a two-part sculpture and a monetary prize that can be used for future projects with a focus on know-how transfer. The award sculpture, designed by Steinbeis director Prof. Detlef Rahe, symbolizes the underlying idea behind Steinbeis transfer and the unique transfer system offered by Steinbeis.

In this edition of TRANSFER magazine, we look back on 15 successful years of the Steinbeis Foundation Transfer Award – the Löhn Award, discovering "what happened next" to the award-winning transfer initiatives as well as the collaboration between different project partners. A variety of Steinbeis experts also explain how the award opened doors to even more opportunity and describe further projects this resulted in. For an overview of past award winners and projects, you can also go to www.loehn-preis.de.

Image: The Löhn Award sculpture

"Transfer has to interpret and understand research findings and know the needs of companies"

A TRANSFER interview with Prof. Dr. Dr. h.c. mult. Johann Löhn, Steinbeis founder and honorary trustee of the foundation

When a man born and bred in the north of Germany uproots and moves to the deepest corner of the Black Forest, that's true commitment. Something that without an iota of doubt applies to Prof. Dr. Dr. h. c. mult. Johann Löhn. It was the early 1970s when Löhn first came to the Black Forest to study at the former Furtwangen University of Applied Sciences. From 1983 until the middle of the last decade, his nickname in Baden-Wuerttemberg and beyond became "Mr. Technology Transfer." In honor of the achievements of the former chairman of the Steinbeis Foundation and Baden-Wuerttemberg Government Commissioner for Technology Transfer, in 2004 the foundation introduced the Steinbeis Foundation Transfer Award – the Löhn Award. Since then, another 15 years have passed. Reason enough for TRANSFER magazine to ask the restless bedrock of the Steinbeis organization for an interview.

Hello Professor Löhn. In your function as Government Commissioner, you've worked on and assessed countless projects. Since 2004, you've also been the chairman of the jury for the Steinbeis Foundation Transfer Award and had to evaluate the projects of Steinbeis Enterprises and their project partners and judge the standard of the transfer process. Looking back over this time, what were the trends and what direction are things going in now in terms of the project partnerships that science and academia enter into with business?

Could I start by saying that in almost 25 years as a Government Commissioner, I must have signed more than 20,000 expert assessments. Gaining that signature was a prerequisite for companies to receive state funding, especially for innovation, introducing modern technology, or setting up new companies.

Over the course of 15 years, the jury of the Steinbeis Foundation Transfer Award has assessed several hundred successful transfer projects, all of which were conducted by Steinbeis Centers with business enterprises. It's astonishing how intensely the projects are focused on, how deep they go and how much detail they go into. I've visited many countries all around the world over the years. The thing I've come to realize is that when it comes to busy gadgeteers, the Germans are Weltmeister. It's only logical that tinkering around with things will result in inventions that haven't yet found a market. But that's better than it being the other way around: a big market but little to offer in the way of products. Being a bit "heretical," I'd define an inventor as someone who doesn't ask customers first and then start cursing when no-one wants his invention. There are two natural talents – inventing and selling – which it's rare to find in the same person. An entrepreneur has to pave the way for synergies between the two poles within one system.

How have things changed over the years? Lots of questions that used to be answered during the transfer process now aren't even asked anymore. Meanwhile, companies do have the right skills. In the old days, companies would come along thinking "we need to do something about this," whereas now they turn up with a specification list. What's remained and, if anything, is becoming more pronounced is the need for companies to turn to research findings.

One of the most memorable phrases you're known for is "Innovation – there's enough of that. We need to implement things!" Where do you see the stumbling blocks within companies – why is there still so much potential to transfer things out of development departments into the market?

Germany has a kind of "value chain" not seen anywhere else in the world. It's fundamental research – applied research – transfer – industry – manual trades. It's why 30% of our gross national product comes from industry, or manufacturing, including industry-related service provision and the manual trades. That's a totally unique competitive advantage. Research just has to produce results for their own sake without any compulsion to think about transfer. Otherwise, it would be the end of all progress. Transfer has to interpret and understand research findings and know the needs of companies. That's fundamentally different from acting as an intermediary. It's even better if transfer applies the findings of research and develops products and processes out of them. That's what Steinbeis is about – it was the first organization in the world to choose transfer as its core competence.

Coming back to your question about further potential: In classic terms, in many areas the manual trades are simply industry or manufacturing. The starting point in terms of the questions they ask is always a product or a problem. This has been my experience over 30 years as the jury chairman for the Seifriz Award (the German skilled trades and science award). During this time we've assessed more than 700 applications. Where's potential? The manual trades still have to be guided more systematically into the transfer process. (Big) manufacturers allow a lot of innovations to lie fallow because they don't fit in with their defined portfolio. This is where more interaction through transfer would help.

You can't simply order people to be innovative. What do you believe are the prerequisites or framework conditions that are needed for a company and its workers to go beyond day-to-day business and innovate, or look forward with a vision?

People have different talents; it's in their genes. But "activating" this, especially when people have the same talents, depends strongly on the environment. An example: I know a really successful business leader who started out as a toolmaker. Even today he sits hour after hour with a cigar or a glass of red wine in front of a machine and mulls over the things he could make better. He would never have been successful as a regular worker in a company. So talent seeks the environment that fits best – hopefully. Another example: A former student was made responsible for seeking out ideas within a corporation. I asked him what the procedure is for him. He makes a remark. He has to take this note to his next up in line and then walk up through the hierarchy. So by the time an idea has made it to the top, there's usually not much left of it. A former senior manager at IBM once told me that they had a search machine at the company long before Google came along. They wanted to sell it to customers, but nobody wanted to pay for it. The project was halted – until Google turned the tables on them, gave away the product for free and made money on advertising revenues. Everyone knows what happened next.

I know as a physicist that potential energy isn't the same as kinetic energy. People keep trying to "flick the ON switch" with innovation. An example of this is the term they've been using for some time now: agility. In simple terms, this is about delegating processes and sometimes goals. What's good about this is that the term is creating awareness. But asking people to do something is always easier than actually doing it. Things like this aren't something you can just get on with in a world of hierarchies where people are kept in line by instructions. I can think of another example: When I was a young man I suffered a meniscus injury playing soccer and had to walk around for weeks with my leg in plaster. When the doctor took the plaster off, he smiled and said, "Now stand up and try to walk around." Of course I couldn't, not right away.

Digital technology is nothing new, but the change it's bringing about is increasingly wielding more and more influence. How does this change compare to the structural changes that helped shape the 1980s? And what influence will digital transformation and rapid technology convergence have on future technology transfer?

I'm an optimist, and there's a good reason for that. Just grab the newspapers from the early 1980s and substitute the word "microelectronics" with "artificial intelligence." If you look at the majority of publications in those days, it looked like we were about to go under. What actually happened? We were successful. There can be no question that just like then, qualifications need to adapt. Now, just like then, technology transfer also plays a key role. The structural change that comes with all this in terms of training or qualifications actually started some time ago. People are becoming entrepreneurs within the company with profiles that are adaptable. We also have to think about the fact that people are now on a completely different level when it comes to IT. People these days have grown up with it. It's not like it used to be, where something like an auto repair shop introduced its first PC and hung a big sign over it saying "Computer Center."

You built up Steinbeis around your self-management and problem-solving method, the Löhn Method. A key part of its success is the so-called "dynamic synergy of opposition" – two influencing factors reflecting interactions between systematic methods and randomness on the one hand, and decentralization and centralization on the other. You will continue to work with Steinbeis as an Honorary Trustee of the Steinbeis Foundation. What things will you focus on in particular?

Could I start by saying that without the Löhn Method, I would never have been able to set up Steinbeis the way I did. It's true to say that the dynamic synergy of poles (DSP) proved to be extremely successful as a maxim for the things we did. It's good that my successors have taken this on board. And there's one particular synergy I'd like to point to: immediate decision-making versus strategy. There are often times when you have to react quickly and "shoot from the hip." That's all right. But you also have to keep an eye on the strategic decisions. An example: The chairman of our Board of Trustees plays an important role. He can control us and push us to think in a more narrow-minded way, or he can get us to think broader. The former chairman, Prof. Dr. Hans-Joachim Förster, was head of development at Daimler. He was already around when I started in 1983. He was gruff, but in a positive way and he had very strong principles when it came to moving Steinbeis forward. If you want to change existing structures on the inside, which of course was what I wanted, you need protection on all sides. That's what he gave me, and that was crucial.

When he left in 1990, it was time to appoint a successor. There was a real danger that a chairman would come along from the Ministry of Economic Affairs, a kind of "puppet on a string." This was where the strategy was crucial. I was convinced that Prof. Dr. Max Syrbe – who was president of the Fraunhofer Society at the time – was the right person for us. The only thing was, I wasn't responsible for making the decision. So I simply sent my suggestion to the ministry, plus a copy to the Minister of Economic Affairs, Hermann Schaufler, who was a friend of mine, and said, "Please, you must say 'yes' if the suggestion lands on your desk." What actually happened? We got a good trustee board chairman again.

Then came the next stage. Long before Prof. Syrbe left, I approached Dr. Vilser and asked him if he could imagine being our chairman. He didn't say no. So he became my "sleeper." Bottom line, we now have another good trustee board chairman who's doing an excellent job supporting the long-term strategy.

Finally, if you could gaze into a crystal ball, from today's standpoint, what developments do you expect to happen in knowledge and technology transfer in the coming years?

Every now and again you have to do a brainstorming session with all the employees and really make sure that people also suggest "nonsense." We did it once in Switzerland in the 1980s during a company outing with people from head office. A couple of years later most of the suggestions had become reality. But one thing that's really important is that there's an atmosphere that allows people to feel safe enough to suggest something without the fear of "sanctions." Otherwise, you might as well forget it. If you get it right, you can adapt renewal as part of a continual process, in ways that we can't even conceive of at the moment.

Johann Löhn was born just outside Hamburg in 1936. After studying physics, he earned a PhD at the University of Hamburg in 1969. In 1977, he was made principal of what was then Furtwangen University of Applied Sciences (now Furtwangen University) and it was in this role that he headed up a technology transfer task force on behalf of the Baden-Wuerttemberg Research Commission. Based on this work and his experience as head of "technical advisory services" at Furtwangen University of Applied Sciences, Löhn developed a model that was unique at the time – an integrated model of entrepreneurial technology transfer, outlining the independent role that should be played by the private sector. Subsequently, in 1983 the Minister-President of Baden-Wuerttemberg, Lothar Späth, appointed Löhn to the position of government commissioner for technology transfer in Baden-Wuerttemberg. Löhn was put in charge of the Steinbeis Foundation and in 1998 he was also given responsibility for Steinbeis GmbH & Co. KG für Technologietransfer, both enterprises he managed with great success until 2004. Since founding Steinbeis University Berlin in 1998, he has acted as the president of this private, state-approved institution. He handed his role over to two successors on October 1. As an Honorary Trustee of the Steinbeis Foundation, he remains a member of the jury of the Steinbeis Foundation Transfer Award – the Löhn Award.

Prof. Dr. Dr. h.c. mult. Johann Löhn
Steinbeis Foundation (Stuttgart)
johann.loehn@stw.de | www.steinbeis.de

“The award motivated us”

Each project leads to the next: stories behind the winners of the Steinbeis Foundation Transfer Award

The project drew to a close, then it won the Steinbeis Foundation Transfer Award – the Löhn Award – and then? What happened next? Steinbeis experts describe what happened to them and their teams after the award ceremony and how the award helped them. There are also a large number of winners of special awards, who were recognized for their outstanding contributions to knowledge and technology transfer and highlight how many successful projects lead to the next one.

2004 | Special award winner

Prof. Dr.-Ing. Walter Kuntz (dec.)

The Löhn Award jury honored the pioneering contributions of Walter Kuntz to technology transfer.

2006 | Award winner

Steinbeis Transfer Center for Medicinal Biophysics, Sensovation AG

Project: A Miniaturized Fluorescence Measurement Module for Use in Medical Diagnostics

“The Medicinal Biophysics Steinbeis Transfer Center (STC) was the first Steinbeis Enterprise to be founded at Heidelberg University Hospital. The honor of winning the Löhn Award just years after setting up the STC confirmed that when it comes to fundamental research in the field of medicine and biophysics, synergistic collaboration can work with medium-sized firms operating at the forefront of international technology. The award had a lasting impact in motivating up-and-coming scientific staff and PhD students at the STC and encouraging them to get involved in technology transfer projects and consulting. As a result, I’d like to thank the Steinbeis Foundation once again on behalf of my co-workers and PhD students.”

Prof. Dr. Rainer Fink (Steinbeis)

2006 | Special award winner

Prof. Dr.-Ing. Eberhard Birkel

Eberhard Birkel received the Transfer Award in recognition of his outstanding contributions to technical advisory services.

2007 | Special award winner

Senator E.h. Dr.-Ing. Wilhelm Schmitt

Steinbeis honored the personal commitment of Wilhelm Schmitt to Steinbeis with the Transfer Award.

2007 | Special award winner

Prof. Dr.-Ing. Jürgen van der List with the Steinbeis Transfer Center Microelectronics/ Göppingen

Jürgen van der List and his colleagues won the Löhn Award in honor of their outstanding achievements and successful technology transfer projects.

2008 | Special award winner

Prof. Dr.-Ing. habil. Prof. h. c. Eberhard Kallenbach (dec.)

The jury of the Löhn Award honored Eberhard Kallenbach for his many years of outstanding services to technology transfer in the Steinbeis Network.

2009 | Special award winner

Prof. Dr.-Ing. Nikolaus Kappen (dec.)

Nikolaus Kappen received the Steinbeis Foundation Transfer Award in honor of his many years of outstanding service as director of the Steinbeis Transfer Center for Computer Applications and his commitment as a university professor.

2009 | Special award winner

Prof. Dr. rer. nat. Dr.-Ing. E. h. Max Syrbe (dec.)

Steinbeis honored Max Syrbe for his outstanding personal commitment to knowledge and technology transfer as a long-standing member of the Steinbeis Board of Trustees and Chairman of the Board of Trustees of the Steinbeis Foundation.

2009 | Award winner
School of Management and Innovation (SMI), Steinbeis University Berlin, and PSD Bank Berlin-Brandenburg eG

Project: Enhancing the Success of Communication at PSD Bank Berlin-Brandenburg eG

"The Löhn Award was fantastic confirmation that we were doing the right thing with our research into 'real life.' The collaborative project with PSD Bank Berlin-Brandenburg was an enormous help for the bank, and at the same time it laid a foundation for a dissertation that received a summa cum laude and a publication in the magazine for business administration. We continued our partnership with the bank and looked, among other things, at the positioning of the financial institution as a 'bank of values.' The underlying idea of the Transfer Award had a strong influence on my professorial chair and still does, particularly in the teaching of business administration, where we notice a tendency for people working in research to detach research from real life. This is a tendency that I find a bit worrying for a number of reasons. Ultimately, the idea behind transfer-oriented research – which I like to describe as 'thinking on the principle level and acting on the phenomenon level' – has made its way into the discussion on how to move our university forward."

Prof. Dr. Dr. Helmut Schneider (Steinbeis)

2010 | Special award winner
Prof. Dr.-Ing. Klaus Boelke

Klaus Boelke received the Löhn Award for his many years of successful work as a director of Technology Consultancy (his Steinbeis Transfer Center at Heilbronn University), and his ongoing commitment to technology transfer.

2010 | Special award winner
Prof. Dr.-Ing. Hermann Kull

The Transfer Award jury honored Hermann Kull for many years of outstanding achievement in the field of technology transfer as part of the Steinbeis Network.

2010 | Award winner &
2012 | Special award winner
Steinbeis Transfer Center for Drive and Handling Technology in Mechanical Engineering in collaboration with the Siemens Generator Plant in Erfurt

Project: An Innovative Bending Machine for Large-Scale Induction Conductors

"Receiving the Steinbeis Foundation Transfer Award – the Löhn Award – in honor of development results is an acknowledgement of the teamworking skills of the transfer center and recognition of its achievements. The announcement of the award motivated the research team. Also, some even bigger projects were awarded by the Siemens generator works in Erfurt and then implemented. On top of that, a number of companies in the region became aware of us and this helped expand our customer base. Overall, the award had a very positive impact on the finances of the Transfer Center."

Univ. Prof. Dr.-Ing. habil. Eberhard Köhler (Steinbeis)

2011 | Special award winner
Prof. Rudolf Voit-Nitschmann

Steinbeis honored Rudolf Voit-Nitschmann for outstanding achievements in the field of aeronautics and lightweight construction.

2011 | Special award winner

Prof. Dr. Werner Bornholdt

Werner Bornholdt received the Löhn Award for his many years of outstanding contributions to knowledge and technology transfer in the Steinbeis Network.

2012 | Special award winner

Sachihiko Kobori

The jury of the Löhn Award honored Sachihiko Kobori for his many years of outstanding contribution to knowledge and technology transfer within the Steinbeis Network in Japan.

2012 | Award winner

Steinbeis Research Center Material Engineering Center Saarland (MECS), shared with Atotech Germany GmbH

Project: Controlled Self-Healing Process for Electrical, Extremely Stressed Galvanic Systems of High-End Circuit Board Production

"For us at the Steinbeis Material Engineering Center Saarland, the Löhn Award 2012 was the starting signal for unprecedented developments. Due to the national attention that the transfer award brought with it, we continue to benefit from enquiries and projects to this day. This has enabled us to successfully expand our core competencies in the areas of surface engineering, materials engineering, and 3D microstructure research, thus making key contributions to major national and international projects. We now have 19 employees and are constantly on the lookout for competent specialists to join the team. Due to the close and good cooperation with Saarland University, we are also always very close to the current research trends and thus also well positioned on an interdisciplinary level, for example with the local computer science in the field of digitalization of materials science and engineering. And with our patented surface functionalization, which was developed in close cooperation with TE Connectivity, the next promising project is already in the starting blocks."

Prof. Dr.-Ing. Frank Mücklich, Dominik Britz (Steinbeis)

2012 | Award winner

Steinbeis Transfer Center Embedded Design and Networking, shared with PHYWE Systems GmbH & Co. KG

Project: A Wireless Sensor Linkage for Didactical Measurement Technology

"We received the Transfer Award for our very first end-to-end development of a systems application for the Internet of Things. Based on this, we successfully worked on many interesting future-oriented developments and projects with Cyber-Physical Systems. Without a doubt, the boost the award gave to our reputation was a help in this."

Prof. Dr.-Ing. Axel Sikora (Steinbeis)

2013 | Special award winner

Prof. Dr. h. c. Lothar Späth (dec.)

The jury of the Löhn Award honored Lothar Späth for his outstanding achievements and contributions as a co-founder and supporter of Steinbeis.

2014 | Special award winner

Prof. Dr. Joachim Goll

Joachim Goll received the Steinbeis Foundation Transfer Award in honor of his many years of outstanding contributions to targeted knowledge and technology transfer.

2015 | Special award winner

Prof. Dr. habil. Hans Jobst Pleitner

Steinbeis honored Hans Jobst Pleitner for his many years of outstanding services to bilateral transfer between science and SMEs.

2015 | Award winner

Steinbeis Transfer Center Energy-Efficient Power Electronics for Electrical Drives and Power Storage Systems, shared with Hottinger Baldwin Messtechnik GmbH

Project: Raw Data Analysis and the Precise Measurement of Electric Drives

"The Transfer Award was an amazing prize and a sign of appreciation for my Steinbeis colleagues and our partner from industry. The Steinbeis Transfer Award allowed me to get to know lots of new people within the Steinbeis Network and other companies. The award motivated us, and the prize money put us in a position to embark on further long-term projects, even without receiving a specific brief from customers."
Prof. Dr.-Ing. Johannes Teigelkötter (Steinbeis)

2016 | Special award winner

Prof. Karl Schekulin

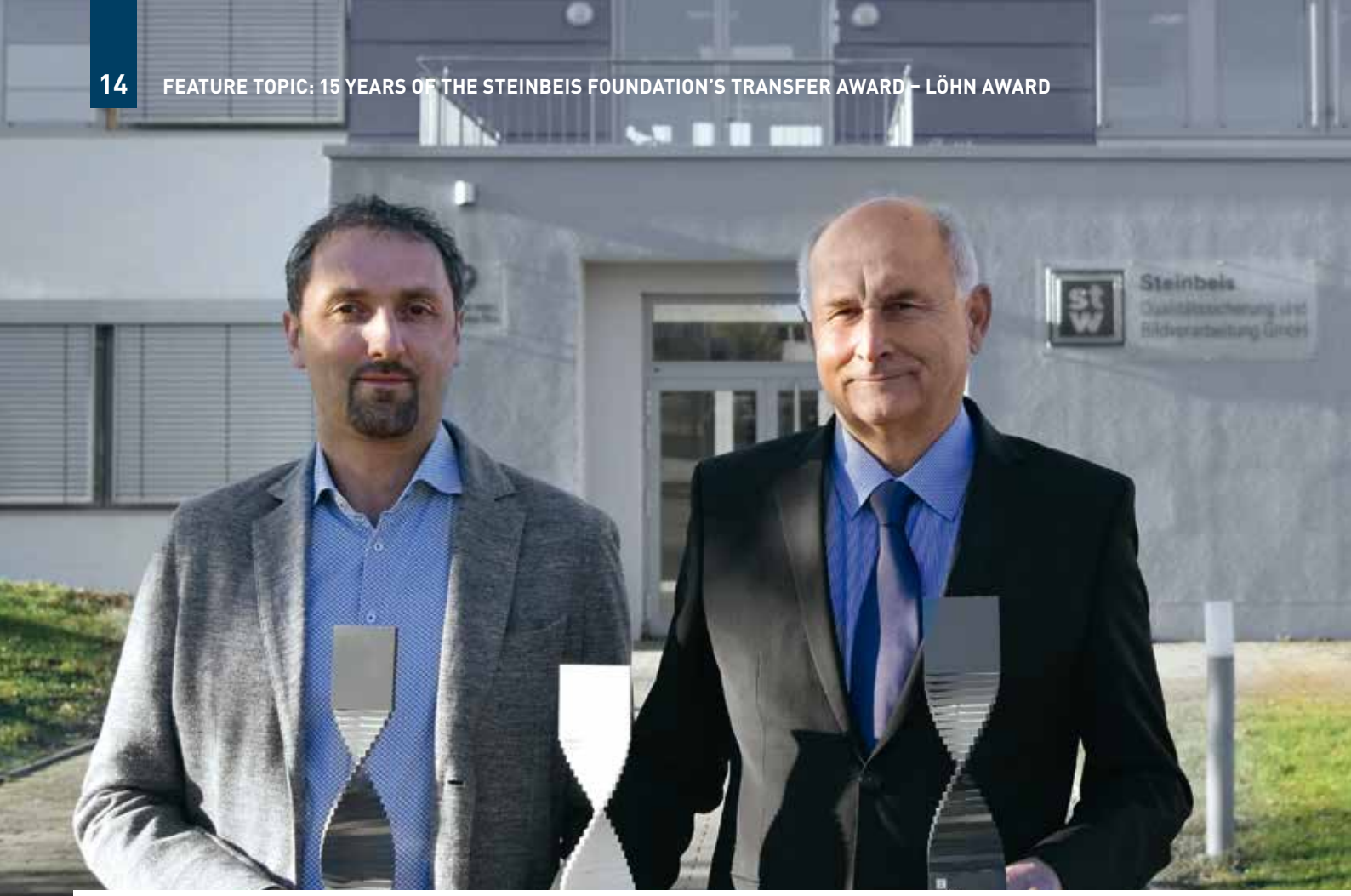
Karl Schekulin received the Löhn Award in honor of his many years of outstanding contributions to knowledge and technology transfer for the Steinbeis Network.

