

TRANSFER

The Transfer Magazine

Drive – Change – Success

Feature Topic: Automotive
Steinbeis experts unearth the facts

**Tracking Down Crime in a
Virtual World**
Steinbeis works on implementation of BMBF
research project

**Tuning Tunisia's Innovation
System to Steinbeis**
Steinbeis experts provide local support

**“For industry, internationalization
stopped being a one-way
street a long time ago”**
An interview with Jürgen Oswald,
CEO of Baden-Württemberg International

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Dear Readers,



Prof. Dr.-Ing. Hermann Kull is director of the Steinbeis Transfer Center for Systems Technology/Automotive in Esslingen. Kull received a special Lohn award from the Steinbeis Foundation in 2010 for his outstanding contributions to knowledge and technology transfer.

A key feature of developments in the automotive field is the growing number of control devices (ECUs) designed to enhance driving comfort and vehicle safety. This includes the expanding scope of functions offered by these control units such as increasing connectivity (car-to-car communication) and a rising number of novel drive systems (hybrids/e-cars). Software developments tend to be of a more mechatronic nature, with a focus on system stability and enriching additions from the types of software technologies that are normally associated with consumer markets, often with extremely short development cycles.

The really big future trend, however, is the shift toward "autonomous(ly driven) vehicles." Most of the car companies are keeping close tabs on this trend and are developing their own vehicles and functions to match. Even beyond the world of automobiles, researchers are looking closely at this area, for example at Google.

As systems become increasingly complex, it's difficult to be sure about anything without simulations, and the tools required for this are constantly being redeveloped and re-applied. More and more specialists are carrying out digital testing, even before experimenting on actual test benches, and this rapid prototyping is increasingly becoming standard practice.

In parallel to these developments, statutory guidelines are increasingly resulting in the development and production of vehicles with reduced emissions. One particularly important development in this respect relates to sensors for cleaning exhaust gases and cutting greenhouse gases. As the recent WHO Death Survey underscores: "Out of 100 deaths, 27 occur due to air pollution." This alarming development was central to a study carried out by the Steinbeis Transfer Center for Systems Technology/Automotive (TZS/A). The study looked at air pollution and made it possible to capture new control process in one's own vehicles.

The TZS/A has now been working with car companies and their suppliers for 15 years, providing support with such developments through a variety of services. These range from development to testing and application. The center's aim is to help its clients conform to requirements and aspirations at every stage of the process, right up to the documentation of key findings and ultimate approvals.

These trends in the world of automobiles will bring about major change in how society travels from A to B. They will also have a major impact on development techniques and skills, and it is here that the Steinbeis philosophy of knowledge transfer between universities and industry has a meaningful contribution to make in providing constructive support during the necessary transition in industry.

This latest edition of the Steinbeis Transfer magazine turns the spotlight on the technology in the automotive field, looking at issues from a variety of angles and introducing a number of projects being carried out in the Steinbeis Network. I hope you find it an interesting read!

Yours,

Prof. Dr.-Ing. Hermann Kull



Keeping Close Tabs on Online Security

The Steinbeis Malaysia Foundation provides support to CyberSecurity Malaysia

The advent of the digital age has resulted in a deluge of digital data, paving the way for the Internet of Things – a smart world of computers that is growing all around us. The drawback with digitalization is that without appropriate security mechanisms and protection, data can represent a danger to users and there are many ways to misuse it. There have already been improvements in the technology used to protect digital data, but any feeling of security has a half life. Working on behalf of CyberSecurity Malaysia, the Steinbeis Malaysia Foundation has been conducting research to identify who can check and assess the value of a robust cyber security defense program.

Founded in August 2014, the Steinbeis Malaysia Foundation (STMY) promotes knowledge and technology transfer between science and business in Malaysia. The Steinbeis Malaysia Foundation has worked with a variety of organizations since it was set up, both in the private and public sector, and this has led to a number of project queries.

The 2011 attack on the Playstation network underscored the danger of insufficient network protection mechanisms. The information of 77 million customers was open to public access and many users had confidential data revealed, including details of the bank accounts and credit cards. The Ponemon Institute estimates the cost of such data breaches at around \$318 per person. The overall potential cost of the Playstation network hack could have been in excess of \$24 billion. But frequently, the more dramatic impact is not in financial terms but in terms of image loss.

CyberSecurity Malaysia is a cyber security agency belonging to the Malaysian Ministry of Science, Technology and Innovation. It was concerned with recent developments and turned to the experts at Steinbeis Malaysia. The goal at CyberSecurity Malaysia is to understand the potential consequences and losses if there is no or only insufficient cyber security on a national level.

Cyber security was not just developed and designed for use in the field of ICT, it is actually relevant to a countless number of areas and sectors of industry. Without robust cyber security, the financial institutions of a country, its stock exchange, exchange rates, Internet platforms and other targets are open to intruders and malware attacks. Hackers and data thieves can simply walk in and steal confidential information for their own criminal means and this could even result in a complete breakdown of the national network, with inconceivable implications.

The Steinbeis Malaysia Foundation took its project brief to several universities and research institutes. The experts at these organizations will now analyze the relevant information for CyberSecurity Malaysia and demonstrate just how important robust and intelligent cyber security is on a national level.

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Feature Topic: Automotive

Insights from Steinbeis experts

The automotive industry is dictated by a strong demand for new developments: travel has to be safe, sustainable, networked and economical. Whether this is possible – and if so, how – is the key topic looked at by the Steinbeis experts. Prof. Dr.-Ing. Günter Willmerding and Jakob Häckh, directors of the Steinbeis Transfer Center Traffic Engineering.Simulation.Software, explore key issues relating to future vehicle drive systems. Prof. Dr.-Ing. Nejila Parspour, director of the Steinbeis Consulting Center for Electromobility and Drive Engineering, takes us behind the scenes in the exciting field of e-travel. Prof. Dr. Wolfgang Küchlin, director of the Steinbeis Transfer Center for Object and Internet Technologies explains how artificial intelligence helps us cope with the huge number of possible variants in the automotive industry. Christoph Königs, Tobias Streitberger and Marc Pejga from the Steinbeis Transfer Center for Microelectronics look at network and integration testing in the automotive industry. We also talk to Prof. Dipl.-Ing., Prof. h.c. (YZU) Gerhard Walliser and Prof. Dr.-Ing. Gregor Rottenkolber, directors of the Esslingen-based Steinbeis Transfer Center for Automotive Engineering Esslingen, and Prof. Dipl.-Ing. Christof Wolfmaier, deacon of the automotive engineering department at Esslingen University of Applied Sciences and project manager at the center, about the future of the combustion engine, introducing the latest developments in the field of vehicle mechatronics and chassis. Prof. Dr.-Ing. Hermann Kull and Harsha Jakkannahli Vishnukumar, who work at the Steinbeis Transfer Center for Systems Technology/Automotive, introduce a simple and inexpensive solution to improve air quality inside vehicles. Prof. Dr.-Ing. Anestis Terzis, director of the Steinbeis Transfer Center DSI – Digital Systems and Innovations, describes the technical requirements affecting the replacement of mirrors with camera monitoring systems. In an interview with Prof. Dr.-Ing. Roland Wahl, the director of the Steinbeis Transfer Center for Laser Processing and Innovative Manufacturing Technology, Wahl talks about current and future challenges in the automotive industry. Finally, our feature topic is rounded off by Prof. Dr. Peter Neugebauer, director of the Steinbeis Transfer Center for Automotive Testing, who concludes by reflecting on the future of travel and transportation.

Image: Steinbeis Transfer Center for Microelectronics; Fotolia.com /Nataliya Hora; Fotolia.com/black_magic; Fotolia.com/Sergey Nivens



Farewell Combustion Engines – Or Maybe Not?

The vehicle drive systems of the future

One of the first vehicles ever developed by Ferdinand Porsche, the Lohner-Porsche, was an electric car with batteries weighing around 1.8 tons. The tires were so overloaded that they burst and the driving range was so poor that the inventor developed the Mixte Hybrid, which combined a combustion engine with an electric motor. This hybrid was too expensive, however, so that Porsche also eventually moved on entirely to drives using combustion engines. With the introduction of the VW Beetle, Porsche succeeded in developing a reliable mass-market product and the combustion engine became the dominant drive technology throughout the world. So what will happen in the future?

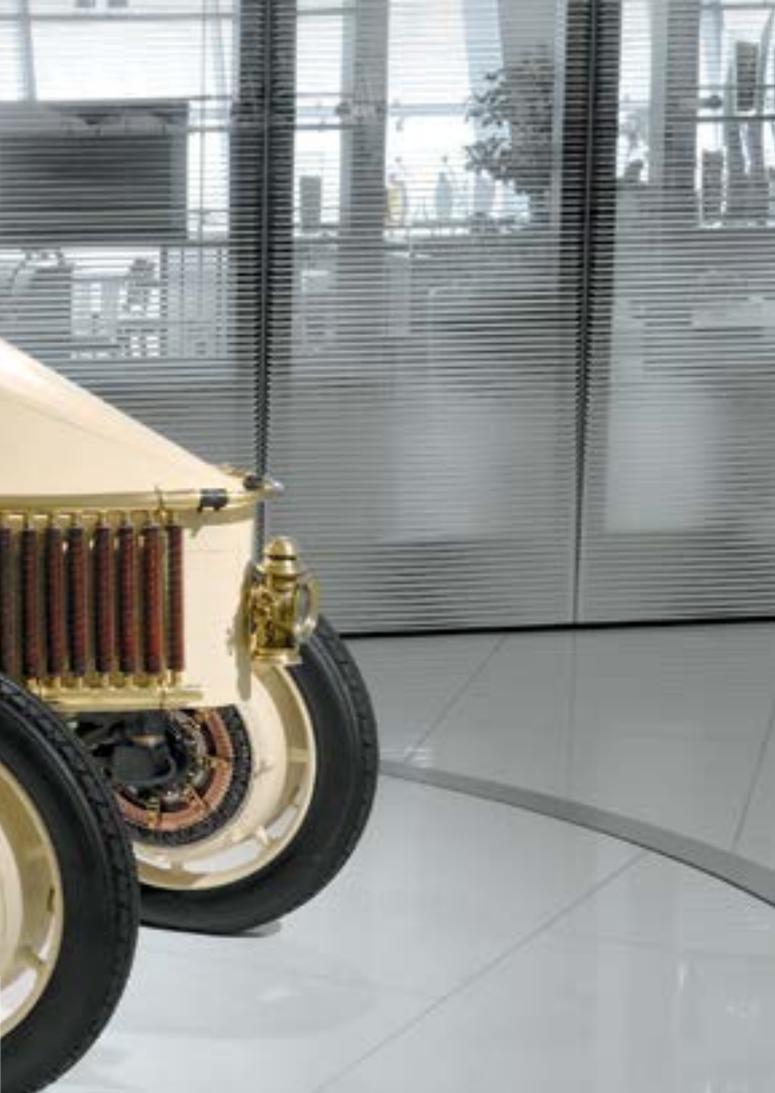
The automobile has become an indispensable part of modern life in industrial nations and it is central to our standard of living, resulting in "worldwide mass-motorization." But as pollutant emissions have led to environmental problems, especially in urban areas with smog, and as the belief has intensified that carbon emissions are causing global warming, the powers that be have introduced radical legislation to reduce fuel consumption and emissions, laws that can only be addressed through huge investments in classic combustion engine technology. With each round of tighter legislation, the outlay on technology rises, so, as a result, the experts are now developing alternative vehicle drives.

