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Das Steinbeis Magazin

Building bridges through transfer

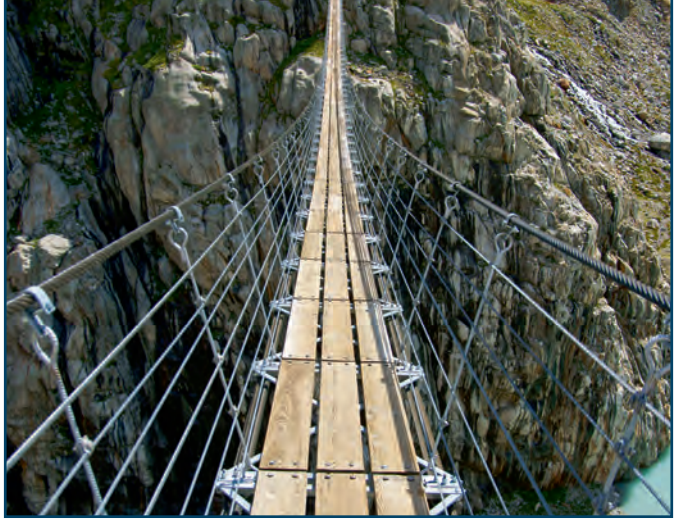
Feature topic: Energy
Steinbeis experts unearth the facts

Out of development, onto the façade
Steinbeis experts develop fiber-reinforced concrete panels for high-rise building in Frankfurt

Holographic product presentations arouse emotion
Steinbeis researchers create interactive exhibition tool

Abrasive blasting behind a protective water screen
New Steinbeis process helps absorb toxic particles

02 | 2014



News

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Dear Readers,

Prof. Dr.-Ing. M. Norbert Fisch is manager of the Steinbeis Transfer Center for Energy, Building and Solar Engineering (EGS).

When it comes to significant global issues, few topics spark as much emotional discussion as the transition to renewable energy. The economic threats are continuously compared and contrasted with potential environmental benefits, but estimates of the required investment and the costs involved depend largely on which protagonist you ask. And there are major differences in their estimates. Despite this, there seems to be general consensus in Germany that the transition to alternative energy is a done deal in political terms, even if no one wants electricity pylons, windmills, and biogas plants in their backyard. Most projects that have already been planned quickly reveal prevading ambivalence.

In the fall of 2010, the German government tabled its energy concept, complete with goals and program for the new era of renewable energy. Its schedule runs until the middle of the century, with demands for a consistent drop in energy consumption in industry, transportation, and construction, and a stipulation that 60% of energy come from renewable sources. Taking this ambitious route will require active participation by everyone in Germany. And this means convincing people of the benefits. We need a concerted "energy and culture transformation." Resolving doubt and involving people who can take more responsibility and make more decisions will just be some of the huge challenges we will face.

It is now more important than ever to implement ideas and innovative projects that will act as a beacon for defining the benchmark for future standards. The Stuttgart-based Steinbeis Transfer Center for Energy, Building and Solar Engineering (EGS) has been developing future-oriented energy concepts for buildings and city districts for over 20 years. After working on the first solar housing projects in Friedrichshafen and Neckarsulm in the 1990s, both of which used long-term thermal storage systems, the center has been involved in countless sustainable office complexes and commercial buildings. It is currently developing carbon neutral housing projects in line with energy transition goals and the EU objectives for 2050.

It is quite possible that a building or housing complex that can cover its own energy requirements through exclusively renewable sources will turn out to be the elusive perpetual motion machine – or simply unaffordable. The main challenge is how to store the energy and reconcile shifting solar energy supplies and energy demands at different times of the day or year. The electricity grids and the networks supplying gas and heating are currently being linked with large energy storage systems – in combination with "Power-to-Gas" and "Power-to-Heat" concepts – to facilitate the widespread introduction of the EnergiePLUS standard. Given the existing infrastructure in Germany, buildings or housing complexes that are self-sufficient in energy terms are, however, unlikely to be the way forward for expanding the renewable energy supply. The EGS transfer center has worked on and organized the co-development of the first EnergiePLUS buildings to be constructed in Germany. It has also monitored the first years of operation. Pilot plans to convert the first urban housing estates are already in place and these should set new standards for sustainable cities by the year 2020. Funding programs such as the BMVBS "Efficiency House Plus" scheme and the Federal Ministry of Economics and Technology's "Eneff City" initiative will help research and development move forward with the EnergiePLUS standard, and this will accelerate the innovation cycle and market introduction in Germany.

We still have nearly 35 years to achieve the environmental protection goals set by the German government. A particular responsibility lies with architects and city planners, who could meet expectations by delivering ambitious, future-proof concepts. But what's also needed now is people with the can-do willingness to take risks and real estate developers with drive and commitment.

This edition of TRANSFER magazine provides insights into the challenges of this technology field and I hope you find it an enjoyable read!

Yours

Prof. Dr.-Ing. M. Norbert Fisch

Research.Science.Management.

A look back at the 2014 Max Syrbe Symposium – The Steinbeis Transfer Arena

"Technology transfer in this state is working well!...?" – a topic that 170 visitors to the second Max Syrbe Symposium were invited to examine in the Stuttgart House of Commerce (Haus der Wirtschaft) on March 26, 2014. This year's symposium was all about interaction, with representatives of universities, colleges, businesses, research institutes and trade organizations all under one roof to discuss the postulation of the former president of the Fraunhofer Society and long-standing chairman of the Steinbeis Foundation board of trustees, Prof. Dr. rer. nat., Dr.-Ing. E.h. Max Syrbe (1929-2011). His theory was that, "Scientific achievements are important not just for their own sake, but for the sake of the synergies and real-world applications they inspire."

The vision expressed by Syrbe with this statement was one of unrestricted yet coordinated (i.e., managed) science which is matched as closely as possible to users in business. He posited that the reciprocal alignment and networking of research and development on the one hand, and practice on the other, is the key to successful knowledge and technology transfer. Syrbe's notion rightly underscores the instrumental role played by knowledge management alongside well-coordinated research and business conditions in safeguarding the competitiveness and innovative power of businesses and entire regions.

Panelists in the Transfer Arena discussed Syrbe's hypothesis in an open forum supported by modern media. Prof. Dr. habil. Achim Walter (Kiel University) expressed the opinion that good research arises from acknowledged – albeit as yet unsolved – problems in business. He also asserted that the purpose of collaborative structures in Baden-Württemberg should be to transfer technology capable of providing solutions to these problems and which can form the basis of new entrepreneurial opportunity. Prof. Dr. Hugo Hämmerle (Natural and Medical Sciences Institute (NMI), University of Tübingen; Innovation Alliance BW) believed the onus is on companies to request and take on more offers from research. Thomas Vetter (ARADEX AG) also highlighted that business managers should not be worried about working with the originators of science and technology, although it is precisely for SMEs that the aims and focus of universities and technology sources are problematic, since research is governed by cumbersome structures. Prof. Dr. Gerhard Schneider (Aalen University of Applied Sciences) said that universities of applied sciences are challenged by the need to network more and gain a more independent profile, while, in coordination with business, expanding their offering and becoming more professional. According to Günther Leßnerkraus (Baden-Württemberg Ministry of Finance and Economy), the state has to expand its strengths in the field of knowledge and technology transfer at a high level and maintain its advantage over up-and-coming regions. To do this, research bodies and companies in the state will have to network more closely than in the past to translate the outstanding work of researchers more effectively into viable business models.

The ideas discussed at the core of the arena were also commented on from the outer circles by representatives of business associations, chambers of commerce and members of the Steinbeis Network. Members of the audience were also actively welcomed to make comments relating to the discussion. Overall, the arena provided key players in the field of knowledge and technology transfer in Baden-Württemberg with a modern platform for meeting others and exchanging ideas. The symposium was moderated by Prof. Stephan Ferdinand (Stuttgart Media University of Applied Sciences) and Christiane Delong (Institute of Moderation, Stuttgart).

The Transfer Arena video is available online at www.max-syrbe-symposium.de. The next Max Syrbe Symposium is scheduled to take place on April 14, 2016.

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Focus: Energy

Insights from Steinbeis experts

Energy and matters related to energy supply are continually growing in importance – a sure sign that society is becoming more aware of environmental issues. With this area of technology gaining in significance, TRANSFER is taking a look at the topic from various angles. The pages that follow give Steinbeis energy experts a platform for sharing insights. We start with Dirk Mangold, head of the Steinbeis Research Center for Solar and Sustainable Thermic Energy Systems (Solites), which focuses on research, development, and the use of large-scale solar thermal energy systems. Then Prof. Dr.-Ing. Dieter Brüggemann, head of the Steinbeis Transfer Center for Applied Thermodynamics, Power, and Combustion Engineering, explains why he thinks we will need to draw energy from a mixture of sources in the coming years. Dr. Eva Schill, director of the Steinbeis Transfer Center for Geoenergy and Reservoir Technology discusses Germany's geothermal potential. And Prof. Gerd Heilscher, head of the Steinbeis Transfer Center for Local Renewable Energy Systems, introduces readers to the field of research called "Energy Meteorology," making predictions about what "the future of energy" might have in store for us.

Image: The Steinbeis Research Center for Solar and Sustainable Thermic Energysystems;
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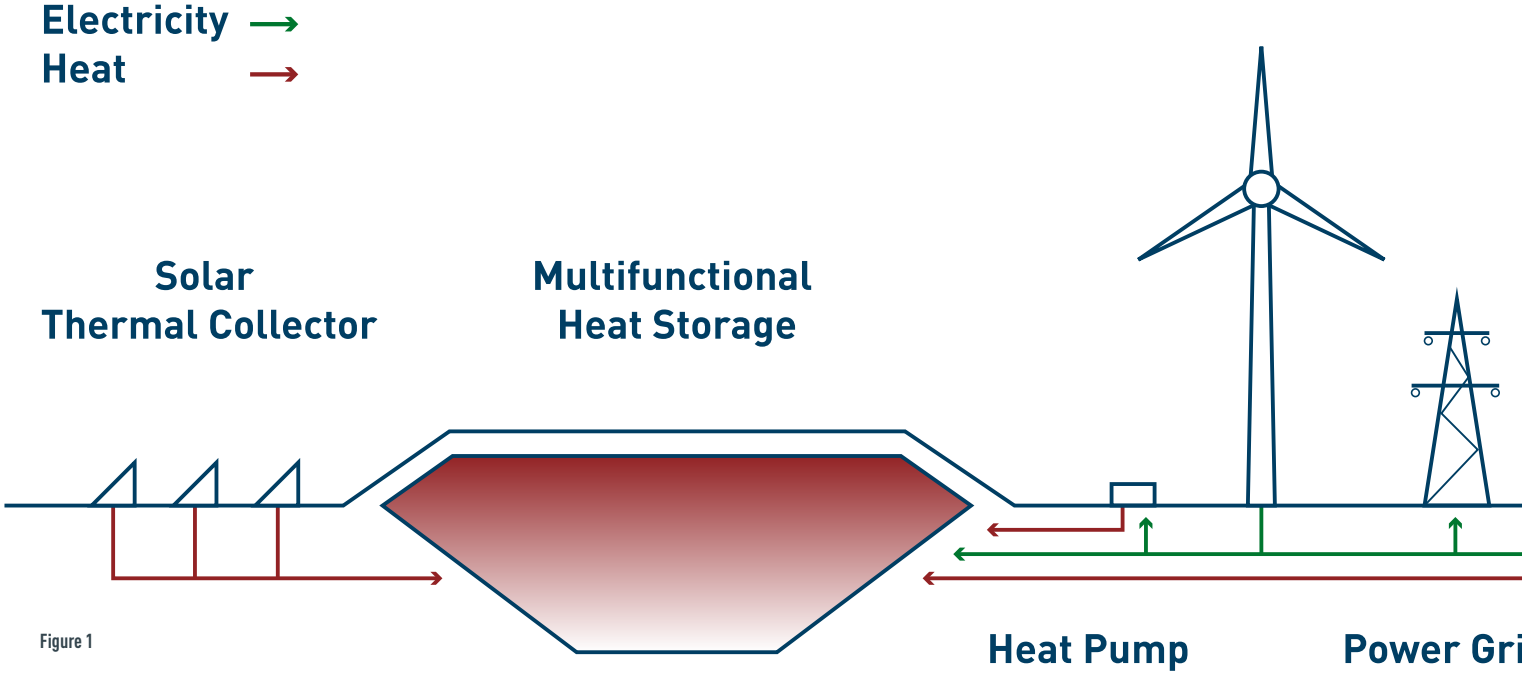


Figure 1

Solar thermal energy: from single family homes to multi-megawatt systems

A key technology for the transition of the heat market to renewable energy

When people think about solar energy in Germany, they usually think about electricity generated from photovoltaic solar panels (PV). In the media, heat generation from solar collectors tends to be of secondary interest, despite the fact that on a global scale solar thermal energy contributes much more for reducing CO_2-emissions than PV. Systems for converting district heating grids and major heat generation plants to solar thermal energy will play a key role in the transition to renewable energy, the so-called 'German Energiewende', in the heat market. The Steinbeis Research Center for Solar and Sustainable Thermal Energy Systems (Solites) is involved in a variety of national and international research and market development projects.

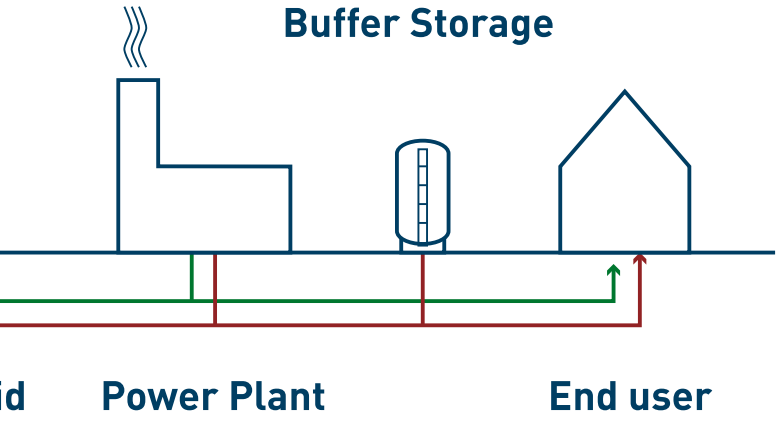
The average German household uses 57 % of its energy for heating, 33 % for private transport and only 10 % for electricity (source: BMWi 04/2014). This underlines the significance of the heat market, as a "sleeping giant".

Around 95 % of the solar heating systems sold in Germany are still mounted on one- or two-family houses. However, the market has been in gradual decline in recent years, partly also because of the increasing competition with PV installations. Today the prices of PV installations are close to the prices of solar heating systems. Under the German Renewable Energy Act (EEG) one can receive much more subsidies for the installation of PV systems than for solar heating systems. However, over 50 % of the potential of solar heat lies in the multi-family-building sector of the housing market. Also trade firms and industrial enterprises as well as district heating providers have an increasing interest in solar heat: The integration of solar heat into district heating systems can even help to supply whole quarters, villages and cities with heat from renewable energies and from other highly efficient energy sources. Also on a local level, there are many opportunities for municipal utilities or energy cooperatives to implement models of citizen participation and citizen finance. In whole Europe the interest in German technical know-how is increasing: In the frame of EU-projects (such as Pimes, Einstein and Pitagoras), first pilot plants are in realization in Poland, Spain, Norway, Hungary, Italy and Austria. All of them are based on the technology that was used in the mid-1990s, when in Germany pilot plants for the use of solar district heat with seasonal heat storage were built.

Industrial enterprises and in particular district heating providers frequently operate combined heat and power plants (CHP). So they typically generate electricity from fossil fuels. The waste heat is usually used for their own heating supply or for district heating purposes. If a solar thermal plant provides solar heat and therefore reduces the operation time of a CHP plant, less electricity is produced. This shortfall then has to be covered by electricity from the German grid related to higher CO_2-emissions. In some cases this can lead to the effect that the installation of solar thermal systems does not help to reduce CO_2-emissions.

Despite this, the transition to renewable energy and thereby the large scale expansion of electricity generated from renewable energy sources (e. g. wind, photovoltaic and biogas) reduces the CO_2-emissions caused by electricity generation in Germany in the medium term.

Further on, the summertime-use of CHP plants operated with fossil fuels is becoming more and more uneconomic because the generation of electricity gets increasingly supplied by renewable energies. Under German law, electricity from renewable sources has priority over electricity from fossil fuels. If CHP plants operated with fossil fuels can no longer supply the grid with electricity on an economically feasible base, they



are switched off. The heat generation then has to be taken over by other sources.

For this, fossil fuel gas boilers as well as renewable energy systems can be used, especially biomass boilers and solar thermal plants. But from a strategic point of view, biomass will increasingly be needed to produce fuels and basic materials. So, just the production of solar heat remains, assuming it is more economic than to operate fossil fuel gas boilers. Also heat generated by geothermal energy systems has a high market potential in the long term. At present, detailed research is underway in this area. Managed by Solites and financed by the Baden-Württemberg Ministry for the Environment, experts are examining quality standards relating to the production of geothermal probes.

Compared to Germany, Denmark already has a much higher share of electricity from renewable wind energy in its electricity grid. Especially on windy days in summer, the entire Danish electricity demand can be met with renewable energy. As a result, fossil fuel-fired CHP plants have to be switched off and the numerous Danish district heating systems require a replacement heat generation. The most economical heat source in Denmark, delivering today heat at less than 50 Euro/MWh, are solar thermal plants in the megawatt range. Until now, 82 large solar thermal plants (with an output of more than 1 MWth) have been built in Europe. The installed capacity of large solar heat plants throughout Europe is 433 MWth (status Dec 2013). In 2013 alone, there was a 31.6% increase in capacity.

Large multifunctional heat stores combined with such plants can store solar heat from the summer until the winter. In addition they can be used for storing waste heat taken from CHP plants, which are today operated by following the ups and downs in electricity prices. A further


Figure 2

option is to store heat from overproduced renewable electricity following the power-to-heat principle. With the support of experts of Solites, first pilot plants using such "smart" district heating systems have been realized, for example in Marstal on the island of Ærø and in Brædstrup (Denmark).

The Steinbeis research institute Solites is working on a variety of projects related to the German Energiewende, not only in electricity sector but especially in the field of thermal energy. This includes: basic R&D related to system development; the simulation-based development of technical and economic concepts, focusing on solar and flexible heat and power generation systems; support to the realization of pilot plants; knowledge transfer; market development projects; consulting of politicians and associations. These are examples of areas in which Solites can contribute with expert know-how on national and international level.

Figure 1: basic principles of a flexible system for generating electricity and heat – an approach that supports the German Energiewende
Figure 2: Carbon-neutral electricity and heat generation in Marstal on the Danish island of Ærø – 35,000 m² of solar collectors (24.5 MWth), 70,000 m³ of multifunctional heat stores and electricity generated from wind energy and biomass (Image: Marstal Fjernvarme)

Dirk Mangold leads Solites – the Steinbeis Research Center for Solar and Sustainable Thermal Energy Systems. Together with Thomas Pauschinger he has been working on the research, development and application of solar heating systems since 1990, as well as on large solar thermal plants, energy-efficient buildings, solar district heating systems and seasonal heat store technologies.

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"There's no single concept that works for everything and everyone"

An interview with Professor Dr.-Ing. Dieter Brüggemann

Professor Brüggemann, your specialty is thermal energy technology. The transfer center you have been heading up for 18 years also works in this field. What were the specialist topics of the times two decades ago, and what are the challenges that occupy you now compared to then?

Even in those days, energy was an important issue. For example, people were interested in making combustion as efficient as possible and reducing pollutants. We worked successfully with laser-optical measurement technology and simulation techniques, and we're actually still using these today. But our activities are much broader now. You just need to think about the extensive climate debate. A big issue these days is sustainability and avoiding carbon emissions. The goal posts have shifted. Renewable energy sources were something really special back then. Today they dictate the discussion and sometimes lead to new challenges.

Among other things, your Steinbeis transfer center tests combustion chambers in gasoline engines and diesel engines. In your opinion, given the current debate about environmental protection, what should we be thinking about environmental compatibility? Do recent technological advances make retrofitting an environmentally friendly and affordable option?

It's important to consider how much has already been achieved. Thanks to research and development work, modern combustion engines now only generate a fraction of the pollutants their predecessors did under comparable conditions. That said, at the same time, our expectations regarding vehicle safety, comfort, performance and zero emissions have gone so far that we need to keep researching and developing.