2017 | Award winner

Steinbeis Transfer Center for Material Development and Testing (WEP) and SEW-Eurodrive GmbH & Co. KG

Project: Optimizing Production Technology with Wiegand Wires Used as an Energy Source

"Both for us and our collaboration partner, SEW-Eurodrive from Bruchsal, receiving the Transfer Award for our successful work on optimizing so-called Wiegand wires went down extremely well, not just within the organizations but also elsewhere. Among other things, the award drew attention to our technicalexpertise in comprehensive material analysis, especially in the field of microscopic experimentation potential. Of course, this had and still does have a positive and lasting impact on the reputation of the Steinbeis Transfer Center. The project we won the award for has now been completed, and on a technical level it reached a point where no further optimizations could be expected in terms of material analysis, so SEW-Eurodrive is now in a position to make things happen with a product that's absolutely ready for the market. Looking back at what happened, not just in terms of the project itself, we feel a certain sense of pride but at the same time we really look forward to the potential this will open up for us in the future."
Prof. Dr.-Ing. Norbert Jost (Steinbeis)



"Cost-effectiveness plays an important role for solutions in this area"

An interview with Prof. Dr.-Ing. habil. Gerhard Linß and Steffen Lübbecke, managing directors of Steinbeis Qualitätssicherung und Bildverarbeitung (SQB) GmbH

Three projects, three times winners of the Steinbeis Foundation Transfer Award. Steinbeis experts Prof. Dr.-Ing. habil. Gerhard Linß and Steffen Lübbecke tell us how it's done, the challenges that have to be overcome beforehand, and the things the prize winners plan for the future.

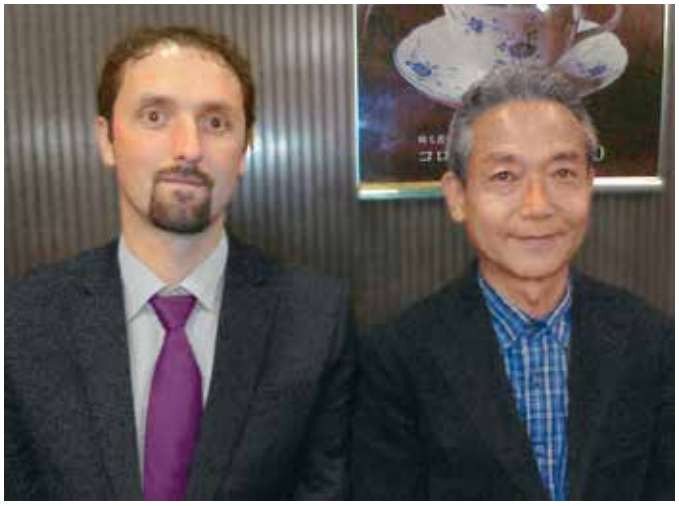
Hello Professor Linß, hello Mr. Lübbecke. Your Steinbeis Enterprise has now won the Steinbeis Foundation Transfer Award – the Löhn Award – three times. The first time was in 2004, the first year the award was bestowed. That's now 15 years ago. What happened with the project afterwards, and how did your partnership with Carl Zeiss Industrial Metrology go?

Linß: We've enjoyed many years of research ties with Carl Zeiss since 2000, and in 2004 we won the Löhn Award for a project called ViSCAN. This project involved using an optical sensor with integrated software to take precise readings with coordinate-measurement machines made by Carl Zeiss Industrial Metrology, who are based in Oberkochen. It also meant delivering corresponding lenses, controllable LEDs, and software licenses. We've now delivered around 1,600 such systems to Zeiss and they're used all around the world. We've been collaborating closely with Carl Zeiss IMT for a number of years now as part of a supply and quality assurance agreement.

We were also involved in adapting ViSCAN to other types of measurement machines made by Zeiss. We introduced numerous new sensors over an extended period, and the responsibility for final sign-offs was also given to SQB. So overall it's been an extremely fruitful business relationship that has been beneficial to both parties!

The project that won you an award in 2008 involved a partnership with WAFIOS, with whom you developed an innovative, user-friendly image processing system for 100% quality in spring production. How did this partnership come about and how's it going now?

Lübbecke: We first came into contact with WAFIOS, based in Reutlingen, through TU Ilmenau, which has highly specialized know-how in spring technology. For example in Ilmenau they organize a so-called Ilmenauer Spring Day every two years. An initial meet-up was organized with the product manager and the developers at WAFIOS, and this evolved into a close and constructive partnership based on mutual trust. SQB GmbH Ilmenau won the contract because of our many years of experience and expertise in the field of hardware and software development in industrial image processing. After years of supplying image processing systems for spring coiling machines, WAFIOS management deci-



ded to carry out more in-house development. But SQB still delivers image processing systems and spare parts for certain machine types.

The third project that won the Transfer Award was in 2011; this was also about measuring and quality. This time it involved a Japanese partner called NT TOOL CORPORATION. What was different about implementing the project?

Linß: It was a particular challenge and a new experience for us because of the language barriers, the huge distances involved, and cultural differences. The development partnership with NT TOOL lasted just under three years. They're based in Takahama City in Japan and we had to get everything done without phone calls between the specialists. Lots of things was done via email and the internet, or by traveling all the way out to Japan. Our counterparts from Japan also came to Ilmenau twice. Lots of decisions during the development phase required several rounds of presenting concepts and ideas. Now NT TOOL has the solution we developed in one of its products in the company catalogue. Taking on the whole task of developing the hardware and software worked extremely well for our Japanese partners.

Lübbecke: Collaboration with the Japanese company NT TOOL was also extremely useful for TU Ilmenau, which is not far from where we're based. Over the course of the project, five mechanical engineering students were able to do a four-month engineering internship at the company in Japan, at different intervals, and they gained important experience in terms of international setups and specialist topics. The feedback from all of the interns who went to Japan was extremely positive and really motivated their co-students. A number of employees also used the opportunity to go on business trips to Japan, which was also an important experience for them. On top of that, we visited the Japanese Steinbeis Transfer Center headed up by Mr. Kobori and got to know lots of new people.

Now that we've looked back a bit, let's turn to the future: What developments will dictate the work at your Steinbeis Enterprise over the coming years? What challenges do you think you'll face in the future in the field of quality management?

Lübbecke: Image processing technology is entering more and more areas in production, and it's also invading different areas of society in general. One new challenge and future direction for our company will be the shift toward using image processing for conducting 100% quality checks in semi-automated and fully automated production. We will see image processing technology and processes based on artificial intelligence opening up completely new applications in the field of industrial quality assurance – so business in this area will continue to flourish. Inspections have to become safer, faster, and more precise. Cost-effectiveness also plays an important role for solutions in this area.

Linß: There'll be major advancements in 3D image processing using multiple sensors. Aside from the usual quality factors and measurements, more and more checks will have to be run on "cosmetic" defects. As products and variants become increasingly diverse, they entail more and more flexibility and complexity in industrial image processing and quality inspection technology. We'll see more and more self-learning algorithms and deep learning in industrial and smart quality assurance.

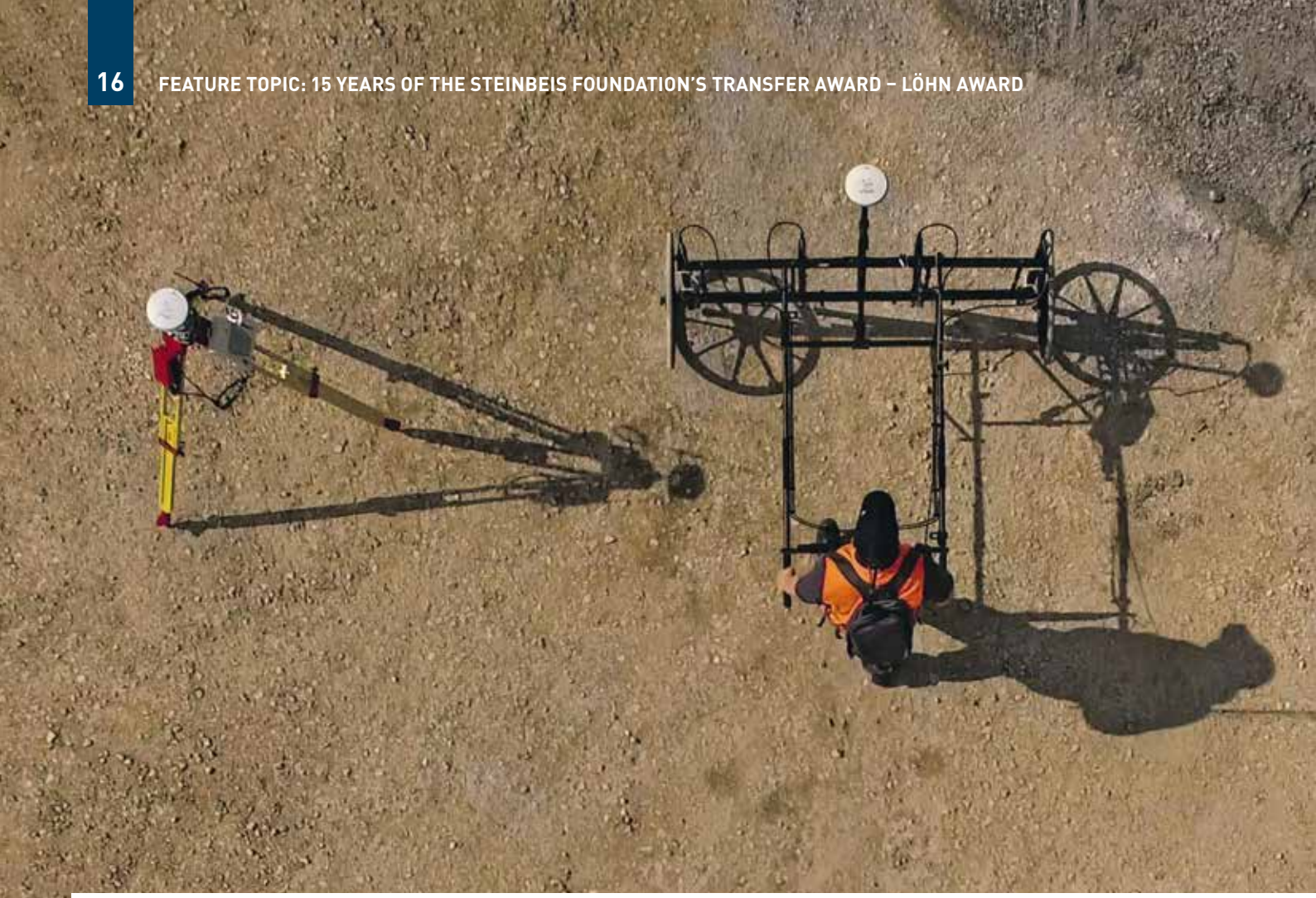
Image left: Steffen Lübbecke (left) and Professor Dr.-Ing. habil. Gerhard Linß
Image right: Steffen Lübbecke and Sachihiko Kobori

Gerhard Linß

Steffen Lübbecke

Professor Dr.-Ing. habil. Gerhard Linß and Steffen Lübbecke are the founders, shareholders, and managing directors of Steinbeis Qualitätssicherung und Bildverarbeitung GmbH. The focus of the work carried out by their Steinbeis Enterprise lies in contractual research and development, production, and advisory services in the field of quality management. This involves the development and production of innovative measurement and monitoring systems (typically used in contactless precision measurement and visual inspection), the development of application software, and the provision of independent and universal software components.

Steffen Lübbecke
Professor Dr.-Ing. habil. Gerhard Linß
Steinbeis Qualitätssicherung und Bildverarbeitung GmbH (Ilmenau)
su1544@stw.de | www.steinbeis.de/su/1544 | https://quick-image.de/



DATA2LINE® becomes DATA2LINE® GEO

STASA team overhauls analysis of magnetic field data

Somewhere in the world, one person is killed by a mine or unexploded bomb every 30 minutes. STASA (Steinbeis Angewandte Systemanalyse GmbH) has been working in close partnership with Institut Dr. Foerster on the development of a system for using magnetic field measurements to ascertain the position, depth, and diameter of metal objects – with an accuracy level of only a few centimeters. The project was awarded the 2011 Steinbeis Foundation Transfer Award – the Löhn Award, and the two companies have been cooperating successfully ever since.

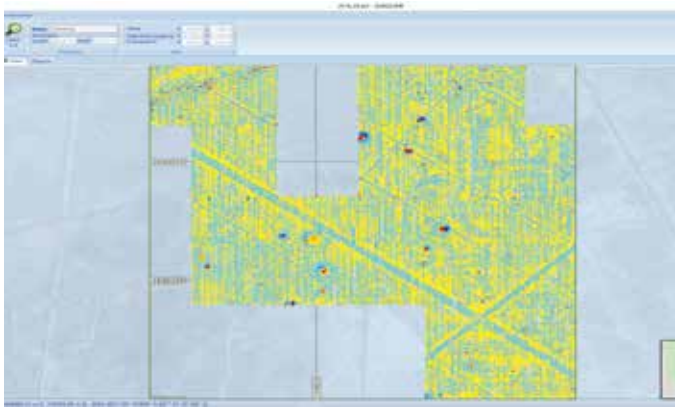
More than 60 countries have to deal with the explosive legacies of past armed conflicts. Even in Germany, thousands of tonnes of munition and bombs from the two World Wars are discovered and recovered every year. To clear out disused weapons – especially unexploded bombs from past conflicts – it is important to be able to reliably identify metal objects, typically by using magnetic field measurements.

One technique used to detect the location of explosive ordnance is high-resolution magnetic field measurement. A machine equipped with hi-tech sensors is driven over strips of ground, gradually recording underlying magnetic fields. To pinpoint the specific location indicated by the measurements, the typical procedure is to use GPS. This is especially important with construction projects in areas affected by residual explosive ordnance.

Foerster is one of the leading companies in the field of gathering, evaluating, and analyzing magnetic field measurements. Its FEREX® fluxgate magnetometer is internationally recognized as an important instrument for detecting key data. Previous systems used to spot the signatures of suspicious objects detected in magnetic field data, but each item of information then had to be evaluated manually. This was a protracted and often costly process. What was needed was a method to assess large volumes of data automatically in order to reliably identify unexploded bombs in the ground.

The system, developed as part of the close partnership between STASA and Foerster, significantly improves the ability to reliably detect old munition under the ground, and most parts of the process are now fully automated. This significantly reduces the risk of overseeing hazardous objects. The system uses georeferenced measurements to establish the exact location of unexploded bombs, including their depth, angle, and general volume. To work this out, the experts merged different filtering methods based on a physical magnetic dipole model. A new kind of pattern recognition process was developed specially for the task at hand to safely identify objects in close proximity to one another.

This new process has now been successfully introduced to the DATA2LINE® software produced by Foerster. This allows specialists to analyze residual contamination in larger areas of land much more effectively, also producing more accurate documentation. Not only does this make



processes more economical, it also reduces the potential risks of land-clearing projects. The DATA2LINE® software has already proved reliable in practical application a number of times.

The successful collaboration between Foerster and STASA has moved forward a stage with the redevelopment of algorithms such that accuracy levels have now improved even further. The aim is to also make it possible to use the software in the field of archaeology. In a similar way to unexploded bombs in the ground, the remnants of bygone cultures – such as the walls of ancient settlements or fireplaces concealed under the surface – change the magnetic field of the Earth due to differences in the density of metallic particles compared to the surrounding soil. These differences are less pronounced than with unexploded munition, however, and this makes it much more difficult to identify objects.

Despite this, the experts at Foerster and STASA succeeded in solving the challenge with a software module called DATA2LINE® GEO. To do this, they developed special filter algorithms that display data in such a way that minute structures within measured data become visible to the human eye.

This now makes it much easier for archaeologists to spot and find hidden settlement patterns in the ground and then work out exactly which areas to excavate. Although the DATA2LINE® GEO module is intended for use by archaeologists, it has also proven to be a valuable tool for assessing data in difficult situations involving searches for explosive ordnance, further underscoring its usefulness in its original field of application.

The two project partners intend to continue working together on new and innovative solutions for use in magnetic field sensors.

Image left: The FEREX 4.034 data collection device, © Institut Dr. Foerster GmbH & Co. KG
Image right: A large area of land with data filtered using Data2Line software, © Institut Dr. Foerster GmbH & Co. KG

Günter Haag

Philipp Liedl

Professor Dr. habil. Günter Haag is a managing partner and Dr. Philipp Liedl is the managing director and a managing partner of STASA Steinbeis Angewandte Systemanalyse GmbH. The objective of the Steinbeis Enterprise is to introduce methods for systematically analyzing data. The focus of the work carried out by STASA lies in data analysis itself, quality assurance, the optimization and control of production processes, and various projects related to urban and regional development, location analysis, and transportation development.

Professor Dr. habil. Günter Haag
Dr. Philipp Liedl
STASA Steinbeis Angewandte Systemanalyse GmbH (Stuttgart)
su1390@steinbeis.de | www.steinbeis.de/su/1390 | www.stasa.de

"We feel most comfortable in the field of heat management"

An interview with Professor Dr.-Ing. Andreas Griesinger, director of the Steinbeis Transfer Center for Heat Management in Electronics

Heat management involves applications in many areas, as Professor Dr.-Ing. Andreas Griesinger explains in an interview with TRANSFER. A winner of the Löhn Award, Griesinger provides some interesting insights into the precise methods used to measure thermal interface materials, the current requirements of heat management in electronics, and how digital solutions are changing this field of technology.

Hello Professor Griesinger. In 2013 your Steinbeis Transfer Center won the Steinbeis Foundation Transfer Award – the Löhn Award, with Behr GmbH & Co. KG for the development of an ultraprecise system for measuring thermal interface materials. In what way was your solution innovative?

The special thing about the solution was that for the first time we managed to combine highly precise mechanical engineering with electronics and corresponding instrumentation. The device we developed was the first to simultaneously show the exact thermal and flow properties of samples exposed to thermal and mechanical stress. It means you can use the kind of highly precise mechanical movements needed to characterize certain materials under real application scenarios, while at the same time taking exact measurements such as temperatures, resistance, layer thicknesses, etc.

How did your partnership with Behr come about and what happened to the collaboration after the award?

We're not really sure how exactly we came to work with one another. All I can say is that we've known Behr for a long time, also because they're based near where we are in Feuerbach in Stuttgart, just a few kilometers from us as the crow flies. They also work on the same topics as us. Behr is a big company and since MAHLE acquired a majority interest in it, it's been a global enterprise. In any case, at some point there was a meeting with the people at Behr and it was worked out that we're both trying to solve the same problem, so this led to collaboration and the partnership is still going strong. We basically developed a device together and stay in touch so that we can keep exchanging ideas.

Of course, the transfer award helped us become known in the area. Two years ago, people sent us lots of samples from all around the world to take measurements, which is what our Steinbeis Enterprise offers as a service. And at some point a famous automotive company approached us and now virtually every material they use has to go through our laboratory. That was and still is a huge success and it creates lots of leads for us.

Increasing international awareness of environmental issues, demands for more sustainable solutions and lower energy consumption – these all spell new demands when it comes to heat management in electronics. Where do you think the biggest challenges lie, and how will the measurement process you've developed help address these challenges?

There are a number of buzzwords going around at the moment when people talk about new tech: autonomous driving for example, and of course electric vehicles overall – e-mobility. These are huge challenges because they entail so many open technology issues. In terms of how that affects our thermal interface materials, or our device, one of the big issues is service life. People aren't really sure how these new materials will behave in the long term. The materials themselves aren't actually that new; what's new is the requirements they have to meet in cars. What this means is that certain thermal stresses overlap with certain mechanical stresses and we don't know enough about how these interact.

But producers also want to move quickly into serial production. It's quite possible that a good number of us will be driving electric vehicles in the near future; at least there are plans in the pipeline for high volumes of electric cars. So the big question is, how long will these cars actually last? That's the challenge, and our device has already made an important contribution in this area, first of all by precisely characterizing the materials. We know exactly how these materials will behave and the material properties this stems from. We can use this information to carry out calculations and interpret properties exactly. The other factor is what this device is now capable of. It has a feature that was only added afterwards. It runs through certain modes, specific kinds of testing procedures, to gather information on durability. So I can use certain types of accelerated procedures, which then allow me to work out how long the material will last in actual applications.

What are the current trends in heat management and electronic systems, and what impact will these have on the services offered by your Steinbeis Enterprise? In what way will your projects or the briefs customers come to you with change?

The trends are very clear – they're pointing us to words that reflect the zeitgeist at the moment: digital transformation and Industry 4.0 (connected manufacturing). One thing that no-one really knows is what underpins this – ultimately it's always hardware, and what underpins that is heat management. Here's an example to demonstrate what I mean. They say that the volume of data going through the internet doubles every 18 months. Data volume is synonymous with servers and those big rooms they keep computers in. And this is precisely where heat management is so important, because heat is sometimes an even bigger problem than the actual design of all the electronics. So in this respect, our services revolve precisely around the most important aspect.

Another interesting issue is energy dissipation. Because more and more information is now being transferred and companies need bigger and bigger computers, more and more energy is being wasted. And another thing that could become a trend is the re-use of energy, especially the energy that inevitably goes to waste when operating larger server facilities, computers, or electric cars. At the moment, heat is simply allowed to dissipate into the surroundings, which ultimately is a waste. But there are already some interesting projects looking into reusing lost energy, for example in cars or in server rooms. As far as our services in this area are concerned, our Steinbeis Enterprise is more into the fundamentals, so we kind of take one step back. We look more at the materials, material values, the cooling concepts. But there has also already been a collaborative project with the DLR to look at using the heat given off by electric cars to provide air conditioning in the interior.

As for the tasks our Steinbeis Enterprise will work on in the future, we work in the field of heat management and we want to stay there because it's where we feel most comfortable. Our job is to identify concepts and develop them in order to optimize thermal design. That means analyzing and optimizing heat flow paths. A big area – that's getting bigger and bigger – is service life or durability, and as I said the question is how will these materials last under certain conditions and how should we predict this as accurately as possible. These are the topics we think about every day and they'll continue to occupy us in the future.

Image left: The Steinbeis experts (left to right): Robert Liebchen, Peter Fink, Prof. Dr.-Ing. Andreas Griesinger, Julia Mayer, Marco Pennetti, Steffen Bedenik and Hubert Gubick
Image right: The measurement system that won the Steinbeis Foundation Transfer Award is used to characterize thermal interface materials

Professor Dr.-Ing. Andreas Griesinger is director of the Steinbeis Transfer Center for Heat Management in Electronics and the Steinbeis Innovation Center for Heat Management at the Baden-Wuerttemberg Cooperative State University in Stuttgart. His Steinbeis Enterprise offers its clients a comprehensive range of services relating to heat management and durability testing involving electronic components and systems.

Professor Dr.-Ing. Andreas Griesinger
Steinbeis Transfer Center Heat Management in Electronics (Walddorfhäslach)
su0685@stw.de | www.steinbeis.de/su/685 | www.zfw-stuttgart.de

Award-winning project in 2018: Real-time control of passenger car powertrain for realistic vehicle testing

Short development cycles thanks to new test bench control systems

Vehicle powertrains are subject to a variety of demands, typically requiring major time and financial investments in order to meet expectations regarding driving performance, emissions, durability, and fuel consumption. To reduce development times and simplify the complexity of parameter-setting, Daimler approached the Steinbeis Transfer Center Traffic Engineering.Simulation.Software. The aim was to develop new test rig control system for powertrains. The project partners were honored with the Steinbeis Foundation Transfer Award – the Löhn Award – in recognition of the innovative and forward-thinking nature of the project.

To keep the development cycles of vehicle powertrains as short as possible, companies use computer and test rig simulations. They also conduct test driving. When testing the vehicle, real route data is recorded, which serves as a basis for the simulations. From a control engineering point of view, it can be extremely difficult to replicate measured driving cycles on a powertrain test rig. This is because different elements within the powertrain can have extended downtimes and are non-linear in terms of functionality. With the previously applied techniques for drawing on data measurements to control test rigs it took a great deal of time to set up parameters, and often this resulted in inconsistent test rig setups and thus unrealistic findings. Daimler, based in Stuttgart, asked its representatives of powertrain development and the company's powertrain testing facility to contact the Niederstotzingen-based Steinbeis Transfer Center (STC), Traffic Engineering.Simulation.Software, with the aim of developing a test rig control system for powertrain technology.