Electric drives use fuel cells and convert hydrogen (H₂) or methanol, the energy sources, into electric current. Using hydrogen results in no harmful gas emissions and storing H₂ is technically complex but this issue has since been resolved and the first promising prototypes do now exist. The driving range and duration on a full charge are also not a problem. Producing H₂ using regenerative electricity is currently under development and appears to be technically feasible.

Another interesting option is the electric drive using electrochemical storage (rechargeable batteries). This makes many of the electric cars that have been introduced in recent years an appealing option, with rapid acceleration, no sudden jolting into motion, a scarcely significant

engine noise and no pollutants at the point of source. On the downside, this option offers limited driving range, the batteries add significant weight, it takes a long time to "fill up" and it's expensive. These drawbacks will quite possibly be reduced to reasonable levels within a matter of years, so it could become possible to travel outside of cities on battery power alone. But this does not solve the problem with the primary energy consumption (including vehicle production and power generation) which in all probability will not go down one iota versus comparable vehicle drives based on petrol or diesel engines. Because electricity has to be available at all times, it is not possible to produce electrical energy through 100% renewable sources, so this also causes carbon emissions. Even with an optimistic assumption that a large share of renewable sources can be used to generate energy, in comparison to classic combustion systems, purely electric drives will still create more carbon emissions for a long time to come [1].

Combining a combustion engine with an electric drive and thus creating a hybrid engine requires much smaller battery storage. In fact, batteries can be downsized because they use braking energy and only drive short distances. As a result, the cost and added weight of storage units are significantly lower than with a purely electric drive. The combustion engine can also be made smaller because both drives click into action when accelerating and their output is added up. Hybrid drives can cut



engine will become established for short-range driving for journeys of up to 200km, but their market share will not be more than 10%. As things stand now, the purely electric engine for vehicles with longer ranges does not make sense from an energy point of view, and because of the manufacturing costs.

If our affluence remains intact – as well as the conviction that carbon emissions are having a negative impact on the global climate – then there will be an opportunity for fuel cell cars in industrialized countries. The technical feasibility is proven and there are some appealing prototypes. But this will all depend on us shifting energy generation to renewable sources, the setting up of a suitable infrastructure for hydrogen and a suitable legal framework to promote the technology. The developing countries – which is where the majority of the world's population lives – will not be able to afford such expensive technologies, and in those places, the combustion engine will continue to dominate for decades to come.

References:

[1] Spicher, U.; Hadler, J.: "Efficiency and Emissions of Vehicle Drives," *Automobiltechnische Zeitschrift ATZ-Extra* p. 10, special publication for VDI-FVT 2014-2015

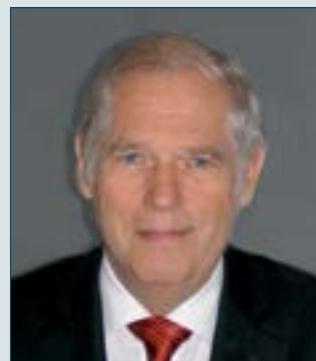
Image: A Lohner-Porsche with two wheel hub motors © Dr.-Ing. h.c. F. Porsche AG

fuel consumption and emissions because they use braking energy and some driving – for example in urban areas – can be completely emission-free by switching off the combustion engine. This makes this option an attractive way to combine two types of drives. The only drawback is the complex nature of the technology and the correspondingly high cost.

Combustion engines must not be overlooked in discussion regarding the future. The potential of the piston engine, based on the four strokes of a petrol or diesel engine, has yet to be fully exploited. There is still room to make significant improvements in terms of efficiency and emissions. With commercial vehicles, using gas (LNG, CNG) can be particularly advantageous in terms of emissions, energy consumption and costs. Also, new types of synthetic fuels are being developed and this offers ways to reduce emissions and consumption. As a result, the vehicle drive of the future will still be dominated for some time by the combustion engine. But looking back, thermodynamic hydrogen combustion turned out to be a false lead.

Vehicle drives such as gas turbines, the Sterling engine, combustion engines based on two-stroke processes, and eccentric rotary engines (the Wankel engine) could not fulfill expectations for vehicle engines, despite intensive research, so these will have no more role to play in the future.

So what does the future hold for engines? For the next 20 years, the combustion engine will continue to dominate – sometimes in combination with the electric engine, as a hybrid. New types of synthetic fuels will galvanize the position of the combustion engine. The purely electric



Günter Willmerding

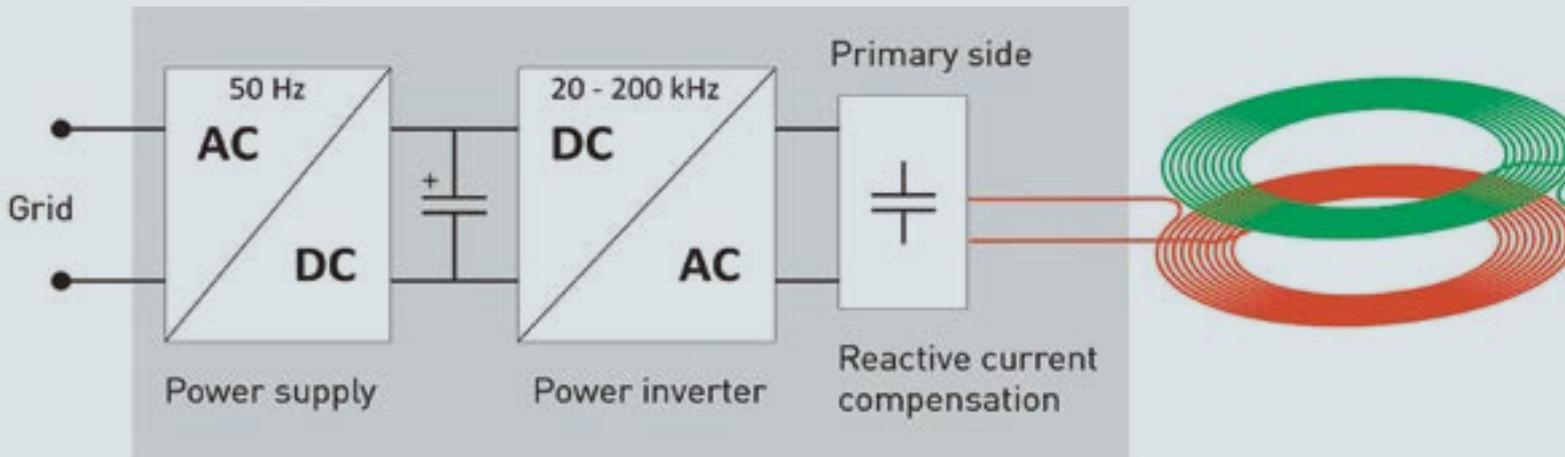


Jakob Häckh

Professor Dr.-Ing. Günter Willmerding und Dipl.-Ing. (FH) M. Sc. Jakob Häckh are co-directors of the Steinbeis Transfer Centers for New Technologies in Traffic Engineering and the center Traffic Engineering.Simulation.Software in Ulm. At both Steinbeis Enterprises, most of their work revolves around traffic flow analysis and simulation, drive chain simulation, fuel consumption, emissions, vibration and the design and calculation of new kinds of vehicle components based on R&D methods and service-life forecasting. In 2004, the Steinbeis Transfer Center for New Technologies in Traffic Engineering was awarded the Steinbeis Foundation Transfer Award together with Voith Turbo GmbH & Co. KG.



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“I’m extremely optimistic about developments in the next five years”

An interview with Professor Dr.-Ing. Nejila Parspour

Professor Parspour, electrical engineering shapes your career and of course your work at the Steinbeis Consulting Center for Electromobility and Drive Engineering, which was founded in 2009. Has the emphasis of the work at your center shifted in recent years or is your sector of industry shaped more by long-term trends?

The trend relating to the development of mechatronic systems got underway around 50 years ago and it’s still going strong. A key part of such mechatronic systems is the electric drive system which has a variety of application areas – for example in industrial automation, which is one of the oldest areas it’s used in, or more recently e-vehicles. I’ve not had to change the emphasis of my center because there is both short-term and long-term potential for exciting developments and some highly promising projects.

One of the areas you’re involved in is the development of high-efficiency, cable-free and contact-free charging systems for electric vehicles. Could you give us some insights into how such charging systems work and describe the pros and cons?

Contact-free electrical energy transmission involves using magnetic coupling instead of cables to join two coil systems. In simple terms, the magnetic field of the stationary coil produces induced voltage in the second coil, in keeping with the physical principles of induction. The second coil is fitted in the undercarriage of the car. To create a really efficient cable-free system, it takes complex calculation of the magnetic field and complicated electronic circuitry – plus a lot of expertise.

Induction-based charging systems bring a number of advantages, most notably ease of charging and the possibility to charge batteries automatically. Vehicles can be charged automatically without any dri-

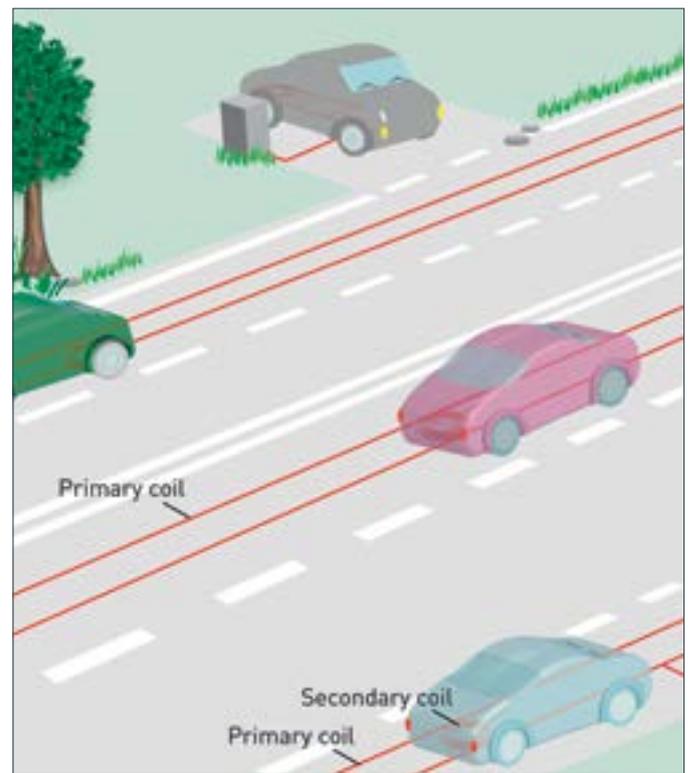
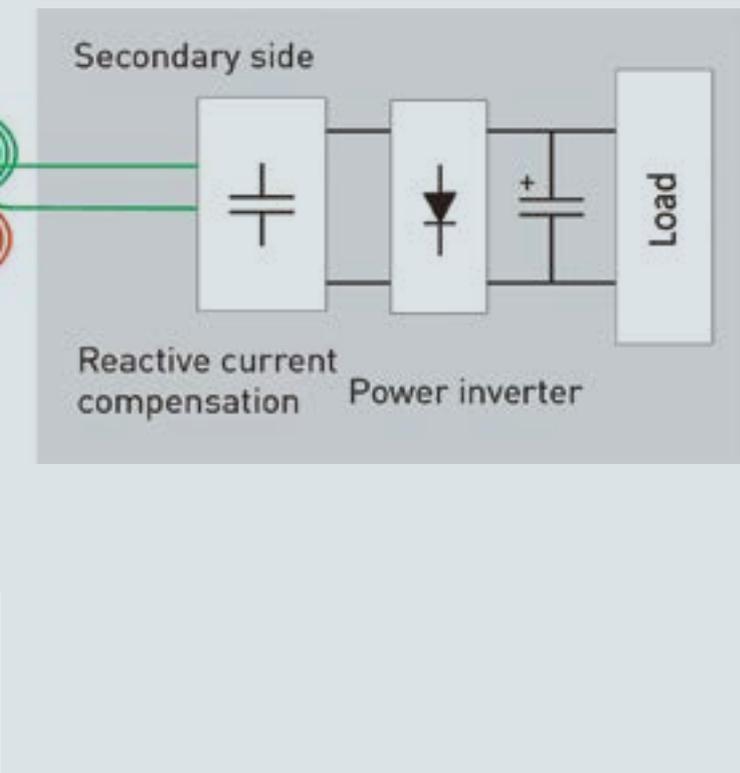
ver involvement, which is especially important if it’s snowing or raining. By automatically loading the vehicle in the parking space or at the traffic light or on a section of road, there’s no need for extra charging areas. The system’s vandal-proof and it doesn’t need much maintenance. On the downside, the systems are still only at the prototype stage so they’re more expensive.