A certain amount of the energy we now produce goes unused because it's not needed where it was generated. This is a problem that goes back to the energy technology. If we set up pipeline systems to shift it around, it soon becomes expensive. Your Steinbeis transfer center works in this area by looking at mobile latent heat storage and transportation on trucks. Give us some insights into this future technology solution!

Before I do: There's no single concept that works for everything and everyone. This is precisely why the individual advice we give to companies and institutions is so important – customized, made-to-measure solutions. Sometimes the challenge is to take excess heat and load it onto special storage devices and to then transport this to the place it's needed, where the heat is then offloaded. The advantage you get with latent storage is that energy doesn't go into the heating of the material but into melting it at an almost constant temperature. Basically, these storage systems work like those hand warmers people use in winter – only on a much larger scale. And it's the size that's one of the challenges: how can I load and unload the heat as quickly and uniformly as possible? In other stationary applications, the priority is to keep the temperature of a component or room constant. We regulate this by selecting the right materials. This is an area we've also been doing R&D work in with LTTT at the University of Bayreuth. And yet another big topic for us is how to transform heat into electricity using the organic rankine cycle (ORC). It's a really useful technique when the temperature of a heat source (e.g., geothermal heat or waste heat) is too low for a conventional water-steam power plant.

Daily newspapers have been full of buzzwords for some time now – terms like solar energy, wind power or the transition to renewable energy. There are discussions and disagreements, but everyone seems to agree that our energy supplies should be environmentally friendly, safe and affordable. Is this ideal actually possible?

In the long term, certainly. In the short term, only partly. But this shouldn't be a surprise to us. If we turn the whole energy supply concept on its head overnight by decommissioning nuclear power stations and only burning coal when absolutely necessary, or gas for as long as necessary, this has implications for our electricity supplies. Wind and solar energy will also have peaks and troughs, but in the energy mix, it has the right of way. So the old concept of normal, high and peak consumption will have to be replaced by new concepts. To do that, you need time, money and determination, but also a willingness to make compromises. We sometimes make decisions without wanting to know about the consequences, without considering the "if – then." For example, if someone's set on using offshore wind, they're going to have to accept that there will be lots of electricity pylons everywhere.

Let's take a sneak peek at the future. What, in your opinion, will the energy market look like in 2050? What will be the future priorities in energy research?

Well I'm not a clairvoyant, but the way I see it, there are three factors which have a particular impact on developments: technology, politics and, last but not least, people. Who would have predicted three decades ago that a small and affordable item called a smartphone would come along and more or less replace not just conventional telephones but also computers, books, maps, notebooks, watches, alarm clocks, calculators, cameras, CD players, video machines and quite a few other things. This is a perfect example of the interplay between technological innovations and user behavior. For users, the freedom to use things wherever they want, whenever they want is more important than the size of images or sound quality. In a similar way, when it comes to the future energy market, it will depend on whether people radically change their behavior. Initial trends are beginning to emerge. We are now seeing younger people place much less value on the size or engine power of a car, or actually even owning one in the first place. Another issue is whether we want to reveal our private behavior just to optimize the energy use of our household devices, the heating or the lights. Then apart from the people and the technology, political developments are important. Would we prefer to answer energy requirements on an international scale and compensate for fluctuations on a European level? Or will the trend go more in the direction of decentralized power generation in our own four walls, locally, or within the region?

I'm pretty certain, at least in the next few years, that we'll need a mixture of energy sources. That's also why it makes sense to not put our money on one horse. So I'm confident that our expertise in the field of energy systems planning and thermal energy technology will still be needed and we'll continue to make some useful contributions.

Image: © fotolia.de/JiSign

Professor Dr.-Ing. Dieter Brüggemann is director of the Steinbeis Transfer Center for Applied Thermodynamics, Power and Combustion (ATEV) at Bayreuth University. The center's key areas of work include power engineering, thermodynamics and heat transfer, combustion research, optical measurement technology, laser diagnostics and numerical simulations.

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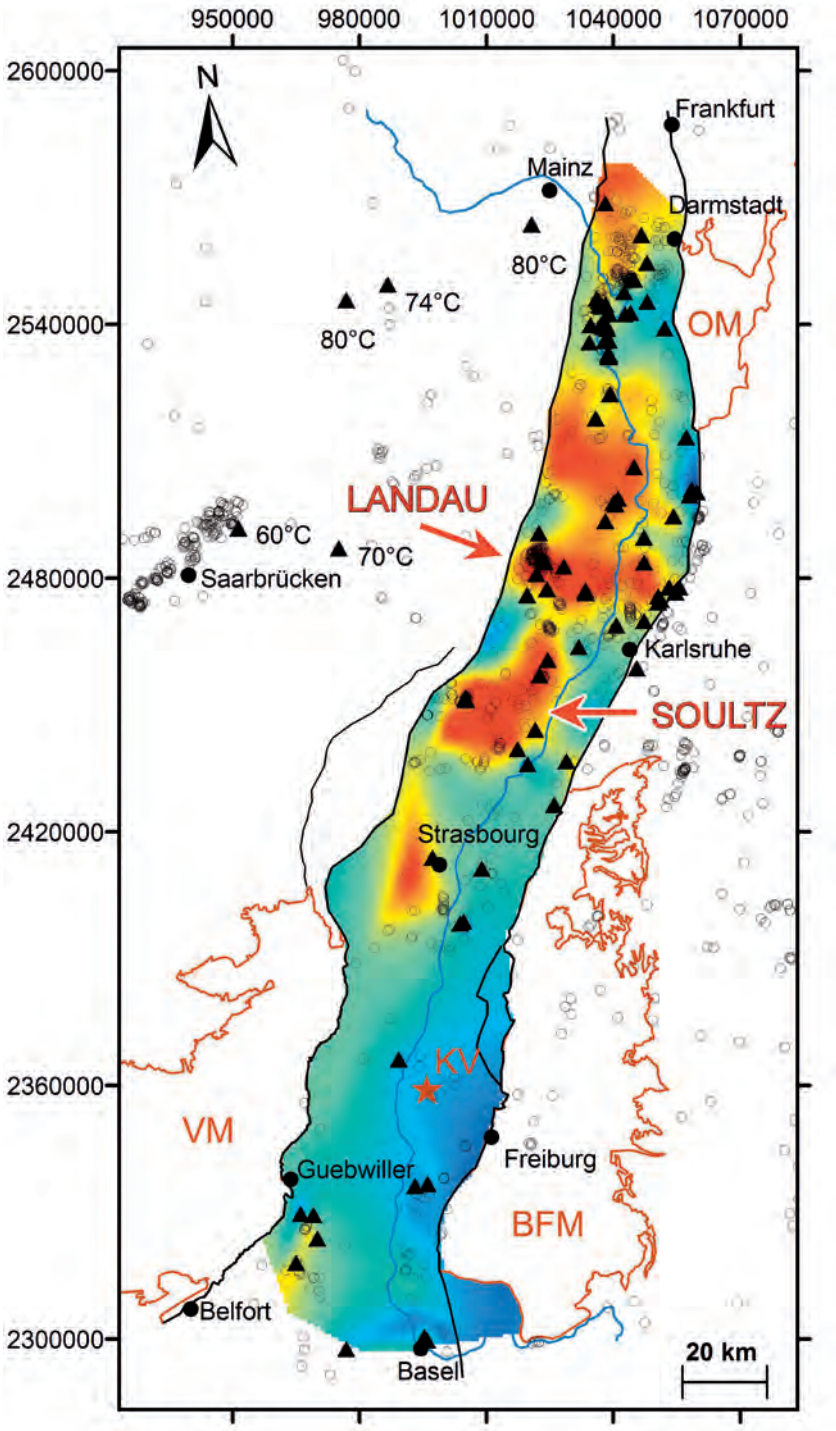

Temperature distribution in the Upper Rhine rift valley at a depth of 2000m with temperatures from 75°C to 150°C (data by Pribnow and Schellschmidt, 2000, as well as Agemar et al., 2012). VM: Vosges mountains, BFM: Black Forest mountains, OM: Odenwald mountains, KV: Kaiserstuhl (Baillieux et al., 2013)

Geothermal energy in Germany – local renewable resources

In addition to its reserves of coal, natural gas and petroleum, southern Germany has particularly high geothermal potential along the Upper Rhine rift valley and the Molasse basin, which can be harnessed to meet the baseload supply of heat and electricity. Several power-plant prototypes are already operational, confirming the great potential capacity of the systems. In the highly industrialized region of southern Germany, a shortfall is anticipated in the electricity supply, and geothermal energy provides a genuine opportunity to cover this gap using local renewable resources. The Steinbeis Transfer Center for Geoenergy and Reservoir Technology works to advance environmentally friendly use of these technologies.

The current transition to innovative alternative-energy technologies presents a major challenge to society and the scientific community. As in the past, geothermal energy is expected to make a major contribution to supplying our society with energy.

In 2010, fossil fuels comprised over 80 % of primary energy in Germany, and over 50 % of them consist of hydrocarbons (petroleum, natural gas). The prognosis for the energy mix in 2030 indicates only a minor reduction in this constellation. Given the current developments in Germany's

energy policy, this forecast will soon have to be revised upward. Awareness of growing energy scarcity will trigger price increases, as will dependence on foreign resources, and this in turn will give rise to doubts about the security of our energy supply. More investments will be necessary to exploit new resources, and this will lead to new exploration measures in Germany as well.

Geoenergy, also called geothermal energy, requires a comprehensive energy management plan which encompasses the use, management and storage of energy sources found in subterranean formations. Transitioning to new geotechnologies means reservoirs will have to be developed in dense and fractured media, and consequently, this field is becoming more relevant from a scientific perspective as well. The focus is on fundamental issues of environmentally friendly development of areas such as geothermal reservoirs. When it comes to generating geothermal energy, there are important environmental questions to be answered about induced seismicity, the use of chemicals and avoiding radioactive deposits in geothermal systems.

Creating microquakes by means of hydraulic fracturing (i.e., forcing water underground) is an important point of reference in determining the need to enhance reservoir properties. Induced seismicity, as it is known, can take place at the beginning of the geothermal project immediately after drilling, and these measures can only occur within a few days. The volume and success of the outcome can be tracked by means of induced seismicity. Scientists are focusing on controlling the intensity of the seismicity. Events which trigger microquakes can release forces which are detectable on the earth's surface and have the potential to damage structures aboveground. Progress has been made in terms of preventing the tangible effects of induced seismicity, especially in regard to controlling the pressure at which the water is pressed into the rock. This can occur during reservoir stimulation by administering high pressure for limited periods. During operations, it can occur by re-feeding thermal water back into several boreholes such as relief holes. One unresolved questioned to date deals with handling the changes in pressure caused by sudden and unforeseen events such as abruptly interrupting operations.

Chemicals are also used to improve the efficiency of the subterranean geothermal water circuit. Like hydraulic stimulation, the chemical stimulation of a reservoir is limited to the initial phase immediately after drilling, and in this case, it can only last a few hours. As a rule, the main priority is the connection between the different deep boreholes and the reservoir. Chemicals are used to dissolve the minerals which can constrict or close off the flow to the boreholes. Different substances are used depending on the mineral in question. For example, calcite can be treated with diluted hydrochloric acid. Unlike other geotechnologies, the chemicals cannot be fed back; instead, the reaction products (in this case CaCl, CO_2 and water) remain underground. The scientific challenges in this area include the use of biodegradable products and the integrity of the boreholes.

When a power plant is operated, mineral deposits should not be allowed to accumulate in the aboveground parts of a geothermal system. The objective is to return everything back underground which the production-related drilling brings to the earth's surface; the only thing to be taken from thermal water is heat. However, the fluctuations in the water temperature can in fact cause chemical reactions (mineral precipitations) within the aboveground closed system. Different substances are used to prevent precipitation; they must be chosen very deliberately based on the chemical composition of the thermal water. The challenge is choosing products which will not cause corrosive damage to the aboveground installations and/or the steel pipes of the drillings. Another concern is that the naturally occurring radioactive minerals (NORMs) which are brought to the surface with the thermal water in naturally occurring quantities are not retained in the mineral deposits and thus remain on the earth's surface. Currently, intense research is being conducted on these issues.

A variety of different scientific partners are now working to develop environmentally friendly applications for geothermal energy technologies. The Steinbeis Transfer Center for Geoenergy and Reservoir Technology is in charge of implementing this process in conjunction with the industry. From the planning phase onward, the center works hand in hand with its partners to develop ideal sites with a lower need for stimulation measures. This is intended to increase the acceptance of the technology among the general public in Germany.

Dr. Eva Schill is the head of the Steinbeis Transfer Center for Geoenergy and Reservoir Technology. The Center offers its clients technology transfer for developing industrial geoenergy projects, technology development for non-conventional sources of geothermal energy, conducting feasibility studies for non-conventional georesources and continuing professional development in the fields of reservoir exploration, geothermal energy and unconventional hydrocarbons.

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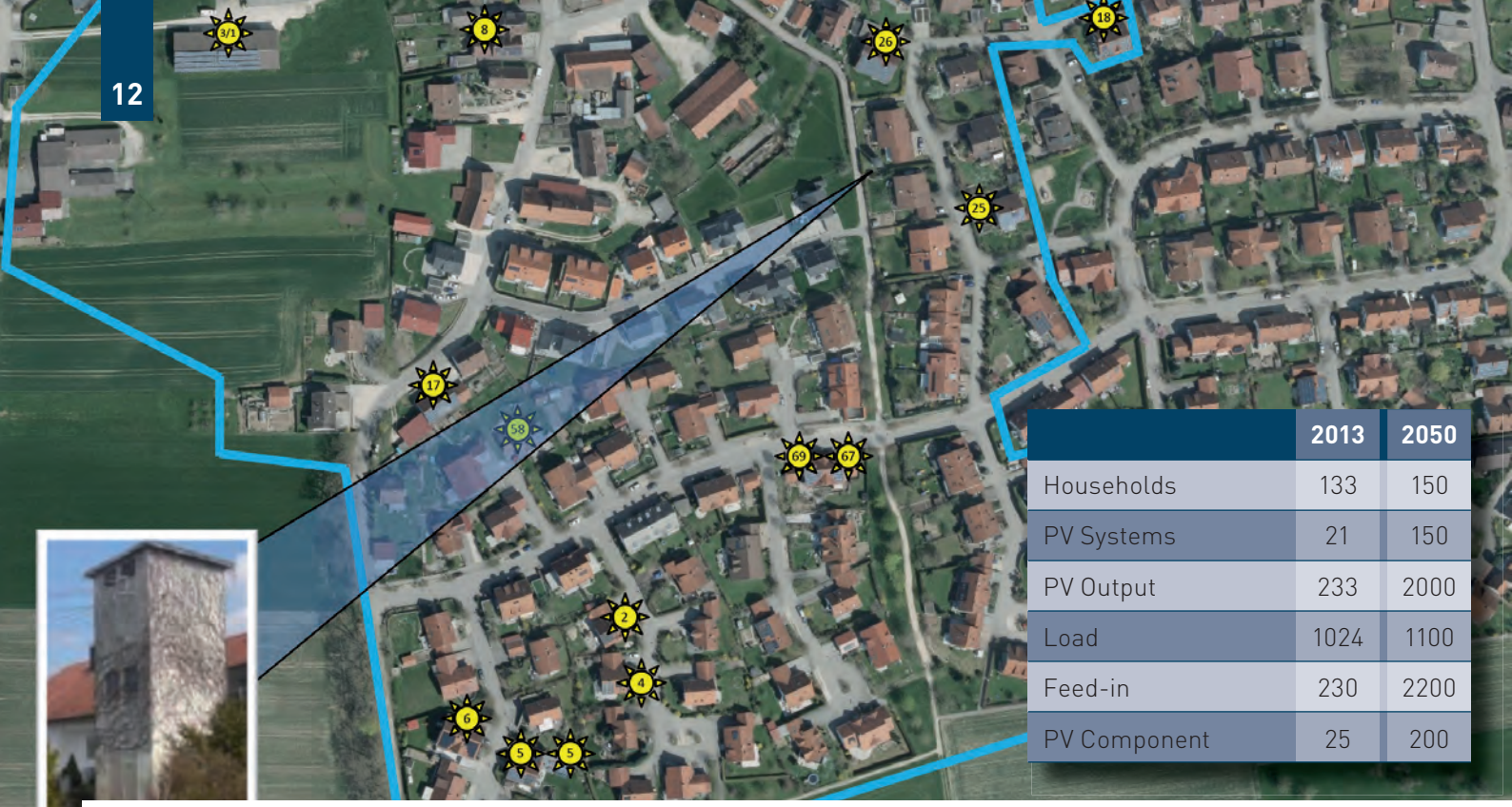

	2013	2050
Households	133	150
PV Systems	21	150
PV Output	233	2000
Load	1024	1100
Feed-in	230	2200
PV Component	25	200

"An energy future built on renewable energy sources is in sight."

A conversation with Professor Gerd Heilscher

Professor Heilscher, you first studied electrical engineering with a focus on communication engineering. However, you also have a Master of Science in renewable energy. Do you think it was a visionary understanding of the future that pointed you towards this key issue?

During my university days in Munich, I was already grappling with visions of how to engineer the decentralized supply of energy. However, that wasn't in the classroom, but in the Protestant student association, where I led a working group that focused on renewable energy. Even back then we were looking at solar electricity and electromobility.

By the time I arrived at the university in Oldenburg, all of these visions were suddenly solid science. We are still building on this scientific foundation today. Many topics that people were already looking at in detail back then have only now become relevant – in that sense, solid, visionary science. The research field of energy meteorology was established in Oldenburg at that time.

You are concerned with photovoltaics and the energy industry at your Steinbeis Transfer Center, and smart grids are one area of focus. Could you please give us an overview of this approach?

The continuously growing number of local renewable energy sources necessitates a fundamental change in the energy industry. Millions of small power stations feed electricity into the grid, but the amounts vary in accordance with the weather and based on their own demand and load. Constantly maintaining a balance between power requirements and the amount of electricity fed into the grid (load balancing) is routine in the energy industry. But up until now it has relied on a handful of large power plants, and load requirements could be reliably calculated by measuring the large industrial operations and the standard load profile of residential and commercial customers.

However, the direct usage of solar power by households and businesses has changed this static load profile, which was based on past experience, and led to an increased uncertainty in forecasting load. This leads in turn to an increased need for reserve energy to maintain the balance between feed-in and load.

At the same time, feeding electricity into the grids – low voltage grids in particular – from local renewable energy sources has led to new challenges for the planning and operation of such grids. Due to the increase in local energy feed-in, what previously functioned with basic network planning and without the need for measurement now has to be re-examined in the planning stage and continuously measured and monitored during operation.

We have introduced a flood warning system for rivers that monitors precipitation and water levels. For the electrical grid, we need new planning approaches in the low-voltage area and more information from the operations – which leads us to smart grids.

The Steinbeis Transfer Center for Local Renewable Energy Systems helps grid operators perform network analysis, in particular with regard to the challenges associated with further growth in local energy feed-in.

Among other things, your Steinbeis Enterprise is also examining the impacts of such local feed-in on the distribution network. Critics say that these energy inputs could lead to voltage fluctuation problems. What has your experience been here?

That is basically correct – feeding in electricity leads to an increase in voltage. However, if and when this will cause problems can be reliably determined in advance by applying new planning approaches. Building on this, technically effective and economically efficient grid expansion measures are then developed. Step by step, this is how the current network will be refashioned into a smart grid which can keep pace with demand and can also accommodate the voltage fed in by local solar energy sources.

You are also involved with the topic of energy meteorology, a relatively new research field that bridges renewable energy and atmospheric physics. What led to the development of this field of research, and what are the objectives of this discipline?

When I leave the house in the morning and the weather forecast has predicted rain, I take an umbrella. The weather forecast for the energy industry has to be much more precise. How intense will the sunlight be at 2:00 p.m., at 2:15, at 2:30? That is a completely new pattern for meteorology, and a new challenge for the future of weather forecasting. Meteorologists, the energy industry and experts in renewable energy systems must learn to understand each other and develop a common language.