To work out the optimal design of powertrain components, load collectives are needed at an early stage. This involves working out topologies for powertrains and simulating these in coordination with specialized departments using winEVA. This ensures a perfect fit between the design and later testing on a test bench. The ideal test bench controls were worked out by the Steinbeis expert Jakob Häckh. His idea was to map the controlled system as a parallel simulation model and to use this for continually comparing data produced by the model with the actual powertrain. "Every driver drives differently depending on the kind of driver they are, or the vehicle engine, so it's only normal for a powertrain to react differently. We had to program all of these factors in real time. The solution was to run the flexible winEVA driver model in the IMC control system parallel to the control," says Jakob Häckh.

To finally solve this new problem, the experts selected a combination between "control" and "regulation." For the test rig control part of

This fundamental approach has been fine-tuned and updated many times over the years, such that it is even possible to use control technology to manage highly dynamic, purely electric powertrain systems, as well as 4x4 drive train based on complex four-wheel drive principles. The project partners have been honored with the Steinbeis Foundation Transfer Award – the Löhn Award – in recognition of the innovative and forward-thinking nature of the project and the manner in which the development partnership continues to build on the success of the collaboration.

The partnership is also being continued. The partners are currently developing an online monitoring tool for test rigs using winEVA plus. This will allow developers to monitor stress placed on parts even more quickly and accurately.

Image: From left to right: Manfred Mattulat (Steinbeis), Prof. Dr. Michael Auer (Steinbeis), Prof. Dr.-Ing. Günter Willmerding (Steinbeis), Jakob Häckh (Steinbeis), Peter Hailer (Daimler), Hubert Reck (Daimler), Raimund Spiller (Daimler), Prof. Dr. Dr. h. c. mult. Johann Löhn (Steinbeis), Dr.-Ing. Leonhard Vilser Steinbeis).

the equation, real-time simulations of the powertrain were carried out using winEVA under testing conditions. Adjustment variables, gas pedal settings, and wheel rotation speeds could then be transmitted to the testing facility. Reactions on the test rig are then compared to the simulation model, and any differences between test bed behavior and the simulation model are used to make adjustments to this model.

Within a short time, the project partners succeeded in adapting the winEVA simulation software already developed by the Steinbeis Enterprise to the requirements of the test rig. To test new functions reliably, Daimler set up a simulator. Daimler first started rolling out the winEVA simulation tool to powertrain test rig in 2011. The updated version, winEVA plus, works independently of specific automation systems, so it is virtually adaptable to use with any powertrain test rig.

Daimler can now use the winEVA simulation software to replicate all kinds of existing and future powertrains, as well as actual driving on roads. By carrying out calculations and experimenting on test beds, the design and duration of different types of parts can be optimized even during early-stage development. This saves Daimler significant time in development.

Jakob Häckh and his deputy Prof. Dr.-Ing. Günter Willmerding head up the Steinbeis Transfer Center Traffic Engineering.Simulation.Software. The main areas of work of the Steinbeis Enterprise are: the simulation of powertrains, fuel consumption, emissions, and oscillation; the real-time control, design, and calculation of new kinds of vehicle parts using FE methods; service life prediction; winADAM, winEVA and winLIFE.

Jakob Häckh
Prof. Dr.-Ing. Günter Willmerding
Steinbeis Transfer Center Traffic Engineering.Simulation.Software (Niederstotzingen)
su1453@stw.de | www.steinbeis.de/su/1453 | www.stz-verkehr.de

"In the media sector, one technical revolution follows hot on the heels of the other"

An interview with Professor Dr. Michael Bauer, director of the Steinbeis Transfer Center for Technical Communication – Paracam

In 2012, new systems came along that allow orthopedic surgeons and trauma specialists to observe ceramic implants going through virtual motions using mobile end devices. This technology is delivered by the BIOLOX app developed by the Steinbeis Transfer Center for Technical Communication – Paracam in collaboration with CeramTec GmbH TRANSFER magazine talked to Prof. Dr. Michael Bauer about the things that make this development so special and other projects currently being worked on by the Steinbeis Enterprise.

Hello Professor Bauer. In 2012, your Steinbeis Transfer Center shared the Steinbeis Foundation Transfer Award – the Löhn Award – with the Plochingen-based company CeramTec, which is an international leader in ceramic hip joints. How did this partnership come about?

We've been working with CeramTec since 2004 – quite some time before we won the Löhn Award together. CeramTec was quick to spot and exploit the teaching benefits of new media. New types of media make it possible to create a whole host of 3D animations, videos, and interactive applications which allow orthopedic experts and trauma surgeons to obtain information on a company's ceramic implants and how they're used in clinical applications.

You developed an app called BIOLOX with your project partner. What makes this app so special, and what was the biggest challenge you faced when introducing it?

What's special about it is that ceramic implants such as artificial hip joints can be observed in motion using virtual reality on an interactive 3D app installed on mobile end devices. To do this, we integrated implants into a model of a kind of "see-through" human body. Our nickname internally for this was CeraMan. He provides physicians with a different way of looking at things because these kinds of implants can normally only be looked at when they're "at rest," i.e. on the operating table or on an X-ray screen. The challenge was to make CeraMan as near as possible to medical reality and make sure he worked in real time, so for example he had to be depic-

ted on a cell phone or tablet, but it also had to be possible to combine him with existing media, such as videos used in the operating room, animations, or brochures. As a whole, this was quite a complex setup.

And that was six years ago already. What other exciting projects has your Steinbeis Enterprise been working on in the meantime? What's planned for the future?

Paracam works in two main areas – in medical technology and in the field of geology, or paleontology. There's been one special project we've been involved in over the last three years – creating a "geo-relief" for the recently opened explorhino Science Center in Aalen. We built a two- by four-meter landscape with a special relief to show the whole area covered by the Swabian Jura mountains. There's a high-resolution projector positioned nine meters away to cast precisely fitting maps and animations onto the relief. Visitors can choose from a selection of 60 maps and 20 animations on a touchscreen. The project has resulted in an entire 3D atlas of the Swabian Jura mountains. Other exhibitions and museums have now asked about similar installations.

Digital solutions are everywhere now and the trend has made its way into teaching and learning materials. What opportunities, but also challenges, does this present to you in your work at the Steinbeis Enterprise?

In the media sector, one technical revolution follows hot on the heels of the other. But that's what makes this profession so exciting. Paracam tries to be directly in the midst of things as each new development moves up a notch and becomes more serious, i.e. when they can be developed into meaningful teaching applications. One such topic at the moment is augmented reality, which is making it possible to merge real camera images of things around us with virtual reality. We're currently working on a similar development for the BIOLOX app. In fact we've already finished the prototype. Now, CeraMan no longer walks around in an artificial world, he can be made to look like he's walking through your office.

Image left: A relief of the Swabian Jura at the explorhino Science Center in Aalen
Image above left: Winner of the Löhn Award in 2012: the BIOLOX app
Image above right: Still just a prototype: CeraMan, now moving into AR

Professor Dr. Michael Bauer is director of Technical Communication – Paracam, the Steinbeis Transfer Center at Aalen University. His Steinbeis Enterprise helps its customers with video productions, 3D animations, and interactive applications of a technical or scientific nature.

Professor Dr. Michael Bauer
Steinbeis Transfer Center Technical Communication – Paracam (Salach)
su1299@stw.de | www.steinbeis.de/su/1299

Award-winning project in 2018: A diagnostics platform for communication systems used in automation technology

Successful joint venture promotes communication beyond the walls of the company

As industrial production becomes progressively networked, it is relying more and more heavily on modern communication systems. To simplify error detection and the analysis of industrial communication systems, the Steinbeis Transfer Center for Systems Engineering joined forces with Steinbeis Embedded Systems Technologies GmbH as part of an alliance with Sercos International, Bosch Rexroth, and Festo. Together, the alliance members developed an advanced platform for diagnosing such systems, an endeavor that earned them the Steinbeis Foundation Transfer Award – the Löhn Award.

In 1966, the manufacturing company Schubert produced a box-making and adhesion machine that could fold and glue up to 50 chocolate boxes per minute. The fully automated packaging lines now made by Schubert are capable of packing thousands of chocolates per minute. Its machines consist of a vast number of individual, networked components, each of which has to communicate with the others in real time. In the old days, these parts were wired to a control unit. These days, they use ethernet-based technology. This makes it possible to control critical parts of a process in real time and integrate internet protocols, providing important help in dealing with the increasingly digital nature of modern production machines. To link individual components supplied by different producers, industrial communication standards are required. One such standard is Sercos, a technology that is often used in more demanding automation applications.

Bosch Rexroth is considered a reliable partner to mechanical engineering firms and the end users of production machinery. It offers open and future-proof electric automation solutions, also based on the Sercos standard. Its systems include a drive system called IndraDrive, which Schubert uses to control complex sets of movements on its machinery. To make it possible to analyze this and other components with a Sercos interface more efficiently, Bosch Rexroth embarked on the project by asking the Systems Engineering Steinbeis Transfer Center in Esslingen to develop a new diagnostics platform – a Sercos Monitor for diagnosing Sercos networks. "One particular challenge with this diagnostics platform was the live operation in production plants. The cycle times are only in the order of milliseconds, and this generates a huge volume of data which not only had to be processed in real time but data sometimes went back several days," explains Manuel Jacob, managing director of Steinbeis Embedded Systems Technologies GmbH.

Other components used on the Schubert machine are supplied by Festo. Festo also uses the diagnostics platform developed by Steinbeis, not only for interactive diagnostic purposes, but also in automatic monitoring systems required in development and testing. Working in partnership with Steinbeis, its experts integrated the diagnostics platform into the

architecture of the platform and broad support from system users lay a particularly strong foundation for future partnership projects on co-developments.

Image: Left to right: Manfred Mattulat (Steinbeis), Christian Hayer (Steinbeis), Prof. Dr. Michael Auer (Steinbeis), Dr. Ralf Koeppe (Bosch Rexroth), Dr. Andreas Selig (Bosch Rexroth), Klaus Weyer (Sercos), Manuel Jacob (Steinbeis), Prof. Reinhard Keller (Steinbeis), Simon Wiedemer (Festo), Dr. Andreas Hölscher (Festo), Alexander Reisenhauer (Festo), Prof. Dr. Dr. h. c. mult. Johann Löhn (Steinbeis), Dr.-Ing. Leonhard Vilser (Steinbeis).

existing software architecture of testing systems used with automation products, also extending it to work with new communication systems. Classic measurement systems used until now were only able to access data held in the outer interfaces of products. "But all of the internal data relating to the overall product is available via the communication interface and wasn't accessible until now. Working with Steinbeis allowed us to do something about this. We managed to expand their diagnostic platform and integrate it seamlessly into our own systems environment," says Simon Wiedemer from Festo.

The platform provides users with a tool for configuring, plotting, and evaluating communication data on standard PCs via an interactive user interface. It can also be used as an automatic tool for testing across a number of protocols in order to understand network components. One particular challenge when developing the platform lay in establishing a common foundation that would be suitable for analyzing different communication systems and their different characteristics. These include ethernet-based protocols, INTERBUS, the sensor/actuator interface IO-Link, and a number of other company-specific protocols.

The project resulted in a widely applicable diagnostics tool for communication systems in the field of automation technology, from troubleshooting on machinery to automated testing and even student courses at Esslingen University of Applied Sciences. The expandable

Christian Hayer

Manuel Jacob

Christian Hayer and Manuel Jacob are the managing directors of Steinbeis Embedded Systems Technologies GmbH. The services offered by their Steinbeis Enterprise include requirement engineering, specifications, the design and implementation of hardware and software, the integration and testing of components and systems, the implementation of system protocols and small series, certification services, and training.

Prof. Reinhard Keller is the director of the Steinbeis Transfer Center for Systems Engineering. His Steinbeis Enterprise works in the field of technical systems, providing hardware and software for distributed embedded systems with an emphasis on industrial communication. It also offers a comprehensive range of services relating to system integration.

Christian Hayer
Manuel Jacob
Steinbeis Embedded Systems Technologies GmbH (Esslingen)
su1661@ stw.de | www.steinbeis.de/su/1661 | www.steinbeis-est.de

Prof. Reinhard Keller
Steinbeis Transfer Center Systems Engineering (Esslingen)
su1439@stw.de | www.steinbeis.de/su/1439 | www.steinbeis-tzs.de

"The importance of testing instruments is rising rapidly"

An interview with Dr. Daniel Ulmer, managing director of Steinbeis Interagierende Systeme GmbH

Innovative testing platforms for modern driver assistance systems: Dr. Daniel Ulmer spoke to TRANSFER magazine about the requirements these solutions have to address, the importance of sustainability in software development, and a number of other key issues.

Hello Dr. Ulmer. In 2015, your Steinbeis Enterprise and Daimler won the Steinbeis Foundation Transfer Award – the Lohn Award – for the development of an innovative testing environment and the development of software instruments for use in advanced driver assistance systems. What was the biggest challenge for you and your colleagues with this project, and how is the collaboration working for you?

The solution we developed and continue to redevelop with Daimler is based on creating a simulation for environment-aware assistance systems which are put into serial production by Daimler. These systems survey their surroundings and partially operate the vehicle automatically. The challenge lies in making the simulation efficient, not just in terms of developing the simulation software but also when it is actually in use by test engineers. Hence the test engineers should be able to achieve their simulation goals with the least possible time and effort. We support a steadily increasing number of increasingly complex vehicle functions. Our aim here is to implement the simulation software in such a way that it can be run efficiently on different platforms, can be used worldwide, and users can be supported efficiently by our service team. Regarding the current collaboration with Daimler, we are continuing to develop the technology together so that we are able to efficiently test future vehicle functions.

Driver assistance systems are becoming more and more complex. How do you make sure they work properly, and how important are the right testing instruments?

The importance of testing platforms is rising rapidly – especially for high-end simulations. There are reports which say that the more complex an assistance system becomes, the more kilometers of driving will be needed in development. One example is an article in the Frankfurter Allgemeine newspaper on Nov 4, 2018, which says that a robot vehicle would have to be tested for over 240 million kilometers to ascertain whether it's safer than a human being. This is the distance that's required for a robot vehicle to be twice as good as a car driven by a human being with assistance technology. So 1,000 robot vehicles would have to be driven for the entire life of a vehicle. When you see numbers like these it's obvious that such large distances can't actually be driven – we can only simulate the highest possible proportion of this. Another factor is that lots of real and simulated kilometers generate massive volumes of data. We have tools and do research to look at different ways to cope with this deluge of data.

But by implication, simulations will have to meet certain quality standards. Yet there are no clear criteria for defining what these standards should be. Also there's the fact that a simulation might do an outstanding job for the purpose for which it's intended, but it might have to be used in different situations. Here's a fictitious example to show what I

mean: We've used our simulations to focus on what might happen with two simulated vehicles in certain situations and look at whether there would be an accident. But these simulations don't allow to predict how badly one of the cars would be damaged after an accident. What I'm trying to highlight is that we can create simulations that meet high quality standards, but there's no absolute quality endorsement. Or expressed more simply: Every question needs a simulation tool to match.

More and more customers place value in an intelligent driver assistance system when buying a new car. What does this trend mean for the work of your Steinbeis Enterprise?

We're only indirectly affected by this trend at our Steinbeis Enterprise. Customers expect more and more functions when driving and want to know that they can trust the vehicle to take over certain tasks without being overwhelmed by warnings and having to take over themselves, especially on longer drives. This is raising their expectations of software and with that their expectations regarding our simulations. So we're indirectly facing this issue. This means for us that driving scenarios have to be depicted more and more realistically. The simulation quality has to meet high standards and has to be evaluated over extended periods. So, our task is to capture more and more situations in extra detail over longer time frames. For example, older assistance systems didn't recognize traffic lights but in the future they'll have cameras that do that. As a result, until now we didn't have traffic lights in our simulations, but now we integrate this functionality. That's not as simple as it sounds, because there are lots of different types of traffic lights: turn left lights, pedestrian lights, lights on the left, lights on the right, lights on the top, different lights in the United States or Germany, and lots of different variations on how to tell a driver what to do. The implication for us is that we have to include a solution in our simulation to model different traffic light scenarios.

A priority for you is sustainable solutions. Why is sustainability so important and in what ways do your customers benefit from it?

When I hear the world "sustainable" in the context of software development, I immediately associate it with "front loading." This means it's better for our software architects to invest more time up front to understand the challenge and work out the first steps that will be needed to make the architecture viable in the long term. If I put myself in the shoes of the customer, I'd actually like to use a solution tomorrow. This is why our development experts approach things step by step to construct complex software incrementally with the customer. Our aim is to provide customers with a simulation that's capable of working right away with functionality that expands incrementally. In concrete terms this first involves understanding the nature of a problem faced within the application scenario of a simulation. We use this to work out technology architecture, which we then implement step by step using different prototypes. This is an agile approach that lots of people are talking about these days. It's sometimes a bit of a challenge making it central to what you do and who you are. We are driven by a desire to get this approach to work with the customer. This usually allows us to use iterative prototyping to develop the functionality that's required by the software in the long term and thereby introducing it into the simulation environment. At the same time, these new functionalities are quicker and step by step available for the test engineers.

Image: © iStockphoto.de/4X Image

Dr. Daniel Ulmer and Dr. Oliver Bühler are co-directors and owners of Steinbeis Interagierende Systeme GmbH. Their Steinbeis Enterprise is a systems supplier and development partner for tools and processes required when testing embedded systems. Its work revolves around the planning, development, construction, and implementation of testing strategies and testing platforms for evaluating driver assistance systems.

Dr. Daniel Ulmer
Steinbeis Interagierende Systeme GmbH (Esslingen)
su1913@stw.de | www.steinbeis.de/su/1913 | www.interagierende-systeme.de

The Only Constant Is Change...

An award-winning team from Pforzheim looks back – and forward

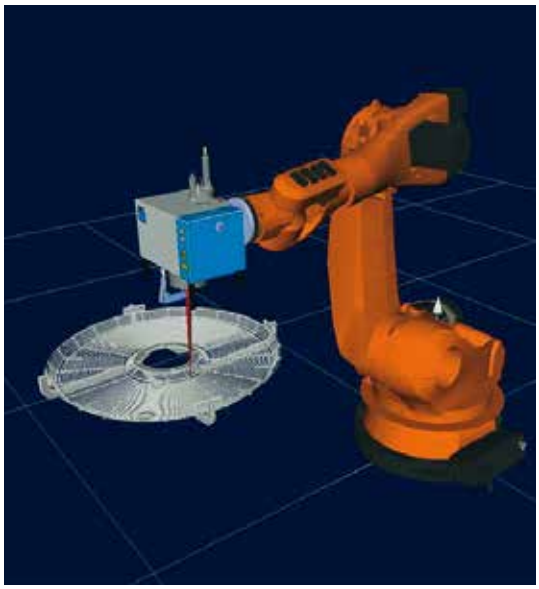
The experts at the Steinbeis Transfer Center for Production and Organization developed a new welding technique in collaboration with Stadtmüller GmbH. Based on laser technology, the solution makes it possible to weld complete touch protection gratings in a single process, an innovation that was honored with the Steinbeis Foundation Transfer Award – the Löhn Award – in 2010. The Steinbeis expert Prof. Dr.-Ing. Herbert Emmerich describes how things went for the Steinbeis Enterprise after the award and the current status of its collaboration with the project partner.

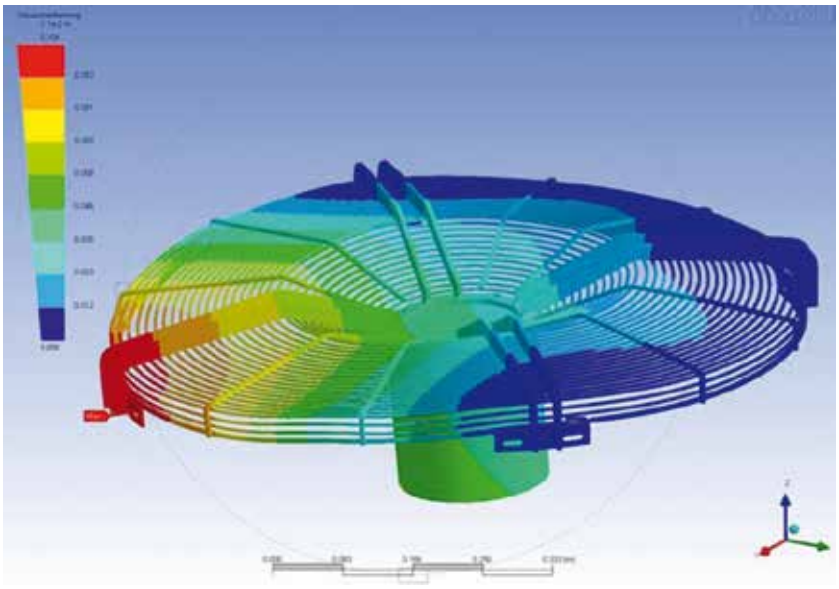
Winning the award and gaining acknowledgement for the project results was an important milestone for the Steinbeis Transfer Center for Production and Organization, as it was for its client Stadtmüller, for both the Steinbeis Foundation Transfer Award – the Löhn Award – was a highlight to look back on in 2010. The project results were published under the somewhat wordy title "A Novel Laser-Welding Procedure for Rotationally Symmetrical Components." The publication was the result of a long-standing, close, and intense collaboration with the client, and after the award the partnership grew even stronger such that it is still going strong today.

One particularly positive aspect was that several projects were initiated after the award and publication, and even if they involved different technologies they did (and still do) relate to similar markets and the same competitive environment. The starting point for projects often has something to do with optimizing or safeguarding competitiveness, especially in terms of business operations. The tools that are used, which are well known and can be combined with the wealth of experience and expert knowledge of the Steinbeis specialists involved, always provide a foundation for making product development processes, production systems, logistics, and delivery processes leaner and thus better.

The optimizations are not enough to hold one's ground against stiff competition in the medium term, however. In an industrial environment, it's particularly important to come up with technological innovations because they differentiate a firm from its competition and thus safeguard the required competitive advantage.

A crucial part of any development program is therefore to identify technology early and make it accessible. To successfully introduce such technologies internally, it's important that innovations are properly developed and prepared for full-scale production. They also need to be matched to technical and organizational procedures. Introducing a new technology almost always requires significant redevelopment by the people working in technical areas of a business, especially if a technology was previously unknown or is not yet being used by the company. It may even entail completely rethinking previous systems and work processes. The areas of a business that are mainly affected by this are product design, process and work planning, and operating material design – or purely operational areas such as tool construction and maintenance. Changes are partly of an organizational nature, and they can only be implemented with the right background and strong technical skills. This know-how is also required as a basis for introducing new technologies efficiently in order to make them an effective part of value creation such that processes remain stable and availability remains high.





From a financial standpoint, it's important to conduct an economic risk assessment even before the planned introduction of new technologies or processes. Not only do the financial and technical risks have to be assessed, resources have to be determined, especially in terms of personnel planning. Also, a step-by-step implementation schedule will be needed. One obstacle that often has to be overcome is the bottleneck caused by hiring skilled workers. As a rule, new processes and technologies will tend to be significantly more automated, not just in terms of material flows but also when it comes to information flows and how information is processed. For example, converting or translating product data (CAD data) into process data – thus immediately making sequence programs available for corresponding production systems – is already considered standard practice (CAD-CAM coupling). There is a direct link between this technology shift and changes in the specific training required by people involved in these processes. Due to the current economic situation, skilled specialists with the right backgrounds are not simply "available for immediate hiring" and as a result, in the future it will be increasingly important to be in a position to provide employee training and education in house.

This was also the situation facing Stadtmüller, where technological and organizational change was an ongoing, or more or less permanent process. Only a few years ago, the workstations used by operators produced protective gratings for ventilation and air conditioning companies with relatively few automation options, but step by step hi-tech solutions had entered the process. The company used to produce its gratings with traditional resistance welding and metal active gas (MAG) technology. It now has its own patented laser welding process, developed specially in house. Specialists design and plan products with the customer in such a way that they are already suitable for production and processes. Stress testing is carried out before signing off samples, mainly using FEM technology, and approvals are coordinated with the customer. The quality of products is mainly guaranteed by optimizing pre-production of the required components using smart fixture concepts. The setup process for this is planned digitally and the time taken to rig each setup has been cut drastically by using special online programs and running simulations to compare setups with past processes. Even the physical setup process, which used to be entirely manual, is now automated thanks to mathematical algorithms and artificial intelligence.