Your Steinbeis Consulting Center also designs and develops electric motor prototypes and energy-efficient drive systems for its customers. What trends and developments are you noticing at the moment in terms of customer demand for engines and drives?

Energy efficiency is still a big issue at the moment, although it’s virtually on a par with cost effectiveness. The trend is going in the direction of compact design – developing engines with a higher output density or torque density – plus the integration of power electronics and the engine into a housing. Another emerging trend, especially since the price of permanent magnets started going up, is the demand for electric machines, things like motors and generators without permanent magnets.

Electric vehicles offer huge potential, but they’re not without their problems. They’re too expensive, they offer a limited range, and there aren’t enough charging stations. Which of these problems do you think are most important to success when it comes to a wide-scale breakthrough of e-vehicles – so what should be the priority?

I’d say it’s in the order you’ve just stated. According to the surveys, lots of people would use an electric car straight away, even if they don’t go very far – if only e-cars weren’t so expensive. As the years go by, the range of e-cars will get better. For example the Tesla S and the BMW i3



are just two vehicles that can be used outside cities. Despite this, we have to work on all three problems at the same time. We need inexpensive e-cars with a good range and a seamless infrastructure, then there would be nothing stopping the breakthrough of e-vehicles.

A number of years ago, politicians announced a target for 2020 of one million electric cars. Given the existing infrastructure, what do you think is realistic from today's standpoint within the next five years?

It's not really possible to give a meaningful answer to that question. The important thing is that quite a lot has already happened since they laid down that target, all within a short space of time; after so many years, things are finally moving in terms of electric car development. If you contrast this with the fact that research into electric vehicles was practically put on the back burner for a hundred years, then I'm extremely optimistic about developments in the next five years.

Image 1: Schematic representation of an inductive energy transfer system

Image 2: Inductive charging while driving and when parked



Professor Dr.-Ing. Nejila Parspour is director of the Steinbeis Consulting Center for Electromobility and Drive Engineering, and is a professor at the University of Stuttgart. Parspour is closely involved in issues relating to contact-free energy transmission, the design and development of prototypes of electric engines and generators, and the design of electro-mechanical systems.



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A	Variant	Z	PVs	Compliant	FS, L	FS, R	FV, L	FV, R	FW, L	FW, R
	401+228+220	●	380	-	PÜ	PÜ	228	228	PÜ	PÜ
	401+228+235	○		TW	PÜ	PÜ	x	228, 235	PÜ	PÜ
	401+228	●	420	TW	x	PÜ	x	228	x	PÜ
	401+220	○		TW	x	x	PÜ	PÜ	x	x
	401+235	○		TW	PÜ	PÜ	x	235	PÜ	PÜ
	401	○		TW	x	x	x	PÜ	x	x
	873+228+220	●	460	-	PÜ	PÜ	228	228	PÜ	PÜ
	873+228+235	○		TW	PÜ	PÜ	x	228, 235	PÜ	PÜ
	873+228	○		TW	x	PÜ	x	228	x	PÜ
	873+220	●	420	TW	x	x	PÜ	PÜ	x	x
	873+235	●	460	TW	PÜ	PÜ	x	235	PÜ	PÜ
	873	○		TW	x	x	x	PÜ	x	x
	228+220	○		-	PÜ	PÜ	228	228	PÜ	PÜ
	228+235	●	460	TW	PÜ	PÜ	x	228, 235	PÜ	PÜ
	228	○		TW	x	PÜ	x	228	x	PÜ
	220	○		TW	x	x	PÜ	PÜ	x	x
	235	○		TW	PÜ	PÜ	x	235	PÜ	PÜ

Mathematical, Logical, Highly Efficient

Intelligent tools for managing the breadth of variants in automotive markets

German automobiles are offered in an exceptionally and still growing number of variants, which may lead to problems during production. The source of the problems are often errors in product data management (PDM). PDM includes the management of logical rules which capture the different configurations of optional extras offered in sales, and the supply of parts to production. Both kinds of rules typically consist of mathematical formulae. Modern Software tools, based on methods of Artificial Intelligence, employ highly efficient mechanical theorem proving algorithms to manage the complexity of the configuration rules.

PDM normally takes place on two levels and draws directly on mathematical logic (Boolean algebra). All optional extras, as well as important other factors such as countries, are represented as logical symbols (codes). Using operators of mathematical logic, such as AND, OR, NOT, it is possible to formulate the conditions that need to be fulfilled to configure a car and for using different kinds of parts.

On the upper configuration level, a customer's configuration options are defined, i.e., which optional extras can be combined within a particular order. There are sometimes a gigantic number of possible vehicle configurations – typically somewhere between 10^{20} and 10^{40} per series – so it's not possible to capture each one individually in a table. Instead, the configuration constraints are captured in thousands of formulae, such that each configuration option is the implicit result of the possible solutions to each set of formulae. Each of these solutions represents a

valid configuration, in other words the actual list of optional extras and other production parameters for each vehicle.

On the lower configuration level, the exact parts required for the production of each individual vehicle have to be identified in the Bill-of-Materials (BOM) for the entire model series, i.e. in the list of all parts from which any vehicle of this series can be pieced together. For every material (part) on the BOM, the condition under which it is required for a car is Captured and documented in a formula. A part is required for a vehicle exactly when its condition is fulfilled for the relevant vehicle configuration.

Because of the huge number of different vehicle variants, a number of problems are encountered on both configuration levels. However, the language of mathematical logic makes it possible to solve many of the-

se problems very efficiently and with scientific precision by using Artificial Intelligence, specifically mechanical theorem proving methods. The Steinbeis Transfer Center for Object and Internet Technologies (OIT) provides its program library Auto. Lib which offers a variety of verification and analysis procedures, as well as editors and display techniques, which are customized and optimized for the use in the automotive industry.

An example of a question that arises on the upper configuration level is which optional extras are permitted – or forbidden, or even compulsory – for a certain engine type and a specific country. This exact information is not specifically captured in individual configuration rules, but it can be worked out implicitly from the possible solutions of the entire set of rules. In addition, permitted combinations (for example pairs) of options can also be calculated efficiently. Overall, the solution makes it possible to submit any kind of query to the configuration rulebook (for example, if certain options make others compulsory) and to receive a quick answer, even if this answer is only an indirect logical consequence from a combination of rules.

On the BOM level, there are the classic problems with duplicate hits and missing parts. A parts list would admit duplicate hits if it were possible to configure a car that could select two alternative parts (e.g. two steering wheels). It would miss a part it were possible to configure a car that would not select any one out of a required set of parts (e.g. no steering wheel) In such cases, two separate rulebooks interact to produce undesirable contradictions. Because of the high number of variants, mechanical solution techniques have to be used as it is not possible to wade through huge numbers of possible configurations one by one to identify problem vehicles. The library provided by the Steinbeis Transfer Center for Object and Internet Technologies offers efficient out-of-the-box solutions to these classic problems with parts lists. The system contains a sophisticated "explanation component" that makes it possible to quickly and specifically analyze the sources of errors, even with highly complex rulebooks, and to make subsequent corrections.

The formulae used in product configuration play an important role in many areas, from sales and development to production and after sales. Based on the computational techniques devised by the Steinbeis Transfer Center OIT, many other problem-solving techniques and analytical methods are now possible, including an editor for correct, defect-free BOM positions, the analysis of assembly structure documentations, support with reconfigurations, configuration optimizations, and the conversion, simplification and graphical representation of logical formulae.

Steinbeis Transfer Center for Object and Internet Technologies

Services

- Consulting, export reports, studies, training
- Application-based research and prototype development
- Design and development of industrial software solutions in Java and C++

Key areas

- Industrial applications of computational logic
- Configuration of complex systems
- Analysis of errors in parts lists
- Formal verification of programs/symbolic debugging
- Special areas in automotive PDM
- Support of variant rich product data management
- Automated analysis of configuration rules
- Automated analysis of automotive parts lists
- Editor for configuration rules and BOM rules
- Acceleration of DMU mock-up
- Information mining from PDM files (PDM data mining)
- Configurators and analysis of configurability
- Software verification
- Error analysis for LINUX device drivers
- Error analysis for expert systems
- Error analysis in the configuration of storage networks (SAN)
- C++, Java, XML

Image: Calculation of possible combinations of optional extras, represented by number codes, for different models within a series (columns), including reason if not permitted.



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Testing that Saves Time and Money

Network and integration testing in the automotive industry

Vehicle networks form the very backbone of car electronics. To make sure everything works in harmony, it is necessary to carry out comprehensive testing during development. This involves putting each control device through a series of integration tests. The first step is to test each individual interface before integrating the various elements into different sections of the vehicle network, and then finally looking at the vehicle network as a whole. Each round of testing is initially carried out under laboratory conditions before integrating the different elements into the vehicle. Such network testing is carried out at the Steinbeis Transfer Center for Microelectronics (TZM) in Göppingen.

The introduction of CAN bus technology in the early 1990s and the networking of electric and electronic vehicle components resulted in a significant rise in the complexity of the electronic systems used in vehicles. Previously, networks were restricted to the electrics in the engine but they have now expanded into all areas of vehicle electronics. Development of the kinds of advanced driver assistance systems, safety systems and driving comfort systems now found in modern vehicles has led to a sharp rise in the number of control devices, and with this: an increase in vehicle data. This has made it necessary to exchange data more and more quickly – and of course accurately – between individual control devices. To meet such requirements, modern vehicles not only need CAN technology, but also LIN, MOST and FlexRay. Even Ethernet technology, previously associated with IT and industrial communications, are part and parcel of modern vehicle technology.

Given the sheer number of control devices now used in modern vehicles (there are over 100 different devices in luxury segment vehicles) and given the huge degree of variety now offered by carmakers, it is clear that tremendously complex processes are required to ensure everything functions as required. Specialists have to establish clear processes to keep things running smoothly and test networks as efficiently as possible in terms of time and money.

Another important and related factor is the degree to which testing can be automated. Automation makes it possible to reduce testing errors to a minimum and slash the amount of time needed to test each control device. One of the challenges this brings forth is the degree to which test processes and individual testing can be standardized, while at the same time taking the immense complexities of the individual control devices into account. For example, LIN slaves, which are actually quite simple in

terms of complexity, have to be tested in addition to highly complex gateways, which link up several, sometimes completely different bus systems.