Things got off to a bumpy start but, at present, I see a lot of progress. Meteorologists are finding new jobs in the energy industry. And energy meteorology has also become an established field at meteorological conventions. Above all, promising progress has been made in forecasting solar irradiation and wind speed – on the European level by ECMWF (European Centre for Medium-Range Weather Forecasts) and on the national level by the German weather service's EWeLiNE project (Erstellung innovativer Wetter und Leistungsprognose-Modelle für die Netzintegration wetterabhängiger Energieerträge).

Until now the focus has been on the uncertainty of solar and wind forecasting. Right now in Ulm, we are looking at weather situations with different types of clouds and how they affect the operation of electricity grids. This generates direct dialogue between meteorologists and the energy industry, with the results leading to the reliable operation of grids that include a high percentage of solar and wind power stations.

We also associate meteorology with delivering prognoses. What is your forecast for our "energy future"? What positive and negative developments can we reckon with?

We are starting to see the success of the liberalization of the energy industry. Grid operators increasingly see themselves as service providers for new customers who don't just purchase electricity, but at times also supply it. The operators are also investing in start-ups that are driving innovation in the field of solar and wind forecasting. For the first five years, my professorship in energy data management for local renewable energy systems was also funded by the regional power company. Here we can see a move towards an energy future built on renewable energy sources.

The green energy revolution – I like to call it the energy system transformation – will also have its losers, as we can see in the current drop in profitability among large energy providers as well as municipal utilities. At the heart of a transformation is a move away from a stable state – a time of chaos which then creates a new, (more) stable state. During this time, it is important not to lose sight of the final objective, even when, as often happens, you get blown off course.

The caterpillar will become a butterfly, but the caterpillar probably doesn't know it yet. In terms of our current situation, this means that people who focus exclusively on the high fees – which are a component of electricity prices under Germany's Renewable Energy Act (EEG, Erneuerbare-Energien-Gesetz) – are behaving recklessly in my opinion. The transformation of the energy system, which is being financed by the EEG fees, is already resulting in an energy system that is environmentally sound as well as competitive, reliable and independent in the long term. That is the objective that we mustn't lose sight of, even when we experience setbacks now and in the future.

Image: Stadtwerke Ulm/Neu-Ulm Netze GmbH, N11, Florian Meier, Network and System Planning
Photo: © City of Ulm

Professor Gerd Heilscher heads up the Steinbeis Transfer Center for Local Renewable Energy Systems at Ulm University of Applied Sciences. The services offered by the center include consulting on project management for solar power equipment, yield assessments, and consulting on the development and introduction of products and services in the fields of smart grids, smart meters and smart homes.

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Decentralized heat pump systems for apartment buildings

Small, compact and inexpensive

If a house containing multiple apartments is built to high standards, almost the same amount of heat is needed to supply hot water or heat the building. Almost one quarter of all heat is lost in the distribution and circulation system used to heat hot water. As part of a collaboration project with Geothermiekontor GmbH, the Steinbeis Transfer Center for Energy, Building and Solar Engineering has developed a decentralized, module-based geothermal heating system for apartment buildings.

Heat is supplied by small, decentralized heat pumps which are set up in each apartment. The building features a cold geothermal network filled with brine and this takes the source heat from the geothermal probes and distributes it. The heat is generated where it is needed almost without loss. Operation of the heat pumps is also more efficient as the supply temperature of recirculating water in the drinking water system is only 55°C instead of 65°C, mainly because of different hygiene requirements. Compared to centrally supplied heat, this approach saves over 20% of the electricity needed for the heat pump. Thanks to the new system, the individual temperature of recirculating water can be regulated for each apartment – a first for such systems.

With only an electricity and cold water bill, there is now much less administration as the heating costs disappear. The new compact heat pump has an integrated system for domestic hot water storage and it is no bigger than a refrigerator (60 x 60 x 210 cm). Since it is extremely quiet at less than 30 decibels, it can also be placed in a family room. By using inverter technology, the heating output can be regulated freely between 2 and 5 kW.

The two-year project is part of program dubbed the "Central Innovation Program in Medium-Sized Enterprise" (German: ZIM), which is sponsored by the Federal Ministry of Economics and Technology.

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Monitoring energy in clean room systems

Steinbeis researchers pinpoint potential cost savings

A special energy monitoring system makes it possible to capture rapid, quick-repetition measurements and usage data in indoor climate control systems (HVAC systems). The insights this data gives into potential improvements can result in significant energy and cost savings. This has been proven by experts at the Steinbeis Transfer Center for Energy, Environment and Clean Room Technology – quantitatively and adjusted for weather variations.

The owner of a clean room (used in sterile production) was planning to optimize the regulation of a mixed air flap to save the energy required to operate its HVAC system. This would have involved retrofitting an enthalpy-controlled mixed air flap regulator onto all eight of its existing HVAC systems, which used defined minimum levels of outside air. The idea was to use "free cooling." Beforehand, a simulation was needed to assess the efficiency of the planned change, based on a reference HVAC system. The results (in terms of the amount of energy saved) would be used as decision-making support for implementing the planned changeover.

Based on the experts' analysis, the mixed air flaps will be switched to enthalpy-controlled operation on all eight systems and errors identified by monitoring energy levels will be eradicated. Optimizing dampness targets within the system is also planned. Compared to operation with a fixed minimum proportion of external air, the new system is expected to save 36% of the energy. With the reference system used, this equates to a cost saving of approx. Euro 28,000 p.a., or Euro 174,000 p.a. for eight systems. Energy monitoring will be extended by one year to verify the predicted savings.

Combined with the system simulations carried out, the energy monitoring used for the project showed that the energy efficiency of the HVAC systems is strongly influenced by the method used to regulate the system. Using energy monitoring not only makes it possible to establish how much energy an HVAC system requires, it can also pinpoint a variety of errors in the control system, such as overlapping heating and cooling cycles. As a result, there's no need for special investments for troubleshooting which contributes to significant energy savings in the HVAC system.

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Micro-CHP systems meet energy efficiency criteria

Steinbeis experts provide advice to the Ministry of the Environment in Baden-Württemberg

The state of Baden-Württemberg is currently drafting a new legislation for the Renewable Heat Act (EWärmeG). The plan is to make it compulsory to use renewable energy to heat buildings. The Baden-Württemberg ministry of the environment asked a Steinbeis research center based at Reutlingen University – Heat and Energy Engineering, Stirling Machines – to conduct a study to evaluate micro-combined heat and power systems (micro-CHPs).

The key question to be answered was whether conventionally operated micro-CHPs that use natural gas would also be sufficient to fulfill statutory requirements based on their levels of energy efficiency. To find out, the scientists went back to the primary energy savings and carbon footprint savings made by the systems. This was because both factors cannot only be observed by using renewable energy, but also because they can be calculated and defined for the operation of micro-CHP systems. The approach has already been used in other studies, for example, when assessing and confirming the efficiency of micro-CHPs in order to meet funding criteria. While using this approach to provide evidence, it was also possible to join forces with Reutlingen University and use their test rig to check and even certify the output of a micro-CHP system, in keeping with DIN standard 4709 or approval guidelines used by the "Blue Angel" environmental endorsement program.

The study also showed that in terms of primary energy savings, highly efficient micro-CHP systems intended for the lower end of the scale – in single-family homes or apartment buildings – can also meet the tighter requirements being looked at for the new law. The study thus concluded with a proposal to consider formulating provisions for micro-CHPs within the Renewable Heat Act as means of alternative fulfillment of the statutory requirement

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Ingenious technology mix of different renewable energy sources

Award for an augmented reality app called Smart Cities

An augmented reality app called "Smart Cities – Ready to go!" which has been developed by Steinbeis-Europa-Zentrum and the Stuttgart company Solid White as part of the EU initiative CONCERTO, is one of the winners of the 2014 Silver Award of Distinction. The app was developed on behalf of the European Commission DG Energy.

The app, which is freely available for iOS and Android systems, uses a brochure as an "image marker" to create 3D environments in augmented reality. The app operates on three levels, revolving around individual buildings, urban districts and cities of Europe. In addition to presenting different types of technologies, examples of implemented projects are shown. An edutainment approach is used to introduce users to the topic with links to videos and Internet content which provides more detailed scientific information. The app is targeted at city mayors, energy managers, architects, city planners, scientists, and anyone else interested in energy-efficient construction and renovations. It is also great for showing how to achieve a clever mix of renewable energy in urban districts. Using simple 3D animations, it shows how schools, offices, residential buildings, and even entire communities can become more energy-efficient and find smart ways to mix different types of renewable energy.

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Balance between research, innovation and education – the approach favored by KIC InnoEnergy

A sustainable energy model for Europe

KIC InnoEnergy is a European company working in the fields of innovation, startups, business development and education, with a focus on energy markets. It is currently fostering the interests of a sustainable energy system for Europe. Steinbeis-Europa-Zentrum (SEZ) is also working as a partner on the project with a view to helping medium-sized enterprises gain support with funding, technology transfer and access to new markets.

The objective of KIC InnoEnergy is to back market-ready technologies for the provision of sustainable energy in Europe. Since its foundation in 2010, it has sponsored 52 business concepts, 458 students are currently enrolled on apprenticeship programs, and 40 patents have been drafted as part of innovation programs. KIC InnoEnergy carries out its work through a network of offices in the Benelux countries, France, Germany, the Iberian peninsula, Poland and Sweden. The German limited company (KIC InnoEnergy Germany GmbH) was established in 2012 and looks at "Energy from Chemical Sources." Its shareholders include the Karlsruhe Institute of Technology (KIT), Stuttgart University, the energy company EnBW and Steinbeis-Europa-Zentrum (SEZ). SEZ ensures that technology transfer measures are successful, especially among SMEs. It also provides support with the validation of possible projects, the forming of consortia, and submission of proposals. SEZ's work on innovation projects involves tasks relating to project management, market analysis and feasibility studies. It also fosters more involvement of women in science, education and business.

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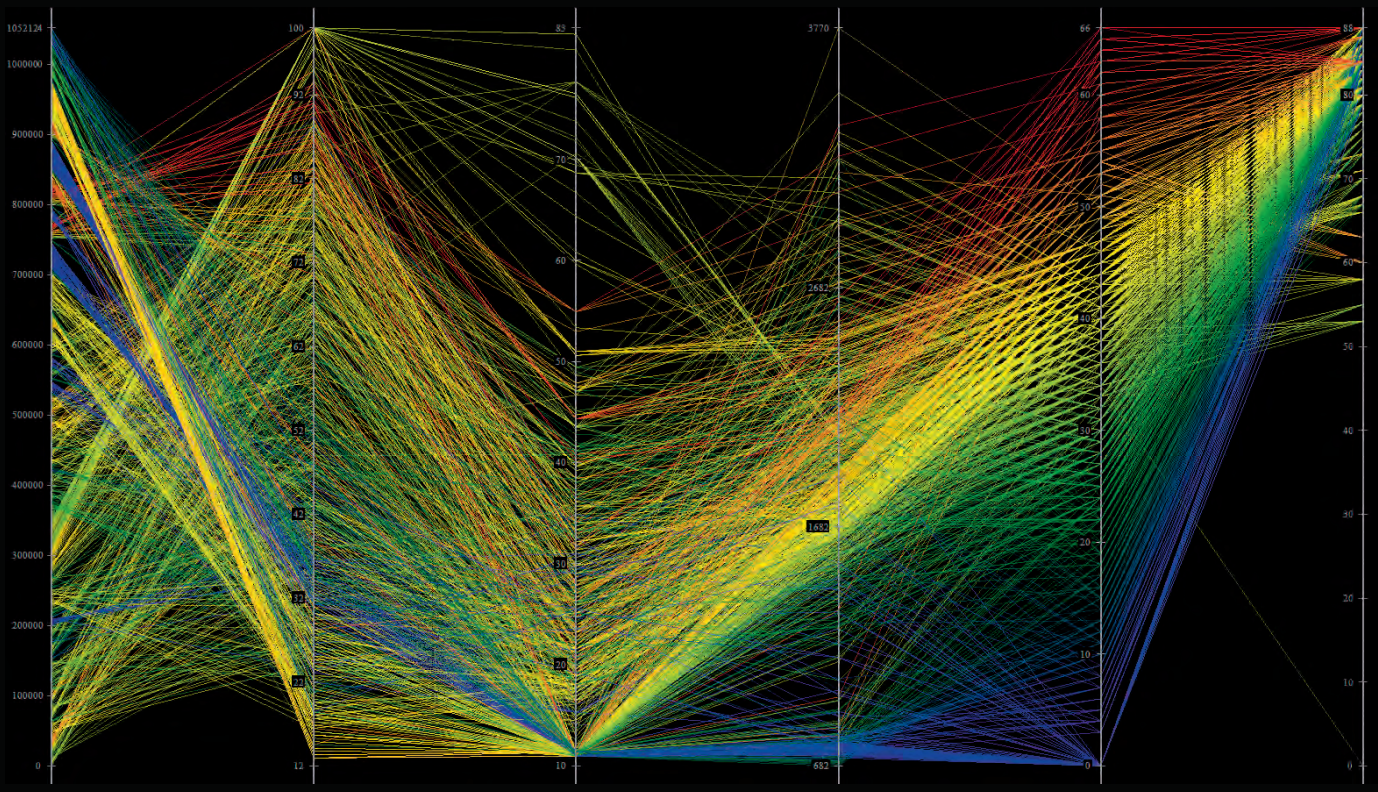

Looking for the needle in the haystack

Steinbeis software recognizes big data anomalies

Experts involved in data mining frequently refer to "needle in the haystack" syndrome which highlights the complexity of their field. But finding anomalies in huge volumes of data is actually harder than the proverbial haystack problem. This is because at the beginning of searches it's not even clear what the needle actually looks like. The first task is to work out if anything stands out in the crowd of existing data and then use this as a basis for further investigation. The Esslingen-based Steinbeis Transfer Center for Software Engineering is conducting research into big data analysis.

These days, automotive companies capture measurements during test drives or in the laboratory almost without thinking – it's practically a given part of vehicle fault analysis. As part of a long-standing research project, the Esslingen-based Steinbeis Transfer Center for Software Engineering has been investigating different ways to automatically pull out anomalies from mass volumes of data generated during vehicle testing.

Vehicles are fitted with a variety of embedded systems which communicate with each other and interact with the vehicle environment via sensors and actuators. A number of measurements are taken during the testing of research and development vehicles, and these are used for subsequent failure analysis. As a result, millions of measurements are logged but it is impossible to evaluate this data using conventional means. Yet just a single anomaly identified in measurement data is enough to highlight an error in the vehicle's software, electronics or mechanics. So there are compelling financial reasons why people are interested in recognizing anomalies before cars enter serial production – partly to protect the reputation of manufacturers, partly to avoid expensive recalls.

The Steinbeis experts at the Esslingen-based Transfer Center for Software Engineering examined two fundamental alternatives for recognizing anomalies.

- The first involves the smart mapping and user-managed evaluation of data, based on visual analytical methods (so-called visual data mining). This works well with fewer recorded data points and one-off analyses.
- The other method they examined involves classification methods used in artificial intelligence. An autonomous classifier was created to recognize anomalies automatically and a self-learning system was developed based on one-class support vector machines (support vector data description, or SVDD). This makes it possible to learn from previously gathered reference data and classify new test data automatically.

The team is currently transferring its research findings to industry and the use of these findings is not being restricted to the automotive industry. If anything, the new classification technique acquired from artificial intelligence offers new ways to evaluate data in all areas of industry where technical measurements are made, for example, in automation technology or on test rigs. The experts at the Steinbeis Transfer Center are taking on each successful technique one by one, and adding it to a new kind of measurement analysis software called Tedradis-DataMiner.

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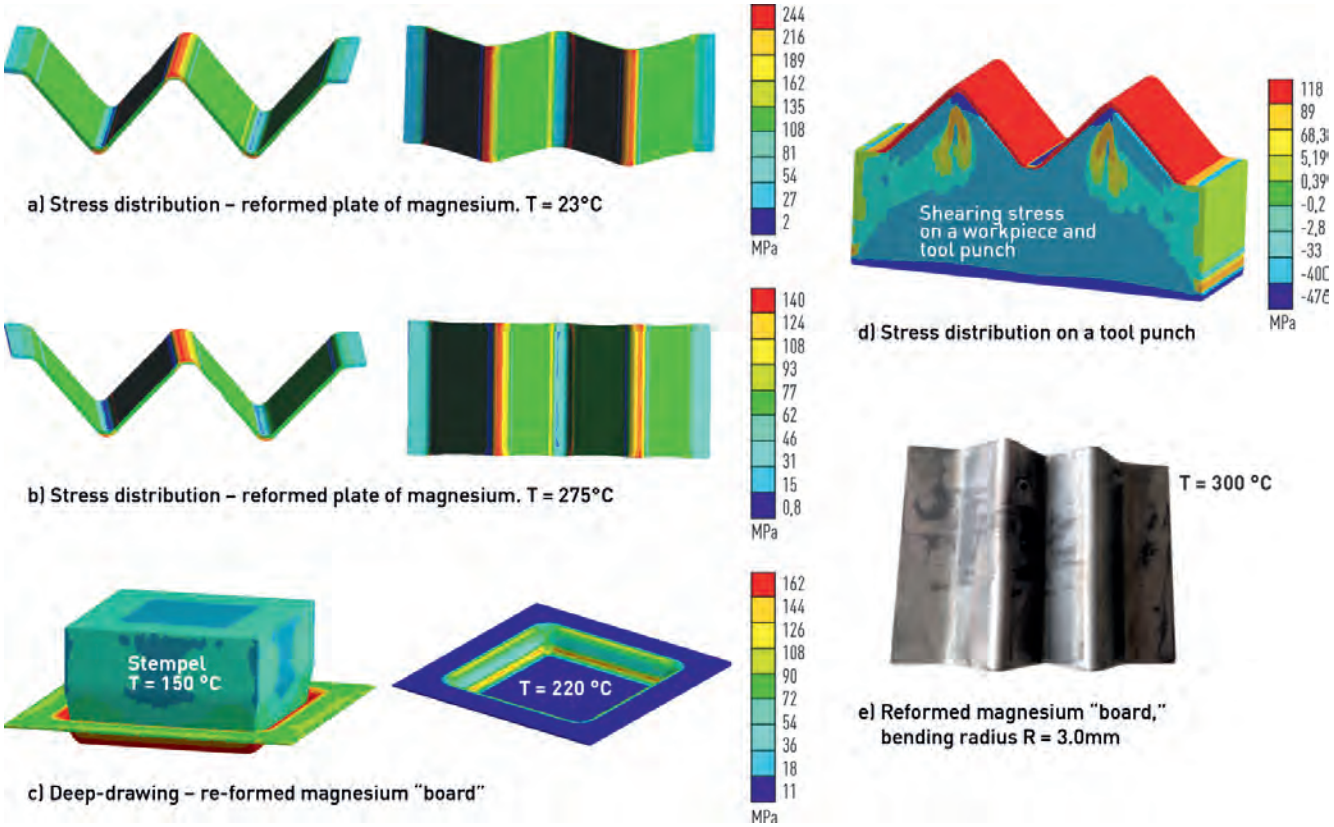

Reforming materials under extreme pressure

Steinbeis experts develop high-performance reforming process

Weight reduction is a key challenge in the metal processing industry, since it is central to reducing energy consumption. As a result of light construction requirements and the drive to minimize energy consumption – especially in the automotive industry – experts are constantly examining the properties and processing techniques of light construction materials. In recent years, magnesium-based materials and magnesium alloys have become particularly interesting as important construction materials. The reason magnesium has become such a popular material for reducing weight: its specific properties. It has a low density, offers excellent thermal conductivity and it is strong. What is needed however, is the innovative manufacturing technology to produce the specific magnesium components that are required – without cracks, and in the right quality for industrial applications. This is where Steinbeis research comes in, currently being carried out in Dresden by the Innovation Center for Intelligent Functional Materials, Welding and Joining Techniques, Implementation.

For the research project, the Steinbeis experts have established a technological procedure for developing a high-performance thermo gas-kinetic reforming process. The aim of the process is to produce magnesium component structures with high reformation levels (formability).

To simulate certain parts of the thermo gas-kinetic process when heating, bending or deep-drawing the high-strength, high-ductility magnesium alloy called AZ31, the Steinbeis experts first created a viscoelastic FE model. This model was used to examine and analyze the influence of integrated sub-processes on the reforming process – from the preheating process (23-350°C) to the use of process-inert gases, the use of lubricants on magnesium sheets of different thicknesses, and tool design (radii). Finally, the project team investigated plastic deformations as well as principal, secondary and comparative stress according to predefined process parameters. Based on their investigations, it was possible to optimize the reforming process. In addition, the experts at the Dresden-based Innovation Center conducted experiments on the influence of the new process parameters on the reforming process. These were pertinent to the heating of metal sheets and tools, the use of an inert gas (Argon), the application of conventional lubricants (Beruforge 120D, Berulit 935 and 393G) and the nano-graphite traction protection that is dispersed when adjusting tool radii and magnesium sheet thicknesses.