In keeping with rapid advancements in terms of the technology options now open to companies, firms involved in development and manufacturing can expect some highly innovative fields to open up in the future and this will help secure their competitiveness. It is important to identify these new areas – as a classic task of technology and innovation management – and each area should be evaluated and carefully introduced to the company, in keeping with a strategy that has been matched to requirements and capabilities.

Image left: An automated assembly process for producing protective gratings © Stadtmüller GmbH
Image above left: Offline programming and simulation of a welding process on a protective grating
Image above right: FEM calculations used as a basis for stress testing

Professor Dr.-Ing. Herbert Emmerich is the director of the Steinbeis Transfer Center for Production and Organization at Pforzheim University. The main areas of activity of his Steinbeis Enterprise are business organization and management, production and work planning, productivity management, handling and assembly technology, and product development.

Professor Dr.-Ing. Herbert Emmerich
Steinbeis Transfer Center Production and Organization (Pforzheim)
su0735@stw.de | www.steinbeis.de/su/735

This Is the Network Calling!

A look back at the 2018 Steinbeis Day

The platform provided by Steinbeis makes us a reliable partner for company startups, business projects, and people who want to apply their expertise to the overlapping areas of science and academia on the one hand, and trade and industry on the other. The annual Steinbeis Day highlights how important the personal exchange of ideas is for this work within and with networks. As in past years, a variety of Steinbeis employees, partners, and friends of the Steinbeis Network met up in Stuttgart on the last Friday in September, and this time they were greeted at the Steinbeis House for Management and Technology (SHMT) by glorious late-summer weather.

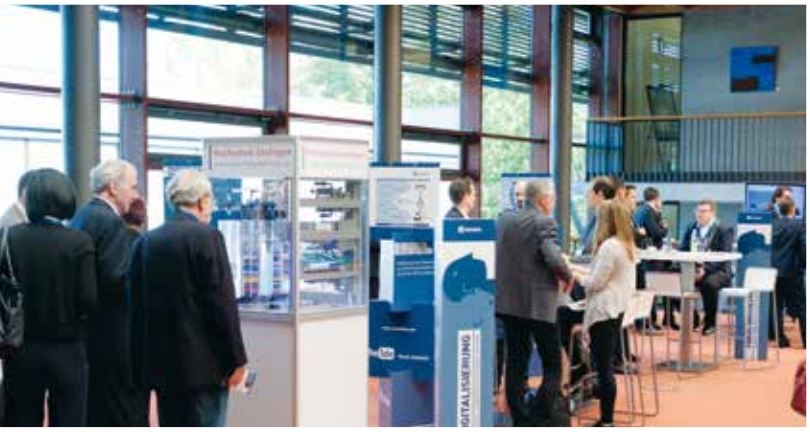
Networking is mainly about communication, as became obvious when you entered the door at the Steinbeis Day at the SHMT. The building was like a beehive, with people busily renewing old and long-neglected contacts, meeting new people, and immediately engaging in conversation about this or the other project. To allow visitors to take a good look at current projects involving digital solutions and Industry 4.0, the Steinbeis Day also organized a Theme Zone. This was an ideal opportunity to talk to experts from the Ferdinand Steinbeis Institute, the Industry 4.0 Transfer Platform, and TZM GmbH.

In addition to this open round of communication, another key area of focus at this year's event was a series of workshop sessions looking at a variety of different topics. To allow visitors to keep talking about the topics after the Steinbeis Day, the speakers are still available for further discussion. To contact the speakers, go to www.steinbeis.de/workshops.

And each Steinbeis Day is only a precursor of the next Steinbeis Day. The Friday for Steinbeisers to keep clear for the following year is September 27. We look forward to seeing you again, this time at the Hospitalhof Stuttgart.

Anja Reinhardt
Steinbeis Foundation (Stuttgart)
anja.reinhardt@stw.de | www.steinbeis-tag.de

Images and other details of the day: www.steinbeis-tag.de



Three Awards, Two Anniversaries, One Bedrock of the Organization

A look back at the 2018 Steinbeis Night

Two numbers stood out at this year's Steinbeis Night at the Stuttgart Liederhalle Arts and Convention Center. It was the 15th time that the Steinbeis Foundation Transfer Award – the Löhn Award – was bestowed. This prize for outstanding technology transfer projects goes back to 2004. And after 35 years of service, Prof. Dr. Dr. h.c. mult. Johann Löhn, the name behind the award and the founder of Steinbeis, bade farewell in the course of the evening and bowed out of everyday business. A variety of Steinbeis directors, customers, former prizewinners, and partners of the Steinbeis Network attended the Steinbeis Night in Stuttgart.

15 years of the Steinbeis Foundation Transfer Award. 15 years of some amazing partnerships with prizewinners. Year after year, a variety of Steinbeis Enterprises and project partners from industry have shown just how much ambition, commitment, and tenacity goes into their shared projects – and that keeping going is worth it. Numerous winners continue their successful partnership after winning the award, and for some the prize is a starting pistol for embarking on new projects (see the focal topic section starting on page 5).

The prize-winning gene is also in the blood of the 2018 winners, as became clear (even to laypeople in the audience) when Steinbeis showed the award films on the projects at the award ceremony. As for this year's Transfer Awards, they also went to two deserving projects. One project honored with the Löhn Award was a successful joint venture aimed at promoting communication beyond the walls of companies. The alliance comprising Bosch Rexroth, Festo, Sercos International, Steinbeis Embedded Systems Technologies, and the Steinbeis Transfer Center for Systems Engineering received the award for the development of a diagnostic platform for communication systems used in automation technology. The 2018 Löhn Award was also bestowed in acknowledgement of the development of a real-time control system for car drive chain test beds. The solution, which adds a highly realistic dimension to vehicle testing, was co-developed by Daimler and Traffic Engineering.Simulation. Software, the Steinbeis Transfer Center. For more information on these two projects, turn to the Feature Topic section of this edition of TRANSFER.

After the award ceremony, all eyes turned to the man on the stage who gave his name to the award. This was the man who as a Steinbeis honorary trustee member of the jury has helped pick countless prizewinners since 2004. Johann Löhn is not only the embodiment of the Transfer Award, he represents everything the Steinbeis Network has become today. He laid the foundation stone for all of this in 1983, subsequently building and expanding the Steinbeis

Images and other details of the day: www.steinbeis-tag.de

Network on a national and international level. Until 2004 he also headed up the organization as Chairman of the Executive Board. Löhn was president of Steinbeis University since its foundation in 1998, and on withdrawing from office in 2018 he also considered it the right time to step down from day-to-day duties. Steinbeis executive board members Prof. Dr. Michael Auer and Manfred Mattulat joined trustee board chairman Dr.-Ing. Leonhard Vilser in expressing their gratitude to Johann Löhn in the form of a Steinbeis award in recognition of 35 years with Steinbeis. This award is bestowed in recognition of Steinbeisers who have worked on particularly successful projects, or Steinbeisers of a particular character or attitude, or Steinbeisers who have earned a reputation as a role model of outstanding service. The only question was, how do you delight somebody who already has so many trophies and awards that there's almost no more place in his trophy case? With a substance that's simply irresistible for a man like Löhn: marzipan. After the official thank-yous, the audience then expressed its high esteem for Johann Löhn in spectacular fashion and said a long farewell as he descended from the stage – with many rounds of standing ovation.

After the somewhat emotional award ceremony, the evening then turned to the more informal part as the lounge area and bar beckoned. As usual there was then enjoyable music from the Silvio Dalla Brida Band. Some took to the dance floor, while others enjoyed conversation with the many guests from home and abroad as the evening gradually drew to a close.

Anja Reinhardt
Steinbeis Foundation (Stuttgart)
anja.reinhardt@stw.de | www.steinbeis-tag.de | www.loehn-preis.de

"The challenge lies in the complexity of different expectations and goals"

An interview with Hartmut Welck and Matthieu Grosjean, experts in international innovation management at Steinbeis 2i GmbH (S2i)

Innovation and internationalization – two areas of focus for the experts at Steinbeis 2i GmbH, which works in close collaboration with the Steinbeis-Europa-Zentrum. As members of the Steinbeis Network, the Steinbeis specialists work under the umbrella of the Enterprise Europe Network, a stepping stone into Europe for companies, research institutions, universities, public administration, and politicians. Hartmut Welck is a senior project manager and the first port of call when it comes to bioeconomics, nutrition, industrial biotechnology, and innovation management. His colleague Matthieu Grosjean is responsible for projects revolving around smart cities, transportation, logistics, and electric vehicles. TRANSFER Magazine invited the two specialists in Europe to an interview.

Hello Mr. Welck. You support SMEs with innovation processes. What sort of companies do you focus on?

We mainly help small and medium-sized enterprises, but also startups in Baden-Wuerttemberg – the sort of companies that are currently expanding and face a question: Where do we want to grow and how – with which products or services, and through which business model?

How do you approach the consultation process?

For the first step, we look at business competences and the potential to innovate, and we examine possible obstacles. The values, culture, and vision of the company also play an important part in this. Then we analyze the business environment by looking at the trends, the market, and the competition. All these insights are then reflected in innovation targets and business goals; these are used to define an underlying strategic concept and how to achieve the innovation targets more effectively. This can result in incremental innovations, leading to related or new products and services, or it can mean looking at related or new market segments. But sometimes a demand for previously unused technologies or processes may be discovered, and this can result in changes to business processes or completely new groups of products. By working through each aspect systematically, the company can work out which approach to prioritize.

Turning to you, Mr. Grosjean, let's think about the world of European project partnerships. How do you consult customers on innovation management in this area? And what challenges does this involve?

Working together on European projects and funding such projects depends on guidelines laid down under innovation policy, although it's also affected by climate and energy policy. The European Commission finances project consortia as part of its goal of accelerating innovation and ensuring that innovations make it onto the European market in the long term. Our

job is to act as an adviser and project partner and help companies develop solutions and innovations. So we look at and discuss intellectual property rights, and we work with a consortium to develop a commercialization strategy, action plans, and business models. We also look after communication and the administrative and financial side of project management.

As an expert in innovation management our job at Steinbeis-Europa-Zentrum and Steinbeis 2i GmbH is to act as a catalyst for the European Commission and the project consortium. We accelerate the exchange of ideas between different partners with a focus on finding solutions. The main challenge in this lies in the complexity of different expectations and the goals of each individual partner. With an EU project, there can be anywhere between 10 and 30 partners from several countries.

So Mr. Welck, what benefit do you think companies derive from your consulting? What direction can an SME decide to go in?

Hartmut Welck

Overall, this opens companies' eyes and gives them a comprehensive, systematic, and validated view of their potential and opportunities to innovate, but also any risks involved. We enter into a coaching process and go through further steps with the company. So we coach them on securing financing through EU funding programs, on setting up an innovation ecosystem with potential partners, on the commercialization or protection of intellectual property, and on working up new ideas. Sitting down with the company and looking at things from lots of different angles allows management to gain new insights into different options in order to develop or adapt innovation strategies.

And you, Mr. Grosjean – your job also involves several "lighthouse projects" under the Smart Cities initiative. Which partners play a particularly important role in introducing innovations to cities, and how do you support them?

Companies have already come a very long way in developing Industry 4.0 and Economy 4.0 ideas, mainly thanks to emerging technologies. But it's particularly challenging for cities and communities to adopt these innovations. The challenge for cities as partners of the Smart Cities lighthouse projects is to lay down an urban development strategy with a focus on future needs, so it has to take renewable energy, sustainable travel solutions, and ICT solutions into account. But at the same time, citizens have to be kept informed and involved in decision-making processes. One general rule is that without someone to drive an initiative – a city mayor, researchers, or a business leader – projects on this scale can't be managed properly.

Our job is to help cities adhere to EU guidelines, so we act as an intermediary between the representatives of different interest groups and the EU, we bring innovative companies on board, and we develop business models. Project success depends on how well collaboration works within a consortium and the interactions between cities, companies, developers, investors, and their advisers. All partners to the initiative are important and nobody is capable of working out solutions by themselves. At the end of the day, it's the cities themselves who will decide what happens in the future.

Are there any examples of new markets or new products that have emerged as a result of these Smart Cities projects?

Matthieu Grosjean

The Smart Cities initiative should be and will be about fostering climate protection and making modern travel solutions more healthy and environmentally friendly, for example by cutting carbon emissions and the energy consumption of buildings. The Smart Cities lighthouse projects have also involved developing technological innovations to make this possible, for example through refurbishments, energy efficiency, using district heating, or introducing renewable energy. New markets have emerged – for ICT platforms that gather, evaluate, and control data, or concepts for parking guidance systems, car and bike sharing, but also different ways to refurbish buildings more quickly and more energy-efficiently. There's an EU project called Triangulum looking at developing a parking guidance system in the city of Eindhoven to direct drivers quickly to vacant parking spaces. It will also record and process car license numbers to avoid unnecessary driving in cities. The REMOURBAN project has involved developing a holistic sustainable urban regeneration model that can be applied to other cities. It's looking at efficient heating and air-conditioning systems in buildings and different ways to combine smart grids and sustainable traffic management systems using ICT applications. There are demonstration districts in the three lighthouse cities – Valladolid (Spain), Nottingham (UK), and Tepebasi/Eskisehir (Turkey) – and they've already succeeded in reducing energy consumption in individual districts by between 50 and 53%. The carbon emissions in Valladolid have gone down 80% and in Tepebasi they're down 63%. To provide a proper overview of all measures, there's a Smart Cities Information System (SCIS), a kind of platform which is also being managed by the Steinbeis-Europa-Zentrum. The SCIS is a supporting measure offered by the Directorate General for Energy, and the idea is to bring together developers, cities, institutions, industry, and experts from across Europe so they can exchange ideas and talk about their experiences, know-how, and information.

Image: The project partners working on the REMOURBAN Smart Cities project pictured with representatives of the European Commission on a demonstration estate in Nottingham (UK), one of three lighthouse cities taking part in the project. The others are Valladolid (Spain) and Tepebasi/Eskisehir (Turkey).

Hartmut Welck, Matthieu Grosjean
Steinbeis 2i GmbH, Steinbeis-Europa-Zentrum (Stuttgart/Karlsruhe)
hartmut.welck@stw.de, matthieu.grosjean@stw.de | www.steinbeis.de/su/2017 | www.steinbeis-europa.de | www.smartcities-infosystem.eu | www.triangulum-project.eu | www.remourban.eu

Saving Energy Through Environmental Communication

Steinbeis experts coordinate initiative looking at the energy efficiency of care homes

Senior care homes do not put much thought into energy issues. Understandably so – they have plenty of other topics demanding the attention of care workers, in all kinds of areas. As a result, it is normal for radiators to be left running while somebody quickly opens a window to air a room. Heated meal delivery carts are often switched on at the start of the day, mainly out of habit, even though they will not be used until later. It's precisely these little things that an initiative called Energy Efficiency at Care Homes has been looking at. The project was launched in 2015 by the Steinbeis Research Center for Solar and Sustainable Thermal Energy Systems (Solites) in collaboration with the Stuttgart Department of Environmental Protection and the consulting company Nowak. The project, which is being supported and financed by the German Federal Environmental Foundation (DBU) in Osnabruck, supports organizations with the introduction of energy-saving measures. Eleven senior care homes and clinics from Baden-Wuerttemberg and North Rhine-Westphalia took part in the initiative. The outcome: Up to 21% of heat and 12% of both electricity and water could be saved in 2017 thanks to simple and straightforward measures.

According to a number of studies, people living in care homes require up to four times more energy and up to six times more electricity than people living in the average four-person household. With approximately 800,000 people living in such institutions in Germany, that points to some major potential to protect the environment. As the results of the initiative show, just by thinking more consciously about what you do and introducing some simple processes or technical measures, a significant amount of energy can be saved.

Unfortunately, care homes have little incentive to cut their energy consumption. This is because their energy outlays are covered by so-called nursing rates, so if they do save money, that's not noticed within the institution itself. Also, investing in efficient equipment pushes up the costs that have to be met by the people in care, so this is difficult to implement. Effective incentives to use energy more efficiently can only be introduced in the care industry by changing underlying processes.

"There's so little room for maneuvering," concludes Steinbeis project manager Magdalena Berberich, "so we focus on energy-aware behavior and low-investment measures." This means in particular focusing on employees. Of course, nothing should be done that will affect the comfort of those in care. "Many people in care have physical or mental impediments that prevent them from helping. But some are actually quite interested in what we're doing and already have suggestions up their sleeves," says Berberich.

There are also restrictions in place that affect how the equipment in homes can be used. For the managers of a care home, the building technology is just one of many topics. There is often only one worker with 50% of their hours for supervising facilities, so homes tend to depend on external service providers. The problem is that some care home heating systems are highly complex, so they require frequent maintenance and adjustment. They are often found to be running inefficiently. There is rarely a good overview of the energy consumption of a building, and it is not uncommon for bills to be merged and sent to the operators who oversee homes. "To work out where there's potential to save money or where there are technical issues, it's really important to know how much energy a home is using and monitor it regularly," says Dr. Jürgen Görres, director of energy at the environmental protection office of Stuttgart city government. The environmental protection office has been working closely with municipal care facilities for many years. By continuously managing energy, care homes can be regularly updated on fluctuations in energy consumption and given detailed advice on running facilities energy-efficiently. As part of the project, this long track record has been tapped in order to plan energy management at the care homes involved in the pilot study.

The team has now been working with these care homes to develop an environmental communication concept with the aim of raising awareness of energy consumption in care homes. It is also hoped to reduce energy use by encouraging people to behave differently, introduce low-

investment technology, and change organizational procedures. The concept entails an initial analysis of building technology and energy consumption levels, staff training, a campaign to create more sensitivity, and workshops for people to talk about their experiences with energy efficiency drives. All in all, the aim of the concept is to make it easier to manage energy in the long term.

The initiative even has a mascot, Eddie, part of an "energy makes people happy" campaign featured on light switches, windows, and meal delivery carts, with friendly tips on using energy efficiently.

To track progress, energy data is being continuously captured and analyzed. Care homes are asked to enter monthly meter readings into a protected area on a special website. The portal automatically evaluates data and compares it to previous months and years. The care homes are also shown graphs, allowing them for the first time to get a feel for their own energy consumption.

The concept was piloted in a variety of homes for two years, and it became obvious that even the smallest changes can help save money. For example, in 2017 no less than 380 tons of carbon dioxide emissions were avoided compared to the same periods in 2013, 2014, and 2015. The amount of energy saved is the equivalent of the heating requirements of 11 four-person households, the water consumption of 26 households, and the electricity use of 55 households.

The care facilities that took part in the pilot study said that something did change as a result of the campaign and people now think and talk more about energy use. They also said that the opportunity to share experiences with other care homes in the pilot study had been extremely important because it resulted in more ideas. The meeting was a chance to discuss things like the common practice of drying cleaning cloths for hygiene reasons before using them again later the same day. The system has now been adapted and cloths are now washed in the morning and used again immediately. This saves one care home twelve laundry drying cycles per week. Depending on the situation and possibilities on site, each care home has introduced a variety of individual measures. Employees have been provided with regular updates on using energy consciously, for example when using the heating, airing rooms, switching on lights, or operating electrical equipment. In addition to thinking more carefully about energy use, savings were also made by turning the heating down, using a hydraulic adjustment device on room heaters, and introducing LED lighting.

"It takes time to change things, but it's worth every effort," concludes Berberich. The German Federal Environmental Foundation (DBU) is also highly satisfied with the results. "Energy consumption in senior citizens' homes and care homes can be reduced without major investments if the people involved think consciously about their energy use," says DBU department manager Verena Exner. The project ran until the end of October, and the plan now is to extend the concept tested in the pilot homes to other institutions.

Image left: Lights are often left on in unoccupied rooms, unless Eddie gives people a gentle reminder.
Image right: The Eddie mascot and project team at the closing session on September 25, 2018 in Mulheim an der Ruhr.

To see an evaluation of energy data from the eleven homes and examples of the measures that were introduced, go to www.ee-fuer-pflege.de (German only).

Magdalena Berberich
Steinbeis Research Center Solar and Sustainable Thermial Energy Systems (Solites) (Stuttgart)
Magdalena.Berberich@stw.de | www.steinbeis.de/su/891 | www.solites.de

It All Depends on the Quality of Management

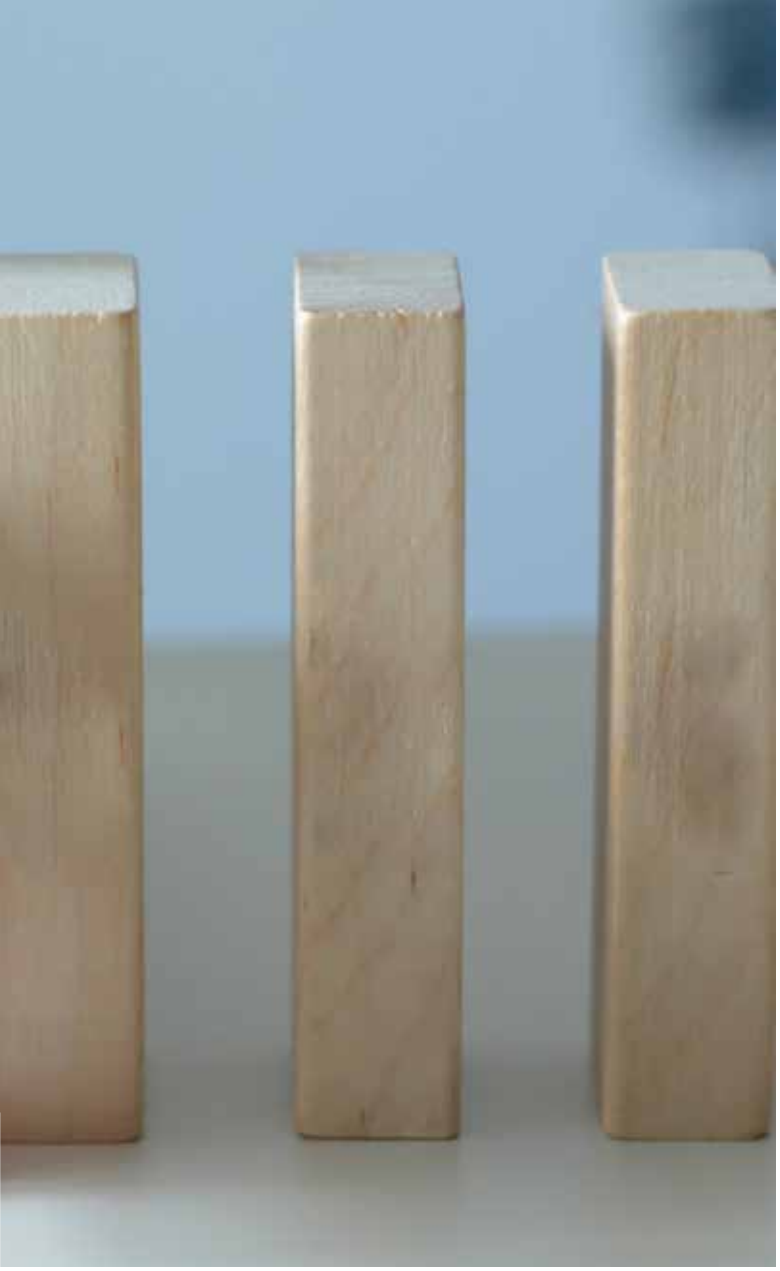
Steinbeis seminar provides insights into management psychology – a key success factor for companies

The Gallup Institute regularly conducts a worldwide study to gauge how motivated and loyal skilled workers feel about individual companies. The outcome: Up to 80% of employees who quit their job do so because of the manager they directly report to. They feel that they were badly treated, not given enough support, or either not appreciated or not allowed to play to their skills and preferences. Yet these are exactly the things that matter when trying to keep hold of good and successful people in the long term. Companies can no longer afford bad managers these days. There is a shortage of skilled workers, so it is becoming more and more important to manage people professionally and keep them loyal to the company. They should also be promoted according to the type of person they are. But that's not everything a manager should do. Good management is also about an ability to solve conflicts constructively, lead teams efficiently, and run meetings properly according to the central topic and how people are feeling in psychological terms. Just how, is something the Alb-Schwarzwald Business School, a Steinbeis Transfer Institute, looks at in its seminar on the psychology of leadership.