To put the right kind of testing environment into place, TZM decided to use products provided by a company called Vector Informatik. The testing environment used for network testing is based on a Vector VT System. This makes it possible to monitor and assess all bus systems simultaneously. Control devices are administered through a database which contains all key information required for the testing. This database also includes the current status of testing and results. A control slip is attached to each control device so that it can be positively identified and the right data can be sent to the database. The testing environment is set up to ensure that the test runs and test parameter sets are kept completely separate. Information from the database is used at the beginning of each testing sequence to create a parameter file in XML format. This is to establish the right parameters for the testing environment.

During each test sequence, all required testing is carried out in the most logical order. This means that the test environment first checks individual bus interfaces, and once each interface has been tested, it switches to the next interface to carry out testing in this area. All parameters are documented along with test results in test protocols so that it is possible to reproduce results later. The control devices are tested both individually and then as part of the overall network. This is to check whether all control devices are reacting in line with the network specification, for example, as outlined by the network management system or wake-up protocols.

Testing can be kept highly automated by ensuring that the test environment is able to test control devices one after the other. Once all the interfaces relating to a control device have been tested, the test environment automatically jumps to the next control device. The setup goes through each control device on a first-in, first-out basis (FIFO queue). This means a previously tested control device can be removed at any point and a new control device can be connected to the test system. As a result, ideally the test system can even carry out integration testing without interruption.

By going through test results afterwards, irregularities can be evaluated to see if there are any problems with individual control devices and whether, for example, these may have been caused by incorrectly setting up parameters for the test environment. If the latter is the case, the preparations made before testing need re-examining and testing will have to be repeated. Test documentation is based on the results of the test evaluation and the assessment of findings. Noticeable irregularities are documented in an error database. The network test is finished once this part of the process is complete.

The TZM has been working successfully on this and other industry projects since 1991. There are currently around 90 people working in the fields of engineering and development, embedded systems and software engineering, spanning a variety of projects related to medical technology, the automotive industry and automation technology. The project outlined above was carried out by the embedded systems division, whose focus lies in networks and bus systems, plus two other core fields: embedded software and the setting up of test systems.

Steinbeis Transfer Center Microelectronics

Services

The TZM (Transfer Center for Microelectronics) was established in 1991 by professors at the University of Applied Sciences in Esslingen and has made a name for itself as a reliable engineering partner. The center develops a variety of innovative solutions within a team of engineers and specialists from different fields. The Steinbeis experts handle complete projects or offer customer support for on-site development projects.

The TZM offers cross-industry engineering services for:

- Electronics development
- Software development
- Measurement and testing technology



Christoph Königs



Tobias Streitberger



Marc Pejga

Christoph Königs (Bereichsleiter Embedded Systems), Tobias Streitberger (Teamleiter Testing) und Marc Pejga (Teamleiter Fahrzeugvernetzung) all work at the Steinbeis Transfer Center for Microelectronics in Göppingen. The Steinbeis Enterprise has been providing companies with engineering services for over 20 years with a focus on the automotive industry, the medical industry and automation. In 2007, the Steinbeis Transfer Center for Microelectronics was honored with a special transfer prize by the Steinbeis Foundation.



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“The combustion engine has been and will continue to be subject to intensive and successful research and development!”

An interview with the experts at the Steinbeis Transfer Center Automotive Engineering Esslingen

Professor Walliser, it has now been 20 years since you set up the Steinbeis Transfer Center (STC) for Automotive Engineering in Esslingen. The automotive industry moves forward at breakneck speed, so two decades are tantamount to an eon. What were your areas of focus in those days and how have they changed over time?

The founding of our Steinbeis Transfer Center was strongly motivated by recommendations from the automotive industry. It was a time of crisis and the industry wasn't really recruiting even though the contracts and money were there. Graduates had little hope of finding a job so we took them on at Steinbeis. This was a great help for industry and graduates. When we set up our STC we were consciously not setting up a "company" with workers; it was just about making the know-how of co-workers and the modern university infrastructure available to trade and industry. We now have 17 experts with backgrounds in all fields of vehicle development. The emphasis at the moment lies in drive systems, services and international courses for students and engineers from China, India, Mexico, etc.

Twenty years ago there wasn't much on offer in the way of IT or electronics training for engineers specialized in mechanical engineering and vehicle technology, and it was difficult to get across how important control technology was for vehicles that didn't have electronics. Now these subjects are core components of the training. It was hardly possible to imagine how quickly navigation or semi-automated driving would make it into serial production. The international Prometheus project was a tremendous help at the beginning and our STC had small overlaps with it. Today, fully automated, accident-free driving is at the top of the list when it comes to vehicle developments, on a par with electric, hybrid and fuel cell-based drive systems, although nobody's really able to say how much of this will really make it into mass production. When it comes to electric cars, the main problems still lie with the battery; with fuel cell vehicles, there's also the price issue. But of course we shouldn't overlook the fact that the combustion engine has been and will continue to be subject to intensive and successful R&D!

Professor Rottenkolber, Professor Walliser, your Steinbeis Enterprise also looks at the field of vehicle mechatronics. This is a topic that's opening the door to lots of new opportunities, but more

than anything, it's posing new challenges in terms of globalization. What do you see as the problem areas in the industry at the moment?

One megatrend of the future, which could be made possible by mechatronic systems, is autonomous driving. It looks like it will be possible within the next decade for intelligent electronics to take on the role of the driver. Modern radar and camera-based driver assistance systems, which are already available in serial production vehicles, have already helped make the first step toward this vision of the future. So it's just a matter of time before the systems are developed far enough to watch traffic around the car and steer, brake and accelerate the vehicle by working together with a powerful computer. Despite the imaginative ideas of the engineers and the sheer scope of technical feasibility, the emphasis in development should still always lie in the needs of the driver, in all kinds of regions throughout the world. All these new assistance, comfort and safety systems will require more energy from vehicles and it's not yet understood what demands this will place on the car electronics. The current 12V wiring systems are reaching their limits because they can't cope with more than 3 kilowatts (kW). Top-of-the-range vehicles now need a lot more at maximum performance. There's been lots of discussion about e-chargers for vehicles with combustion engines but they'll need even more energy. One solution could be a new car electronic system running on 48 volts; that would provide up to 12kW of power. Hybrid cars already have high-voltage circuits of up to 400 volts, but the extra cost is significant compared to a 48-volt system. But these are just two examples of the types of vehicle technology trends that are made possible by mechatronic systems. Almost every area of the vehicle market is now dominated by mechatronics, whether it's the drivetrain using more electricity, the active chassis or automatically operated parts in the car body.

Professor Rottenkolber, automotive engineering now faces highly complex demands: everything has to be profitable, environmentally friendly, safe and easy to use. All of these factors are strongly influenced by the drivetrain. What do you think is the best way to make power trains clean, inexpensive and cost-efficient?

The innovation drivers in automotive engineering, especially in the drivetrain, are efficiency improvements and environmental friendliness. By 2021 the CO² limit for fleet consumption will be 95 g/km. The limit for toxic contaminants will also become stricter throughout the world, even by making changes in driving cycles. But at the same time, travel is supposed to be affordable. When the demands get this complex there's usually not a simple technical solution. Drive developments will still be dominated by combustion engine optimizations for years to come. It's a highly complex unit within the overall system of the drivetrain, so, as it is today, there will still be potential to make more efficiency improvements and preserve resources at a moderate cost in the future. This applies just as much to classic combustion engines and the drive system itself as it does to a combination with an electric motor (as is the configuration in different versions of hybrid systems). Concepts for downsizing – i.e., small engines with exhaust gas turbocharging – are a huge challenge in terms of construction and materials design. Another focus lies in technologies for reducing friction. Looking at other areas in which our center has been conducting research for years, there's also more potential for lowering consumption and emissions by further optimizing existing combustion methods and developing the combustion concepts of the future. But new fuels will also play a major role in developments in the future. In the next few years, one of the most important trends in the automotive industry on the road to sustainable motor transportation will be ongoing developments in electric vehicles and their introduction to serial production. The main driver of this is the goal of reducing emissions in many areas of the world, especially in mega-cities. People have been developing fuel cells for decades to extend the range of electric vehicles and they're on the verge of serial production. But an eye has to be kept on the effort and cost of producing these new types of drive technology, as well as the costs of alternative energy formats.

Professor Wolfmaier, materials and the production methods used for vehicle chasses continue to move forward and this is placing new demands on developers and producers. Where do you see the greatest need for action?

For decades, the onus has been on carbody engineers to keep up with the constantly more demanding requirements of legislators in terms of emission controls and vehicle crash safety, mainly in relation to lightweight design. This has been exacerbated by the fact that customers have gotten used to high expectations in terms of comfort. The target values for average carbon emissions, which legislators are expected to set for vehicle fleets in the coming decades, will no longer be possible to achieve by just making conventional developments in materials and production processes. This is why the focus lies in developing new power trains. E-vehicles have an important role to play in this respect, but with them comes a monumental growth in the weight of the overall vehicle. Chassis carbody engineers have to compensate for the additional weight by coming up with new lightweight design concepts.

Discussion also currently revolves around the protection of passengers during accidents and crash setups that provide backseat passengers with better protection. Legislators have also been turning the spotlight more on pedestrians involved in accidents with vehicles in recent years and this has a bearing on measures in the front section of vehicles. So light-

weight design will remain a focal topic for chassis developers. Fiber-reinforced materials could play an important role in this area, as well as more established lightweight materials like high-strength and ultra high-strength steel, aluminum and magnesium. But at the moment it's not worth using carbon fiber composites in mass production, neither for commercial nor for ecological reasons. It's still early days for fiber composites and research into structural durability and crash properties. So we need interdisciplinary teams from the engineering sciences to keep developments moving forward and to ensure we find new materials, new production methods and new assembly techniques. The world of automotive development has to meet the environmental demands made by lawmakers. Only with extreme efforts in R&D will it be possible to make motor transportation safe, environmentally friendly and comfortable.



Gerhard Walliser



Gregor Rottenkolber



Christof Wolfmaier

Professor Dipl.-Ing., Prof. h.c. (YZU) Gerhard Walliser und Professor Dr.-Ing. Gregor Rottenkolber are directors of the Esslingen-based Steinbeis Transfer Center for Automotive Engineering. They have been working intensively in the area of vehicle power trains and vehicle mechatronics. Professor Dipl.-Ing. Christof Wolfmaier is deacon of the automotive engineering department at Esslingen University of Applied Sciences and is a project manager at the center.



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The Easy Way to Improve Air Quality

Steinbeis experts develop an inexpensive solution for improving air quality inside vehicles

Air pollution is the main cause of medical conditions such as asthma, bronchitis, fluctuations in blood pressure and other serious health problems. To do something about air quality in confined spaces such as the interior of vehicles, a number of issues have to be addressed: Why does the air get so bad inside compared to outside? What do we know from recent studies? Are there already any solutions to this problem? Experts at the Steinbeis Transfer Center for Systems Technology/Automotive took a close look at the key issues.

Put people in an enclosed space and at any given point in time they could be breathing air with a carbon dioxide (CO²) content of between 1,300 and 2,000 parts per million (ppm). According to DIN standards, CO² levels should not exceed 733 ppm. More thought needs to be put into this invisible risk of poor air quality and its impact on people and animals. The aim should be to identify a simple solution to this problem that's as cost-effective and technologically feasible as possible.