The identified process window could be used to produce crack-free, faultless magnesium component structures according to defined forming contours with high levels of formability. The results of thermo-bending based on the newly integrated process parameters will now be transferred to simulations and experimentation with the deep-drawing process used to produce finished magnesium parts, possibly with adaptations

Figure: Example of simulation findings with the thermo-bending and deep-drawing of a magnesium sheet (plate) under varying process parameters

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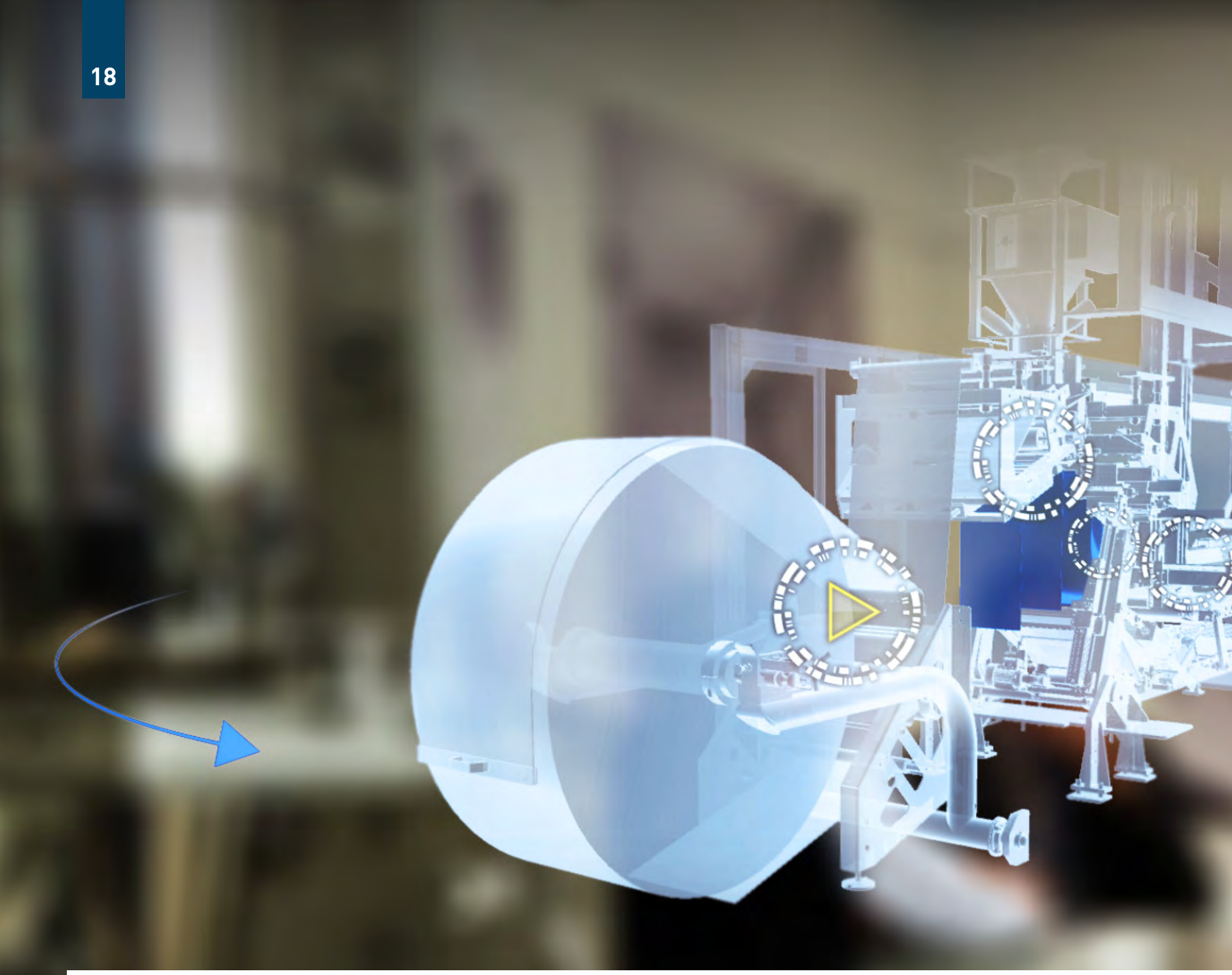


Showcasing products and arousing emotion with holography

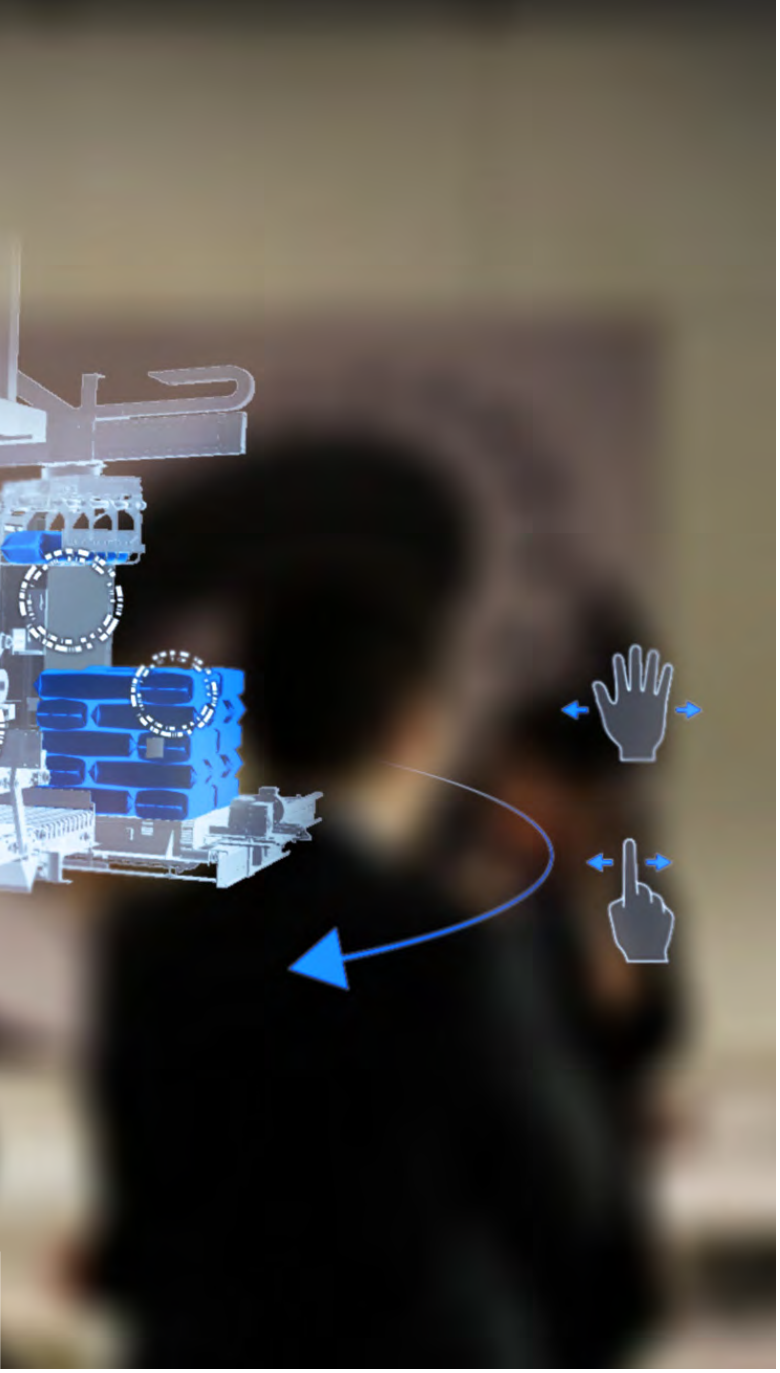
Steinbeis researchers develop an interactive exhibition tool: Holographic Interface

For decades, digital media were defined by user interfaces that were predominantly dictated by the concept of transferring content metaphorically from an analog world. For a long time, operating principles were constrained by the nature of established input devices. Now, technical evolution makes it possible to present increasingly complex content with increasingly shorter half-lives. This is a new challenge in terms of the way we process graphical content and display intuitive interaction scenarios. To present content that is apparently difficult to access or is purely factual ¬– and maintain interest and the value to observers over time, as they view and work with the content – they have to be pulled in on an emotional level. The Steinbeis Research Center for Design und Systems, which works in the field of applied interdisciplinary research with a focus on digital information media, has developed an interactive exhibit for Coperion GmbH.

The design brief entailed coherently combining graphical elements with an operating logic that matched the medium. Information would only be absorbed in the long term if people enjoyed using the system and were intrigued. The Steinbeis experts developed an exhibition concept for Coperion that engaged the observer with a 3D hologram. A real-time 3D simulation now shows all processes used within a fully integrated packaging system used for granular bulk materials. The hologram can be rotated freely in space and, in some areas, cross-sections can be shown to make otherwise invisible processes and functions instantly visible. By activating certain hotspots, additional media such as animations or 2D films can be called up and viewed "mid-air."

Users interact with the system through contactless "micro-gestures" of the hand, the syntax of which is based on analog metaphors. So swiping or pointing generates a response in the digital space that would also be expected in the real world. The system works with a Leap Motion sensor, which uses an integrated infrared camera to detect the tiniest movements of the fingers or hand and translates these into digital movements. An interface of this kind was considered the most intuitive control for presenting 3D digital information since it captures movements in space.

The animated components can be viewed from all sides as they hover like ghosts in space. This holographic effect actually goes back many



Steinbeis Research Center Design and Systems

Services

- Applied, interdisciplinary research and development in the field of digital information and communication media
- Development and design of new types of information and communication tools (knowledge tools)
- Development of groundbreaking interaction scenarios and the implementation of specific interfaces
- Planning, development and implementation of sustainable exhibition-concepts and holistic installations
- Prototype development
- Strategic consulting

Key Areas

- Sharing of complex knowledge with digital media
- Research of new knowledge technologies and future concepts for digital communication
- Analysis of problems encountered in networked industry, society and cultures
- Implementation of digital, experimental concepts aimed at optimizing the activities of industry and science
- Expansion of the application areas of digital tools and adaptation to specific application scenarios
- Development of new application areas with digital communication
- Prototyping and realization of projects in the areas of: Information Design, Augmented and Virtual Reality, Interface Design, Real-Time Visualization, Data-Visualization, Mobile Computing, Computational Design, Real-Time 3D Applications and Renderings, Physical Computing, New Technology, Development of Interfaces

years to an illusion that was made popular by John Henry Pepper in the mid-18th century: Pepper's Ghost. Transferred to an interactive digital medium, the concept makes it possible to present products in an intriguing way and make content more fun. The device was first presented at the Interpack 2014 trade show.

The development of new instruments for communicating content is a key area of focus for the Steinbeis Research Center for Design and specific interfaces makes it possible to demonstrate complex processes in a way that can be understood. The resulting "knowledge tools" can be adapted to the specific information and communication aims, and hidden processes can be unveiled. When acquiring information, intuitive controls are just as important as the emotional experience.

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Consulting companies competently

New certification courses start summer 2014

Steinbeis University Berlin (SHB) and the Steinbeis consulting division are starting an innovative university-level certification training program this summer. Based on international standards, it is targeted at corporate consulting divisions and the first certification training will focus on teaching both general and specific consulting methods.

In keeping with the Steinbeis project skills philosophy, the required methods will be taught through a mixture of classroom-based instruction and case studies, plus a live consulting project or a consulting task.

The courses are targeted at consultants, students and any other people working at companies who place value on continuous professional development, methods skills, networking, and success-oriented projects in a competitive field. The university certificate offers credit points in line with the ECTS scheme, providing a thorough understanding of the classic management and strategy consulting tools that are the hallmark of outstanding consultants.

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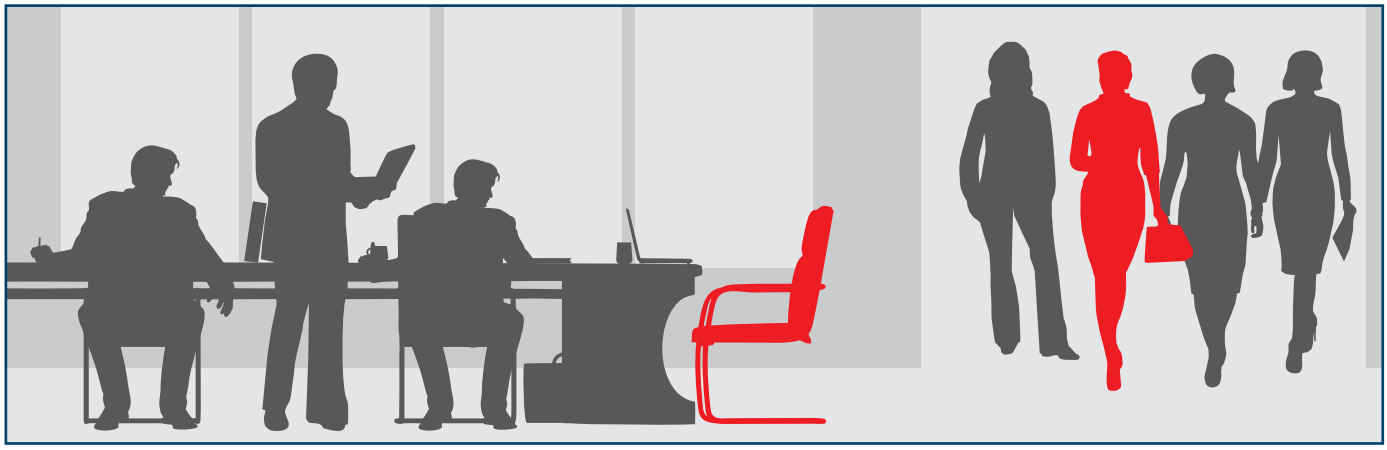
New ways to answer supervisory board requirements

Personal advice for companies and supervisory boards in Baden-Württemberg



There is a sea change underway in the kind of people who sit on company supervisory boards, and the current debate about "women quotas" is only part of the picture. More and more supervisory boards are looking for technical skills and there is increasing demand for greater transparency in how board members are selected. As part of a project initiated and sponsored by the Baden-Württemberg Ministry for Finance and Industry, the Steinbeis Transfer Center Business Development at Pforzheim University has set up a database of women not only with management experience but also an active interest in becoming a supervisory board member.

The database, which is called "Top Women on Committees!" (German: Spitzenfrauen in Gremien!), can be used free of charge by companies in Baden-Württemberg during the selection process of their supervisory board members. For companies, using a database to select exactly the right qualified female managers for their supervisory board is entering new realms. But it is also an opportunity to improve the quality of their boards by introducing people who are in a position to draw on specialist skills and personal experience, and thus contribute to corporate development.

To get the ball rolling, a profile must be set up for the future supervisory board member. This is where the consulting approach adopted by the center's directors – Professor Dr. Elke Theobald and Professor Dr. Barbara Burkhardt-Reich – comes in. Working together with the company, a personal profile is created to match the specific requirements of the company and take into account current and previous members of the supervisory board. A particular aim of the consulting services is to support small and medium-sized companies as they manage this time of transition. This consulting support is also free to all companies and supervisory board chairpersons in Baden-Württemberg.

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The town as a classroom

Raising sustainability awareness among vocational students

Launched in February 2014, an initiative called "Sustainable cooperation – the town as a classroom" is aiming to blaze new trails in education for sustainable development through a partnership between four schools and one non-school partner. The project was initiated by the Steinbeis Innovation Center for Logistics and Sustainability in Sinsheim, Germany, and is funded by the Baden-Württemberg Ministry of Environment, Climate and Energy using lottery revenues. The lead partner of the project is the LUBW State Institute for Environment, Measurements and Nature Conservation Baden-Wuerttemberg.

The term "sustainability" has been subject to a certain amount of inflation. Examined more closely, it becomes apparent that many sustainability activities are limited to a specific project and can therefore only achieve limited results. In the field of training and professional development in particular, it is essential to look beyond initiating and carrying out innovative projects – long-term structures must also be created. In this way, a foundation can be laid for education for sustainable development. The current state of affairs has been discussed at venues such as the United Nations Conference on Sustainable Development in Rio de Janeiro (Rio+20). At that event, held in June 2012, a resolution was formed to foster sustainability education and to more actively integrate sustainable development in educational systems over the coming years, in part through the UN Decade for Education for Sustainable Development. Vocational schools in particular offer numerous contexts and opportunities for integrating sustainable development approaches.

The "Sustainable cooperation – the town as a classroom" initiative has embraced this approach and has even gone a step further. The participating schools will be charged with raising awareness for sustainable practices and anchoring them in the curriculum. Methodologies such as group work and materials such as educational puzzles are used, tailored to the needs of the participating classes. The municipal administration of Sinsheim, a major district town in Germany's Rhine-Neckar metropolitan region, serves as a non-classroom center for learning.

The administration runs a variety of municipal projects and activities which relate directly to sustainability issues. They are included in the initiative as examples of specific focal areas.

In the first step of the interactive process, the students identify how sustainability has been integrated into the planning and implementation of municipal projects up until now, what value is generally placed on a sustainability mindset, and the practices followed by the municipal employees in their daily work. Different practice-based focal areas form the basis for the activities carried out by the vocational school and the municipality. Ongoing dialogue with the employees in the municipal administration creates a network between the participants. In addition, this approach ensures that knowledge is not only transferred from the schools into actual practice, but that direct feedback also flows in the other direction at the same time. Both the students and the professionals benefit.

Image: (from left to right) Sandra Aisenpreis, Sabine Rotermund, Mayor Jörg Albrecht (all from the Sinsheim municipal administration), Jens-Jochen Roth (Steinbeis Innovation Center for Logistics and Sustainability in Sinsheim), Karl-Heinz Schneckenberger (Max Weber Vocational School, Sinsheim)

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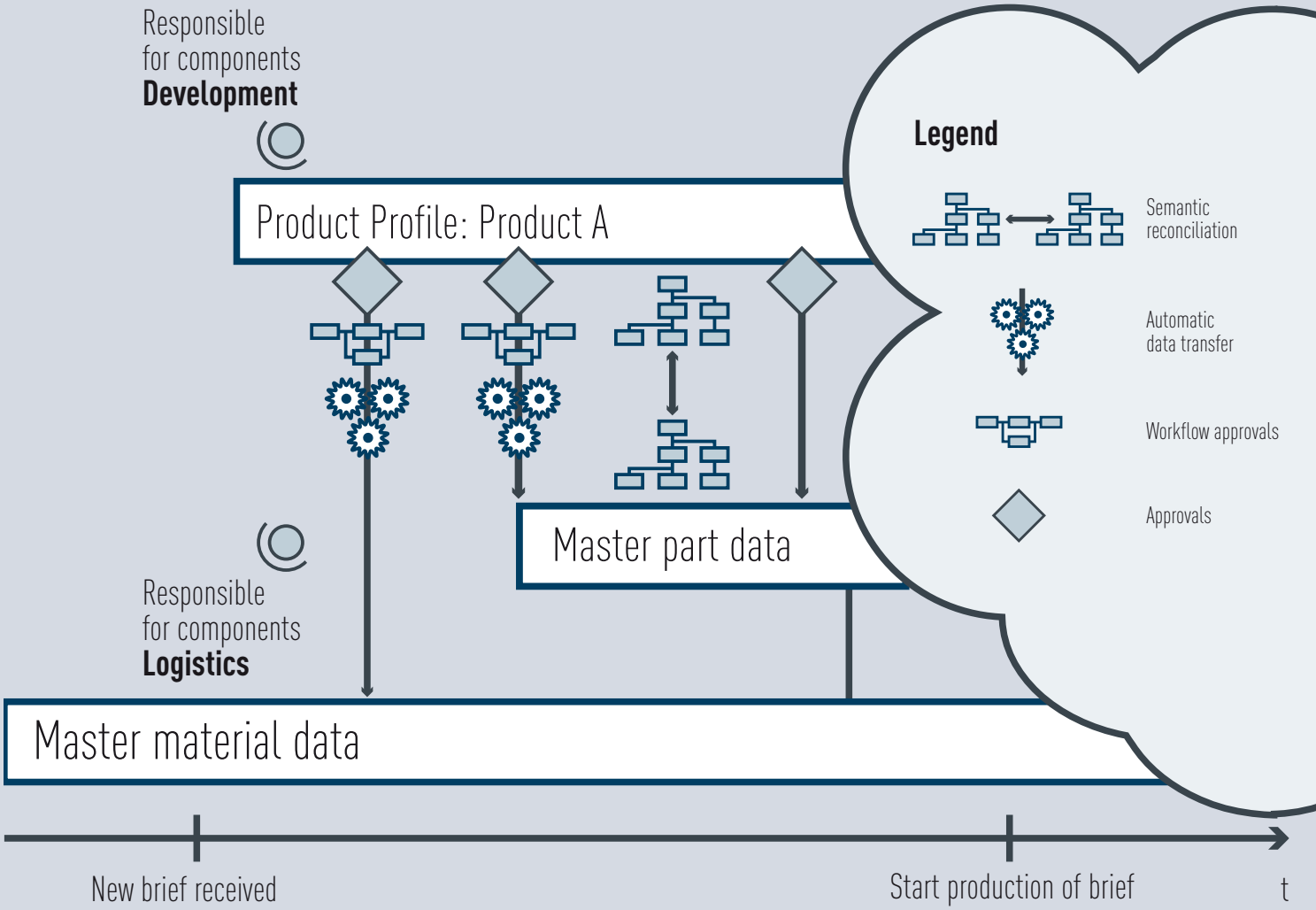

Figure: The ideal product development process

Ready for PLM?