More and more highly qualified specialists want to become involved in their company. They want to be treated as individuals. They want to be fostered. For modern managers, this can be quite a challenge and something that stretches people beyond their specialist area, especially if they had no psychological training while getting to where they are today. Yet one key success factor for them will be a solid grounding in psychological issues. This makes it possible to judge people properly and manage them individually, to consciously steer communication and tackle conflicts constructively by focusing on solutions. This all takes more than specialists or technical expertise; it requires psychological skills.

Can leadership skills be learned? Yes they can! This is because leadership is not about acquiring certain personal attributes; as a manager, one has to get to know the right tools and methods. These are needed to unravel complex conundrums and find individual solutions for any given situation. To do this properly, one has to be self-assured and possess problem-solving skills. Perhaps these will be required to deal with customers or employees who are supposedly being difficult; perhaps they will be needed to moderate complex workshops or meetings. This is because even if conflicts arise, and even if there will be differences in opinions, outcomes should revolve around clear goals.

When managing people becomes difficult, the last thing you need is a rigid instruction manual. It's much more useful to draw on techniques and tools that make it easier to work out what's actually going on in a certain situation and steer things toward a sensible solution. Modern communication and management psychology has the corresponding



Seminar content

Module 1: Communication and management – fundamentals
Fundamental models help develop a detailed understanding of personal and inter-human processes.

Module 2: Managing meetings professionally – the foundation of discussion
Managing people properly is one of the most important skills of a manager. Knowing the right techniques and when to use them boosts your professionalism.

Module 3: Dealing with conflict – with confidence and professionally
If something is simmering under the surface, a good manager really should not let it continue to simmer. This is because even a small amount of tension can quickly develop into conflict and become a huge burden on all fronts. This module focuses on the right ways to clarify situations tinged by conflict and thus defuse simmering conflict.

Module 4: Managing teams – pulling in the same direction
Team leaders should quickly get new teams moving forward. They should also know how to quickly intervene in the right ways, so that teams can function well and avoid major conflicts.

Module 5: Moderating decision-making processes
An important task of management is paving the way for decisions, making decisions, and implementing decisions. This module looks at different ways to prepare the ground for decisions in a way that as many people as possible come on board and make things happen.

tool kit to do this. This can even help untangle highly confusing situations and tackle seemingly hopeless problems. Naturally, such instruments also help you to deal with normal situations encountered in everyday scenarios as a manager. They offer practical support in working out an individual way forward that should result in a positive outcome and ultimately help everyone succeed.

Managers shouldn't have to spend days thinking about how to make things work. If they do find themselves outside their comfort zone, they're always happy to have some useful techniques and analytical tools up their sleeve. These can be used to assess complex situations, pinpoint the actual cause for something not working, and point processes in the right direction so that an individual solution can be found.

What are the core communication competences a manager requires? One is the ability to manage meetings, even if things become difficult. Others are the ability to manage and solve conflict (without letting it get to you) and knowing how to steer teams in the right direction, despite rapid change in things going on all around. But without a doubt, the really big challenge is to ensure any decisions that are made receive the support of as many people as possible and are then implemented by them.

Alb-Schwarzwald Business School is now working with the renowned Schulz von Thun Institute to offer a course spanning five two-day modules and provide insights into communication and management psychology. The communication and psychology know-how is being shared by a lecturer from the Hamburg-based institute.

It is also important that acquired know-how can be transferred into practice. Evening practice sessions take place between the modules to dig deeper into lessons learned and discuss how they can be applied to business. The feedback from course participants confirms that the concept is working for them, as one manager explained at a practice session: "My mindset is shifting, step by step, in terms of my own leadership role. I feel more confident now, even if I get into a situation that confuses me at first or looks like it could cause conflict." This highlights how beneficial it can be to invest in your own management competence.

Image: © fotolia.de/Adrian Ilie825

Ute Villing
Steinbeis Transfer Institute Business School Alb-Schwarzwald (Berlin/Gosheim)
ute.villing@stw.de | www.steinbeis.de/su/774 | www.bs-as.de

Music Running Through Your Veins – and Your App

Steinbeis coach supports startup in the world of advertising music

Press rewind – back to a master's degree course at Baden-Wuerttemberg Pop Academy, where Markus Schwarzer, Jakob Höflich, and Joshua Weikert first met. The three friends quickly realize that they not only share a passion for entrepreneurship, they're also united by a strong interest in tomorrow's world of music and have overlapping skills in the field of business, communication, and IT. It was almost like they're predestined to work together at the nexus of music and technology. And so it came to be that they embarked on a project while still studying, based on the notion that people should unite through music. Now fast-forward three years. They've now just released their first app for musical moments – Groovecat. After successfully drumming up investments totaling a six-figure number, their concept is available in app stores and they are rubbing shoulders with the alumni of the world's only music accelerator: Music WorX in Hamburg. The journey from the dreamy days of a student project to becoming a key new player in music tech was accompanied by the city of Mannheim and the state of Baden-Wuerttemberg, two key sponsors who played a central role, most notably thanks to the fast-track consultation process offered by Business Start-up, the Steinbeis Consulting Center, and backing from the ESF funding program.

Looking back at his time before the coaching sessions, Groovecat CCO Jakob Höflich says, "There was something special about that time – we were brimming with ideas and the urge to do something, but what we lacked was structure, the long-term view, and a holistic approach regarding a comprehensive business model. Oh, and at the same time we still had to write our master's dissertations." Thanks to the Mannheim economic development agency, represented by Sonja Wilkens, the team heard about the ESF funding program and they were put in touch with the Steinbeis Coach Eligiusz Skwara. A couple of phone calls later and the first appointment was set up. After that, the Groovecat team took part in regular workshops with Skwara.

The aim of the coaching sessions was primarily to make Groovecat "investor-ready" and work out a visionary but at the same time sustainable business model. The main issues that had to be tackled in the first coaching session were: How do I create a free social media tool for music, but also how do I make it appealing to investors? The first major milestone during the coaching sessions came with a radical change in the strategic direction (pivot) of Groovecat, from offering a social music app to working as a search machine for advertising tracks. The idea is based on a revolutionary data set that makes it possible to select music for any kind of audiovisual content. Not only did this add a B2B dimension to the business model, it also pinpointed a central issue that many face when choosing a track to go in advertising. It's expensive, it takes too long, it's subjective, and it's not based on proper information because until now, the data lacked real substance.

Looking back at the coaching sessions, Groovecat CEO Markus Schwarzer says they were the starting point for the business model pivot and

successes until now: "We initially provided benefit to music lovers, but we didn't solve a tangible problem. Eligiusz used the coaching sessions to constantly prod us where it hurts, and doing that allowed us to look our weaknesses in the eye, adapt our business model, and reject our original concept. If you've ever had to throw out an idea you've felt really passionate about, you'll certainly know how difficult that is." Looking back, taking this step was worth it, however. After the pivot, Groovecat moved to the premises of the Music WorX accelerator and won a variety of prizes, one of which was the CyberOne Special Award from bigFM. It also went to the final round of the Mannheim startup awards at the end of 2017, thus qualifying for the BWM investment fund offered by the Mannheim Economic Development Agency.

After several pitches and further rounds of negotiation, the BWM investors finally decided to come on board in April 2018 with a six-figure investment. And although the coaching sessions finished a long time ago, Skwara continues to provide the team with the support of a trusted adviser. He is also still a constant companion when searching for investors. The fixed coaching process has thus developed into a long-term partnership precisely in the area where young entrepreneurs normally have little or no experience: attracting capital. Skwara: "The way I see it, being investor-ready is about two things: ensuring startups are in a position to win investors over in the heart and in the head. With Groovecat, we succeeded on both fronts. The team has every potential to change a market worth billions – but what's much more important is that they have the ability to translate strategies into actions and implement those actions. The current trend in user numbers and the interest expressed in pilot projects by big players like Sony Music go to show how well we've done. So there's now nothing to stop us taking on more investors."

Now that the app has been successfully launched, there are two challenges for Groovecat. One will be to continue expanding the user franchise – steadily and organically. The other will be to process valuable data sets as efficiently and qualitatively as possible, in keeping with the company culture, and in a way that does not divulge personal user data. To do this, the team has already entered into a partnership with the audio communication department at TU Berlin, which will help Groovecat with data analysis. The team also flew to New York in December to take part in a 5-day startup and entrepreneur program. The trip was a prize won at the STEP USA pitch organized by German and American chambers of commerce. Not only can the United States be considered the homeland of social media, it's the biggest international market for advertising tracks and thus a lighthouse location on the long journey ahead for Groovecat.

Image: © Stadtmarketing Mannheim GmbH/Nadja Capellmann

Eligiusz Skwara
Steinbeis Consulting Center Business Start-up (Stuttgart)
Eligiusz.Skwara@stw.de | www.steinbeis.de/su/1635 | www.steinbeis-exi.de

The 2019 Steinbeis Engineering Day: Digital Transformation Without "The" IT

Successful examples from restaurants and catering, the manual trades, wholesaling, and manufacturing

Digital solutions are often a bit of an obstacle for traditional companies. Making the transition often fails because of existing IT infrastructures or a lack of specialist know-how. There are so many technological innovations out there, even big companies struggle to understand the overall picture. As a result, it's all the more important to be able to experiment with new technology in networks that transcend different sectors of industry. Steinbeis is inviting visitors to the fifth Steinbeis Engineering Day, which will take place this year at the Sparkasse Academy in Stuttgart on May 8. The theme: digital transformation without "the" IT!

Digitalization is about adding value by introducing new technology; it's about new business models spanning networks with new and existing customers. The idea is to work together across different sectors of industry – and not just stand there and react when something happens! There is also increasing competitive pressure on local and national SMEs as global corporations and startups enter the fray, facilitated by digital technology. The 2019 Steinbeis Engineering Day provides SMEs with a helping hand in dealing with this pressure, offering different digital transformation models that can already be implemented now and are competitive. There are number of ways for traditional firms and business models to adopt a global positioning and expand customer reach.

The event will involve two rounds of discussion, with leading business people explaining how they experimented with and then leveraged cross-sector networks and then succeeded in using digital technology to unleash new potential as part of their business models. Visitors will then have the opportunity to meet the SME presenters, new business founders, startups, Steinbeis experts, and students. The event will allow people to discuss overlapping ideas and different ways to develop a future digital business model. A number of presenters and projects from the field of restaurants and catering, the manual trades, wholesaling, and manufacturing will demonstrate what is already possible – and that new value creation scenarios are possible even with only little time or money, mainly by using cross-sector networks and working beyond a company's internal IT structures. The methods presented at the Steinbeis Engineering Day will offer a chance to identify new business partners and networks in all sectors of industry, opening the door to future-ready, competitive, digital business models.

For further information and online registration, go to www.steinbeis-engineering-tag.de.

Alexander Neff
Ferdinand-Steinbeis-Institute (Stuttgart)
Alexander.Neff@stw.de | www.steinbeis.de/su/1212 | www.steinbeis-fsti.de

It Doesn't Always Have to Be Amazon

Steinbeis mentors provide coaching support to young business founders linking up online searches with on-site shopping

Where can I find those running shoes, that school bag made from recycled plastic bottles, or that delicious wine from Spain? It's so easy to find yourself on the internet again when looking for that certain something. At the click of a button, off goes that order for the desired goods. More and more downtown stores are suffering as a result of this purchasing behavior. Valentin Uhrmeister, Moritz Simsch, and Anna Pfeifer want to do something about this. Since June, stores in Constance have featured an orange octopus to indicate that they support an app linking online shops to their bricks-and-mortar retail outlets. The three young entrepreneurs have been working with Steinbeis coach Jens Freiter to make the system work.

Shopping via app – not just through Amazon and co., but through local stores: The three young business founders from Constance have set up a company called Nemms, which promises to revolutionize shopping behavior by enticing customers back to downtown stores. "Downtown stores stock most products – you just don't know where," says Moritz Simsch. So customers often have to traipse from store to store. Shopping online is often more convenient, but it can sometimes become irritating when you have to collect goods from a local parcel store or send everything back again. Nemms' aim is to merge the convenience of online searches with local advice offered by stores. The app allows customers to ask questions which are forwarded to the stores to be answered.

"We were surprised by how quickly the stores were won over by this concept," says Valentin Uhrmeister. Most stores said running an online shop themselves would not be profitable. They also said they frequently receive queries from customers via email anyway. Nemms' founders say this is where they plan to plug the gap. The majority of outlets run by local traders in the city have already registered: 80 in all. The first 55 had to be acquired as customers, the others got in touch themselves. Lots of people from Constance already recognize the octopus logo. The app probably won't convert hard-core Amazon customers, but the founders of the new company believe that seeing downtown areas go into decline has made lots of people start to think again. The trio believe that customers are more likely to go back into stores more often if they know they can find the product they're looking for.

"More and more purely online providers – like My Muesli – have realized that online customers are not very loyal and so they're now setting up stores in downtown locations," says Anna Pfeifer. Having an actual outlet and people to give advice on site is a clear advantage for local businesses. The only missing link is the app. "This is where there's definitely enough room for Nemms," says the 31-year-old. Unlike Nemms, which has someone to talk to at the store, Amazon cannot provide access to someone to offer advice on which product to take.

The biggest problem for the trio from Constance during the startup phase is funding. Since setting up their company in early 2018, the young entrepreneurs have developed and continuously optimized the app. But until now, their idea has not earned them any money. Following approval from the Federal Ministry for Economic Affairs and Energy for an Exist startup stipend for innovative projects, all three entrepreneurs have given up their jobs in IT. But in 2019, Nemms will have to be self-supporting.

The trio took part in several workshops with Steinbeis expert Jens Freiter to examine exactly how to make that happen. Freiter was a co-founder of Holidaycheck, which revolutionized the travel market. He also works as an expert for the Hilzingen Startup Initiative, which according to initiator and mayor Rupert Metzler has worked with 70 startups over the last 20 months alone.

"The biggest challenge is scaling up the business model," says Freiter. This is because being able to live off the proceeds of Nemms will require the involvement of at least five communities. There are also a good number of competitors, like Findeck in Freiburg, Lokafox, Buy Lokal, and Atalanda, which all help local stores make the leap into the internet and they always want a slice of the cake for doing so. Even the big players like Google and eBay have discovered the merits of local retailing.
Identifying the right strategy is not easy. When asked about the coaching with Steinbeis, Pfeifer says, "Looking at things from the outside in did us good." They found it particularly useful that their Steinbeis expert had even set up a successful business himself.

The young entrepreneurs are now optimistic that their plan will work. Following in the footsteps of Constance, Karlsruhe and Aachen have now also come on board. Discussions are also underway with another large city in the north of Germany. The idea is to launch with a basic version, which is free, plus a subscription option that costs stores 25 euros per month. Stores can try out a free subscription version of the app for one month. The interest is certainly there. And if the firm does run into problems, their Steinbeis expert is close at hand: The startup center in the city is virtually right next door to all the startups.

Image: Shopping using an app – the three business founders Moritz Simsch, Valentin Uhrmeister and Anna Pfeifer are hoping to entice customers back to downtown stores with Nemms. Their first venture in Constance went well. The trio are now looking to expand in other cities across Germany. Image: Kerstin Conz

The Hilzingen Startup Initiative

The Hilzingen Startup Initiative (District of Constance) was set up in 2015 by Rupert Metzler, the mayor of the 8,500-strong community. "On average we work with about 60 startups each year," say Metzler and Winfried Küppers, who set up the network of specialists in the region on behalf of Steinbeis. Its services include free open-door sessions for startups and a startup day, which is often attended by celebrities. In March 2019, the managing director of Freiburg soccer club, the entrepreneur Fritz Keller, and the brain jogging coach Dr. Michael Ullmann will hold keynote speeches for the initiative.

Jens Freiter
Steinbeis Consulting Center Business Start-up (Stuttgart)
jens.freiter@stw.de | www.steinbeis.de/su/1635 | www.steinbeis-exi.de

Winfried Küppers
Steinbeis Consulting Center Sales Analytics (Hilzingen)
winfried.kueppers@stw.de | www.steinbeis.de/su/2159

Welcome to the Steinbeis Network

The platform provided by Steinbeis makes us a reliable partner for company startups and projects. We provide support to people and organizations, not only in science and academia, but also in business. Our aim is to leverage the know-how derived from research, development, consulting, and training projects and to transfer this knowledge into application – with a clear focus on entrepreneurial practice. Our platform has now resulted in the foundation of more than 2,000 enterprises. The result is a network spanning more than 6,000 experts in approximately 1,100 business enterprises – working on more than 10,000 client projects every year.

And this network continues to expand. For an overview of our most recently founded centers, go to www.steinbeis.de/en/news. Welcome to the Steinbeis Network!

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

...or go to https://twitter.com/SteinbeisGlobal.

Turning the Spotlight on Rolling Bearings

Steinbeis experts compare optical confocal and white light measurement technology with tactile roughness measurement

The Steinbeis experts working at the Steinbeis Transfer Center in Herzogenaurach are specialists in the field of bearings. For some time now, they have been looking closely into optical measurement technology used with rolling bearing components. The reason for this is that there has been a noticeable rise in quality requirements in the rolling bearing industry, and demand for high-precision measurement technology is intensifying. Optical measurement methods make it possible to analyze materials with incredible accuracy, even down to the nanometer, and some technologies based on contactless measurement can now be integrated into existing production processes. But how closely do tactile roughness measurements correspond with measurements taken using optical methods? This was the question investigated in research conducted by the Steinbeis experts.

The normal way to ascertain the quality of a surface is to use tactile measurement methods – involving contact. But over the last 30 years optical methods have become more and more prevalent. These are capable of capturing features without making any kind of contact with the surface. To assess the potential offered by optical measurement, results are compared and contrasted to standardized tactile measurements according to DIN standard EN ISO 4287.

The researchers conducted a series of experiments with a multisensory device called the FRT MicroProf® 200. The equipment, supplied by the metrology specialist FRT, comprises a confocal chromatic white light sensor (CWL) and a confocal microscope (CFM) [1]. It is capable of determining surface topography, roughness, and contours. Using optical measurement techniques even makes it possible to analyze components with complex geometries. As well as measuring simple lines, optical procedures allow surfaces to be measured down to less than one millimeter.

The white light sensor integrated into the measurement unit is based on a combination of confocal measurement principles and the principle of chromatic depth scanning. The chromatic effect of the lenses fans out white light along optical axes, creating focal points of different wavelengths. The confocal capability of this measurement technique means that the spectrometer only detects points that are in focus. Each individual wavelength is given a height coordinate. The sensor is capable of continually determining a plethora of points to provide measurements across a wide area [2]. To measure an area 5 x 5mm, the system scans along 5,000 lines, each containing 5,000 points on the surface of an outer bearing ring ("race").

This technique using a confocal microscope in the measurement unit is based entirely on confocal measurement principles. Light emitted by the microscope lands "in one go" on the focal plane of an object. Rays are then reflected and picked up by a detector. Recording the intensity of reflected light makes it possible to assess the height of confocal measurements. The system includes an integrated Nipkow disk which allows images to be captured across an area measuring up to 890 x 655µm [3]. The measurement system requires surfaces consisting of several layers one on top of the other, such that only one confocal point is measured within a single layer. To allow the measuring device to determine new confocal points on new layers, each current focal point is taken one step away from the surface using an adjuster. The measurement method developed by the Steinbeis experts involved merging individual image fields into a measuring range of 5 x 5mm.

To take tactile measurements, the researchers from Herzogenaurach used a roughness measuring device called the MarSurf LD 130, which was supplied by Mahr. This offers a profile method using a contact stylus according to DIN standard EN ISO 3274. The device has a conical diamond mounted on the tip of a contact arm with a radius of 2µm at an angle of 60°. The probe is drawn over surfaces and resulting deflections of the arm are evaluated to provide surface parameters [4].

The question is: What are the correlations between the tactile readings and the optical readings? To answer this question, the experts working with the two Steinbeis directors, Prof. Dr.-Ing. Stephan Sommer and Dominik Helfrich, measured the outer surface of four outer races (bearing rings) using both tactile and optical methods. Races #1 and #2 both had a homogeneously milled surface. Grooves had been added to the surface of races #3 and #4 in order to observe any effects resulting from the different measurements. The benchmarks used for each of the measurements included average roughness (Ra), arithmetic range in roughness (Rz), and skewness (Rsk). These are all in keeping with DIN standard EN

	Ring No. 1			Ring No. 2			Ring No. 3			Ring No. 4		
■ ± 30% Difference ■ ± 50% Difference □ > 50% Difference												
	Tactile	Confocal	White light	Tactile	Confocal	White light	Tactile	Confocal	White light	Tactile	Confocal	White light
Ra (average roughness) [µm]	0,17	0,16	0,22	0,17	0,17	0,17	0,5	0,49	0,52	0,18	0,18	0,2
Rz (range of roughness) [µm]	1,9	1,25	1,76	1,47	1,51	1,46	3,38	2,73	2,91	1,47	1,34	1,25
Rsk (skewness) [-]	-0,7	-0,3	-0,1	-0,7	-0,2	-0,1	-0,3	-0,3	-0,4	-0,9	-0,7	-0,3

ISO 4287. The Ra and Rz readings were used because they are frequently looked at in industry to assess the surface quality of rolling components. The Rsk value was added because it can be used by the rolling bearing specialists as an additional assessment parameter. If it's negative, it indicates a plateau-like profile on the surface. Such profiles are generally good in terms of load-bearing properties [5]. The percentile differences between the tactile and optical values are highlighted in color in the correlation table. Tactile results are shown in green to serve as a reference.

"Aside from the measurements themselves, we ascertained a tendency toward a close correlation between the tactile and confocal procedures," explains Stephan Sommer, "especially with races #3 and #4, where there's a good match between the confocal readings and the tactile readings." With the white light measurements, the results showed that the Rsk values had a more pronounced deviation versus the tactile values. With races #1 and #2, the Rsk values for the white light measurements differ significantly from the tactile values. Many of the differences between the confocal and the tactile readings are between +/-30% and +/-50%. The only significant difference was found with the Rsk value from the confocal reading on Ring #2. As the tables show, the Ra and Rz parameters for the two optical methods correspond closely to the readings of the tactile methods. In comparison with the tactile sensor, however, the white light sensor does deliver a more positive value when determining Rsk. Since the value it returns is almost zero, one interpretation could be that the surface has less effective load-bearing properties than is actually the case.

Bottom line, what conclusions did the scientists come to following their measurements? As the correlation table clearly shows, the confocal measurement technique has an almost 80% correlation to the tactile method. On the other hand, the white light approach has only a 66% correlation to the tactile method. The lower percentages are due to the fact that the Rsk values of the white light measurements deviate significantly from the tactile values. This compares to the values of the confocal microscope, which generally delivers better results with the Rsk value. Not too much should be read into these deviations, however. These differences are only in the order of nanometers, so on a general level it can be assumed that there is a correlation between the two optical methods and the tactile method. In the rolling bearing industry, values in the micrometer range are considered acceptable.

"Optical measuring is not just intended for use in roughness measurement. It also offers other special characteristics. Measuring areas also makes it possible to assess several points at the same time. Information on peaks can help with things like displaying surface structures in two or three dimensions," explains Dominik Helfrich, underscoring the benefits of the measurement technique. Measuring areas using optical methods is especially common in dentistry because it can be carried out without coming into contact with surfaces. In addition, white light sensors can be integrated into live production processes. Because the sensors can take measurements along lines, they make it possible to run 100% checks fully automatically within the shortest possible time.

Literature

[1] FRT GmbH: Instruction manual, Bergisch Gladbach: FRT GmbH, 2013.

[2] Gevatter, H.-J.; Grünhaupt U.: Manual of Measuring and Automation Technology in Production, Berlin: Springer, 2006.

[3] FRT GmbH: FRT CFM DT instruction manual, Bergisch Gladbach: FRT GmbH, 2013.