According to a study conducted last year by the World Health Organization, there are around 7 million premature deaths per year linked to air pollution. What's most shocking about this is that 4.3 million people die each year as a result of air pollution in their own four walls at home. This means that, for the majority of people affected by this problem, air quality in an enclosed room is the main cause of their health problems. Given the fact that the average person spends 90% of their day indoors, this is perhaps not surprising. The United States Environmental Protection Agency has ascertained that the concentration of pollutants in enclosed areas is often between 2 and 5 times higher than typical measurements outdoors. All of these health problems are primarily caused by a gas that we don't normally consider harmful: CO².

This motivated the experts at the Steinbeis Transfer Center for Systems Technology/Automotive to look more closely into the issue of air pollution in confined spaces.

The experts pooled all available data and carried out experiments in collaboration with students. For example, the Steinbeis experts wanted to measure whether air quality improves significantly – and in what way – if a window is opened or a simple ventilation device is switched on. To do this, they developed a small control device for the experiment. The system includes sensors installed inside and outside the room and the data provided by these sensors reflects the concentration of different gases, the temperature and air humidity. If the system determines that air quality is better outside the room than inside, air is exchanged. Depending on the system, this can be carried out by simply opening a window or by activating a ventilation system.

The system also compares air currently inside the room with standard values and provides the user with feedback on whether the air quality in the affected areas is good or bad. Since the system was being investigated for subsequent introduction to use in vehicles, it includes a CAN interface. This makes it possible to integrate the unit into existing vehicles and can transmit commands directly to an existing control unit in order to manage the ventilation system.

The system can also assess whether the vehicle is moving or not, making system adjustments as necessary to adapt the behavior of the ventilation system. If the air is still, windows and flaps can be opened wider and ventilator rotation is higher than it would be if there is more wind or airflow. It is also possible to limit temperatures to minimum and maximum levels. Temperature sensors inside and

Steinbeis Transfer Center Systems Technology/Automotive

Services

- Technical consulting on concept development of microcontroller systems (consisting of hardware and software)
- Technical consulting and development of systems based control technology (classic concepts, fuzzy concepts, condition/rule concepts)
- Simulation studies (including hardware in-the-loop)
- Product training for industry including under contract
- Training on: software technology, system dynamics and modeling, simulation of technical processes, control technology, fuzzy technology

Key area

- Development and documentation of control device software, with a focus on the automotive industry
- Fundamental investigation and functionality testing of new functions in automotive construction and drive technology
- Development and testing of application software for industrial systems (tool development for hardware and software systems)
- Industry seminars in the automotive industry (electronic diesel control) in German and English
- Management and supervision of computer systems (computer networks, LAN)

outside the room allow the system to determine if airing the room will make it warmer or cooler and react in keeping with pre-defined settings. This can also help reduce the burden on heating systems or the air conditioning, which makes sense not just for financial reasons but also for the sake of the environment.

The entire system was designed to make it as inexpensive as possible to produce. The low-price sensors used by the system mean that the software has to verify data. The controllers needed to control the actuators were programmed in Python for an ARM7 processor, which is the core of the system. The system has a variety of interfaces including Bluetooth, WiFi and Ethernet. These make it possible to transfer stored data directly to a smartphone and it's also possible to link up directly with Internet devices. Users can also store data directly on a memory stick via USB.

The system is controlled manually and indicates the quality of the air on LEDs. By linking up to smartphones or Internet devices a variety of other functions and settings can be used, such as providing more detailed information on current measurements. A closed control loop is implemented to keep room for error down to a minimum.

The Steinbeis experts believe that by combining their concept with modern smart control devices, it will be possible to create simple solutions that help minimize problems with the air quality inside vehicles.



Hermann Kull



Harsha Jakkanahalli Vishnukumar

Professor Dr.-Ing. Hermann Kull is director of the Steinbeis Transfer Center for Systems Technology/Automotive and works with Harsha Jakkanahalli Vishnukumar on the development of control device software with a focus on the automotive industry. This involved the fundamental investigation and functionality testing of new functions in automotive construction and drive technology, as well as the development and testing of application software for industrial systems.



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Car Mirrors – Looking Back on Developments

Camera monitor systems enable digital mirrors based on ISO standard 16505

Under current law, vehicles must have equipment to provide "indirect vision". This is achieved by simply using conventional mirrors attached to the vehicle. Under the new ISO standard 16505, the technical requirements are outlined for the replacement of mirrors of camera monitor systems. The Steinbeis Transfer Center "DSI – Digital Systems and Innovations" was involved in the drafting of the new standard and now offers advice on the topic, as well as courses, physical prototypes and measurement technology.

The new international ISO standard 16505, which defines "Ergonomic and Performance Aspects of Camera Monitor Systems," describes the minimum technical requirements that must be fulfilled by a digital mirror or camera monitor system (CMS). These have a bearing on safety aspects, ergonomic factors, performance criteria and the testing of such camera monitor systems. The new standard forms the basis of new standard-conforming systems design and standard-conforming systems testing carried out by technical service providers.

Against the backdrop of recent technical developments in modern driver assistance systems, a variety of camera systems have now been introduced in series production vehicles. The offered functions range from simple rearview cameras to advanced 360°, all-round viewing systems and even night vision assistance with object recognition and sensor fusion. As a rule, under current legislation, such systems offered in series production are a driver convenience or assistance system and can not be considered as mandatory. ISO standard 16505, however, focuses on camera monitor systems which are intended to replace systems that are compulsory by law. These are means that are prescribed by law and make it possible to view objects indirectly, as is already the case with current vehicles which simply use conventional mirrors.

The automotive industry is currently busily trying to meet requirements relating to the reduction of carbon emissions in new vehicles. A key part of this is an emphasis on reducing vehicle weight and reducing air drag. Looking at vehicles as a whole makes it possible to pull together a vari-

ety of measures for optimizing vehicle design. One of these is the improvement of aerodynamic qualities by doing away with rearview mirrors. This is nothing new, but until now there was no international legislation framework for such solutions in vehicles in mass production. A Mercedes-Benz concept vehicle, the F200, did include a camera monitor system instead of a sideview mirror as early as 1996 – quite a futuristic concept at the time. In more recent years, a number of automotive companies have developed concepts vehicle which included camera monitor systems. The Volkswagen XL1 is already in small-scale production and is capable of minimal fuel consumption thanks to a variety of measures that help optimize the overall vehicle design. This concept includes a CMS to replace the sideview mirrors. Especially with driving cycles that are typical for larger commercial vehicles, this method of replacing mirrors can be particularly beneficial. Another Mercedes-Benz concept vehicle, Future Truck 2025 shows how this can be translated into practice with larger commercial vehicles. With commercial vehicles, too, mirror replacement systems are just one of a number of measures that can be combined to optimize carbon emissions.

On its own, ISO standard 16505 does not provide sufficient binding regulation for such mirror replacement systems. In Germany, the current version of UN-ECE Regulation No. 46 is applied for systems that enable indirect vision. Vehicles can be given an operating license if they fulfill the minimum technical requirements. The rules laid down under UN-ECE regulation No. 46 came from the commission of the United Nations for Europe (UN-ECE, whereby ECE stands for Economic Commission for

Europe). As part of the UN-ECE, there is a World Forum for the Harmonization of Vehicle Regulations or UN-ECE WP.29. A committee was set up in 2009 to start an initiative to redraft UN-ECE Regulation No. 46 in order to take camera monitor systems into account as a replacement for mirrors. To define the technical parameters, an Informal Group on Camera Monitor Systems (IGCMS) was set up within the committee. One of the results of the work carried out by the IGCMS was a standards initiative for such systems, within the expert framework of the International Organization for Standardization (ISO). This standardization initiative was based on the realization that this technology is a highly complex issue. Detailed work was carried out on ISO standard 16505 between 2010 and 2014. The IGCMS II used ISO standard 16505 as a basis for the content of a new version of UN-ECE Regulation No. 46, which is aimed at permitting the use of prescribed indirect vision systems by using camera monitor systems. Once the standardization and regulatory process is complete, the use of CMS's will be possible in vehicles in mass production and this is currently expected to happen after 2016. This will establish an international regulatory framework out of a combination of normative and regulatory guidelines. Since UN-ECE Regulation No. 46 is not applied by some countries outside the EU, the likelihood of approval will still have to be assessed on a country-by-country basis. The Steinbeis Transfer Center DSI – Digital Systems and Innovations was also involved in technical aspects relating to these developments.

There are a variety of ways to improve vehicles by replacing conventional sideview mirrors with digital mirrors. As already mentioned, optimizing aerodynamics provides one way to reduce carbon emissions. This reduction depends on the driving cycle and the overall vehicle concept. According to a publication issued by the automotive supplier FICOSA, the carbon emissions of commercial vehicles can be reduced by around 1 to 2 percent. With e-vehicles it is possible to extend the driving distance and with sports cars the maximum speed can be raised. Especially in the premium segment, such a measure can even audibly improve the aero-acoustics for passengers. One key safety aspect that is improved with a CMS is visibility. For example, the field of vision laid down under UN-ECE Regulation No. 46 for a car (Group III, main sideview mirror) starts on the left and the right at 4 meters behind the eyes of the driver. This can result in invisible zones ("blind spots") which can be captured and displayed by a CMS by widening the viewing angle using a wide angle camera. The technology also exists to adapt and optimize views depending on the situation. For example, image processing algorithms can be used to recognize dangerous objects such as a quickly approaching vehicle and give the driver an early warning. This could make the CMS a fundamental technology for the development of other driver assistance systems. With conventional mirrors, indirect vision can be adapted as required simply by moving the head, but this means the driver is constantly moving around. The need for drivers to move around can be reduced by showing the optimized viewing area and combining this with ergonomically positioned displays. Conventional mirrors also sometimes distract drivers with glare from the sun or vehicles behind the car. Glare can be significantly reduced with a CMS.

ISO standard 16505 defined the minimum technical requirements of a CMS. The minimum field of view that has to be displayed corresponds with guidelines under UN-ECE Regulation No. 46. One of the advanta-

ges of systems with mirrors compared to a CMS is that everything is in genuine real time. Processes involving a camera, data transfer, signal processing and a display can result in slight delays. Under ISO 16505, the system's complete latency period must be under 200ms with an image refresh rate of at least 30Hz (or at least 15Hz under darkness). In terms of image resolution, ISO standard 16505 outlines a process which includes for the camera and display position as well as the compulsory visual acuity of the driver. As a quality criteria for image resolution, a modulation transfer function (MTF) is used. For each requirement, standard conform testing procedures are described. Since a camera monitor system involves electronic functions with a bearing on car safety, ISO standard 16505 has to be used for the systems designed in accordance with processes outlined under ISO standard 26262.

The German Federal Highway Research Institute (BAST) carried out a study on behalf of the Federal Ministry for Transport and Digital Infrastructure. This involved a comparative assessment of camera monitor systems and conventional mirrors and one key area looked at in the study was human-machine interaction. The results of the study show that, at a fundamental level, it is indeed possible to use a CMS for providing indirect vision in cars and trucks (final report, dated Jan 22, 2015).

Image: Mercedes-Benz Future Truck 2025, © Daimler: <http://media.daimler.com>



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“Multifaceted challenges in the automotive industry”

An interview with Professor Dr.-Ing. Roland Wahl

Professor Wahl, for years you've been working in the field of lasers. Which developments in the field would you define as milestones in industrial applications since Theodore H. Maiman's ruby laser became the first functioning laser in 1960?

There have been two major milestones in the industrial application of lasers for processing materials: lasers for high-performance use, and better lasers with shorter pulses for precision processing. Both kinds of laser became widely available as stable devices as of the 1980s, and over the years they've improved in terms of focus and energy efficiency. At the same time, new areas of industrial application are constantly emerging.