Steinbeis helps companies maintain consistency in their engineering processes

Product development is a complex process. And it's getting even more complex as people introduce issues like smart products and Industry 4.0. But does intensifying complexity automatically mean the product development process will become more expensive? Certainly not. Instead, according to the experts at the Steinbeis Transfer Center for Computer Applications in Engineering based in Karlsruhe, it is becoming more urgent than ever to optimize the product development process (PDP).

Thanks to simultaneous engineering, lots of development work is virtual these days. It involves many people in different departments working simultaneously on one and the same product. This makes it necessary to synchronize countless items of information, spanning different methods and departments. If managers overlook the impact a change could have on all systems involved in a process, the follow-on costs and outlays caused by corrective measures soon shoot up. Steinbeis experts can point to an actual example of this which involved an automotive supplier. The firm made a change to the design of its construction method – as requested by the customer – but it didn't change the methods being used in quality assurance (QA). Good parts were then categorized as rejects and destroyed because the documents used in QA were out of date. The damage to the company was a 7-figure number. It's rare for such examples to be documented and often they are swept under the rug. Sometimes even senior managers in the same company don't even get to hear about them.

Until now, the usual way to deal with such problems has been to revert to good engineering logic – typically by introducing a system such as product lifecycle management (PLM). Realigning the PDP instead, along the lines of a more rationalized organization, is usually not on the agenda. Existing processes are simply not challenged. It is expected that by introducing new software, existing processes will sort themselves out. But in the same way that a person's inability to organize themselves won't be solved by buying a new closet, good software is no substitute for shortfalls in semantic, structural and organizational concepts. It's crucial to organize the PDP properly when a PLM system is introduced. And it's important to see this as a genuine opportunity to actively rationalize organizational procedures and to leverage this carefully as part of a continuous improvement process.

Working in collaboration with the Steinbeis Transfer Center for Computer Applications in Engineering, Siemens Industrial Software has developed a consulting technique called Do(PLM)Con to help rationalize organi-

zational procedures used in product development. One of the underlying considerations during the development of this technique was to apply tried and tested principles of lean management to the design of product development processes. It is based on the logic of continuous improvement, in which the current status of product development is made transparent to everyone involved in the process by analyzing information flows. Once that has been achieved, Do(PLM)Con design guidelines can be used to start developing a more suitable target scenario. This scenario consists of a structural or semantic concept that goes hand in hand with an organizational concept. The third step is to develop a PLM technology concept. This establishes an engineering foundation for achieving the target scenario which can then be introduced.

Comparable techniques often fall foul of the complexity of the PDP. Until now it was seldom possible to map the actual situation and target scenario in such a way that everyone in the process actually understood them. So with the Do(PLM)Con model, lifecycle mapping was developed as a tool which is roughly comparable to value stream analysis in production management. This makes it possible to draw a map of the product development process – without complicated IT terminology – in a way which is easy for others to understand. Using the Do(PLM)Con technique is particularly useful when picking or working on the introduction of a PLM system. But even when it's not used in connection with a PLM introduction, it brings major benefits. This is because rationalizing organizational procedures in the PDP is often possible in existing system environments. On a project of average complexity, between 10 and 15 consulting days can be expected.

The Steinbeis experts introduced the Do(PLM)Con technique at a company involved in the contract manufacture of tool machines. An analysis of PLM information flows highlighted a string of weaknesses in the company's PDP. For example, the company was not coordinating the methods used for products or its stock keeping processes. It was often ordering the wrong parts, resulting in excessive costs. Another problem was that it was taking a long time to deliver projects that involved intensive development of new products. The competitors were often quicker to deliver and key contracts were frequently being lost. To get to the root of the problem, Steinbeis analyzed the information flow of product data using Lifecycle Mapping. When a new order came in, the product manager drafted a first profile for the new product using a TDM system and forwarded corresponding briefs to the design engineers. As product development got underway, the engineers spoke with, met with or called logistics on an ad hoc basis to discuss materials for adapted or new parts. Before completion of the design stage, the product manager drafted – by hand – a master list for parts in the ERP system, which had been pulled manually from a product profile in the TDM system. The PDP analysis showed that this back and forth was a key cause of the problem. The link between the material master data and the actual product design had developed organically. Everyone coordinated information between each system however they wanted. There were no consistent data semantics and no organizational guidelines to coordinate the master part data or the master material data with product profile data. Links within the different IT systems were managed manually. Changes in each method were therefore often not even communicated, or only communicated badly.

How to check product development in your company:

- Have there been projects where people had to discuss and design how to manage product information during the product life cycle?
- Can people involved in the PDP name the value and purpose of calculation models they set up?
- Do people know how much detail is needed in these models?
- Do people know which IT models are needed and when?
- Are original and target scenarios known for each model?
- Can information be generated in such a way that it is available exactly when it is needed?
- Cankey players describe how the information flows between models as the PDP progresses

The Steinbeis experts first solved semantic issues and then turned to organizational problems. Following an initial analysis, they concluded that it would be possible to allocate parts according to product profiles, master material data and master part data. To do this, the advanced, functional structure of the semantics of the product profiles was transferred to the more logistics-based semantics of the master part data. This entailed changing the scope of module profiles to ensure they would always be captured securely and clearly in the master material data in the ERP system. To make sure things were 100% clear, all relevant allocation options were worked out between different methods and each was solved individually. This made it possible to manage master material data and master part data via the product profile. This product profile was defined as the primary source of information. Now materials could be worked out at any time by looking at the product profile.

The next step was to redesign how the PDP was organized. When a product profile is set up, the product manager defines who is responsible for parts or components to be used in development and logistics. These people communicate amongst themselves according to defined approval processes initiated by the design engineers. Once parts have been approved, data is transferred between the systems. To provide technical support, a PLM system was introduced to replace the TDM system. This contains all product profiles. It was then possible to automate key parts of the previously defined process. The PLM and ERP systems were then linked up via a special interface to allow for the automatic transfer of parts information into the ERP system.

The Do(PLM)Con method and its associated Lifecycle Mapping tool can simplify PDP as an integral part of an organizational rationalization. Given different Industry 4.0 scenarios, these methods are likely to become more and more important. Industry 4.0 techniques will make it much more important to integrate and manage information throughout the entire product life cycle in the future, and with Do(PLM)Con, this information can be planned easily and precisely long before software is introduced.

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Certification courses for compliance officers

School GRC and the BITKOM Academy provide training as "Compliance Officer Mittelstand" for medium-sized enterprises

In collaboration with the BITKOM Academy, the School of Governance, Risk & Compliance (School GRC) at Steinbeis University Berlin is launching a certification training program for compliance officers at medium-sized enterprises. The Compliance Officer Mittelstand (COM) scheme, which starts in September 2014, will provide people responsible for compliance at companies from a variety of industries with an opportunity to receive training in line with the idiosyncrasies of medium-sized enterprise.

The course content and topics covered will reflect the fact that compliance officers at medium-sized firms are typically responsible for a complex number of governance, risk and compliance issues. At the same time, they have to be able to work on a conceptual level. "Compliance officers in the Mittelstand or even family businesses are involved in strategic and legal issues at the same time, overlapping with pricing agreements, fraud and embezzlement, the loss of know-how and data protection. In addition to this, they control computer-based monitoring and control processes, update guidelines and run courses. It's a complex task and one that's impossible to cover properly in a one- or two-day seminar!" explains Birgit Galley, who is the director of School GRC. Galley goes on to explain that to match needs precisely, a certification program has to be fast-track, since managers typically have little time to invest in training.

The certification program consists of a number of modules: Law & Economics, Competencies and Compliance. Course participants come looking for training in areas like the statutory fundamentals of compliance, the key success factors of compliance management and an in-depth look at interviewing, conflict management, or IT compliance. The curriculum spans three months and involves six classroom-based sessions, concentrated e-learning modules, and periods of at-home study. Examination involves passing three tests. On successful completion of the course the participants are awarded a certificate as a "Compliance Officer Mittelstand."

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Certification program to become a License Manager (SHB)

Course focuses on software asset management

Procurement and the license management of software can be a major challenge for people working in purchasing and IT, in both the free economy and public administration. Licensing programs are often complicated, user numbers vary, and people use a system in different locations, making it difficult to ensure nothing slips through the net. The licensing rules laid down by the producers change continuously, as do the needs of the organization. The Steinbeis Transfer Institute ACADEMY of Public Administration and Law has developed a certification program based on business practice in collaboration with the COMPAREX licensing academy. The first course starts in Berlin in October.

The course involves 14 days of teaching over a six-month period, with two or three days of seminars per month. It starts with an introduction to the fundamentals of software asset management, followed by modules on Microsoft licensing laws, license management I and II, an overview of SAM tools, procurement and contract management. Students learn how to systematically identify and gather validations, and how to keep software inventories and manage license balance sheets. Processes in the organization are evaluated with respect to SAM and optimized in line with the DIN/ISO standard 19770-1. The aim is to install sustainable software asset management procedures to manage the in-house software portfolio and keep tabs on costs incurred.

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Certification course as a Competence Project Manager (SHB)

How to successfully manage projects

Project teams are often under time pressure, have limited resources, work across multiple departments, but have no authority to give orders. As a result, they need a basic toolkit of methods, procedures and approaches to systematically manage projects successfully, in keeping with the actual aims. Working in collaboration with stw unisono, the competence institute unisono (kiu) now offers certification as a Competence Project Manager (SHB).

Project management also involves determining organizational requirements and proactively establishing the appropriate framework conditions within a company. Non-material influences are pivotal to projects and often interpersonal skills are the key to success.

Training lasts 12 days spanning 150 teaching units. This lays the foundations for successful work as a project manager. Course participants receive training in three modules, learning how to embark on projects and understand the roles and responsibilities of project organization, despite the conflicting interests encountered in companies. They learn about the necessary prerequisites, instruments, tools and methods to manage and complete projects effectively and efficiently.

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Entering Asian markets in real time

Seminar for evaluating market potential in Asian countries

The population of Vietnam is 90 million and the country has risen to become the second biggest market in Asia – outstripped only by China (CBRE Study, 2014). German products are held in high esteem, but for German companies, the markets of Vietnam are still undeveloped and untapped in many areas. For many medium-sized enterprises, entering the market with its 90 million inhabitants is a major challenge and they find themselves confronted by a market lacking in transparency, with insufficient development carried out by unprofessional sales partners. One new option for assessing a company's chances is offered by a real-time seminar called Growth Manager ASEAN. The course is run by the Steinbeis Transfer Institute MiWIN (Management Institute for Education, Innovation and Sustainability).

The seminar addresses three fundamental questions regarding market entry. (1) What is the potential for my company in the new market? (2) What will it cost to leverage this potential? (3) What is the best way for my company to enter the market? The focal topic of the seminar is how to solve specific issues faced by the company during the actual seminar. The integrated approach adopted by the course participants allows them to derive immediate value for the company and to develop skills needed in the long term. It also enables people to solve similar problems independently in the future.

Course participants systematically evaluate the market potential for their companies in an ASEAN country and create an individual road map for market entry. In the first module, the key success factors of internationalization are determined, complete with a brief for an agency to carry out a market study. Based on this brief, in the second module, an individual study is carried out for each company in the field. In the final and third module, each course participant uses this market data to draft a roadmap for decision-making. This also covers specific steps needed to enter the Vietnamese market. The program starts in September.

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Developing leadership qualities

Leadership training in management

Quick and confident decision-making under time pressure in an environment dictated by uncertainty. Communication with team members so that decisions can be implemented properly. Successful crisis management. Mistake avoidance. These are the kinds of skills that will be covered by a new leadership course offered by the Steinbeis Transfer Center for Management Innovation. Scheduled to run in November 2014 and April 2015, these courses will be held in the German city of Essen. The training is targeted at entrepreneurs, business leaders and managers who would like to hone their leadership skills.

The two instructors – Prof. Dr. Waldemar Pelz and flight captain Farid Merdaci – also teach techniques specifically developed for aviation relating to leadership, decision-making, stress and communication. The training, which also takes place in a flight simulator, provides direct feedback on how participants managed situations and what they could improve. To ensure training targets are met, a comprehensive diagnosis is offered hand-in-hand with systematic training which becomes more difficult at each stage. The two-day course finishes by transferring lessons learned back into everyday practice. The maximum number of course participants is eight.

Farid Merdaci is a flight captain for a large German airline and has frontline business experience as an engineering graduate at a construction company. He was also a long-standing member and spokesman of a bargaining committee and member of a supervisory board at an airline company. Dr. Waldemar Pelz is a professor of international management and marketing at the Mittelhessen University of Applied Sciences. He is also director of the Steinbeis Transfer Center for Management Innovation in Bad Soden near Frankfurt. He has over 15 years' experience in a variety of roles within industry.

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Spreading innovation with green packaging

Steinbeis is coordinating the EU's Danube PIE project

Improving product design can let companies reduce negative environmental impacts throughout the product life cycle. Ecodesign takes an integrated view of products and processes at all stages of the cycle. It aims to find solutions that not only shrink the environmental footprint of products, but also lower their production costs. The Steinbeis-Europa-Zentrum is helping small and medium-sized enterprises (SMEs) which manufacture packaging to optimize their products by applying ecodesign principles. The target group, SMEs in Europe's Danube region, is provided with consulting and training to boost their competitiveness.

Ecodesign represents an opportunity to make products more efficient and innovative from the earliest phase – concept development. SMEs in particular can benefit from direct communication and cooperation with product and industry designers as well as technical experts in the fields of ecodesign and resource efficiency. At the Steinbeis-Europa-Zentrum, EU funding is making it possible to offer individual, tailored services and product analyses which apply the ecodesign approach. These are provided to the companies free of charge.

The program allows SMEs from Germany, Bulgaria, Croatia, Romania, Serbia and Hungary to participate in company visits and training sessions, which are funded by the EU's Danube PIE project and conducted in cooperation with project partners. The information and skills are transferred during company visits, in-house classes and workshops on ecodesign and resource efficiency, as well as in roundtable discussions with experts.

Target groups include: (1) SMEs and SME associations that either make, supply, sell or process packaging materials, or manufacture or develop packaging machines. They should have in interest in innovative packaging concepts or produce innovative technologies and materials. Large businesses in every sector that contract with such SMEs are included in this first target group. (2) Environmental consulting firms that can benefit from the training. (3) The nearly 600 partners in the Enterprise Europe Network. The consultants in the world's largest technology transfer network have an opportunity to add ecodesign to their skill sets with the aim of applying it to their work.

The project's first-year numbers demonstrate the widespread interest in the topic. To date, more than 1,100 companies have benefited from the initial information on ecodesign, while consultants have visited and advised 240 companies in Baden-Württemberg and the Danube region.

138 companies participated in in-house classes. Twenty-four consultants from the Enterprise Europe Network attended an intensive training course lasting several days, and are now positioned to transfer their expertise to companies across Europe. These activities will continue to run until 2015.

To analyze products, the consultants make use of an IT tool developed by the Vienna-based company Ecodesign, also a Danube PIE project partner. It allows them to calculate the product carbon footprint (PCF) – the amount of carbon emissions which are directly or indirectly produced or generated over the product life cycle.

Global Flow GmbH, from Reutlingen in Germany, is just one company that has benefited from such a product analysis. An engineering service provider in the field of waste management and recycling, the small firm specializes in helping companies optimize their disposal structures and cut waste. Global Flow consultants attended one of the Danube PIE training session – a course on ecodesign and resource efficiency – and familiarized themselves with the PCF calculation tool. The company's management is currently testing the computer-aided instrument, which is a perfect match for its portfolio. One key advantage with the Ecodesign tool is that it makes it easy to understand the principle of ecodesign and the inherently complicated life cycle analysis. The results of the analysis are presented clearly in a PDF file, including the calculated PCF and a bar chart showing carbon equivalents per kilogram at each phase of the product's life cycle. The tool also offers the option of comparing the analyzed product with similar items and charting a comparison of emissions. In this way, SMEs can measure the environmental impacts of established, innovative products and have data at their fingertips to publicize as needed.

Above all, companies profit from ecodesign when they can market their activities and commitment to environmental protection. They also benefit from being able to calculate environmental impacts and can compare PCFs when they are planning product optimizations (e. g. new materials, changes in production methods, various disposal methods) or developing new products. The consultants at Global Flow have used the analysis tool to grow their expertise, and are now in a position to transfer the ecodesign principle to SMEs.

Image: © pixelio.de/Peter Smola

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Successful knowledge and technology transfer

Steinbeis financial results 2013

A problem solver for business; a competent service provider focusing on consulting and R&D in addition to training and employee development across all areas of technology and management – these were the strategic objectives outlined not only for the previous financial year but for 2014 as well, as summed up by Steinbeis Foundation board members Prof. Dr. Michael Auer and Manfred Mattulat at the board of trustees meeting held this spring. At the meeting, they presented the 2013 financial results, which showed that the Steinbeis Network is achieving these goals.

Dr.-Ing. Leonhard Vilser, chairman of the board of trustees, thanked all employees in the Steinbeis Network on behalf of the whole committee for their commitment over the past year. The numbers speak to the success of the network: Customer transfer projects run by Steinbeis Enterprises achieved a total turnover of 145 million euros in 2013. Some 6,000 dedicated employees made this outstanding result possible. 1,708 employees, 730 professors and 3,544 independent contractors were involved in Steinbeis projects in 2013.

Today the Steinbeis Network spans more than 1,000 enterprises, managed by experts at scientific institutions or not belonging to an organization. It also includes companies operating under franchising arrangements and minority shareholdings. In 2013, 105 new enterprises joined the network.