[4] DIN EN ISO 3274:1998-04, Geometrical Product Specifications (GPS) – Surface texture: Profile method – nominal characteristics of contact (stylus) instruments (ISO 3274:1996).

[5] DIN EN ISO 4287:2010-07, Geometrical Product Specifications (GPS) – Surface texture: Profile method – designation, definition, and parameters of surface texture (ISO 4287:1997.)

Image left: The measured item – the race (outer bearing ring) of a grooved ball bearing (left) and a confocal microscope with six enlargement lenses (right).
Image right: Correlation table for the races showing the surface structures of each race and the differences in percentages.

Prof. Dr.-Ing. Stephan Sommer, Dominik Helfrich
Steinbeis Transfer Center Bearing Technology (Herzogenaurach)
su2148@stw.de | www.steinbeis.de/su/2148
Including a laboratory for quality standards, production measurement engineering and bearing technology; Department of Mechanical Engineering University of Applied Sciences Würzburg-Schweinfurt (FHWS)

Achraf Kouramola, Sebastian Dinkel, Daniel Wagenhäuser
Laboratory for quality standards, production measurement and bearing technology
University of Applied Sciences Würzburg-Schweinfurt (FHWS)

Frank Pohli
Tribology Laboratory University of Applied Sciences Würzburg-Schweinfurt (FHWS)

A Different Approach to Mobile Robotics

Team of students at the Baden-Wuerttemberg Cooperative State University (DHBW) in Ravensburg develops fully automated seating robot

According to a study conducted by the Institute for Employment Research (IAB), technology can currently already perform more than 70% of the activities in a company. The experts behind the study see tremendous new areas of potential for professions in production technology or for simple, repetitive tasks. This was reason enough for a team of students at the Baden-Wuerttemberg Cooperative State University (DHBW) in Ravensburg to look more closely into driverless transportation systems. Their focus lay in different ways to fully automate the setting up and clearing up of chairs in rooms and halls. The facilities at the campus in Friedrichshafen were also ideal for implementing their ideas in technical terms: The students have local access to a fully equipped experimentation workshop: A "Lernfabrik" (learning factory) has been set up on the campus to learn about connected manufacturing, technologies revolving around augmented reality, and even human-machine interaction. The research facility is part of a project funded by the Zeppelin Foundation in Friedrichshafen, and the initiative is being coordinated by IWT Wirtschaft und Technik GmbH (IWT), a company belonging to the Steinbeis Network. The Lernfabrik not only provides technical equipment, it also gives students access to expertise and experience.

The project team started by conducting a detailed survey of 350 potential customers with the aim of understanding the demand for an automatic chair arrangement system for halls, trade shows, and other event locations. The demand was certainly there: Some companies have to set up and clear away up to 2,500 chairs per day. But would such a technical solution be worth it in economic terms? This was another aspect the students looked at. Based on the findings of their research, they subdivided potential users of the robot into different groups and

application areas. The first group comprises trade show organizers and convention centers, who have to set up chairs for visitors. The second group of potential users they looked at comprised people working in catering, who often have to set up rooms for special celebrations. Further possible users include event organizers, who also set up or clear away rooms full of chairs for clients and even offer this as a service.

The DHBW students then conducted a follow-up survey to examine the business case from a customer angle. The idea was to make the potential to automate the process more tangible and highlight the time it would save. The main factors that affect the financial viability of a seating robot are the purchasing costs and how adaptable the system is in use. Actual cost savings are only possible if using the system is flexible and straightforward. One downside is depreciation on the initial investment, and this stands in opposition to the hourly rates of trade show personnel.

Having established a theoretical framework for their project, it was time for the students to roll up their sleeves. As part of a collaborative program between DHBW Ravensburg and the IWT, the DHBW students worked under an IWT project manager, Kris Dalm, who helped them construct a demonstration unit for a fully automated seating robot. "We took on the seating robot project in three stages," explained Christian Zull, the student who spearheaded the project. "First we selected a driverless transportation system, then we researched the software components, and then finally we set the thing up to match the task at hand." The driverless transport system (DTS) was based on a solution provided by Omron. The system contains a variety of sensors for the DTS to work out its exact location, such as sonar and laser sensors. The DTS works out its position without needing any connection to a tablet.

The students designed and built a carrier frame for the chairs, mainly consisting of square profiles mounted on the unit. The bottom section is fixed to the DTS, allowing the other parts to move up and down a vertical guide rail. The moving parts are controlled by a screw jack system driven by an electric motor. The energy required by the electric motor is supplied directly by the DTS. Finally, there is a control unit to make sure the motor and the DTS work in unison. This ensures the lifting fixture can be moved and positioned.

The software used by the unit was partially provided by the manufacturer, but some elements were taken from a pool of open source solutions. To position the DTS, the students decided to use software called Mobile Planner because it also enables the unit to be remotely controlled.

For both the DHBW and IWT, the seating robot was one of many projects that involved smart DTS solutions, and the systems can be used in a plethora of different fields. It will be exciting to see which applications catch on in the long term in a non-industrial setting. The Friedrichshafen campus will continue pursuing the seating robot concept. And who knows – perhaps the students' DTS will turn up one day at an event organized by the DHBW or IWT!

IWT Wirtschaft und Technik GmbH:
Innovation through partnership

Aside from offering bachelor's and master's degrees, the Ravensburg campus of Baden-Wuerttemberg Cooperative State University (DHBW) offers vocational training to students, academics, and managers. Training courses and events span a variety of business, technology, and management topics.

The IWT specialists in Friedrichshafen (Lake Constance) work in the field of knowledge and technology transfer, offer contractual research, and deal with continuing professional development, Industry 4.0, and open innovation.

IWT is a partner to the DHBW in Ravensburg and a business enterprise within the Steinbeis Network. In its role as a DHBW partner, it is responsible for vocational training for students, partner companies, a variety of other bodies and individuals, research activities, and research alliances. Bringing all these factors together (the Steinbeis Network, its partnership with the DHBW, the DHBW's membership of IBH (the international university on Lake Constance), and all the research activities at the Lernfabrik experimentation workshop in Fallenbrunnen) provides rich internal know-how, giving IWT access to an extensive pool of knowledge.

Images: The robot designed by the team of students in action.

Kris Dalm
IWT Wirtschaft und Technik GmbH (Friedrichshafen)
su1790@stw.de | www.steinbeis.de/su/1790 | www.iwt-bodensee.de

Christian Zull
Baden-Wuerttemberg Cooperative State University (DHBW) Ravensburg
www.ravensburg.dhbw.de

Straight from University into Management

An interview with Nicoline Janssen, alumna of Steinbeis University Berlin

In her main job, she is a specialist in labor law at the Max Planck Institute in Stuttgart. But Nicoline Janssen is also a mother, a volunteer lifeguard for the DLRG, and part-time self-employed. She has been pursuing her latter profession of self-employment for more than a decade. It all started during her MBA studies at the School of International Business and Entrepreneurship (SIBE), at Steinbeis University Berlin. During her degree, she put theory into practice and co-founded the charitable limited company Menudos. Its specialty: childminding. In an interview with TRANSFER, Janssen talks about the challenges of self-employment.

Hello Ms. Janssen. Could we start by thinking about your original motivation for becoming self-employed while still studying?

Setting up my own company was more of a challenge for me rather than a conscious decision – it was staring me in the face. I was studying for an MBA and working as an assistant to the plant managers at Bosch. While I was doing this, one of my responsibilities was to work on a parents' initiative. The idea of the initiative was to solve an issue regarding the shortage of kindergarten places for employees with kids. It got two of my co-workers and myself thinking about preschool childcare arrangements. We went off on our own and started renting a house in Reutlingen. Thanks to the support of Bosch and countless volunteers, we then renovated the building and the entire plot of land. The yard was redesigned as part of an apprentice project at Bosch. Then in 2008, the "Spatzennest" – as it was called at the time – got up and running.

What was your motivation for taking on such a role for the initiative?

Our main motivation was that we wanted to take on a really magical project and be responsible for it ourselves. When you work for a big company, you only get to work on small parts of a project. We had to seize the opportunity. And for me, stopping was never an option. When you've planned everything from day one, you still want to stay tuned. My companion on the journey, Victoria Pérez-Solórzano, who also works on the project with me, sees it the same way.

What were or still are the biggest challenges associated with your task as an entrepreneur?

The biggest challenges at the beginning were the legal aspects of providing child care. Surprisingly, money wasn't the biggest issue we had to deal with. One year we lost staff, for various reasons, from one day to the next, and another year we had just the right number of teachers, but there was so much construction work going on in the city, mainly for statutory reasons, that we didn't have enough children to look after. At the moment everything's going quite well, but with the situation in the job market and the increasing number of problems families face, we're already being confronted by the next set of challenges. But often it's those moments when you solve a problem that you realize what you're really capable of, and it motivates you day after day!

How have things progressed for your business until now?

Two years after opening our doors we changed the format of our association and became a charitable limited company called Menudos. This allowed us to organize the project like an enterprise and not the way we had done until that point as an initiative. We count as a youth welfare organization, so we're on an equal footing with municipal care institutions. It's essential for our concept to work in close cooperation with the city authorities. Since 2014 we've also been responsible for a second care facility in Betzingen, which is also a part of Reutlingen. We now offer full-day preschool care to children under the age of three and we have ten employees at two facilities. Our aim is to offer a second place for children to call home and make it possible for parents to strike the right balance between their work life and family life. We've now managed to take on a supervisor, so we can take a step back from the front-line operational aspects of the business. Now we tend to stand more in the background and deal with things like staff planning and the finances, or training and legal changes. That's totally all right with us because we've always focused more on the business administration side of things in parallel to our work commitments.

In what ways did studying at SIBE help with setting up the company?

My MBA at SIBE played a central role in the success we've now enjoyed. I'm a legal expert and my business partner is a physicist, so the business theory part of my degree gave us a solid foundation, especially at the beginning of our venture. I drafted the financial plan and balance sheet planning for the first 36 months of the company as part of my MBA-studies. Especially in the early days it was good to be able to refer to the teaching materials.

Image: Nicoline Janssen

Nick Lange
Steinbeis School of International Business and Entrepreneurship GmbH (Herrenberg)
nick.lange@stw.de | www.steinbeis.de/su/1249 | www.steinbeis-sibe.de

Nicoline Janssen
Menudos Kinderbetreuung gGmbH (Reutlingen)
info@menudos.de | www.menudos.de

A Vision of Future Generations

A network revolving around a Steinbeis company organizes a high school and university trip to the Vision trade show in Stuttgart

It's never too early to foster the next generation of specialists – as six members of a technology alliance will tell you. The partnership comprises the Steinbeis quality assurance and image processing experts at SQB (Ilmenau), Vision & Control (Suhl), the Ilmenau-based firm TechnoTeam, the society for image and signal processing GBS (also from Ilmenau), the department of quality assurance and industrial image processing at TU Ilmenau, and the trade fair company Messe Stuttgart. Building on the success of 2016, they all joined forces on what was now the second occasion and organized a trip on November 8 for high school and university students to Vision, the world's leading trade show for image processing in Stuttgart.

The idea was to allow more than 60 young people from Thuringia to experience new products, technologies, and trends at close quarters. The students were divided into small groups and taken on guided tours, not only to provide them with detailed information on the products and processes on display, but also to explain the career options in the field. The intensive discussion between the students and people at the trade show booths highlighted their strong interest in the educational initiative. This was totally in keeping with the sponsors' aim with the trade show visit, which was all about networking. The idea worked – for the high school students, the university students, and the companies looking for employees. The alliance partners also sponsored a small prize this year and asked "Who can find the image sensor with the highest resolution?" The prize for the winner was a Raspberry Pi kit. This was won by students from the Bülow High School in Neudietendorf, who unearthed a Canon sensor with a resolution of 250 megapixels.

The positive feedback started for the organizers the moment the students got on the bus back home. The return journey was also a useful opportunity for students on the trip to get to know some of the firms that came along. "That really did fulfill our expectations as organizers; our hope was to make a useful contribution to attracting the next generation of specialists to Thuringia," concludes Steffen Lübbecke, managing director of SBQ, who felt extremely positive about this event. The time and effort invested by TU Ilmenau in organizing the event deserves particular mention, as does the department of mechanical engineering under the supervision of Prof. Dr. Gunther Notni and Dr. Maik Rosenberger. The area around TU Ilmenau has already been coined Vision Valley. A whole host of small and medium-sized businesses in the area would like to use such events to foster specialists in the field of image processing. In all likelihood it will therefore not be the last such trip to be organized for high school and university students.

Image: © Vision & Control, Suhl

Steffen Lübbecke
Steinbeis Qualitätssicherung und Bildverarbeitung GmbH (Ilmenau)
su1544@stw.de | www.steinbeis.de/su/1544 | https://quick-image.de/

Translating Wear and Tear into Sound Using Acoustic Fingerprints

Steinbeis experts work with the University of Stuttgart to develop a new kind of algorithm for monitoring milling processes

The competitiveness of manufacturing facilities and companies in high-salary countries like Germany depends on the cost-effectiveness and performance of production machines. In Germany, production sites in the field of machining can only remain viable in the long term if they can automate as many procedures as possible. To do this, robust and reliable process-monitoring systems are required in order to quickly assess the current status of processes and if necessary make corrections. In July 2018, a collaborative ZIM project looking into "the development of a system for monitoring and diagnosing milling processes by analyzing acoustic fingerprints online" came to a successful conclusion. For the project, STASA (Steinbeis Angewandte Systemanalyse GmbH) and the University of Stuttgart Institute for Machine Tools (IfW) co-developed self-learning algorithms capable of identifying malfunctions and wear during milling processes. The algorithms help record acoustic signals through special microphones mounted in workshops. The project was funded by the Federal Ministry for Education and Research.

Heightening competition is forcing a large number of businesses to reduce the number of people working on their technical systems, which are frequently now highly automated. Many modern processing stations are now completely behind barriers, making it extremely difficult for humans to monitor individual production processes. As a result, machine operators are often not even in the same location as certain processes. Jumping in with manual overrides when something goes wrong is practically impossible, especially given the high traveling speeds and axial accelerations of many machines. With good maintenance and early fault-finding, many machine faults can be avoided nowadays, but unforeseen situations and malfunctions – often caused by the actual machining process – will always be difficult to anticipate. Such anomalies frequently result in quality issues with finished workpieces, or faulty tools and machine parts.

With milling processes, vibrations can occur when the cutting tip of a tool makes its way into a workpiece. These can be measured by using

relatively expensive sensors which pick up noises inside structures ("structure-borne sound"), or they can be detected through workpiece vibrations when sounds are emitted into the room where the milling machine is being used. This allows malfunctions to be detected by the human ear. Experienced operators who have worked for some time on the same machine often notice changes in the sound caused by processing, so they know if a process is working as intended or a change occurs in the running noise of a spindle or feed axis.

When a new tool causes wear to a cutting insert, this initially happens quite quickly before leveling out, after which point wear remains relatively stable before peaking again toward the end of the usage cycle of a material. The typical progression of wear and how long this takes depend on the material the workpiece is made from. The algorithm developed for this project makes it possible to determine the status of tool wear by simply listening to airborne sound emissions, which can be recorded using a microphone. In practice, recognizing wear using airborne sound analysis can be completely automated. This makes it possible to react quickly to signs of tool wear by changing cutting inserts or adjusting milling speeds.

Airborne noise analysis also makes it possible to detect cutting defects. The analysis is carried out at specified moments in time so that cutting defects can be picked up in real time. A machine can then be halted to protect undamaged cutting edges from exposure to excessive loads. This does not require a learning and calibration phase before production, so the new algorithm is particularly well suited to production volumes as low as a batch size of 1.

The team working on the project also confirmed that detecting internal shrinkage on workpieces – i.e. undesirable material defects – is also possible using microphones and airborne sound analysis. The algorithm compares acoustic signals of workpieces during processing with reference recordings of sounds previously emitted by workpieces without faults. The skill is to almost completely filter out disturbances caused by acoustic influences in the surrounding area – for example noises from a neighboring machine. Otherwise it can be impossible to detect minute shifts in the frequencies detected by microphone recordings, which are typically caused by material shrinkage. To do this, different filtering and analysis processes are combined, such as software-based lock-in techniques and other noise-cancellation algorithms.

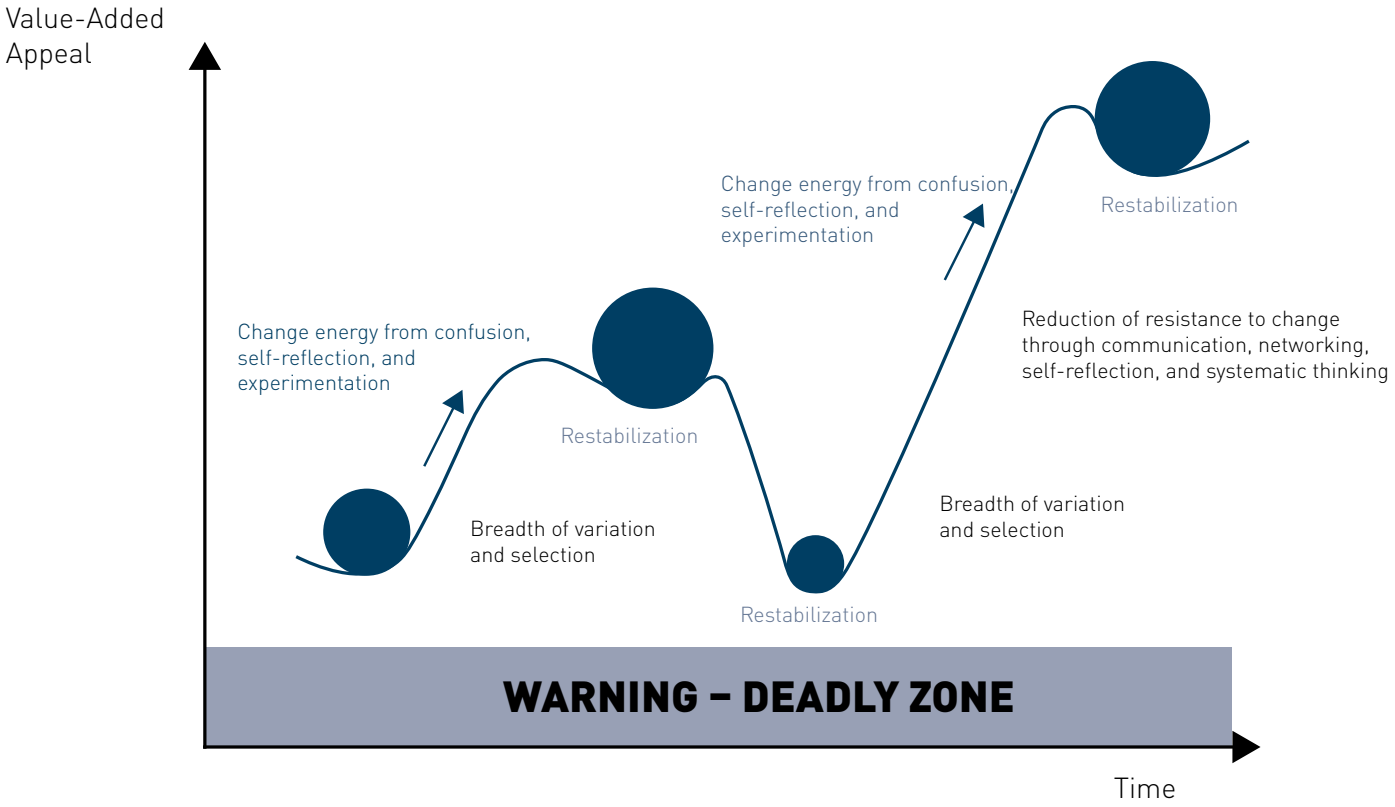
To spot the differences between shrinkage and an intended change to a workpiece, such as a drill hole, reference sounds are required, ideally from the acoustic signals emitted by a perfect processing routine on a milling machine. This allows the algorithm to learn the characteristic features of a perfect process – the timings and frequency ranges of airborne sounds – and these provide a reference point for detecting imperfect processes. Users can set threshold levels for the point at which a workpiece counts as a reject. Compared to simply sorting workpieces manually – shrinkage or no shrinkage – live testing showed that this approach is much better suited to practical application, since shrinkage comes in different shapes, sizes, and extremes. Also, depending on the application, there are times when shrinkage may be acceptable.

The project team at STASA and the University of Stuttgart have introduced the algorithm developed for the ZIM project to hardware and software prototypes for testing in actual machining processes. The experts are currently looking for hardware partners to translate the developed process monitoring solution into a product that's ready to go into serial production and enter industrial application.

As producing small batches becomes increasingly important and more and more processes go down to single-batch production, it is becoming crucial when using process monitoring systems to avoid long set-up and learning phases. Process monitoring needs to get underway quickly, and the prototype that has now been developed offers a decisive advantage over conventional systems. The new algorithms can start monitoring tools without running a single reference cycle. To monitor workpieces, only one reference cycle is needed. Setting up microphones is a relatively inexpensive and versatile alternative to conventional structure-borne sound detectors, which are also unsuitable for quality monitoring purposes. To filter out sounds coming from the surrounding area, software algorithms can be used, many of which would have been unimaginable even only a few years ago due to limited computational capabilities.

Image left: An example of a five-edge milling tool used in the experiments conducted for the project at the Institute for Machine Tools (IfW) at Stuttgart University.
Image right: The experimental setup at the IfW at Stuttgart University for recording airborne sound in milling processes. The microphones are positioned around the workpiece (shown here for testing purposes: four microphones with round, light yellow covers).

Dr. Philipp Liedl
STASA Steinbeis Angewandte Systemanalyse GmbH (Stuttgart)
philipp.liedl@stw.de | www.steinbeis.de/su/1390 | www.stasa.de



The Self-Renewing Enterprise: The Potential Success Offered by Corporate Succession

Steinbeis creativity workshop develops criteria for successful self-renewal processes

Two Steinbeis consultants, Martin Ritter and Günther Luber, have dedicated their expertise to the field of salvaging companies. At a creativity workshop held at the last Steinbeis Day they showed how important it is for a company to be able to reinvent itself. Working with a group of highly motivated workshop participants, the consulting duo pinpointed the principles, tools, and infrastructure a company requires to enable an "ongoing and directed process of self-renewal."

The workshop participants saw a number of parallels to human stem cells, which possess an amazing ability to renew and repair themselves. The group realized that self-renewal is not just a one-off change process with the potential to enhance value creation and the appeal of a company. A process of self-renewal can become a key success factor and, if it can be systematically instilled within a company as an iterative process, it can even develop into a competitive advantage. During the workshop, the group worked up seven central aspects (see box) which all revolve around the same question: What can we do to establish an environment that allows the operational side of the organization to continuously renew itself as required? For self-renewal to become "ongoing and directed," these aspects have to become systematically embedded within an organization as an iterative process. Of course, even by setting goals you already embark on the journey!

As more and more firms will face handover issues in the future, the team looked at the impact an ongoing and directed process of self-renewal can have on succession planning. Their answer: It will significantly raise the value of the business if – over and above the seven central aspects – the iterative process of self-renewal also looks at further factors.

Aspects that need to be covered include ways to consider the potential of a possible successor to "create confusion" within a firm, any investment plans, personnel decisions, as well as organizational changes. Describing his experience, Günther Luber said: "I took on three separate companies in succession in the past and handed them on to others. I made sure that any operational decisions I took considered the impact they would have on an imaginary successor. My business decisions were 'ego-neutral' and resulted in a more appealing company for my successor."