The main focus of your Steinbeis Transfer Center for Laser Processing and Innovative Manufacturing Technology is implementing laser material processing technologies in your customers' manufacturing, who, as one might expect, come from the automotive industry. What are the key areas where lasers are used in this field, and which services are particularly sought after?

The key areas where lasers are used in the automotive industry are engines, powertrains and the chassis. For powertrain components, the most important issue is laser welding, which is already well established. But there is growing need for newer processes like laser hardening and laser contract welding, especially for parts that bear major loads or are in danger of warping. As far as the chassis is concerned, laser welding and laser soldering are the most critical processes for the sheet metal parts themselves. There's also rising demand for laser hardening and laser contract welding when it comes to the forming dies and cutting tools used in processing sheet metal. And there's a growing demand for R&D services in terms of developing laser processing for applications involving specific components. These parts come from a variety of areas in the car – powertrains, auto bodies and tool manufacturing.

You developed laser hardening for Camtronic camshafts, which won you the Steinbeis Foundation's 2014 transfer award in con-

junction with Daimler. Where do you see further development potential for this process?

Integrating more functionality into engine parts, powertrain components and tools makes parts even more complex and they often become lighter in the process. Laser hardening helps make components stronger without any damage from melting or excessive warping, which is something more and more manufacturers are looking for. So there is major potential.

The automotive industry plays a pivotal role in the German economy. Which challenges do you see approaching in the future, and what effect will they have on work at your Steinbeis Transfer Center?

The challenges in the automotive industry are multifaceted. Some have no impact on the core business of our Steinbeis Transfer Center – things like the growing amount of IT in vehicles, or traffic around the vehicle, or the financially viable use of new kinds of drive energy. There are other areas, however, where we foresee our work at the Steinbeis Enterprise continuing to have an impact, like the constant technological optimization of components used in the powertrain, chassis and tool manufacturing, not to mention continued development of cost-cutting high-tech production processes used in the automotive industry. The latter, by the way, is a help with the challenge of keeping automotive manufacturing competitive in Europe.

Image: Laser hardening of Camtronic camshafts. Both the cam face and the slot walls have to be laser-hardened without distortion.



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The Future of Transportation

Will tomorrow's cars be determined only by technology?

When we think about what the transportation concepts of tomorrow might bring, we quickly see that there seems to be a broad consensus in society that the electric car will shape the future of travel. When we press the topic, people appear to have rather simple ideas about how this will all play out: The combustion engine will someday be replaced by an electric motor, and the need to put fuel in a tank will be made obsolete by batteries, and everything else can more or less stay the same. Is there anything to this thought? That is the question that Prof. Dr. Peter Neugebauer asks himself. He is the director of the Steinbeis Transfer Center for Automotive Testing.

These oversimplified notions underestimate the profound changes that converting to "electromobility" will have on our society as well as our natural and technical environment. In other words, the transportation of the future is by no means a simple matter of technology. Many other challenges will have to be overcome, including energy storage systems, urban infrastructure and primary and secondary costs.

Engineers who work in automotive and mechanical engineering more or less agree that the power unit of the future is an electric motor, but the question about energy storage remains unanswered. The reason is that sources of fossil energy are incomparable in terms of their power density: Fossil fuels store over ten times as much energy as the best batteries. To compensate for this imbalance, research into new batteries has to yield more than gradual improvements. It has to lead to substantial new technologies. We have to assume that within the near future, hybrid vehicles will come to prevail on the market. They use electrical motors to propel the wheels, but they rely on conventional energy sources. One important source of energy could be hydrogen, although storing it in a vehicle is a highly complicated process. Especially if it comes to wider-scale use of renewable forms of energy, the focus will be on technologies which convert electrolytically obtained hydrogen into a substance such as methane – a main component of natural gas. This is still relatively ineffective, but it would be offset by the practically endless availability of solar and wind energy.

Nowadays there are some 14,000 conventional gas stations in Germany but fewer than 100 hydrogen stations, and the latter figure includes both the ones that have already been built and those planned. An extensive network of electrical charging stations is not yet in sight. Within Europe, charging a car by plugging it in is becoming standard practice, but at the same time the technology of inductive (wireless) charging is nearly ready for serial production and achieves an output that is nearly as good as using a charging cable. The conversation is turning more and more toward the idea of using battery-powered vehicles as energy storage devices themselves at peak times. But we have to keep in mind that our

electricity grids are designed for power to be distributed from a central source to a (decentral) consumer, and not the other way around. In this context, setting up "smart grids" still remains a pipe dream: both the necessary technical innovations and the wide-ranging restructuring of our infrastructure would entail major expenditures. The automotive supplier Bosch estimates that the overall costs of operating an electric car will amount to about one and a half times that of driving a conventional car. The infrastructure needed would entail extensive excavation work and would fill our cities with new construction sites for years to come. If nothing else, however, a certain trend has become well established when it comes to car ownership: Fewer and fewer young people have a car of their own. Instead, they rely upon local transportation and car-sharing concepts. Perhaps travel in the future will become a product unto itself. And maybe we will be able to buy ourselves transport from A to B, just like we can now book trips via the Internet.

Image: Parking and charging in one – will all parking lots look like this in the future? © Siemens AG



Professor Dr. Peter Neugebauer is director of Steinbeis Transfer Center for Automotive Testing at Karlsruhe University of Applied Sciences. His enterprise offers services ranging from the installation and operation of HiL HiL test benches to the design and construction of diagnostic systems, ECU software development and ECU test routines and programs.



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Fitness for the 50+ Target Group

Steinbeis supports a personal trainer from Freiburg with his startup

Jonas Bünger has turned his hobby into his profession: As a dedicated athlete, he underwent training to become a state-certified physiotherapist and personal trainer, and in the course of his career he has worked at a variety of sports and health institutions. Having laid the cornerstone in terms of his professional experience, Jonas Bünger decided to take the plunge and become self-employed. Since August 2013, he has used his experience and specialist knowledge to provide clients with individual support in improving their wellbeing and quality of life. To get his new endeavor off the ground as smoothly as possible, he turned to the experts at Business Start-up, the Stuttgart-based Steinbeis Consulting Center.

Jonas Bünger faced the challenge so many people experience when they launch a business. To add to his specialist expertise, he needed business skills so that his entrepreneurial plans could be made into something financially viable. The experts at Business Start-up, a Steinbeis Consulting Center, took direct steps to assist him. Thanks to an ESF Funding Program that provides "EXI startup vouchers," Jonas Bünger received a free initial consultation, followed by more detailed consultations that were subsidized at a rate of up to 80%.

With the help of Fritz Schneider, an experienced startup consultant, Bünger's portfolio of services was optimized and the necessary marketing and sales campaign was added to package the entire concept into a meaningful business proposition. Jonas Bünger, who has made Freiburg his home town, now focuses his personal training services on the prosperous target group of people over 50, a segment which is not always the focus of attention. After offering a free trial to potential clients and conducting an extensive medical history, he customizes the training and nutritional plan, guides clients through their personalized training program, offers therapeutic massages and relaxation exercises, and even accompanies them to doctors' appointments. The services he offers are provided exclusively at clients' homes or held outdoors, eliminating the need to rent business premises.

He still needed startup capital to get his idea off the ground, however, so Jonas Bünger joined forces with his business consultant and prepared for a meeting at the bank with all of the necessary paperwork. As a result, he was quickly given a loan from the local bank. The key to success after launching his business was the challenging task of finding clients. Without media contacts or connections to well-known figures, the first step for a personal trainer is an effective marketing campaign, especially if there is

limited potential through networking. By implementing the marketing and sales program he developed with Fritz Schneider, Jonas Bünger rapidly overcame this problem as well. He is now satisfied with how quickly he managed to build a solid client base. His professional coaching sessions are also getting good recommendations so he will continue to grow his network. Working with the professionals at Steinbeis paid off for Jonas Bünger: After successfully becoming his own boss, the young man from Freiburg now has big ideas for his future. He has mid-term plans to keep expanding and even hire staff of his own.

The Steinbeis Consulting Center in Stuttgart is an important partner and source of support for startups. Difficulties in the preparation phase and the first steps on the market are easier to manage with the professional support of the startup consultants. Many fledgling businesses are overwhelmed at the beginning when it comes to organizing all the things that have to be done and systematically checking each box. Ralf Lauterwasser, the head of Business Start-up, and his accredited startup coaches have experience in supporting aspiring entrepreneurs with these challenges.



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And That's Progress? Really? Thoughts on the Value of the New

In *The Development of Humanity*, one of the best known poems by Erich Kästner, we are told: "Once, the guys sat in the trees; Ugly, and with angry faces. They were coaxed out of the woods; And their world was "story-ed" up; Right to the thirtieth floor. [...] Thus they achieved with head and mouth; The progression of mankind. But that aside, and seen by light, they still remain; The same ol' hairy apes." In a nutshell, what Kästner is saying is that lots of things that are called progress have not actually changed us or the world. Basically, despite all the progress, we are treading water. This is one view of "progress made by humanity."

The famous saying by Georg Christoph Lichtenberg reflects the other point of view: "I cannot say whether things will get better if we change; what I can say is that they must change if they are to get better." Somewhere deep down inside our humanness, there is something that drives us to want progress, something that makes us believe in progress, an unavoidable and unconditional sense that the here and now, where humanity currently stands, is never good (enough); humanity always feels that there must always – at the very least – be something better than the existing. Somehow, we as humans are always like the donkey in the fairytale about the Bremen Town Musicians who basically works out that you will always find something better than what you have here and now.

This belief in the ever superior there and then seems to be firmly anchored deep within our being. But in all our modernity and enlightenment, a mere belief is still not enough, so it is little wonder that we also try to rationalize our belief in progress. One possible line of argumentation is that our modern world is always on the move, so economies and businesses have to work constantly to make a leap forward themselves, as an evolution or even as a revolution. The ability and the willingness to make continual progress or even wander off the trodden path dictate the destiny not only of economies but also of companies.

One vehicle of progress is innovation, an act whereby "the New" becomes a reality. Our belief that progress is always something good means we tend to feel that everything which bears a label as an "innovation" is also good. Innovation – one of those terms that is overused by so many people, especially in management literature: It's now a thinly veiled secret that innovating is the best and most sustainable way to improve competitiveness, raise profits and turnover, and get more of practically everything.

But beyond this naïve enthusiasm for progress and the indiscriminating obsession with the term "innovation," we do have to ask certain questions: What is the actual use of progress? What is "the New" actually worth? Does an innovation make everything better or just different?

We concluded that the time had come to define a term and provide substantiation for this – a term that would show what the value of "the New" and the value of an innovation actually is. The name we coined for this variable: InnovationQuality, or just InQ. This is the

central topic of our recent book, *InnovationQuality. The Value of the New*, which is available from Steinbeis Edition.

Steinbeis Swipe! is a new section in *Transfer Magazine*. The aim is to examine specific topics at regular intervals. Occasionally, the author might take a swipe, left or right, up or down, along the lines of a critical commentary.



InnovationQuality. The Value of the New (Werner G. Faix, Jens Mergenthaler, Rolf-Jürgen Ahlers, Michael Auer) has been published by Steinbeis Edition and is available by going to www.steinbeis.de/inq.

Their key question regarding the value of "the New" is also the main issue that was discussed at the Steinbeis Innovation Arena on April 22, 2015. For more information turn to page 45 or go to www.steinbeis-innovationsarena.de.