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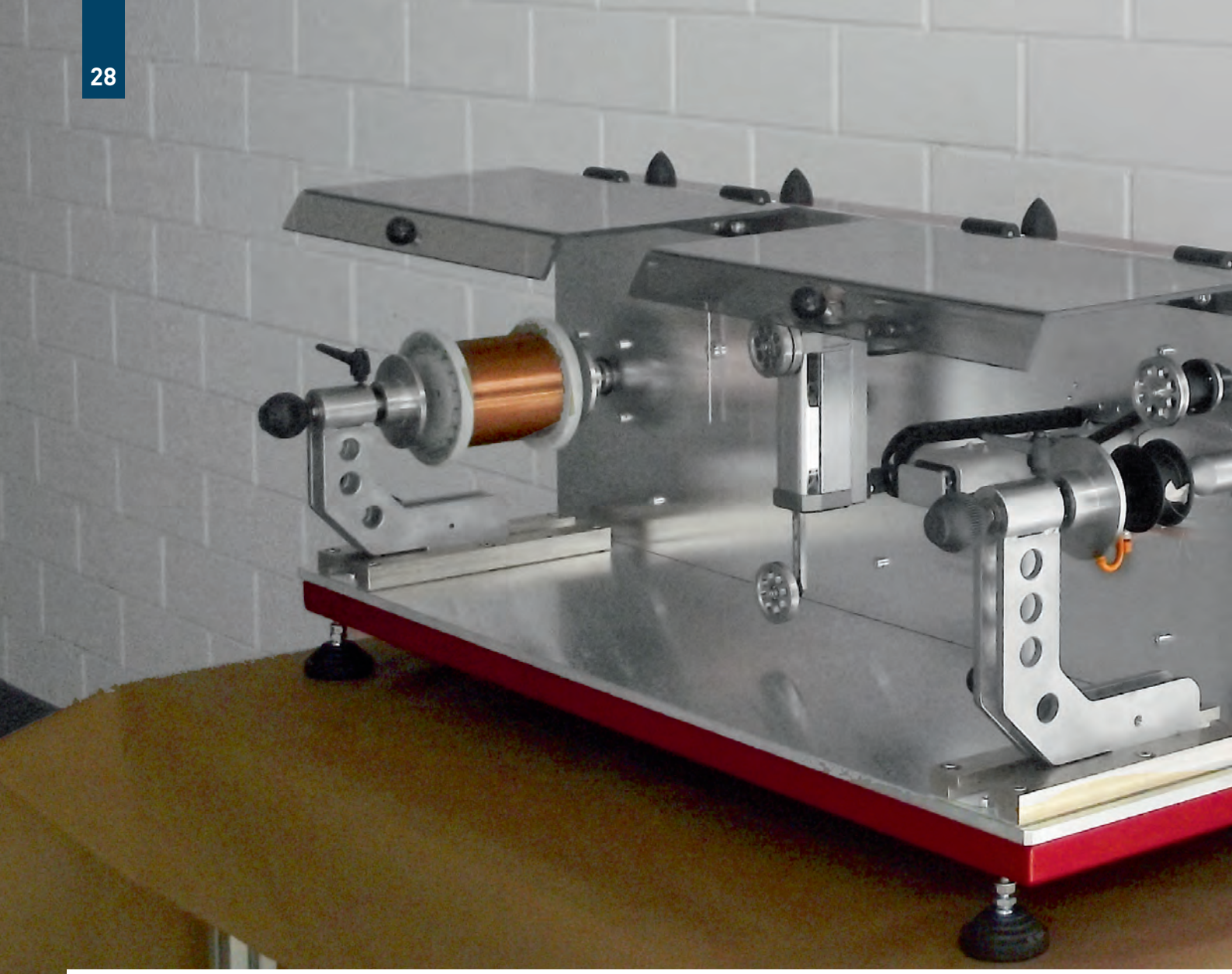

The perfect wind up

Steinbeis Center develops winding unit for fragile materials

The Chemnitz-based Steinbeis Transfer Center for Drive and Handling Technology has developed a special winding unit for resistance wire. This type of wire has special properties which shouldn't be affected when it is wound onto customer-specific spools. The new winding unit can be used in the lab as well as in production and can be modified for a variety of applications.

The materials used in resistance wire can vary greatly and demand particularly careful handling. The newly developed winding unit can accommodate resistance wires with diameters ranging from 0.02mm to 1mm, and these can be transferred from a source spool to various processing spools again and again. The wire can be exposed to tensile forces ranging from 20mN to 5,000mN (2g to 500g), and values can be selected and kept constant as desired throughout the complete re-spooling process.

The wire is guided from the source spool to the desired target spool using a force sensor and guidance pole. The source spool is mounted on a motor driven axle. During the re-spooling process, it is readjusted within milliseconds based on the specified tension generated by the electromagnetic dancer on the force sensor.

During this process, the force sensor generates the force specified by the control unit and keeps it constant within its work range, regardless of its displacement. If the dancer arm comes close to a defined limit, the speed of the source spool is adjusted automatically. By combining the synchronized drive shaft with a sensor, the wire can be spooled very gently in a process that isn't affected by external forces – even when very fine wires are run onto a spool. Using the linear wire guide traverse, radial and cross-winding can be achieved on the target spool. The required pitch is calculated automatically depending on the diameter of the wire being wound.

A laser sensor installed with the wire guide traverse ensures that the target spool edge is measured completely automatically. Readings are then saved in the control unit as limit values for the wire guide traverse. The advantages of this approach are twofold: (1) the point at which the wire guide traverse reverses its direction can be influenced directly by manual adjustment and (2) the direction of cable feeding onto the spool can change very quickly once the spool reaches the limit. The length of wire to be re-spooled and the number of windings, as well as the

tension and wire diameter can all be set via a control panel, and these parameters are displayed during automatic winding.

Stepper motors running in closed-loop mode are used to drive the application. The drives are controlled by a microprocessor based controller developed by the Steinbeis Transfer Center for Drive and Handling Technology in Chemnitz. This controller allows to run brushed DC motors, stepper motors and servo motors with a maximum output of 2.5kW.

Fig: Re-spooling unit

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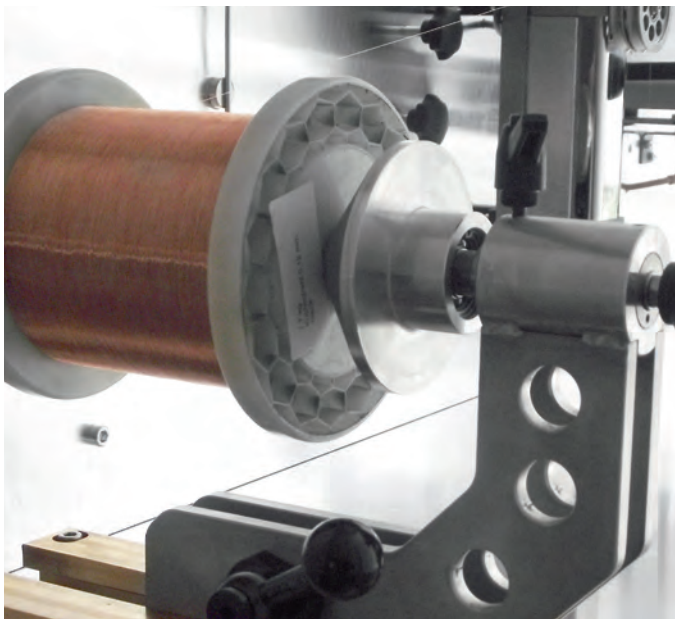
Steinbeis Transfer Center for Drive and Handling Technology

Portfolio of services
- Consulting
- Applied research and development
- Expert reports

Key areas
- Industry consulting
- Training/continued professional development, particularly for pneumatic drives and computer controls including CAD project planning and design (ME 10, PROENGINEER, Auto CAD, PATRAN, Catia)
- Development of innovative production techniques for work piece handling
- Project planning for drives and controls
- Development and design of assemblies and machine systems, including lab samples for all areas of general mechanical engineering
- Development of new operating principles and processes
- Ongoing patent research, studies and drafting of patent documentation
- Processing of renewable resources
- Use of composite materials in mechanical engineering
- Use of thermography technology

Winner of the Steinbeis Foundation Transfer Award – 2010 Löhn Award:
Innovative Bending Machine for Induction Conductors Used in Large-scale Generators, Siemens Generator Plant, Erfurt; Steinbeis Transfer Center for Drive and Handling Technology in Mechanical Engineering, Chemnitz

Special Award Winner, Steinbeis Foundation Transfer Award – 2012 Löhn Award:
Prof. Dr.-Ing. habil. Eberhard Köhler



Help getting more mobile

Steinbeis study on the effectiveness of orthopedic devices

In 2012, German health insurance companies paid out almost seven billion euros for medical equipment. A significant proportion of that money went into orthopedic devices. To ensure products listed in medical catalogs provide tangible benefit, manufacturers have to provide evidence that they are safe and effective. The Steinbeis Transfer Center for Biomechanics, Training and Sports Technology (BTS) conducted a study to examine the properties of three different foot and lower thigh support solutions for treating patients following Achilles tendon injuries and operations.

To stabilize the feet of patients with Achilles tendon problems, there are industrially manufactured tall boots with specially incorporated removable and adjustable reinforcement parts to support the heel. I n the front section there is a strong but pliable tongue. Sometimes plaster casts or removable plaster replacement devices are used. For ligament and tendon injuries without injuries to bones, treatment is increasingly offered to provide extra functional stability. This is to prevent the negative consequences of complete immobilization (such as muscular dystrophy).

As part of a study conducted by the Steinbeis transfer center, healthy volunteers were invited to a biomechanical test lab and asked to wear a variety of medical devices and walk with them on a treadmill for 15 minutes. Mechanical stability was measured directly on the lower leg while walking. Muscle activity was also measured by placing an electromyography device on the skin and with each step taken, the distribution of pressure was measured under the shoe. Miniature acceleration sensors were also used to measure oscillations at the Achilles tendon. It was discovered that the stabilization effect of all three devices was similar but while walking there were differences in muscle stimulation during the upright leg phase. By conducting complex biomechanical evaluations, it may be possible to gain new insights into the functional properties of orthopedic medical devices.

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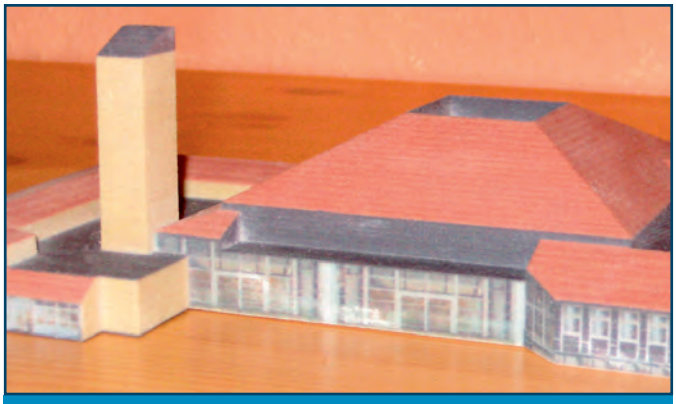
Making models of buildings using digital 3D printers

Steinbeis experts experiment with printing processes

To exhibit local construction projects and show decision-makers and people from the community what something will look like, 3D models are often used. In the past, these models had to be designed by hand and pieced together from small parts. Thanks to lightning-fast developments in 3D printing technology, the traditional separation between models in digital and physical formats has now been eroded. Modern 3D printers can automatically produce cheap 3D models as required based on digital designs. Experts at the Steinbeis Transfer Center for Technology Consultancy at the HFT Stuttgart are currently carrying out experiments with 3D printing processes and testing different techniques.

The center has already been using 3D printers on architecture projects since 2010 in order to produce physical models based on digital 3D models. The starting point of the process is a digital 3D model of the building in a format called CityGML. After quality checks are carried out, the model is converted into a format that can be processed by a 3D printer, which produces the model layer by layer. To do this, a 3D printer called ZPrinter 450 is used. The printer can produce detailed 3D models in color by using a roll to add thin layers of powder only about 0.1mm thick. A liquid bonding agent is then added, carefully retracing the model outline so that each powder layer hardens into place where the model needs to be. This is repeated layer by layer until the entire printed model is ready. The vertical height of the model is dictated by the dimensions of the 3D printer. If larger models are needed, models have to be divided into sections and each piece can then be connected after printing. Examples of the Steinbeis experts' work include a model of the convention center on the island of Lindau. 3D printers offer a number of interesting possibilities, especially in combination with photogrammetric data-gathering techniques. There are already Web-based services that can be used to reconstruct printable 3D models from photos. It is thus possible for private individuals to quickly create and print 3D models.



3D print of the convention center on the island of Lindau

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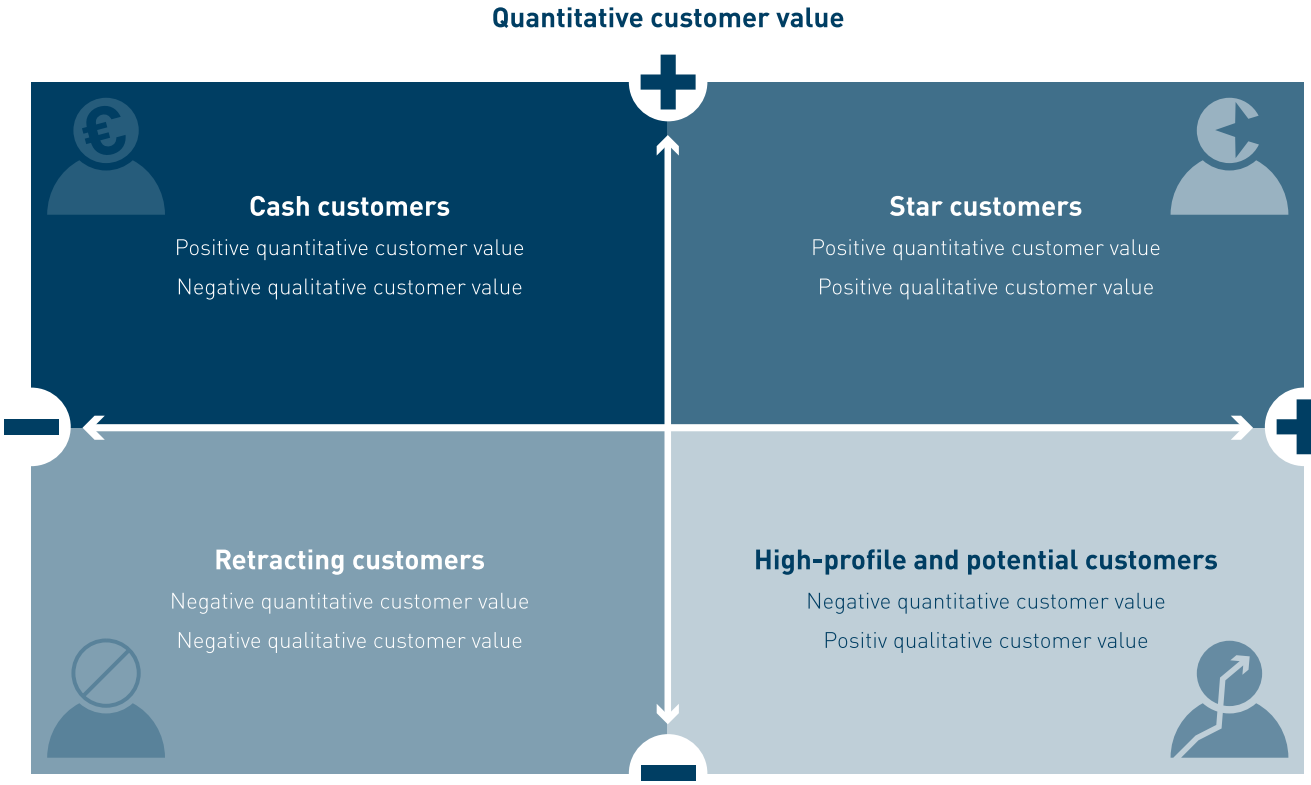

The planning, implementation and strategic implication of a customer success evaluation tool

Steinbeis student examines the contribution made by customers to company success

Which customers contribute to the success of a company and how much? According to a study carried out by EBS (European Business School), many board members, senior managers and entrepreneurs simply don't know. There are few analytical tools and control instruments to do justice to the growing importance of customer relationships. As a result, as part of his master's thesis in financial control and consulting at the School of Management and Technology, Michael Ritzmann decided to look at the contribution made by customers to the success of the company sponsoring his degree, an electronics firm called SÜTRON.

SÜTRON electronic GmbH develops, manufactures and markets customized solutions in the field of machine operation and observation – HMI solutions used in the automation of machinery and mechanical equipment. Given the company's focus on customer understanding in sales and the heterogeneous structure of its client base, it is particularly important for the company to work out the different ways its customers affect its success, since this dictates how customer relationships should be managed. Michael Ritzmann developed a tool that is based closely on business theory and can help senior managers at SÜTRON to understand the contribution made by its customers to success, analyze this in detail, and thus work out control mechanisms.

To determine customer value, an integrated model was designed that revolves around the requirements of SÜTRON. Particular emphasis was placed on working out customer value in quantitative terms. Drawing on a comprehensive battery of assessments of the cost and profit structures of each customer, Michael Ritzmann developed a way for his company to calculate each individual customer's direct profitability. Based on this, he established ways to analyze and depict the customer value structure of the company and adapted this to its individual business environment. Such methods are an important starting point for senior managers at SÜTRON in order to understand the strategic implications of how they manage different customers and customer groups. As part of his study, it became clear how important it is for the company to carry out meaningful assessments of customer successes. To use the instruments in practice, however, reliable data is needed and calculation methods need to be identified that do justice to the likely causes.

The result of Ritzmann's project is a comprehensive, meaningful, standardized, multi-dimensional model for calculating customer success, which largely works automatically. As an instrument of evaluation and control, the customer success evaluation tool helps determine the value of all customers in a detailed and transparent manner. This can then be analyzed for specific use by senior management. Having completed his degree, Ritzmann is now responsible for management accounting at SÜTRON, a job which involves calculating success rates every month, as a key tool for providing information to manage customers as required.

Figure: The customer portfolio of SÜTRON electronic GmbH based on quantitative and qualitative customer value

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Michael Ritzmann
SÜTRON electronic GmbH (Filderstadt)


Figure 1


Figure 3

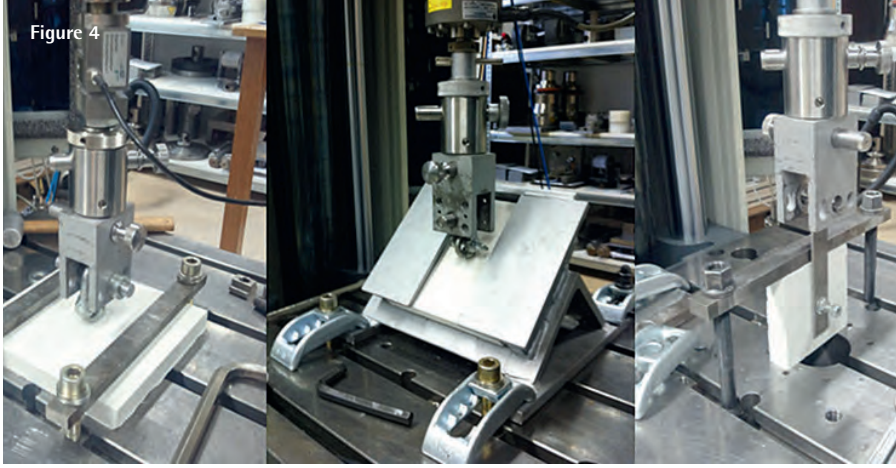
Figure 4

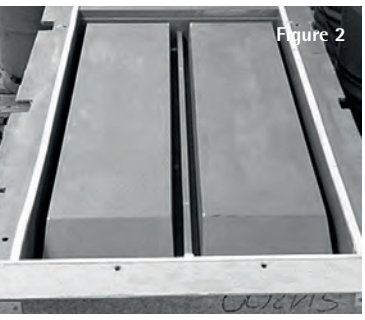
Figure 2


Figure 6a


Figure 6b


Figure 5

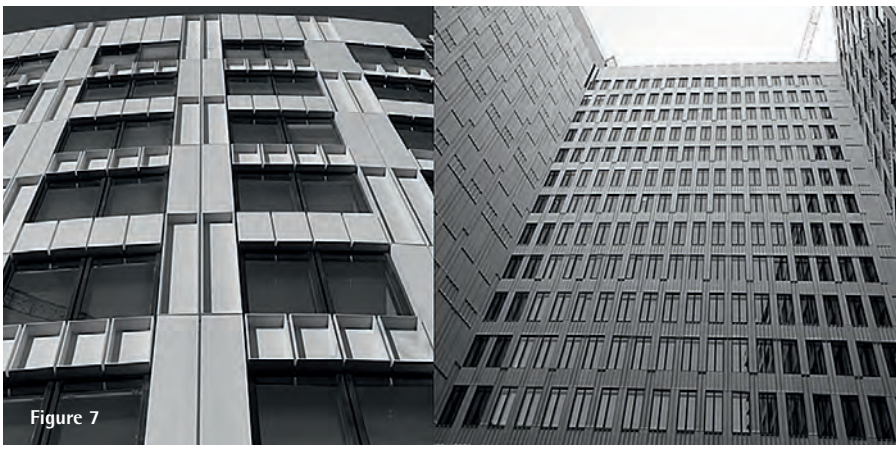
Figure 7

Out of the development department, into the world of business

A free-formed façade made from fiber-reinforced concrete panels on a high-rise building in Frankfurt

Fiber-reinforced concrete architectural panels can be used in a variety of formats in lightweight construction to provide thin walls and answer the most demanding design requirements in terms of finish and surface quality. Indeed such prefabricated parts are practically predestined to add an aesthetic touch to façades. Detailed research has been underway for years, looking into different ways to combine new fiber-based reinforcement materials with conventional concrete construction materials and thus create fiber-reinforced concrete (FRC) and textile-reinforced concrete (TRC). As members of a project consortium, the Chemnitz University of Technology, Hentschke Bau GmbH, Fiber-Tech Products GmbH and the Saxony textile research institute Stfi have recently developed a new textile-reinforced façade system. Reference construction projects will be central to transferring their developments into the world of business. The Chemnitz-based Steinbeis Innovation Center FiberCrete (FC) is providing the companies with scientific and application support.