Another essential factor is that employees are informed early about succession planning and that some kind of change communication is established. Managers should be involved in the succession process, but previous employees should also think about the different persona-

Seven key success factors for the self-renewing enterprise

1. Maintenance of a state of "restlessness" and "potential to create confusion"
   Possible tools:
   - The Steinbeis ECC – the Enterprise Competence Check for detecting confusion
   - Communities of practice in the form of "dissident teams" and reverse mentoring

2. Business environment tracking and intensification of communication and networking
   Possible tools:
   - Digital customer and employee survey and market observation
   - Change communication with clear information, convincing arguments, and communication techniques that motivate
   - Internal social network and world café

3. Maintain diversity of personalities, skills, motives, and behavior
   Possible tools:
   - Management profiles
   - Training of a change team using character structure analysis

4. Room and time for self-reflection: continual self-monitoring
   Possible tools:
   - A theater stage within
   - A personal identity system

5. Allow enough leeway for experimentation and establish an error culture
   Possible tools:
   - Techniques of design thinking and value proposition design

6. Develop systemic thinking, decision-making, and action, as well as learning through experimentation
   Possible tools:
   - Macro perspective
   - Empowering leadership

7. Encourage people to think and act in keeping with the strengths, potential, and opportunities of a company
   Possible tools:
   - Profiles detailing strengths and potential
   - Planning workshop

lities of the successor and the predecessor in terms of values, attitudes, inner sentiments, attitude toward risk, how they deal with emotions, ability to cope with frustrations, communication skills, and leadership style. Successors should also be shown tolerance and be given enough leeway to "try things out for themselves."

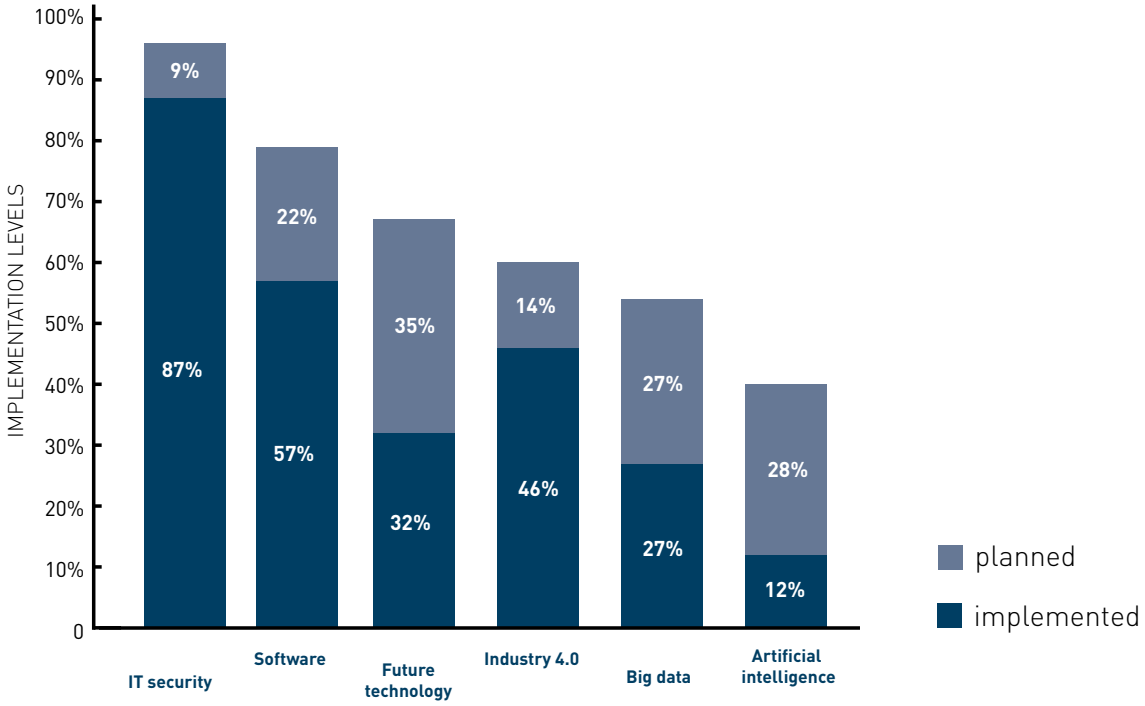
"For the succession process to pass off without friction, it's especially important for the successor and their predecessor to explain their own intentions and emotions as part of an ongoing process of self-reflection. They should also keep looking at things from a macro perspective, so that the handover is safe and not tinged by conflict," continues Martin Ritter, outlining the key prerequisite for a successful handover. Succession is thus also a chance to approach the process of self-renewal with an openness to new experiences; it has every potential to uncover new opportunities for the business and find different ways to make things happen. For successors, this entails installing a learning process that enhances their abilities and the skills of the company, underscores coherence between words and actions, engenders courage, promotes an ability to actively listen, requires people to be open-minded and unite, reflects credibility, and – assuming employees want this – allows successors to act as a role model.

The results of the creativity workshop speak for themselves. Nonetheless, both Steinbeis experts have more to offer in their repertoire. With their expertise in "ongoing and directed business self-renewal," plus diverse experience thanks to a number of successfully completed takeovers and business succession processes, Martin Ritter and Günther Luber from the Steinbeis Consulting Center for Safeguarding Companies offer a variety of key skills that help companies move forward in the business succession process. As well as actively accompanying and supporting management successors and their predecessors, as highly motivated experts in sustainable and conflict-free business succession they offer a treasure trove of business skills.

Image: The self-renewing enterprise: ongoing and directed self-renewal

Martin Ritter, Günther Luber
Steinbeis Consulting Center Safeguarding Companies (Esslingen)
su1950@stw.de | www.steinbeis.de/su/1950 | www.langfristige-unternehmenssicherung.de

IMPLEMENTATION LEVELS, DIGITALIZATION TOPICS



Well Done – With Room for Improvement

Experts conduct research into digitalization levels of companies in the Black Forest district of Baar-Heuberg (SBH)

Are businesses in the Black Forest district of Baar-Heuberg (SBH) prepared for future challenges, and in which areas do they still need to take action? These were the topics examined in a study carried out by the Steinbeis Transfer Center for Applied Methods of Project Management, the SBH Innovation Network, and the Baden-Wuerttemberg Cooperative State University, Villingen-Schwenningen campus. They were supported by several interest groups: Südwestmetall, the metalworkers' union IG Metall, and economic development agencies of the SBH and Villingen-Schwenningen. Their finding: Companies in the area are doing well when it comes to digital transformation. Despite this, SMEs with fewer than 50 employees are particularly at risk of being left behind in important areas for the future.

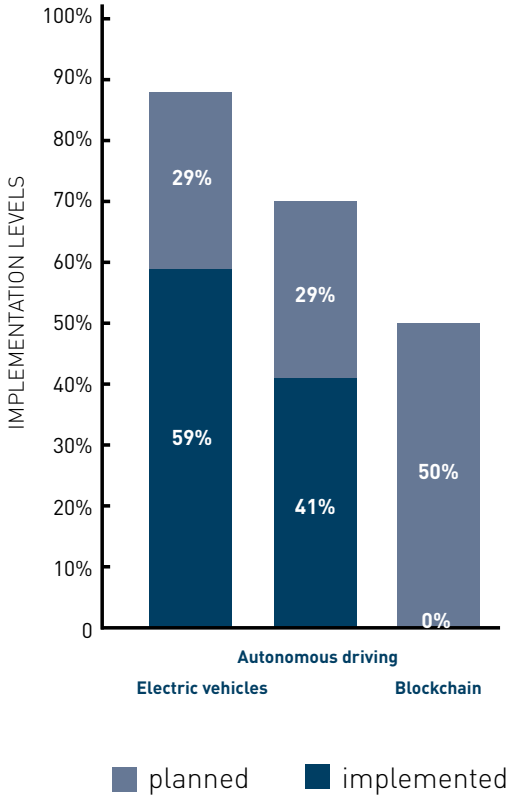
The project alliance looked at the topics of IT security, software, Industry 4.0 (connected manufacturing), big data, artificial intelligence, and emerging technologies. They also examined concerns regarding new technologies and employer attractiveness. To carry out the study, the experts analyzed 143 questionnaires using structural equation modeling. This method makes it possible to ensure that technologies can be broken down into individual disciplines of technology and that they can be correctly weighted.

The top-line result first: The study showed that implementation levels are high when it comes to IT security, enterprise software, and the implementation or planned implementation of classic Industry 4.0 and big data topics. This is across the board, independent of company size or sector of industry. With artificial intelligence and initiatives relating to future technology (such as autonomous driving), implementation levels are low, however.

Looking at the topic of software across different areas shows that overall, implementation levels are very high. When asked whether they have developed or are developing a software concept and a digital technology strategy, most companies replied positively. It can therefore safely be assumed that any existing gaps will soon be plugged. Where software has not been introduced yet, this is probably because not all companies need all types of solutions. If there are any topics that have still not been addressed, these can be considered less complex and if needed, firms can bring support in from outside.

One area that scored somewhat lower than software is the degree to which classic Industry 4.0 topics have been addressed. As with software, it can be assumed that not every company has to have every kind of technology. One possible issue could lie in implementation levels in combination with company size: As companies get bigger, implementation levels rise. This may become a problem for smaller firms, especially if medium-sized companies penetrate their "home territory." Another problem is that 21% of all companies reported difficulties due to a lack of business concepts, and for 12% of firms this has even become a "show-stopper" – independent of sector of industry. This clearly points to a need to take action. More support services are needed for smaller companies to find out about different technologies and their implementation options for Industry 4.0.

EMERGING TECHNOLOGIES



The study also looked at big data, asking specifically about data mining and how data is used to control processes. The topics looked at in the area of artificial intelligence included condition monitoring (automatically checking machine parameters), forecasting models, the use of artificial intelligence to estimate future orders, intelligent pattern recognition software in production, operations research into production improvements, and forecasting models/artificial intelligence for anticipating machine downtimes. The results show that implementation levels are not as high as they are in classic Industry 4.0 areas, probably because these are more recent topics. One can assume, however, that implementation levels will improve in these areas in the midterm. This will require support, however, as many of these topics are highly complex. In addition, more university graduates will be needed in these areas to cater to the long-term demand for skilled workers.

The researchers also looked at how many companies have already worked on e-vehicle projects, autonomous driving, and blockchain technology. A large number of projects have already been carried out in the areas of electric vehicles and autonomous driving, and more are due to follow in the years to come. However, this depends strongly on the sector of industry, which otherwise had little impact on answers. High levels of implementation can be found in mechanical engineering and the automotive industry, whereas these topics are of little interest in medical technology.

The picture is completely different when it comes to blockchain technology. The companies surveyed for this study have not started any projects in this area, but at 50%, the number of firms planning projects is extremely high, and this does not depend on the sector of industry.

One aspect that can be considered positive is that companies have understood how important this issue is. Despite this, a great deal of explanation and research will be needed to identify which companies this technology will be relevant to in the first place. This is a complex area of technology, and it calls for the right skills. So it will be important to foster these skills in the region. This know-how needs to be made available for free so that smaller firms with limited financial means do not miss the boat.

The study also looked at concerns regarding digital technology (such as cyberattacks, the theft of company know-how, investment risks, or losses resulting from system failures). Companies are not too concerned by these issues. They prefer to tread cautiously in some areas, but they would not let this subsequently prevent them from introducing new technologies.

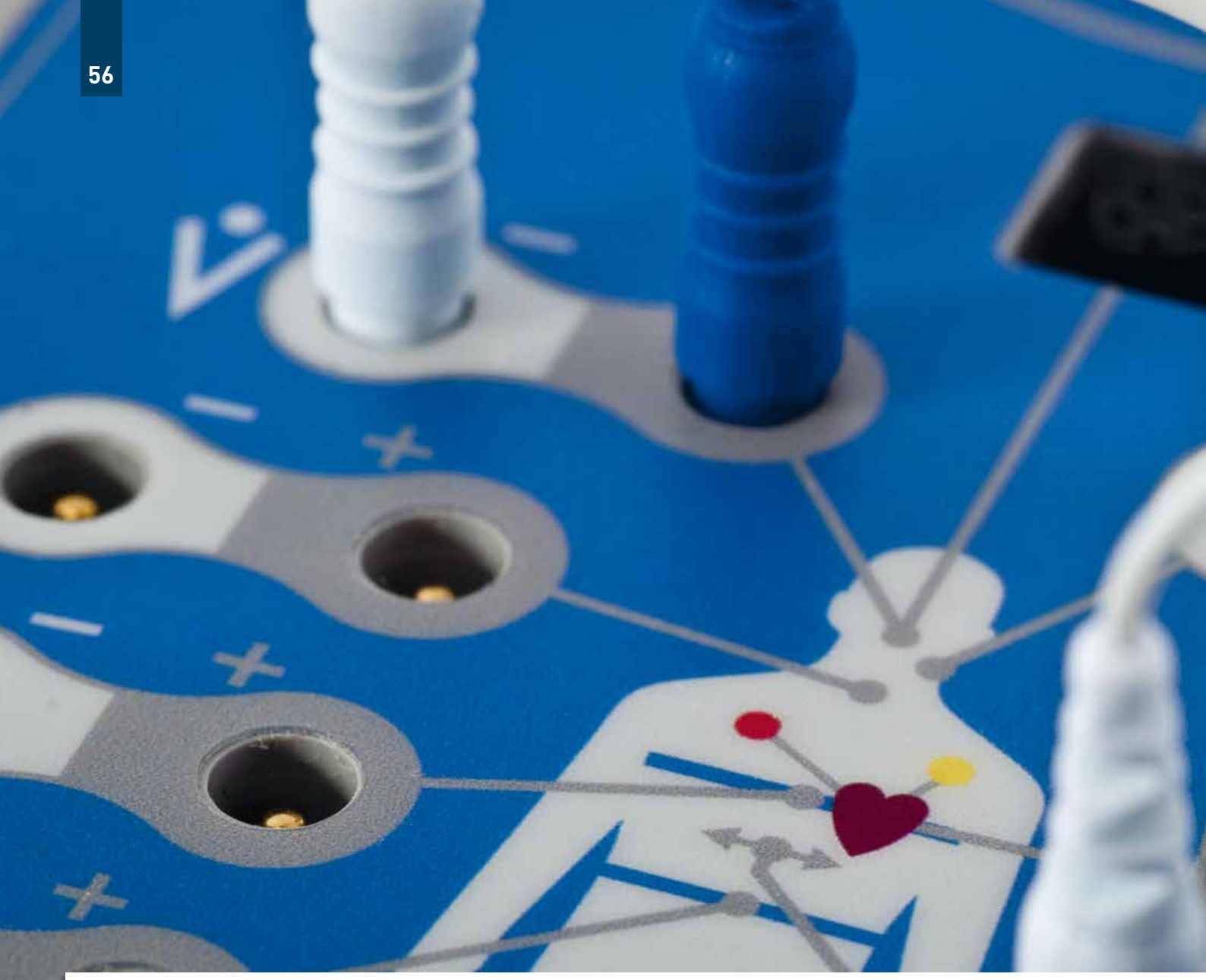
One other thing the study made clear was that being based in a rural area or running a business in an urban area has no influence on the extent to which digital solutions have been introduced. Finally, the study also successfully highlighted a link between high levels of digitalization at a company and high levels of employer appeal, independent of the sector of industry or size of business. Firms that have achieved high levels of digital implementation are also winning the war when it comes to attracting brains.

The team that worked on the project feels positive about the future. The study confirms that companies in the Black Forest district of Baar-Heuberg are doing well when it comes to digital transformation. They are making continual optimizations and updating systems, and any gaps that do exist are being filled in the medium term. There are, nonetheless, some specific areas where action is required. Smaller companies run the risk of falling behind with digitalization, and the topics that need tackling relate to complex fields of technology, such as artificial intelligence. To address this deficit, the SBH Innovation Network and the Steinbeis Transfer Center for Applied Methods of Project Management are planning to set up a business know-how cluster. Not only should companies be shown different ways to introduce emerging technology, they could also be offered practical support. A suitable foundation of knowledge also needs to be established by research and development initiatives in this area. Both project partners are planning to enter into cooperations with economic development bodies in order to drive more business startups in specific areas in the region. Companies and universities are also being advised to train more graduates with a background or know-how in corresponding areas.

Image left: Overview of implementation levels with respect to digitalization. Only pertinent sectors of industry were looked at for each topic – IT security and software were looked at for all sectors; emerging technology, Industry 4.0, big data, and artificial intelligence were only looked at for mechanical engineering, the automotive industry, and medical technology.

Image right: Implementation levels of projects revolving around electric vehicles, autonomous driving, and blockchain technology. The first two topics are only shown for mechanical engineering and the automotive sector – such fields are not pertinent to areas such as medical technology. None of the companies questioned until now have implemented a blockchain project. At 50%, the number of firms planning to introduce the technology is extremely high, however.

Prof. Dr. Bernd Kaltenhäuser
Steinbeis Transfer Center Applied methods of project management
(Villingen-Schwenningen)
su1816@stw.de | www.steinbeis.de/su/1816 | www.steinbeis-projektmanagement.de



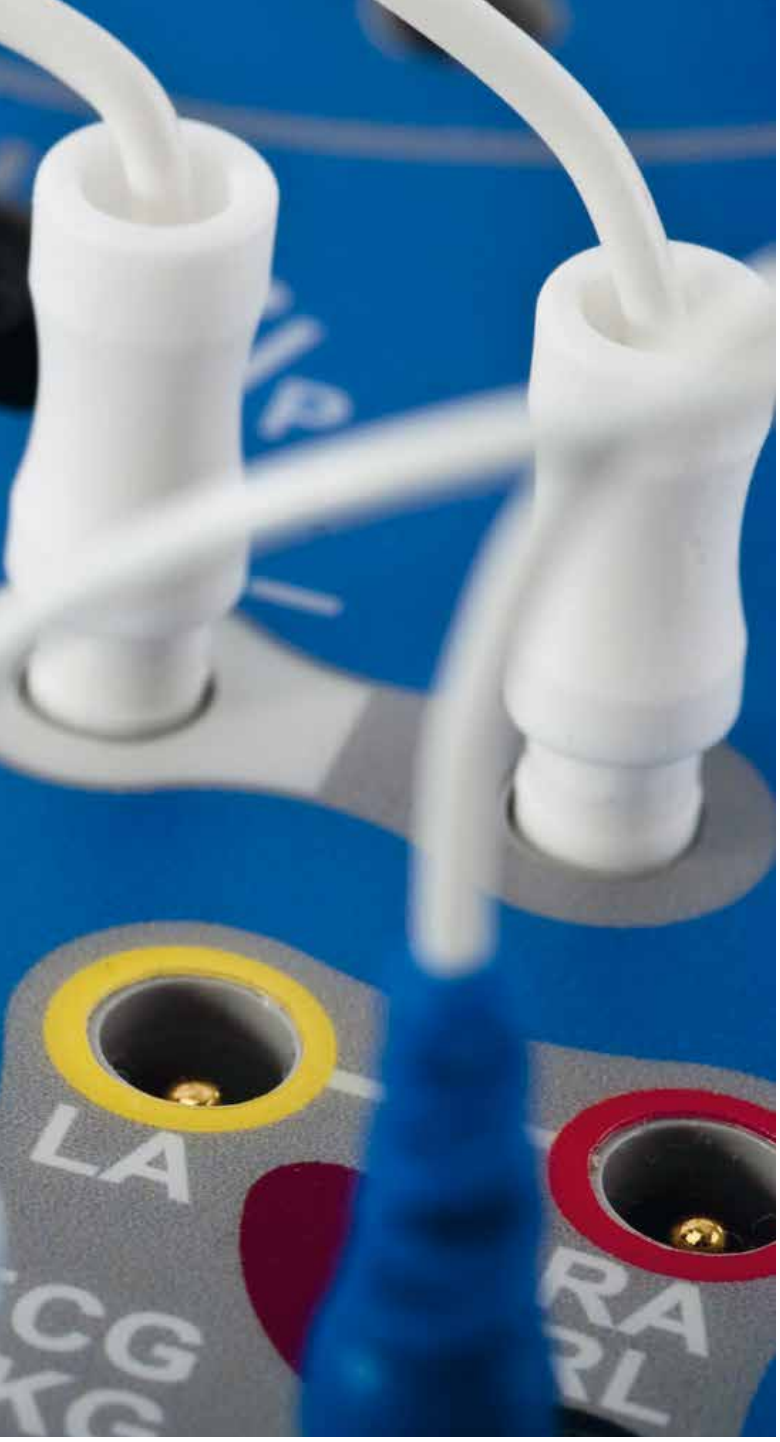
Medical Technology in an Era of Digital Solutions

Network initiates forum for creating successful SME business models through participative technology development

In a democracy, technical know-how, action, and decision-making should not be reserved for a handful of experts. They should be accessible to a broad section of the population. It is only logical that doing this will require a new education concept, one that sees technology training as a central educational asset of explanation, discussion, and involvement. The German term for this concept is SocioMINT – an approach that two Steinbeis Enterprises and three establishments of higher education feel Germany society is clearly still far from achieving. As a result, they have joined forces and initiated a business forum called Sociotechnology and SocioMINT. The forum is dedicated to examining the conditions for developing future-oriented, innovative technologies, and whether such solutions can be developed in such a way that they satisfy societal requirements and take the interests and needs of users into account. The new forum is mainly targeted at medium-sized businesses.

Expectations regarding how to plan for the future shape social models and have an impact on the support that society gives to research and business. Which of the often extremely different models is adopted largely depends on the social groups involved in their development and how much influence they have in asserting their interests. "Social groups thus exert a massive influence on the significance and urgency of technical innovations. This has knock-on implications for the nature and scope of research and development in industry and science. Decision-making often ignores social aspects relating to innovative and socially sustainable technology development," explains Dr. Maja Jeretin-Kopf, director of the Steinbeis Transfer Center BAT-Solutions. The commercial consequences of this are products that are not used as intended, or used differently, and the political consequences are inefficient research programs, whereas the implications for individuals can be a lack of acceptance and ignorance.

Although the state provides funding for research and development initiatives, the number of innovators in Germany and other countries is in decline. But why are German companies so lacking in terms of the innovative ideas they can be expected to come up with – despite state



Steinbeis Transfer Center called Institute for Transfer Technologies and Integrated Systems).

But maybe medical technology can show how to move things in a different direction. This field ranges from biomedicine to genetic engineering and classic medical technology, and it often comes in new digital guises, making it a key area of technological innovation. In social terms, few would dispute the need to regain physical autonomy and individual mobility through solutions such as exoskeletons, smart health systems, or autonomous driving in wheelchairs and cars. Such systems are well accepted, they are of "human import," and they appear to be highly probable options for conveying the meaning or significance of such technological innovations among the general public. What is important, however, is that user groups are involved in their development. This will allow them to act as pioneers of technologies of social importance, in the same way users strongly influenced the development of smartphones and IT applications. Digital solutions make it possible to engage in participative product development in this area, even as early as the primary development stage.

The Sociotechnology and SocioMINT business forum provides a platform for key players in all social groups, and its aim is to facilitate dialog between decision-makers at small and medium-sized enterprises. The opening event of the forum will revolve around the topic of "biomedicine in an era of digital solutions," offering a unique chance to discuss different ways to organize participative technology development. All Steinbeis Centers and Steinbeis Enterprises are expressly invited to the event if they would like to take part in the conference.

Image: © fotolia.de/Aenne Bauck

funding? The winners when it comes to state funding tend to be bigger companies, who usually have high numbers of patent registrations to point to. As market shakeout results in fewer and fewer players, innovation drives are increasingly limited to fewer companies, even if they are big and economically powerful (EFI – Expert Commission for Research and Innovation [2018]: expert report on research, innovation, and the technological performance of Germany in 2018).