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Tracking Down Crime in a Virtual World

BMBF backs research project involving experts from Steinbeis

The growth in e-commerce has been one of the most important consumer trends of the last decade. But in parallel to a shift in the shopping habits of many Germans, there has been a change in the side effects of crime. Once the initial mistrust toward online mail-order companies was dealt with, all eyes turned on data protection issues and now the major problem is fraud, which is affecting many online sellers. This mainly revolves around payments either not being made at all or being transferred through illegally accessed payment channels. The Federal Ministry of Education and Research (BMBF) is currently sponsoring School GRC (the School of Governance, Risk & Compliance at Steinbeis University Berlin) alongside the University of Göttingen and Zalando SE to look more closely into the issue over the course of the next three years.

Often, personal identities set up online to buy products are stolen or forged and this makes it difficult to investigate incidents and prosecute criminals. According to an organized crime survey issued by the Federal Crime Office (BKA), property and financial crime in general (including online and credit card fraud) have become a particularly important source of income for criminals in recent years (Federal Situation Survey on Organized Crime, 2013). A survey has yet to be carried out on organized fraud in e-commerce, however.

This hitherto generally neglected topic has been the focal topic of a collaborative research project called ABBO, which was launched at the beginning of this year. ABBO (a German acronym for the "analysis and combat of organized fraud in online shopping") will investigate new security concepts aimed at analyzing and combatting organized fraud in e-commerce. The project involves systematically pulling together key issues relating to technology, legal aspects and crime. School GRC (which has many years of experience in the field of business crime) and its project partners have successfully attracted BMBF funding with a research concept that falls under a general program called "Research for Civil Security." The project sponsor on behalf of the BMBF is VDI Technologiezentrum GmbH.

Under the leadership of the network coordinator Prof. Dr. Konrad Rieck (University of Göttingen), School GRC is responsible for aspects relating to background research and gray areas/unreported incidents. The aim is to assess the current level of risk and thus lay a foundation for experts at the Institute of Computer Science at Göttingen University to look into programming and the development of an evaluation platform. The work carried out by School GRC will involve researching the empirical evidence relating to fraud in e-commerce. The results this provides will

be used to make actual statements about structural preparations and set up the evaluation platform. The evaluation platform is a core aspect of the technological solution and its aim is to pinpoint incidences of fraud early and assess the risk for online sellers in real time. But the aim of the platform is not just to provide more effective protection for online sellers. The project is also about generating relevant information for police investigations and law enforcement.

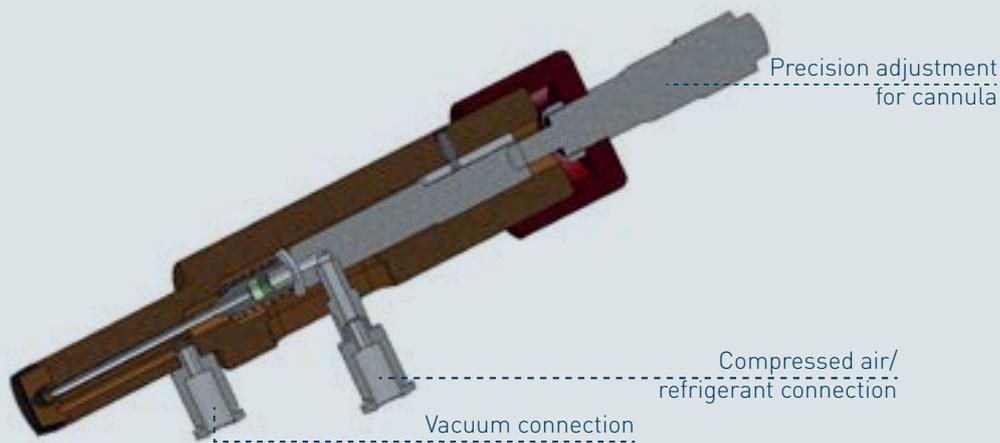
To detect irregular patterns of behavior, the platform works with a variety of interdisciplinary research fields and pseudonym order data. Using pseudonym data also provides the required degree of data protection, since the data that is affected is only visible to the online seller. This allows Germany's biggest online seller, Zalando, to try out the concept in an actual online environment and thus say with confidence whether the evaluation platform is working and can actually be used in the future at a reasonable cost. Other partners involved in the consortium are Heinemann SE & Co. KG and the Göttingen police department.

The project got off to a promising start in February when ABBO was voted "Project of the Month" by the Federal Ministry of Education and Research.

Image: © iStockphoto.de/Kameleon007



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A Perfect Solution

Steinbeis team develops technology for removing protective film from prepregs

Lightweight construction is making waves in all sectors of industry. An increasing number of lightweight structures used in the aerospace and automotive industries are now based on fiber-reinforced plastics. A particularly important field of application is pre-impregnated, semi-finished fiber products, so-called "prepregs". Prepregs are typically made of glass or carbon fibers, which are available as textile woven-meshes or scrims. The resin in which the fibers are embedded undergoes a continual hardening process making it necessary to store materials at -18°C . The resin content also means that surfaces are highly adhesive. To make it possible to transport, store and process prepregs, they are coated on both sides with a film. The Chemnitz-based Steinbeis Innovation Center for Drive and Handling Technology in Mechanical Engineering joined forces with KVB (the Institute of Construction and Composite Design) and Cotesa GmbH to develop a gripping technology to remove these films. This involved looking more closely into the bond between the protective film and the prepreg.

With the previous process, after the prepreg was cut to size, an operator would pierce the corner of the foil with a cutting knife, turn the corner up and tear the film off by hand. Depending on the strength of adhesion, this process would be more or less long-winded and it involved significant investment of resources.

To establish how strong the adhesion force is between the film and prepregs, the project team developed special testing equipment. This made it possible to examine different carbon fiber-reinforced plastic prepregs with a surface mass of between 110 g/m^2 and 650 g/m^2 , as well as cover films of between 32 g/m^2 and 96 g/m^2 . To investigate whether it would be possible to use conventional gripping technology, the surface topography of the protective films was closely examined visually and the adhesion level was ascertained. One finding of the tests was that the adhesion force was between 2 N/cm^2 and 12 N/cm^2 .

The results of the tests and the need to make a partial separation near the edge were used as the starting point to test conventional gripping technology. The benchmark the experts defined was to be able to remove material safely without damaging embedded fibers. The results soon showed that this was only possible with a vacuum suction device if adhesion was at minimal levels. Since the majority of cover films adhere much more strongly to prepregs, it is not possible to remove films safely with conventional gripping technology.

To develop a specially adapted gripper, the project team leveraged the tendency for adhesive force to be significantly impaired by refrigerants. After bringing the separation device into contact with the protective film, refrigerant is injected through a cannula. A vacuum sucker then partially separates the film from the prepreg. This process has been patented, and the device that has been developed can be

used manually or integrated into automated processes.

Together with its partners, the Steinbeis Innovation Center for Drive and Handling Technology in Mechanical Engineering carried out the development of the separation device as part of the Central Innovation Program for SMEs, which is funded by the Federal Ministry for Economic Affairs and Energy.

Image: A cross section diagram of the separation device



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Tuning Tunisia's Innovation System to Steinbeis

Steinbeis experts join forces in the country to set up a transfer system

After the sudden and peaceful change in the political system in December 2010, the economic system in Tunisia has been transforming into a modern knowledge-based economy. Tunisia has developed into a pioneer in North Africa, not just in political but also in economic terms. Around 1% of gross domestic product (GDP) investment goes into research and development, making Tunisia a positive exception to other countries in the region, which only invest between 0.2–0.7% of GDP. Tunisia's figures compare more to the EU average of around 2% but they also show that there is still room for improvement. The classic economy also shows scant interest in innovation projects. At only 20% of total expenditures, the share of investment from the private economy in R&D is extremely low. To counteract this, Steinbeis experts are providing support with the setting up of sustainable technology transfer in the country.

As innovation is a central pillar of a modern and sustainable economic system, there is a need to build up more of such activities in Tunisia. Improvements are needed in the country, not only in the innovation infrastructure but also in terms of innovation know-how. Apart from fighting the loss of specialists, there is a particular need for the proper framework to make it possible to facilitate the transfer of scientific know-how and adapt this to the demands of local industry. There are more technology parks and business hotspots in Tunisia than in its neighboring countries. A new generation of business startups is starting to expand, originating from research establishments. Despite this, the number of technology transfer institutions based in academic and scientific locations – and with this the degree of collaboration between science and business – is still minimal and still in the starting blocks.

This is where PASRI (Le Projet d'Appui au Système de Recherche et de l'Innovation) comes in. PASRI is an EU project involving GIZ (the federal enterprise of international collaboration from Germany), which is acting as a partner on the PASRI project in Tunisia and has asked Steinbeis not only to develop strategies for eight existing technology transfer organisations, but also to join forces with Tunisian experts and conduct a tour of 30 companies to gauge requirements and determine possible solutions by using technology transfer.

Four Steinbeis experts went on regular trips to Tunisia in 2014 to work with Tunisian partner organizations and companies. Delivery of the project was carried out in partnership with Tunisian consultants to include local knowledge and make it possible to coach consultants. The results speak for themselves: Based on the previous analysis, all eight technology transfer organizations (which stem from a variety of technology fields) have now worked up concrete action plans and strategies for achieving more technology transfer. This involved exploring a plethora of different measures:

- The creation of independent establishments in order to work self-dependently and efficiently
- Regular visits and analysis of companies
- Evaluation of the results of these analyses to assess which services could be offered to Tunisian companies
- Collaboration with Tunisian consultants in order to make the process of project management more professional and to bridge cultural gaps between science and business
- Mobilization of scientists at research institutions,
- The drumming up of additional funding for personnel and material costs
- Establishment of a national network to facilitate exchange and offer the services of all transfer establishments
- More promotion of initiative and entrepreneurial thinking

- Development of marketing campaigns specifically tailored to the target group

The second part of the project entailed a tour of 30 companies with an emphasis on business in ICT, biotechnology, food and beverages, and mechanical engineering. This was based on the Steinbeis concept of short consulting sessions and special consultations. To prepare and carry out the visits, help was provided by Tunisian consultants, who were briefed beforehand on different ways to approach businesses and analysis. The analytical method used by the experts helped industry to recognize areas of deficit with respect to innovation.

The company tour allowed the Steinbeis experts to identify around 80 key issues that will need to be addressed by companies through the use of technology transfer. These include:

- Set up departments responsible for R&D within companies
- Improve environmental standards
- Introduce recycling
- Test new products
- Offer analytical services
- Develop and implement marketing instruments
- Make it possible to collaborate with European partners on R&D
- Forge more business contacts in Germany

There was clear interest on behalf of the companies to solve these issues with Tunisian experts, who work professionally and offer industry experience. The analysis of requirements showed how important it is that transfer establishments focus on the needs of industry. This was also taken into account within the strategies of the eight establishments.

There is unanimous agreement among the Steinbeis experts that the innovation system in Tunisia is making good progress and that the support from Steinbeis helped to clearly underscore the methods of transfer and, in particular, market orientation. The Tunisian consultants will continue to work with the technology establishments and there are already initial plans to form these into a Steinbeis Tunisia Network. The work with key players in Tunisia was also fulfilling for Steinbeis as it was possible to understand and explore many specific issues relating to the country. Collaboration within the Steinbeis team was also highly fulfilling for all those involved at the different Steinbeis enterprises and a variety of skills were pooled from different industries, areas of consulting and federal states. Summarizing his deep satisfaction after the project, Frank Graage, head of the Steinbeis Research Center Technology Management North East, stated: "This kind of interdisciplinary and intercultural experience, which often hopped between communication in three languages – no more than two of which I actually understood – is something I'm glad I didn't miss out on. I look forward to more projects in Tunisia with Steinbeis colleagues."