The Steinbeis experts were called in to work on the renovation of a high-rise building in Frankfurt called the Poseidon House. The building needed a more energy-efficient façade. To redesign the appearance of the 3D façade, the experts replaced aluminum panels with a high-strength, fiber-reinforced architectural concrete with a high-quality appearance. The white façade measures around 13,800 square meters and has around 11,500 surface-mounted panels. The renovation project was planned by the architects Schneider and Schumacher from Frankfurt in collaboration with Josef Gartner GmbH. Arge Hentsche Bau GmbH and Fiber-Tech Products GmbH were commissioned with the production of the façade panels. The Steinbeis Innovation Center FiberCrete looked after scientific aspects including formal applications for planning permission.

The façade panels used for the renovation project are made from fine-grain concrete, which was modified to include alkaline-resistant short glass fibers. This was to reduce sediment forming in the fresh concrete and shrinkage cracks in the hardened concrete. The mixing technique used to produce the modified concrete had a key influence on the homogeneity of the fresh concrete and thus also an impact on the properties of the hardened concrete. The morphological properties of glass fiber can complicate the production of homogenous fresh concrete. To avoid so-called spike irregularities in the mixing process, a high-intensity mixer was used to significantly reduce the cutting force applied to the fresh concrete during mixing. To make it easier to mold each section, the architectural concrete was also made more runny. The visible surfaces of the façade panels, each measuring up to 5 meters in length, are pore-free and contain no color blemishes or marbling. The concrete panels can withstand pressures of over 100 MPa and have a 3-point flexural strength of around 20 MPa. Durability was also confirmed and validated.

Production of the formwork panels was designed around the number of sections needed to make the façade and how long the molds would be needed for. There were 240 different types of sections needed to make the concrete panels in the façade. The molds for façade panels required in higher volumes were produced with glass-fiber reinforced plastic (GRP). An important factor with the design of these molds was the texture of the formwork face, since this had a pivotal influence on the properties of the surface of the architectural concrete. The experts

selected a non-absorbent face based on a kind of gelcoat used in GRP molds.

Because of the special shape of the façade panels and their thickness (only between 13 and 25 millimeters), it was not possible to find a conventional mounting system with appropriate building approval. Instead, new mounts had to be developed. Mounting points were positioned on each façade panel using anchors with internal threads (type M8). These internally threaded anchoring points have a sleeve with a continuous thread, a pressured washer, and a sealing cap to prevent runny concrete entering into the insert during molding. To design the high volume of mounts needed for the façade panels, pull-off testing was carried out on test panels of different sizes in the laboratory. Depending on the length of each panel, four or six mounts were needed. The upper mounts bear the main weight of each panel and also have to withstand the influence of wind. The middle and lower mounts only help counteract wind suction.

The fiber-reinforced concrete developed for the project did not entirely meet DIN standards. The method for mounting the finished concrete panels – with embedded anchoring devices featuring an internal thread – also did not fall under DIN standards. As a result, project partners had to apply for usability permits under building regulations, providing not just individual approval for the fine-grain concrete but also for the mounting system. This was made possible by the close collaboration between Hentschke Bau GmbH, Fiber-Tech Products GmbH and FiberCrete, the Steinbeis Innovation Center in Chemnitz.

This example of research with a direct relevance to business application demonstrated that the fiber-reinforced architectural concrete that was developed combines features of strength, surface quality, durability and recyclability. The increasing use of innovative, fiber-reinforced, inorganic, non-metallic, high-performance materials makes it possible to create thin-walled, single- and double-curve free-formed surfaces for use in construction – with particularly practical benefits to light construction. This paves the way for architects and planners to explore new potential designs, especially on "organically" formed buildings. The light construction materials used in such areas will become increasingly important in the future, not just for design reasons, but also because of the potential to save resources.

Figure 1: to ascertain material strength and 3-point flexural strength
Figure 2: GFP mold (without back section)
Figure 3: The visible part of a molded panel
Figure 4: An experiment to test samples at 0°, 45° and 90°
Figure 5: Façade panels (visible sections; integrated mounts)
Figure 6a: Frame for transportation to the construction site
Figure 6b: Mounted façade panels
Figure 7: Mounted façade panels on the high-rise building

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The 2014 Steinbeis Day

Friday, September 26, 2014
Haus der Wirtschaft (House of Commerce), Stuttgart

10:00 **Official Opening of the 2014 Steinbeis Day**

10:15 **Award ceremony: Prof. Adalbert Seifriz Award 2014**

Start: 11:00 **Steinbeis Marketplace**
Steinbeis Network exhibition

11:15–12:15 **Steinbeis Information**
Internal event for Steinbeis managers

12:00–13:30 **Lunch Break**

Start: 12:00 **Steinbeisers' Corner**
Short lectures by Steinbeis Enterprises

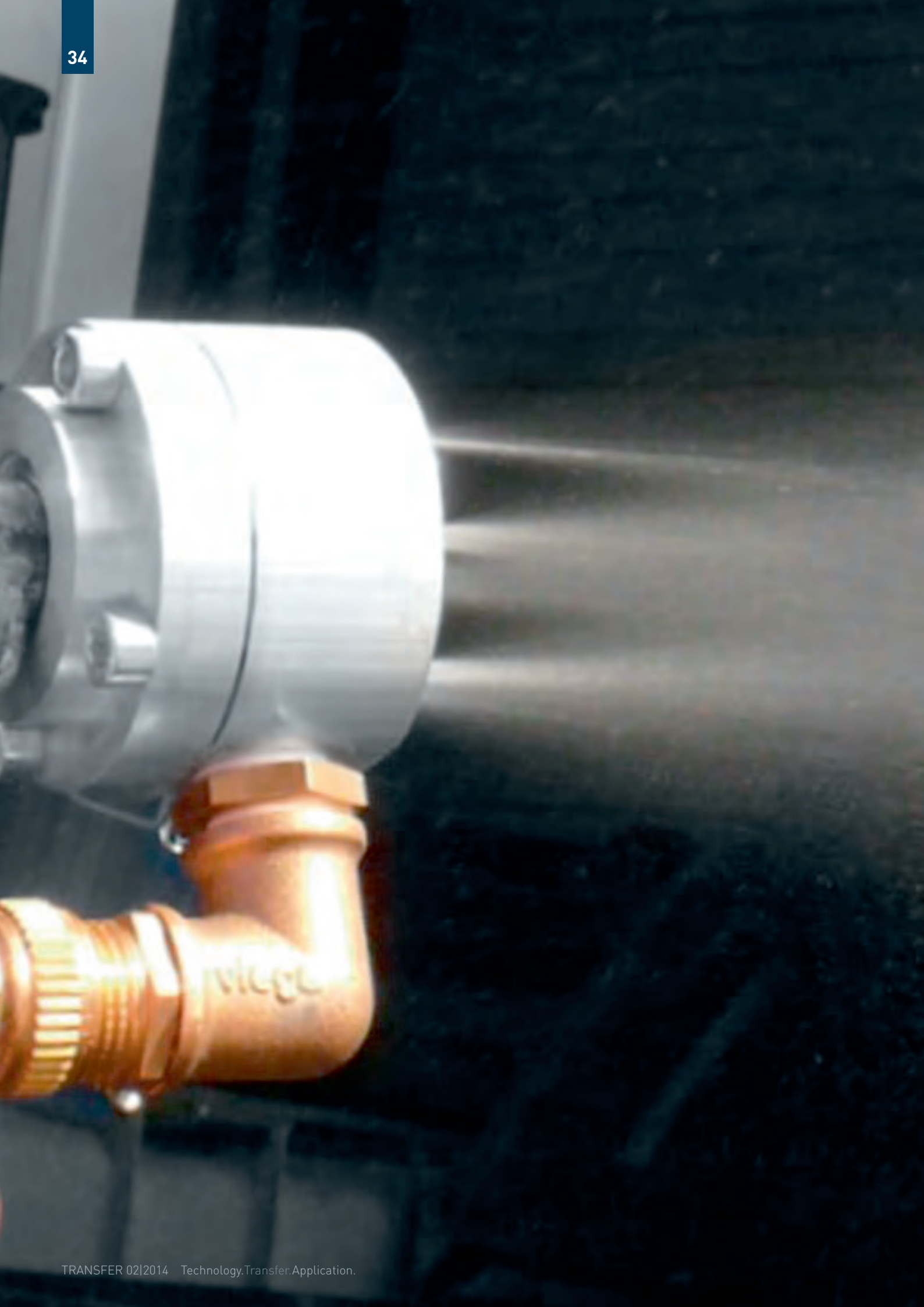
13:00–16:30 **Supporting Program**
(by invitation only)

17:30 **Day program ends**

Start: 19:30 **Evening event**
Internal event for Steinbeis managers

(As of 5/2014)

Attendance at the Steinbeis Day is free but visitors are kindly requested to register. To find out more and register online, go to **www.steinbeis-tag.de**.



Abrasive blasting behind a protective water screen

Steinbeis process for absorbing toxic particles

Using abrasive grains to blast-clean material has been an established practice in industrial manufacturing and construction for years. The technique mechanically removes oxide layers, protective coatings and contamination. It is also used to finish and deburr surfaces. The problem with abrasive cleaning using hard grains is that fine dust is emitted and, depending on the material being cleaned, this is not just dangerous because it is so small, it can even be highly toxic. A research project carried out by the Steinbeis Transfer Center for Process Development together with mps Strahltechnik GmbH aimed to develop a process that would use a screen of water droplets to absorb fine dust particles and prevent them escaping into the surrounding area. The project was partially funded through innovation vouchers from the State of Baden-Württemberg.

Dust is a natural byproduct of abrasive cleaning processes. As such, the grains used for the cleaning process are not actually a problem as they are typically 50 to 200 µ in diameter and are easy to bind or remove. The real difficulty lies in the particles that shoot off the material as it is being blasted. The fine particles that are discharged can measure anywhere between 1 and 20 µ. These particulates spread out from the cleaning area due to the pressure of the jets. Engineers soon reach the boundaries of technical possibility trying to filter out these particulates because of the large volumes of air. And despite protection, these processes are still hazardous to workers.

The process developed by the Steinbeis Transfer Center for Process Development involved free-form testing of the impact on material surfaces of jet-blasting using hard grains such as pumice, glass beads, aluminum oxide, steel shot, sand or crushed nutshells. The grains are blasted onto work surfaces at high velocity under high pressure. Important process parameters include not just the kind of grains used, but also the speed of delivery, the volume of grains and, in particular, exposure time.

The development project enabled the Steinbeis experts to solve the key dust problem by positioning a water screen around the blasting nozzle. This was formed out of water droplets to provide a protective shield around the dust source. It involved six or eight jets supplied by the very latest sprinkler technology as well as hollow-cone nozzles used in standard household pressure cleaners. The water nozzles were positioned in a coaxial arrangement inside a circular housing around the blasting nozzle. The device can be adapted to any kind of conventional nozzle found in trade.

Blasting tests carried out by the Steinbeis experts showed that the process absorbed more dust than expected. Also, there was a marked rise in the amount of dust removed from the material being cleaned. This had not been expected since particle binding is only possible when fast grains and slower water droplets are travelling at exactly the right velocity.

The particle movements in such a process were so complex that a flow model was developed along with a computer simulation to explain what was happening. This was followed by verification testing. The results were as remarkable as they were logical. Abrasive blasting without a water screen creates a pressure cushion on the material surface formed by lots of tiny discharged particles. This cushion brakes particles approaching the material. With a water screen, a major proportion of the miniscule particles that slow down movement are absorbed – thus allowing abrasive grains to do their job and erode surface layers on the material. As a result, not only are fewer pollutants emitted, the process actually becomes more effective.s

Steinbeis Transfer Center Process Development

Services
- Technological crisis management
- Consulting and innovation support
- Applied research and development
- Systematic design in product development
- Identification of process characteristics
- Design and testing of prototypes
- Field trials
- Expert reports
- Research in patent and specialist literature

Key areas
- Development and testing of new manufacturing processes
- Research and process development in the areas of erosion, electrical discharge machining (EDM), ultrasonic erosion, laser-beam machining, high-pressure water jet machining, processing and handling of flexible machinery
- Product development using design systems
- Design and testing of prototypes up to start of production
- Machinery and surface inspection with REM and EDX

Image: A spray nozzle producing a water screen

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M. Pfefferle
mps Strahltechnik GmbH (Balingen)

Early detection mechanism for migraine patients

Steinbeis researchers develop new medical test for migraine sufferers

Migraine sufferers can tell you a thing or two about it: agonizing pain that, if left untreated, can last anywhere from one to three days at a time. These attacks, which can strike several times a month, can have disastrous effects on a patient's quality of life. Most people familiar with migraines report similar symptoms: fatigue, a stiff neck or trouble concentrating. Yet if it were possible to objectively predict migraine attacks, preventative treatments – either through medication or alternative means – would be an option. And this would be a vast improvement for patients. Psychophys, the Steinbeis Research Center at the University of Rostock, is currently developing predictive medical tests for patients to carry out themselves at home. A pilot study is looking into this new testing technique.

During a migraine attack, short-term electrophysiological and blood vessel changes have been observed in patients. Researchers attribute these to functional disorders in the brainstem. Comparing migraine patients to non-sufferers, EEGs show marked differences in the amplitudes and latencies of individual testing components. And in contingent negative variation (CNV) measurements – a simple attention paradigm that stimulates a standard expectancy situation and the neuroelectric changes this brings about – there were significant differences between test candidates from the control group in comparison to the migraine patients. These tests not only reveal differences in amplitudes, but also changes in habituation during the measurements. Steinbeis researchers are including these findings in their work on the new medical testing technique.

But migraine patients also exhibit particularly strong electrophysiological changes in the days leading up to and throughout the attack itself: Before the attack, the CNV measurement shows a sharp increase in electrocortical negativation; these then start to normalize during the migraine spell itself. Researchers have recognized: In cases of extreme negativation, a subsequent migraine episode is likely.

These electrophysiological changes that accompany a migraine occur systematically. That's why researchers are using this measurement technique and the results it delivers as an indicator for an impending migraine.

If CNV measurements can help predict migraines, all kinds of novel medication-based and alternative treatment options would open up, allowing sufferers to prevent the actual migraine itself. For example, the cortical excitability that occurs in the initial phase of the migraine could be reduced for a few days with medications such as fast-acting, short-term beta blockers; daily medication doses could be avoided altogether. Even alternative practices such as progressive muscle relaxation treatment could be applied as relaxation techniques to reduce cortical hyperactivity.

Until now, CNV amplitudes could only be measured in the lab – medical facilities with an extensive infrastructure. As a result, CNV measurements could previously only be used as an early detection mechanism in very few cases at very high cost. The Steinbeis researchers are actively working to change this: For migraine sufferers, their work could result in a significant step towards a pain free life.

Image: © iStockphoto.de/webking

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New centers in the Steinbeis Network

The Steinbeis Network comprises nearly 1,000 Steinbeis enterprises spanning all fields of technology and management. Depending on the nature of their work, these may be Transfer Centers, Consulting Centers, Innovation Centers, Research Centers, Transfer Institutes or separate legal entities. The following Steinbeis Enterprises have been newly established since February:

Aachen

Steinbeis Consulting Center Numerical Software Analysis, Transformation and Optimization
Prof. Dr. Uwe Naumann
E-mail: SU1807@stw.de | Web: www.steinbeis.de/su/1807

„The results of numeric computer simulations have a growing impact on our everyday lives. We want to be able to believe in this simulated reality. We cannot trust it blindly (yet)!"

Services

- Training and employee development
- Software project management
- Software development

Au

Steinbeis Consulting Center Corporate development and social space planning
Konrad Roth
E-mail: SU1803@stw.de | Web: www.steinbeis.de/su/1803

„Don't just work in your company – work on your company! Every business has to keep developing and optimizing its structures and processes as this happens. The goal of the SCC is analysis and concept development as well as technical and mental implementation."

Services

- The Steinbeis Enterprise delivers planning and development services for companies and organizations. Its services range from analysis to concept development and front-line implementation. A key priority throughout is its holistic approach.
- Planning and development of companies and organizations (NGOs)
- Business startups and consolidation
- Development of business concepts and support with implementation
- Management of funding including analysis of financiing options, submission of proposals, bookkeeping and monitoring/management accounts
- Social space planning for communities
- Consulting on financing options, preparation of financing
- Coaching of managers

Baden-Baden

Steinbeis Transfer Institute zeb/business.school
Regina Lister, Prof. Dr. habil. Michael Lister
E-mail: SU1811@stw.de | Web: www.steinbeis.de/su/1811

„The zeb/business.school at Steinbeis University Berlin has joined forces with the SHB to create the first university business school operated by a consulting company. At the zeb/business.school, academic excellence is combined with hands-on content derived from the learning curves of corporate consultants. Students here are taught to meet the challenges of increasingly complex financial markets, and our perfectly customized class schedules take their work-life balance into account. The university-accredited professional development courses, bachelor's and master's programs focus on financial services with a specialization in bank management, insurance management, wealth management and organization/IT. Research and development projects across all management sectors are also conducted on an ongoing basis at zeb/business.school."

Services

- University certificate courses
- Bachelor of Science in Financial Services
- Master of Science in Financial Services with the specialization bank management,
- insurance management, wealth management, organization/IT
- Management of the SHB doctoral program
- Research for all management areas, especially of the financial services sector

Bruchhausen-Vilsen

Steinbeis Transfer Center Material and Component Testing (MCT)
Prof. Dr.-Ing. Uwe Reinert
E-mail: SU1802@stw.de | Web: www.steinbeis.de/su/1802

„The right material for the right application will guarantee success."

Services

- Expert reports
- Applied research and development
- Consulting
- Training and seminars

Cloppenburg

Steinbeis Innovation Center BBS Engineering Cloppenburg
Dipl.-Ing. (FH) Heinz Ameskamp
E-mail: SU1804@stw.de | Web: www.steinbeis.de/su/1804

„The Steinbeis Innovation Center BBS Technology Cloppenburg was established to focus on continuing and higher education including consulting; we also provide lab-tech services."

Services

- Continuing professional development
- Staff training
- Consulting
- Laboratory services

Dettelbach

Steinbeis Transfer Center New Media and Data Science
Prof. Dr.-Ing. Frank Deinzer
E-mail: SU1806@stw.de | Web: www.steinbeis.de/su/1806

„New forms of media dominate our daily lives and generate data sets, and scientific methods can be applied to obtain valuable information that will shape our future with innovation and an emphasis on success. Our goal is finding solutions, both in terms of an ideal experience for the media user and in using data intelligently."

Services

- Applied, interdisciplinary research and development in the area of digital new media
- Planning, conception and implementation of innovative solutions for the target-oriented data analysis
- Development of new interaction concepts in the everyday media-related environment
- Seminars on topics of new media and data analysis

Großmehring

Steinbeis Transfer Institute Energy Industry
Dipl.-Ing. (FH) Dirk Fieml,
Dipl.-Betriebswirt (FH) Christine Ulrich
E-mail: SU1798@stw.de | Web: www.steinbeis.de/su/1798

„People. Performance. Power. Education and training help people perform at levels they would hardly be able to achieve otherwise. In the context of the changing landscape of energy usage, it is becoming increasingly important to provide strategic training that will create experts in the field. This is exactly what our institute offers."

Services

- Certified education programs for energy management
- Seminars on topics relating to energy management
- Research projects focusing on current issues in energy Management

Hamburg

Steinbeis Transfer Institute East Asian Management and Culture
Reinhard Stuth, Dr. Alexander Bode
E-mail: SU1810@stw.de | Web: www.steinbeis.de/su/1810

„Managers who have solid knowledge of the language, culture and corporate leadership practices in Asian countries will be absolutely indispensible for companies competing on the global market."