A variety of European funding programs provide member states with financing options. These are supposed to be applied to tackling major social challenges that cannot be solved on a national level. Fund allocation is based on criteria such as the field of technology that research will be conducted in. "Politics gives pointers for the direction that technology should go in, based on the assumption that the target technology holds promise when it comes to future needs. According to the numbers, this isn't necessarily logical. Despite the high volume of investments in research and development, so many technologies fail when it comes to market introduction or acceptance," concludes Prof. Dr.-Ing. Rüdiger Haas, director of SITIS (the

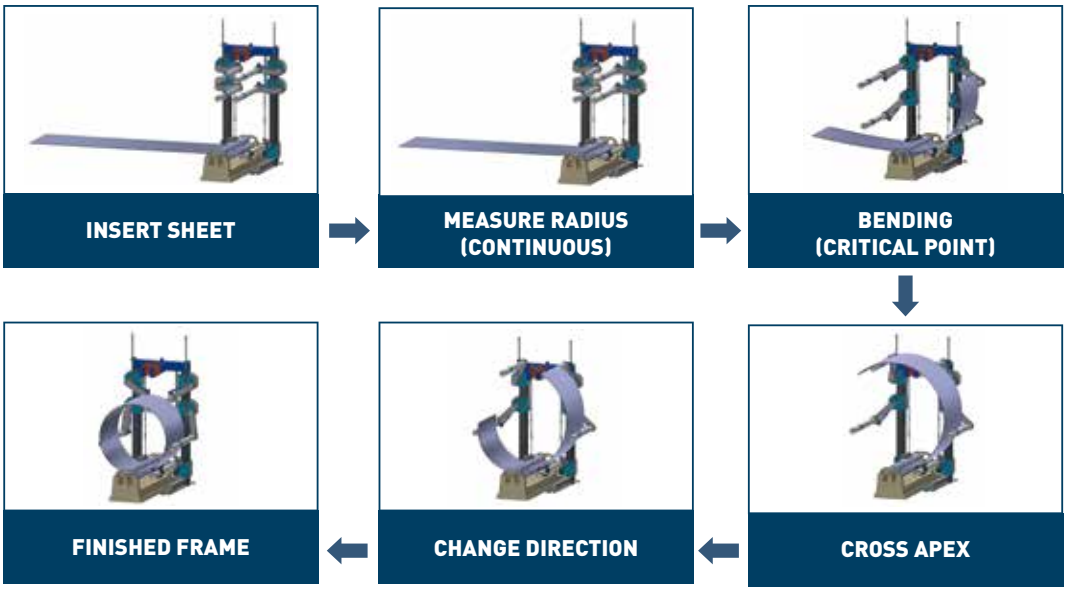
Information and registration for the Entrepreneur Forum: https://bat-kompetenztage.de

PD Dr. habil. Maja Jeretin-Kopf
Steinbeis Transfer Center BAT-Solutions (Karlsruhe)
maja.jeretin-kopf@stw.de | www.steinbeis.de/su/2083 | www.bat-solutions.de

Prof. Dr.-Ing. Rüdiger Haas
Steinbeis Transfer Center Institute for Transfer Technologies and Integrated Systems (SITIS, Karlsruhe)
ruediger.haas@hs-karlsruhe.de | www.steinbeis.de/su/1289 | www.sitis-karlsruhe.de

Hon.-Prof. Dr. Uwe Pfenning
University of Stuttgart, Social Sciences (Stuttgart)
uwe.pfenning@sowi.uni-stuttgart.de

Prof. Dr. Christian Wiesmüller
Technical Training, University of Education (Karlsruhe)
christian.wiesmueller@ph-karlsruhe.de



Innovation That Bonds

Steinbeis experts work with a plant manufacturer on the development of individually produced tanks

Container and equipment requirements necessitate increasingly precise and adaptable production options, especially in the fields of food and beverages, pharmaceuticals, and chemicals. A particular problem faced by small and medium-sized companies is that the automation options for very small batch sizes, even to a batch size of one, are still very much in their infancy. This contrasts to welding robots used in serial production, without which fields such as the automotive industry would be unthinkable these days. This is where a welding handling system developed by Empl comes in. The machine maker has developed a device that is suited to an array of sheet thicknesses, container diameters, and frame lengths. The Mannheim-based Steinbeis Research Center for Applied Measuring Technology worked with the container and industrial equipment producer as part of "SME Innovative," a funding program backed by the federal government. Aside from providing the Schwindegg (Bavaria) firm with expertise during the application process, the center gave hands-on support and coordinated the experts at Empl during the project.

The welding-handling system works with metal thicknesses of 1 - 25 mm, frame diameters of 750 - 4,000 mm and frame lengths of up to 2,000 mm. It can carry out a number of tasks. For a start, the system helps bend sheets into a frame. With classic production methods, bending radii have to be defined using templates, unlike the new system which determines the bending radius using automatic measurements. It also has roll arms to support metal sheets and improve safety.
Using a workshop crane, finished frames can then be secured to a handling system for transporting to automatic welding equipment, where it can be fixed for welding. Until now, it required a great deal of effort from operators to undertake the dangerous process of transporting thin metal frames from the bending machine onto the automatic welding equipment. It was also difficult to place materials in exactly the right position.

The next step of the process involves using the handling system to add circumferential welding points to several frames or welding frames and bases. This involves exactly synchronizing the movement sequences between the handling system and the automatic welding equipment. The automatic welding device uses plasma taphole welding, and seams are tracked automatically using an integrated camera system. The project partners are learning as the project progresses until they succeed in developing a product that is ready to be commercialized. The next big step will be to launch bending radius measurement in the market, either by working with bending machine producers or by offering it as an add-on. The research and development project (UNISA) was financed by the Federal Ministry of Education and Research under a funding program called SME Innovative: Production Research (official ref. 02P15K650). The initiative is being overseen by the PTKA project sponsor (Karlsruhe).

EMPL-ANLAGEN GmbH & Co. KG
Behälter- und Apparatebau • Edelstahlverarbeitung
Fachbetrieb nach WHG

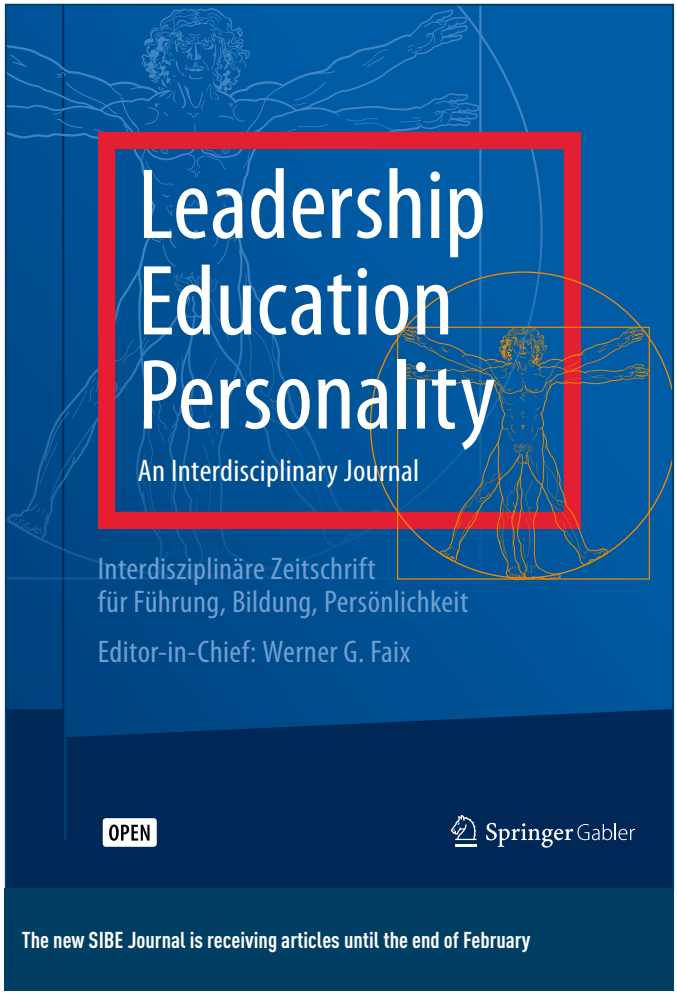
FOUNDED BY

Bundesministerium für Bildung und Forschung

Image: The welding handling system

Rüdiger Jung, Christian Prager
Steinbeis Research Center Applied Measuring Technology (Mannheim)
su1536@stw.de | www.steinbeis.de/su/1536

Tobias Empl
Empl Anlagen GmbH & Co. KG (Schwindegg)
info@empl-anlagen.de | www.empl-anlagen.de



Leadership, Education, Personality: An Interdisciplinary Journal

Call for papers from the School of International Business and Entrepreneurship (SIBE)

The world is undergoing sweeping change – transcending society, the state, politics, the media, culture, and business. It's times like this that leaders are needed who know how to lead themselves, organizations, and entire sections of society through this change. The sign of a good leader is that he or she possesses certain leadership qualities and skills, that they are committed in their entire being to the challenges posed by change. What can a community do to ensure that some of the people in that community are capable of leading and want to lead? An important answer to this question lies in education. The School of International Business and Entrepreneurship (SIBE) at Steinbeis University is launching a regular scientific publication called the Open Access Journal. Produced by Springer, the specialist publisher from Wiesbaden, the journal aims to publish research findings on these topics. The editors are currently calling for articles for the first issue of the journal.

The journal will revolve around the fascinating topics (and sometimes conflicting interests) of "leadership, education, and personality" and it sees itself as a transdisciplinary, transfer-oriented platform for discussion in this area.

The journal is expressly looking for articles from all fields of science, since the real world of business functions beyond the boundaries of individual disciplines. The central terms of leadership, education, and personality are in themselves interdisciplinary – ubiquitous issues that can be defined neither by a specific term nor by a particular theory:

- Leadership, education, and personality have no specific social or historical context. Leadership can be regarded as an interdisciplinary topic of research; it can be witnessed happening at any time and in any organization or community.
- Leadership, education and personality have no direct link to a particular interest, aim, or method of acquiring knowledge. As a result, education is a topic that occupies teachers, scientists, philosophers, etc.
- There is no defined way to interpret leadership, education, and personality, nor how these areas should be looked at as a topic of research. Personality is an interdisciplinary object of research; it may have a certain aura about it, but it can be interpreted in a number of ways.

The journal is open to articles in German or English from all areas of societal interest. This is because new insights should not just be transferred from science into business practice, but also the other way around. It is therefore hoped that published scientific articles will be written by the representatives of business, politics, the religious community, and society in general. The editors would also welcome different types of methodological approaches, i.e. analytical models, interview-based studies, hypothetical case studies, and descriptive or empirical analyses.

Information on submitting articles

- All articles will be subject to double-blind expert review
- Authors are kindly asked to note the guidelines on the website (see contact box)
- Articles may be submitted in German or English by using the Editorial Manager on the website
- Submission deadline: April 16, 2019
- Questions may be submitted via email to research@sibe-scientific.de

For more information, go to the journal website:
www.springer.com/42681

Liane Windisch
SIBE Scientific Projects GmbH (Herrenberg)
liane.windisch@stw.de | www.steinbeis.de/su/2097

Photonic FabLabs – The Next Digital Technology Revolution

Steinbeis acts as partner in an EU project called PHABLABS 4.0

Light is one of those diverse areas of technology that excite people, probably because there are very few areas that photonics cannot be applied to. From energy transmission to energy control, modern travel solutions, food safety, bio-photonics, healthcare, IT solutions, Industry 4.0 (connected manufacturing) and aerospace – photonics can be found in all kinds of areas. The partners of the PHABLABS 4.0 project, which include S2i and FabLab Karlsruhe, would like to raise the public profile of photonics and make it a central long-term feature of FabLabs (short for "fabrication laboratories"). FabLabs enable invention by providing access to tools for digital fabrication to everyone.

Within the Phablabs 4.0 project 33 photonics workshops were organized last year, involving 13 European photonics partners working in collaboration with FabLabs and organizations involved in math, IT, science, and tech disciplines (German "MINT" topics). They also organized 11 photonics Challenger projects and photonics toolkits for different target groups – from schoolchildren to students and young professionals. A website provides free instructions for the 33 workshops and is also available for use by other FabLabs, schools, scientific centers, or even private individuals.

Each workshop lasts between 3 and 5 hours, providing participants with an opportunity to learn the fundamental principles of photonics, including topics like polarization, photonics meets the arts, spectrometry and interference. During the challenger projects, people can even develop their own prototypes. Last summer FabLab Karlsruhe organised workshops and projects for young and old to learn how to make their own solar oven or a Heliostat which can be used as a solar charging device.

Further workshops will look at mini-microscopes, a special infrared remote control device for all kinds of electronic equipment, and a photonic piano which can be played with light. A schedule of workshops will be published on the FabLab Karlsruhe website.

Melanie Ungemach
Steinbeis 2i GmbH (Stuttgart)
melanie.ungemach@stw.de | www.steinbeis.de/su/2017 | www.steinbeis-europa.de | www.phablabs.eu/

Video: www.youtube.com/watch?v=ABRHMPEiBIs

Live networking at the 2017 Meeting Place for Business event

Feature topic: Networking at Business School Alb-Schwarzwald

Guests welcomed to the Meeting Place for Business event on April 13, 2019 in Rottweil

Lots of people want to be innovative, but in all honesty: Is anyone actually innovative? Probably not the sort of company that sits quietly in the corner, filing away at its own ideas. And surely not an educational establishment that churns students through seminars and degree programs without giving them the chance to network with each other. So what could be more logical than to bring everyone together and invite them to a small but important trade show – to encourage them to engage in informal conversation and exchange ideas? The business school in Alb-Schwarzwald is going to stage its Meeting Place for Business event for the fifth time this year. It will provide an opportunity to anyone interested in networking to meet new people and see what's going on behind the factory gates in the region.

This year, Meeting Place for Business starts at 10 a.m. on Saturday, April 13 in Rottweil town hall. The exhibitors will include students, alumni, and partners of the business school, which forms part of Steinbeis University. Anyone with an interest in regional networking is welcome to attend.

Aside from networking at the information booths, for the first time this year's event will include spotlight topics as a way of inviting visitors to talk in more detail about a specific topic. This will allow visitors to share their knowledge with experts working at or with the business school and the Steinbeis Network, and look at a variety of subjects such as IT security, social media marketing, lean management, or business relations in Arabian countries/Turkey/Asia. The event will also offer an opportunity to discuss management in an era of digital transformation and emerging technology.

What will visitors get out of Meeting Place for Business? Previous experience shows that there are a variety of benefits, from new ideas regarding special technology to first contacts with potential new employers, plus new openings with potential clients and suppliers.

There is not yet a fixed program for the "agile" event. The schedule will be finalized at the last moment. To find out more about the current schedule and registration, go to www.treffpunktwirtschaft.com. The event is free.

Ute Villing
Steinbeis Transfer Institute Business School Alb-Schwarzwald (Berlin/Gosheim)
ute.villing@stw.de | www.steinbeis.de/su/774 | www.bs-as.de

Prof. Dr.-Ing. Frank Mücklich at the official ceremony to become a Fellow of ASM © ASM

Honors and Awards to the Power of Three

Prof. Dr.-Ing. Frank Mücklich honored by several institutions of materials science

All good things come in threes. The Saarbrücken-based materials researcher and Steinbeis director Prof. Dr.-Ing. Frank Mücklich has been honored by three German and international institutions for his outstanding expertise in the field of materials science.

The world's biggest society of experts in materials science, ASM International, has named Mücklich an ASM Fellow. Announcing the honor, ASM pointed to Mücklich's outstanding theoretical knowledge and his technological contributions to the field of 3D microstructure research. Only a small number of foreign scientists have ever been honored with the American award. Mücklich is a professor of functional materials at Saarland University and the director of the Material Engineering Center Saarland (MECS, a Steinbeis Research Center). He is the only German to be honored as a new fellow this year. The American society of experts is appointing Mücklich as an ASM Fellow in acknowledgement of his scientific achievements as a material researcher over the past decades.

Mücklich was also appointed as one of the two presidents of the German Materials Society (DGM) at the society's annual conference. Working alongside Dr. Oliver Schauerte (Volkswagen AG), he will be the joint chair of the traditional German society.

And last but not least, the German Academy of Science and Engineering (Acatech) has appointed Mücklich as a member. His task will be to provide advice on recommendations made to the Federal Government regarding materials topics.

Mücklich's work at the University of Saarland focuses first and foremost on the inner structures of materials. "Our 3D analysis techniques allow us to capture quantitative changes in the microstructures of materials. Development engineers working in industry have known little until now about the mechanisms within the inner structures of high-performance materials, or how these affect desired properties," explains Mücklich. "So we can work out which tweaks to make to change the functional properties of a material – targeted and quantified – even on a micro, nano, and atomic scale."

Prof. Dr.-Ing. Frank Mücklich
Steinbeis Research Center Material Engineering Center Saarland (MECS) (Saarbrücken)
frank.muecklich@stw.de | www.steinbeis.de/su/1294 | www.mec-s.de

Experts.Knowledge.Sharing.

New releases from Steinbeis-Edition

Sharing our know-how with you.
Steinbeis-Edition, the publishing arm of the Steinbeis Foundation, regularly publishes works reflecting the scope of the Steinbeis Network's expertise. Spanning a broad spectrum of topics, these publications include individual papers, series, magazines, conference proceedings, and works linked to specialist events. All titles are easy to order via our online shop at: www.steinbeis-edition.de.

Of Guilt and Responsibility

Gernot Barth, Bernhard Böhm (eds.)

2018 | stapled, color | 84 pages, German
Mediation | Quarter IV/2018
ISSN 2366-2336

Art Creates Bonds

Alexandra Maria Schumacher, Monika Hägele

2018 | paperback, color | 94 pages, German
ISBN 978-3-95663-173-3

About the Steinbeis Enterprise

The Steinbeis Consulting Center for Mediation of Business was founded in 2004 and specializes in dealing with conflicts and mediation (primarily within companies), collaborative projects involving more than one company, and public bodies/government administration.
The Leipzig-based Steinbeis Enterprise has been publishing Mediation as a specialist magazine (formerly Mediation of Business) since 2012. There are four editions of the magazine every year with a focus on out-of-court conflict settlement, particularly through mediation. The publication focuses on conflict resolution, decision-making, and communication, offering a broad and practical entry point to the options offered by dealing with conflicts out of court. A separate publication on Mediation and Conflict Management has been published since 2015. This publication is also based on that magazine format and offers a variety of practical articles showing the options for dealing with conflicts.

About the artists

The 2018 art catalog was the result of a partnership with Design. Materials. Standardisation., the Steinbeis Consulting Center. Hägele associates painting with personal experiences and memories. Her initial focus was on pictures that add structure, but later her interest underwent a transition to focus more on soft shapes and luminous worlds of color. Her wish for the future concerning creative expression and experimentation is periods of time without judgment or the pressure to achieve something – in order to explore new kinds of self-perception and joy in creating pictures.
Schumacher rediscovered art in 2009 and has not looked back since. Between 2009 and 2011 she was a member of a painting party under the leadership of Christel Fuchs, also supporting communal projects with pictures for fundraising events. From 2012 to 2014 she was a member of the Workshop No. 17 art group in Schopfloch. Her focus is on concentrating on The Within with the consequence that "everything can be affected in The Without – highs and lows, brightness and darkness." She has also discovered how to support others with painting and runs her own workshops and painting events.

Platforms4CPS
Haydn Thompson, Meike Reimann

2018 | paperback, color | 56 pages, English
ISBN 978-3-95663-183-2 (print)
ISBN 978-3-95663-184-9 (non-print)

Emerging Technology and Social Innovation
Victoria Blessing, Sarah Mortimer, Ute Bongertz, Georg Mildenberger, Jonathan Loeffler

2018 | paperback, color | 154 pages, German
ISBN 978-3-95663-185-6 (print)
ISBN 978-3-95663-186-3 (non-print)

About the project partners
The publications were the result of a working relationship between Steinbeis-Europa-Zentrum (SEZ) and Steinbeis 2i GmbH (S2i). The SEZ builds bridges across Europe on behalf of companies, research institutions, universities, and regional economic development bodies. Steinbeis 2i is involved in projects relating to innovation and internationalization, drawing on more than 25 years of experience at the Steinbeis-Europa-Zentrum.

Industry 4.0 at SMEs – The Feasibility of Autonomous Production Processes
Oliver Brehm, Rüdiger Haas, Maja Jeretin-Kopf (eds.)

2018 | paperback, color | 70 pages, German/English
ISBN 978-3-95663-170-2 (print)
ISBN 978-3-95663-171-9 (non-print)

About the editors
Dipl.-Ing. (FH) Oliver Brehm is a freelance business consultant. His focus is on the field of product development involving CAD, PLM, and ERP, but also content management systems (CMS). This mainly entails system-independent advice on projects involving the selection and introduction of new methods and software. Brehm has been the director of the Steinbeis Transfer Center for Innovation and Organization since 2001. Prof. Dr.-Ing. Rüdiger Haas is head of production engineering and production at Karlsruhe University of Applied Sciences and director of the Institute for Transfer Technologies and Integrated Systems (SITIS), also a Steinbeis Transfer Center.
Associate Professor Dr. phil. habil. Maja Jeretin-Kopf is manager of a project called Learning Factory 4.X at Karlsruhe University of Applied Sciences and a project manager at SITIS. She earned a professorship at Karlsruhe University of Education, where she still works as a guest lecturer. Since 2017, she has also been co-director of the Steinbeis Transfer Center BAT-Solutions alongside Rüdiger Haas.

Internet Communication – A Practical Introduction to Java
Sandro Leuchter

2018 | paperback, color | 353 pages, German
ISBN 978-3-95663-189-4 (print)
ISBN 978-3-95663-190-0 (non-print)

About the author
Since 2016, Sandro Leuchter has held the professorial chair for distributed and mobile applications at the Information Technology Department at Mannheim University of Applied Sciences. He is also a founding member of the Lehre & Lernen ("teaching and learning") center of excellence at Mannheim University and director of the Steinbeis Transfer Center for Distributed and Mobile Applications. He was previously head of software engineering and infrastructure software at Atlas Elektronik, a joint venture between ThyssenKrupp and EADS. In 2009, he gained an engineering PhD at the department of mechanical engineering and transport systems at TU Berlin. He also gained a diploma in information technology at TU Berlin in 1999.

Challenges and Business Competences within the Context of Industry 4.0
Steinbeis-Stiftung (ed.) | Maximilian Werling

2018 | paperback, color | 130 pages, German
ISBN 978-3-95663-187-0 (print)
ISBN 978-3-95663-188-7 (non-print)

About the author
Maximilian Werling (M.Sc.) has a bachelor's degree in business information technology from the University of Stuttgart and the University of Hohenheim. He completed a master's degree in technology-based business administration at the University of Stuttgart with a focus on business information systems and information management. Since early 2018, he has been working as a project manager for the Steinbeis Enterprise for Lifecycle Management, where he works on the supervision and development of Steinbeis Enterprises on behalf of Steinbeis GmbH & Co. KG für Technologietransfer in Stuttgart. In this role, he looks at digital transformation and its impact on small and medium-sized business enterprises, the setting up and moderation of micro-networks in the Steinbeis Network, and the development and introduction of digital instruments and tools in consulting services.

facebook.com/SteinbeisEdition twitter.com/steinbeis_ste

Yvonne Hübner
Steinbeis-Edition (Stuttgart)
edition@steinbeis.de | www.steinbeis-edition.de

Publication details

Transfer. The Steinbeis magazine

The magazine on tangible knowledge and technology transfer
Edition 4/2018
ISSN 1864-1768 (Print)

Steinbeis GmbH & Co. KG für Technologietransfer
Willi-Bleicher-Str. 19
70174 Stuttgart | Germany
Phone: +49 711 1839-622
Email: stw@steinbeis.de
Internet: transfermagazin.steinbeis.de | www.steinbeis.de

Editorial coordinators:
Anja Reinhardt, Marina Tyurmina
Email: transfermagazin@stw.de

Cancellation:
If you would like to stop receiving Steinbeis Transfer magazine, simply cancel your subscription. Please contact us by writing an email to media@steinbeis.de or you can call us at +49 711 1839-5. Please note that the cancellation of your subscription may not come into affect until after the next edition.

Concept and design:
Steinbeis Foundation

Overall production:
Straub Druck + Medien AG, Schramberg

Photos and images:
Unless stated otherwise, photos and images were provided by Steinbeis Enterprises and project partners named in this magazine.
Cover: The Steinbeis Löhn Award sculpture

The platform provided by Steinbeis makes us a reliable partner for company startups and projects. We provide support to people and organizations, not only in science and academia, but also in business. Our aim is to leverage the know-how derived from research, development, consulting, and training projects and to transfer this knowledge into application – with a clear focus on entrepreneurial practice. Over 2,000 business enterprises have already been founded on the back of the Steinbeis platform. The outcome? A network spanning over 6,000 experts in approximately 1,100 business enterprises – working on projects with more than 10,000 clients every year. Our network provides professional support to enterprises and employees in acquiring competence, thus securing success in the face of competition.

198525-2018-04