Services

- M.A. course economic sinology for students with knowledge of Chinese language. The aim of the practice-oriented simultaneous studies is the development of sound language skills in modern Chinese and management know-how in an international context.
  - The two-year job-integrated project-competence-studies Master of Arts in economic sinology (M.A.) is intended for young academics and young professionals with an at least finished first-degree of at least 180 Credit Points (university, university of applied sciences, university of cooperative education or comparable degree from a German or foreign university). Knowledge in Chinese language is required.
  - The studies are aimed to future-oriented enterprises in the global competition so they can recruit and develop their future professionals for the management of the Asian business at an early stage. This concerns big enterprises as well as small and medium-sized enterprises.
- Intensive language course in preparation for studying or a visit to China
- Research on language and culture as well as management methods in the Asian region
- Science-based consulting at the interface Asia/Europe

Karlsruhe

Steinbeis Transfer Center Software-Engineering (SWE)
Prof. Dr. Holger Vogelsang
E-mail: SU1814@stw.de | Web: www.steinbeis.de/su/1814

„We support companies in software projects and provide consulting as they integrate new technologies and frameworks."

Services

- Support in software development
- Consulting on the use of technology and frameworks
- Consulting on software architecture
- Development of prototypes and studies

Konstanz

Steinbeis Transfer Center Project Manufacturing
Armin Dingler
E-mail: SU1801@stw.de | Web: www.steinbeis.de/su/1801

„We light the spark of new ideas."

Services

- Modular idea analysis and product development
- Design and development of product ideas
- Implementation of product ideas
- Product marketing
- Prototype design/pilot production

Meersburg

Steinbeis Transfer Center Signal Processing and Algorithms
Prof. Dr.-Ing. Wolfgang Schulter
E-mail: SU1808@stw.de | Web: www.steinbeis.de/su/1808

„Signal processing and algorithms for industrial applications"

Services

- Consulting on procedure drafts
- Modeling of systems
- Software prototypes (MATLAB/Simuluink, C, C++)

Netphen

Steinbeis Transfer Center Fluid Mechanics and Fluid Kinetic Machines
Prof. Dr.-Ing. Thomas Carolus
E-mail: SU1797@stw.de | Web: www.steinbeis.de/su/1797

Services

- Aerodynamic dimensioning of air-conveying turbine machines (ventilators, wind turbines, air turbines) and components in ventilation engineering
- Calculations of ventilation systems using fluid kinetic machines
- Consulting on acute issues relating to air-conveying machines and systems – reduction of noise and echo
- Surveyor's reports

Ravensburg

Steinbeis Transfer GmbH an der Hochschule Ravensburg-Weingarten
Dipl.-Wirt.-Ing. (FH) Hans-Joachim Hölz
E-mail: SU1799@stw.de | Web: www.steinbeis.de/su/1799

Services

This enterprise focuses on knowledge and technology transfer between the worlds of science, academia and business, particularly in the Lake Constance and Upper Swabia regions. To this end, the company established Steinbeis Transfer Enterprises for the purpose of offering research, development, consulting, and training services. In addition, the company develops and sells products and services relating to the services mentioned above.

Stadtlauringen

Steinbeis Consulting Center Specialist Retention. Talent Management. Succession Planning
Dipl.Soz.-Päd. (FH) Volker Elsner
E-mail: SU1805@stw.de | Web: www.steinbeis.de/su/1805

„Businesses of every shape and size are all striving to find suitable new fast-track employees. As an external staff development specialist which emphasizes retaining skilled labor, we help companies find and keep the right specialists, managers and up-and-coming young professionals for their business. We look forward to helping you find your own pool of ideal talents."

Services

- Organizational development and human resources development (both strategic and operational) in the field of specialist, new talent, and manager retention
- Concept development for the complete process of recruiting employees, communicating with and attracting employees, employee loyalty and rehiring employees. (Support with implementation optional)
- Our company- and location-specific services offer even small and medium-sized companies and trades with no human resources development departments more freedom to act on their own, independent of temp agencies and head hunters

Stuttgart

Steinbeis Consulting Center Applied Business Information Technology
Prof. Dr. Thomas Kessel
E-mail: SU1813@stw.de | Web: www.steinbeis.de/su/1813

Services

- Consulting services
- Training courses
- Expertise
- Project management and implementation

Weingarten

Steinbeis Transfer Center Health and Social Research
Prof. Dr. Anselm Böhmer, Prof. Dr. Silvia Queri,
Prof. Dr. med. Bertram Szagun, Prof. Dr. Maik Winter
E-mail: SU1809@stw.de | Web: www.steinbeis.de/su/1809

„Social and health research makes major contributions to managing demographic shifts and shaping the transformation of the welfare state, which in turn secures our society's future."

Services

- Prevention research (health promotion) in different settings (workplace health promotion/prevention in schools, municipalities etc.), e.g. psychological load analysis, analysis of causal connection and development of recommendations or consulting
- Evaluation research (evaluation of the results and analysis of the cause-effect relationship of health, engineering and social sciences interventions)
- Health services research (pilot project: new health services models considering demographic and socio-political developments, e.g. physical disability and old age diseases; demand analysis)
- Health and social report for public and private institutions
- Qualification and labor market research in health and social services

Vienna (Austria)

Steinbeis Transfer Center New Cybernetics
Dr. Karl H. Müller, M.A.
E-mail: SU1815@stw.de | Web: www.steinbeis.de/su/1815

„The field of new cybernetics is at a crossroads – it's where systems theory meets complex systems. Based on research done by Heinz von Foerster, Gordon Pask and Humberto R. Maturana, it makes innovative solutions possible by creating a radical shift in perspectives, research designs and analytical quality."

Services

- Research and development in the area of complex system analysis
- Evaluation and expert reports
- Education and teaching
- Consulting

Insights into the work of a logistics consultancy

Steinbeis center introduces itself at the logistics day

This year's nationwide "Logistics Day" event drew an audience of many interested listeners to the Consulting and Planning Center in Göppingen on April 10. Hosted by the Steinbeis Transfer Center for Logistics and Factory Planning, attendees included production and logistics managers as well as directors form regional companies. Representatives from universities of applied sciences and anyone generally interested in logistics were also in attendance.

Dietmar Ausländer, head of the transfer center, was joined by members of his staff, Marina Grupp and Peter Sturm, to guide guests through the afternoon with up-to-date presentations from specialists. Ralf Bannwarth and Katja Kuemmerle featured as guest speakers from the Alb Fils clinic. All the latest trends were introduced along with developments from the areas of shop floor and supply chain management, intra-logistical planning, the use of IT systems in logistics processes, and even production and factory planning. The Steinbeis value stream tool, winner of the 2013 Innovation Award, was also presented. Each presentation was followed by a Q&A round in which participants could ask questions and engage in deeper discussion with other guests. The event gave the audience of specialists a chance to familiarize themselves with the daily work of logistics experts.

The Steinbeis Transfer Center for Logistics and Factory Planning develops process-oriented systems for the flow of materials, information and value streams within companies. Based on principles of holistic, sustainable and pioneering work, the Steinbeis experts provide innovative solutions and know-how for planning and implementation, including in an international context. Their aim is to help customers quickly achieve effective and sustainable improvements. Key areas include logistics, factory and production planning, in addition to process optimization.

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International summer classes for students and engineers

Professional development courses at the Steinbeis Transfer Center for Automotive Engineering in Esslingen

Since 2001 the Steinbeis Transfer Center for Automotive Engineering in Esslingen, Germany, has been offering courses in English to students from the Mexico City campus of ITESM Tec de Monterrey, a private Mexican university. In the years following the launch of the program, the center has expanded its reach to other countries. In 2014, courses were offered to students and engineers from China, India, Mexico and South Africa. With more than 550 participants to date, the numbers confirm the popularity of the summer classes.

Steinbeis experts are currently offering students a class called "Selected Topics in Automotive Engineering." Some 30 participants from China, India, Mexico and South Africa are expected to attend. And a course in "Basic & Advanced Automotive Engineering" is planned for international engineers. Since it is being offered in cooperation with a partner institution in India, most participants will come from that country. Following a week-long introductory class in India, the engineers will come to Esslingen for advanced modules.

In addition to theoretical instruction at Esslingen University of Applied Sciences, the courses each include field trips to automotive companies in the Stuttgart area. The participants' performance is assessed at the end of every course, with students receiving a certificate from Steinbeis University Berlin listing their grades.

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Industry 4.0 – Opportunities and challenges for rural areas

12th Business Day held at the Technology and Startup Center in Schmalkalden

Forming networks is one of the most important instruments available for promoting municipal businesses. In the states of former East Germany, the southwestern part of Thuringia has the highest numbers of industrial jobs, but the region's structure is defined by small companies which are frequently owner-operated. As a result, it is even more important to organize the right kind of networking structures which offer participants a tangible added value. This is why a Business Day is regularly held at the Technology and Startup Center (TGF Schmalkalden). The Steinbeis Consulting Center for Land-Use Planning and Structure Development helped coordinate the event held in April.

The event focused on „Industry 4.0" – a topic which comes up in countless discussions and publications, and yet the opportunities and challenges it presents are still more or less unfamiliar to businesspeople in largely rural areas.

Business Day is designed for entrepreneurs from the southwestern Thuringian area as well as regional economic-development agencies. Thuringia's minister of economics, Uwe Höhn, came to Schmalkalden to open the event with a presentation on the economic policy strategies for the districts in Thuringia, which tend to be more rural in character. His speech was followed by the technical part of the event program, beginning with Dr. Sebastian Schlund (Fraunhofer IAO), who discussed a study entitled „Production work of the future – Industry 4.0." Many participants learned more about the potential that changes in production processes can offer. Lorenz Schmid (BMW AG) addressed things from a hands-on perspective, discussing the features of the lightweight construction used for the new BMW i3. Dr. Martin Schilling (3-D-Schilling GmbH) held a vivid presentation on industrial applications.

Around 150 participants then had a chance to discuss topics with one another and the speakers. The collaborative nature of the event was evident in the fact that it was jointly organized by TGF Schmalkalden, the Schmalkalden-Meiningen district's economic development authority and Meiningen's Steinbeis Consulting Center – striking a balance between technology promotion, administration and knowledge transfer.

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The 10th Business Intelligence Symposium
Andreas Seufert, Peter Lehmann, Klaus Freyburger, Thomas Becker (Publ.)

2014 | Paperback, B&W | 180 pages, German/English
ISBN 978-3-941417-89-2

About the publishers

Prof. Dr.-Ing. Peter Lehmann and Prof. Dr. Andreas Seufert are directors of the Steinbeis Transfer Institute of Business Intelligence. Prof. Dr. Klaus Freyburger and Prof. Dr. Thomas Becker are part-time lecturers at Steinbeis University Berlin (SHB).

More online

Promotion of Market Orientation in Small, High-Service Retail Businesses
Klaus Hacker

2014 | Paperback, B&W | 312 pages, German
ISBN 978-3-943356-92-2

About the author

After gaining his business degree at the University of Science in Lahr, Klaus Hacker went on to complete two more university degrees culminating in a business diploma and a diploma in business teaching. Hacker gained his PhD through Steinbeis University Berlin in 2013. One aim of the author's research is to foster transfer potential in order to provide retailers with suggestions and ideas.

More online

Back to Work? The Obstacles Women Seldom Talk About
Sandra Weiß-Schilling

2014 | Paperback, B&W | 78 pages, German
ISBN 978-3-95663-004-0

About the author

Sandra Weiß-Schilling studied at the Business School of Alb-Schwarzwald, an Institute belonging to Steinbeis University Berlin, where she successfully completed her degree in 2013 culminating in a Bachelor of Arts in Business Administration. As part of a degree project, she looked at the problems encountered by women when they return to work after parental leave. The current debate in politics, the local community, businesses, and society as a whole underscore the strong relevance of the topic and forms the central theme of this publication.

More online

Steinbeis Innovation Study A Metastudy on Innovative Capability and Activity in the Economies of Brazil, China, Germany, Switzerland and the United States
Steinbeis-Foundation (Publ.) | Jens Mergenthaler, Werner G. Faix

2014 | Paperback, color | 168 pages, German
ISBN 978-3-943356-98-4

About the authors

Prof. Dr. Werner G. Faix is the founder, managing director and a partner of the School of International Business and Entrepreneurship (SIBE) at Steinbeis University Berlin, which has over 1,000 students enrolled in master's programs in the field of management. Jens Mergenthaler is a project manager at SIBE, where he is responsible for scientific projects and program coordinator for PhD projects.

More online

The 2014 Steinbeis Entrepreneur Forum A Networking Platform for SMEs
Steinbeis-Foundation (Publ.)

2014 | Paperback, color | 64 pages, German
ISBN 978-3-95663-000-2

About the Entrepreneur Forum

The first Steinbeis Entrepreneur Forum took place in March 2013 to provide a platform for meeting people, discussing different topics together and setting new ideas in motion. The forum revolved around presentations

organized in tandem, in keeping with the principles of project skills: an examination of the principles underlying a particular topic from a Steinbeis expert followed immediately by a Steinbeis project partner discussing the same topic from a practical perspective. This was followed by question and answer sessions with everyone in the audience.

More online

Corporate Mediation – 01/2014
Negotiation – How to Avoid Being Taken to the Cleaners
Gernot Barth, Bernhard Böhm (Publ.)

2014 | Magazine, color | 68 pages, German
ISSN 2194-430X

About the publishers

Associate professor Dr. habil. Gernot Barth has been working as a mediator and trainer of mediators since the foundation of IKOME® (the Institute of Communication and Mediation), the Steinbeis Consulting Center for Corporate Mediation and the Academy for Social Aspects and Law (Steinbeis Transfer Institute at Steinbeis University Berlin). Bernhard Böhm is a qualified attorney and works alongside Dr. Gernot Barth as a director of the Steinbeis Consulting Center for Corporate Mediation as well as the state-approved Steinbeis Consulting Center conciliation office, which is part of the Steinbeis Network. He also shares responsibility for a variety of domestic and European mediation projects on cross-border mediation.

More online

Collective Intelligence,
Team Intelligence and Intelligence in General. Commonalities and Differences
Andreas Aulinger, Laura Miller

2014 | Paperback, B&W | 140 pages, German
ISBN 978-3-943356-99-1

About the authors

Prof. Dr. Andreas Aulinger has been a full-time professor and holder of the chair for Organization at Steinbeis University Berlin since 2005. Since 2011, he has headed up the Institute for Organization & Management (IOM), which he set up with Markus Heudorf. Laura Miller studied business and has been working successfully in B2B marketing for ten years. In addition to her role as head of marketing for a technology business, she has been researching the fundamentals of collective intelligence at Steinbeis University Berlin for several years now.

More online

MECHATRONIC DIALOGUE 2013
Focal Topic: Mechatronics – Safeguarding the Future
Fritz J. Neff (Publ.)

2014 | Interactive PDF | DVD, German/French
ISBN 978-3-943356-90-8

About the publisher

Prof. Dipl.-Wirtsch.-Ing. Fritz J. Neff founded the Steinbeis Transfer Center for Mechatronics and Sustainability in 1999, which he still heads up today. He is also the dean of studies for Mechatronic and Micro-Mechatronic Systems at Karlsruhe University of Applied Sciences in the department of Mechanical Engineering and Mechatronics.

More on DVD

Trend Study on Master Data Quality 2013
Assessment of the Current Situation Relating to Master Data Quality in Companies and the Trends This Points to
Thomas Schäffer, Helmut Beckmann

2014 | Paperback, color | 82 pages, German
ISBN 978-3-95663-008-8

About the authors

Prof. Dr. Helmut Beckmann is a Professor of e-Business Systems for the Electronic Business degree program (now Business Information Technology) at Heilbronn University. He is also director of the Steinbeis Consulting Center for Electronic Business (SBZ-EB). Thomas Schäffer completed a diploma in computer science at the University of Stuttgart in 1999 and has also worked as a member of staff at the Steinbeis Consulting Center for Electronic Business (SBZ-EB). As part of his thesis, he is researching the field of master data and data quality management.

More online

Back in print:

Manager Cookbook.
What Managers Can Learn from Cooking
Ulrich Holzbaur

2013 | Hardback, color | 204 pages, German
ISBN 978-3-943356-35-9

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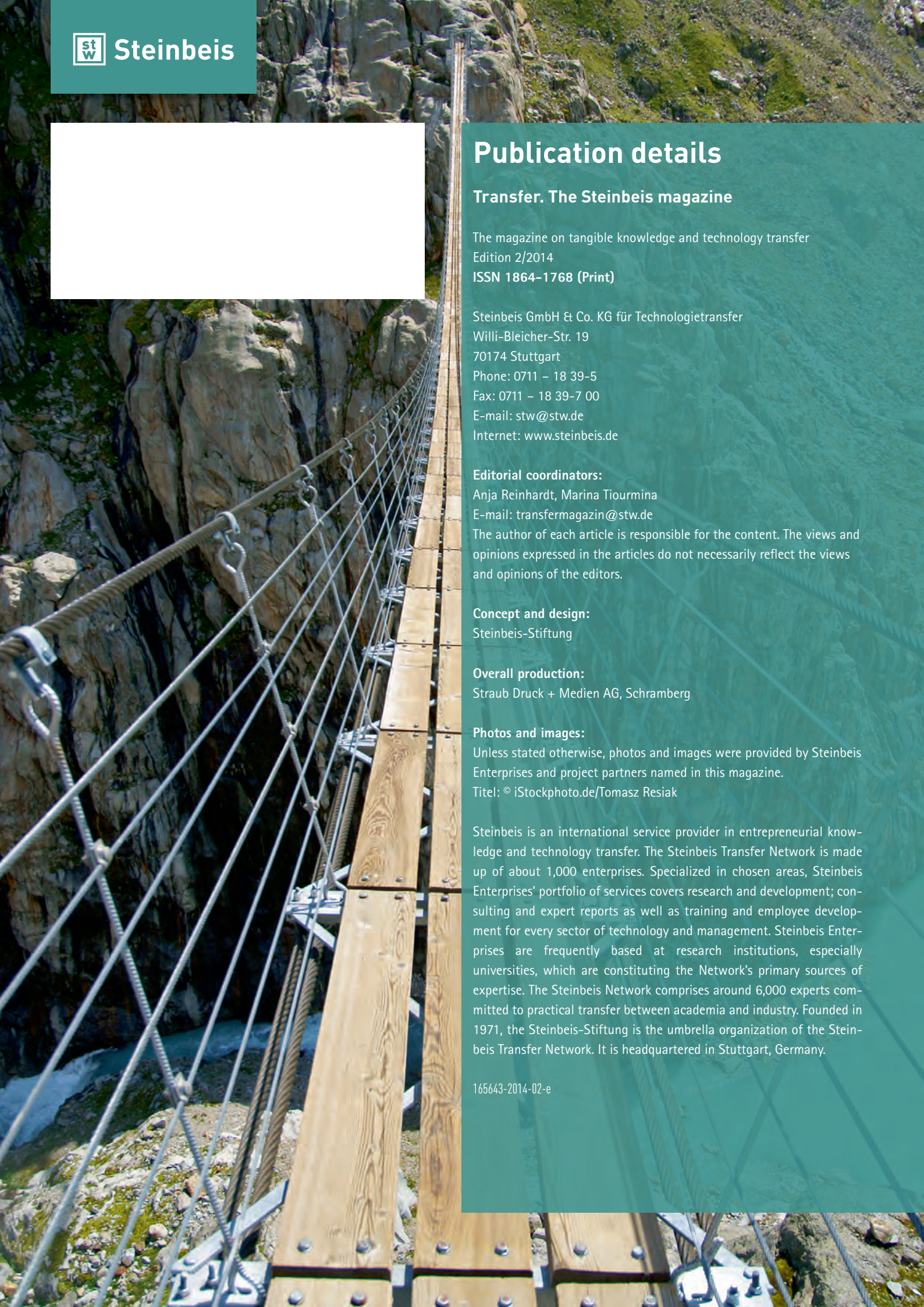

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Steinbeis is an international service provider in entrepreneurial knowledge and technology transfer. The Steinbeis Transfer Network is made up of about 1,000 enterprises. Specialized in chosen areas, Steinbeis Enterprises' portfolio of services covers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

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