Steinbeis Research Center Technology Management North East

Services

- Management of EU and innovation projects in the fields health economy, biotechnology, environmental technology and renewable energies
- Consulting and coaching of technology SMEs for internationalization and innovation management
- Seminars and Training on EU applications, management and use of research results
- Access to partners through the Enterprise Europe Network and Baltic Sea network ScanBalt

Steinbeis Transfer Center Economic and Technology-Policy Dialogue

Services

- Policy advice, consulting and coaching of decision-makers
- Training, coaching of work shadowing
- Seminars, conventions
- Information and study tours for entrepreneurs and decision-makers
- Expert reports

Steinbeis-Europa-Zentrum

Services

- Information on European Union research and technology programs
- Advice on submitting applications and financing projects
- Analysis of companies' research potential
- Support with searches for collaboration partners for training in consortia
- Project management
- Support with the use and application of research results and transnational technology transfer
- Running of conferences, information days and workshops

Image: Fatma M'Selmi, who coordinated the project on behalf of GIZ, and who will also be involved in building up a technology transfer network in Tunisia based on Steinbeis principles.



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Wanted: Consultants!

Setting up a successful new business with Steinbeis – the EXI startup voucher

Steinbeis has been reapproved as a project partner for the ESF Funding Program for Business Startup Consultation. Sponsored by the Baden-Württemberg Ministry of Finance and Industry with funding from the European Social Fund, the program offers consultation vouchers (EXI) to entrepreneurs for free advice – without red tape – on almost all issues relating to setting up a new business.

The previous funding program ran from 2012 – 2014, during which time the founders of over 800 potential startups in Baden-Württemberg were helped to prepare for future self-employment. Steinbeis consultants can provide potential entrepreneurs with advice, support and coaching on the planning and implementation of a new business. Up to 10 working days of backing is available per business founder. To join the pool of EXI advisors, consultants must fulfill the following conditions:

- Consulting knowledge
- Management and organizational skills
- General business knowledge (business and technical knowledge, industry and product know-how)
- Interpersonal skills
- Willingness to undergo further training
- University degree or similar
- Five years' experience as a consultant
- Expertise relating to startups

Funding the Efficient Use of Resources

Steinbeis provides L-Bank Baden-Württemberg with expert advice

Since 2012, Steinbeis has been acting as an expert advisor on the energy efficiency funding program of the Baden-Württemberg State Bank (L-Bank). The energy efficiency funding program enables small and medium-sized businesses in Baden-Württemberg to apply for subsidized loans for investments in their business, on the condition that these will result in significant energy savings. Steinbeis acts as an expert advisor to banks on issues relating to energy savings by providing the lender with the necessary validations.

Around 1,000 funding applications have been assessed by Steinbeis since the program was set up. In February, L-Bank expanded the existing energy efficiency funding program as part of a collaboration with KfW. In the future, small and medium-sized enterprises in Baden-Württemberg will also be able to apply for subsidized loans for measures aimed at saving company resources (e.g., raw materials, parts, consumables and auxiliary materials) and for measures that help protect the environment (e.g., air pollution controls, soil and groundwater protection).

The conditions and the process for submitting applications for investments relating to saving resources are the same as they are for energy efficiency projects. Steinbeis will continue to act as a professional



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partner to lenders and the state bank for the expanded resource efficiency funding program and provide expert advice on resource efficiency.

The resource efficiency funding program is divided into two parts. Part A - Energy Efficiency – offers funding as before for (a) individual measures relating to generating and consuming energy efficiently, (b) the construction of new, energy-efficient business premises, (c) the refurbishment of existing buildings to improve energy efficiency. Part B – Material Efficiency and Environmental Technology – will make it possible to fund measures aimed at saving company resources and measures with a general bearing on environmental protection.



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“My hope is to forge good contacts through the Steinbeis Network”

An interview with Professor Dr.-Ing. Heinz-Leo Dudek

Professor Dudek, you're the founder and managing director of IWT Wirtschaft und Technik GmbH which has been part of the Steinbeis Network since last year as a corporation under Transfer GmbH at the Baden-Württemberg Cooperative State University (DHBW). What are the goals of your corporation and what benefit do you derive from the network-like nature of the Steinbeis organization in pursuing those goals?

IWT Wirtschaft und Technik GmbH sees itself as an institute of adult education, knowledge sharing and technology transfer at DHBW Ravensburg. So our focus lies in the development and organization of continuing professional development programs. Our target group is people working for companies in the region. We talk about “rounding off the engineer” and offering a variety of courses and seminars on business administration topics and personal development, but also specialist technical fields. Of course, as we want the courses we offer to expand, we'll need more experts to come on board as lecturers in the future. My hope is to forge good contacts through the Steinbeis Network.

The emphasis of work at IWT lies in continuing professional development and knowledge transfer, as well as research and technology transfer. What services do your customers ask about, especially around Lake Constance and in Upper Swabia?

Knowledge and technology transfer is a further key area for us and it's about providing companies in the region with advice and support with their development projects. To do this, we line up contacts for the companies with professors working at the DHBW in Ravensburg. They work on testing projects, analysis and consulting projects. There's particular demand for topics like electromagnetic compatibility, lean production and telematics.

Could you give us some insights into your current projects? What are the main areas you're working on and what trends are you noticing?

The biggest project we're working on at the moment involves the verification and validation of user-guided IT systems. It's an extremely interesting topic because it's about finding ways to test complex software when

the control loop under normal operation includes people. Because software has to be tested every time a new version comes out, wanting to automate testing is obvious. The only thing is how to automate the human part. Also, at what point does it make sense from a financial standpoint to invest in automated testing? These are questions we're looking at extremely closely at the moment, using data taken from software development projects from a variety of partners in industry. And because more and more companies will network their IT systems (as in Industry 4.0) this topic will become even more important in the future.

Antoine de Saint-Exupéry wrote: “You cannot look into the future, but you can lay foundations for the future – for the future can be built.” What does your construction plan for the future look like, and how do you want to implement it?

I was over the moon in January 2015 when IWT Wirtschaft und Technik GmbH was selected to receive the honor of becoming a project sponsor for the RegioWIN Lighthouse Project (“BodenseeInnovativ”). This should bolster innovation even more after 2016, to the benefit of companies in the area. I'm sure we'll also need support from other Steinbeis experts for this.



Professor Dr. Heinz-Leo Dudek is the director of IWT Wirtschaft und Technik GmbH, an enterprise in the Steinbeis Network under Transfer GmbH at the Baden-Württemberg Cooperative State University (DHBW). The purpose of the charitable corporation is the development of vocational training including student support and the promotion of science and research.



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Rolling Up the Sleeves and Experiencing Technology

Steinbeis helps the next generation at the phaenovum school research center

In Lörrach, in the southwestern tip of Germany, young researchers can be found going about their work at a school research center called phaenovum. The center, which offers instruction on scientific and technical topics to children and adolescents from Germany, France and Switzerland, is enough to raise the pulse of researchers of any age. The Steinbeis Transfer Center for Embedded Design and Networking is responsible for organizing activities relating to information technology and robotics. The center offers students with a variety of school backgrounds the opportunity to dabble with their creativity and explore robotics and IT – without the pressure of the classroom or curriculum.

To get their minds around the fundamentals of robotics, students use LEGO robot kits called Mindstorms and a humanoid robot called NAO. In a series of extracurricular courses, they gain hands-on experience of programming in Java, Python and C/C++. Topics that particularly pique the interest of the young programmers are explored in more detail in weekend workshops. Top of the charts at the moment is embedded programming using the popular platforms Raspberry Pi and Arduino. The students also enjoy programming modifications to the popular computer game Minecraft.

"The programming skills the students pick up here can be intensified on school projects or presented at school contests like the youth research 'Jugend forscht' initiative," explains Lars Möllendorf, a project engineer at the Steinbeis Transfer Center for Embedded Design and Networking, and director of the department of information technology/robotics at phaenovum. Another alternative for the young ones is to join the teams taking part in robotics competitions with LEGO Mindstorms or NAO – as they did with success in November 2014 when a phaenovum team came third in the Obstacle Robot Race category at Quanta, the international science competition in India.

Students do not just acquire much sought-after IT and robotics skills, however. At the same time they can also rub shoulders with potential future employers. A number of companies in Lörrach and the area back the program, arranging outings, showing students the world of work

and offering internships. This is the way up-and-coming talent will be fostered in the future and both parties benefit.

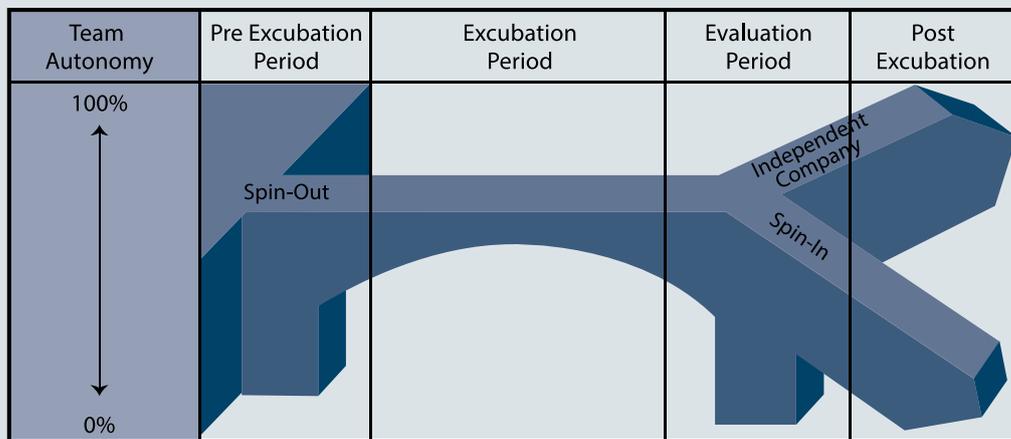
The program for promoting the next generation began in 2003 when Prof. Dr.-Ing. Axel Sikora, director of the Steinbeis Transfer Center for Embedded Design and Networking, partnered with Innocel Innovations-Center Lörrach GmbH, an economic development enterprise belonging to the city of Lörrach. Together, they launched a project called IT Seminar to provide extracurricular courses on robotics. The weekly courses revolved around work with the LEGO Mindstorms kits. The phaenovum school research center was set up in the Lörrach border triangle in 2007 at which point the IT Seminar project was expanded to include information technology and robotics. From the start, the student activities have been sponsored by a variety of well-known firms in the region, as well as foundations and public funds.



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Excubation: An Alternative Innovation Model

bwcon helps companies with the implementation of innovation projects within the organization

With a variety of specialized high-tech businesses in the area, Baden-Württemberg is one of the leading technology regions in Europe. The fast pace of the internationally networked technology markets in which these companies operate requires them to make existing processes as efficient as possible, and, at the same time, implement revolutionary innovations. This is the only way for such companies to secure their competitiveness in the long term. bwcon, an enterprise in the Steinbeis network, has set up a special interest group (SIG) working on the topic of "Excubation – corporate innovation with autonomous teams." Its aim: to help companies meet this challenge.

One reason that companies differ in their ability to adapt to the competitive nature of innovation lies in the fact that established technology firms sometimes find it difficult to implement transformational innovation within the company. One of the key challenges they face is how to allocate resources efficiently, given the internal battle for resources between projects that are aimed at preserving the existing business (through exploitation) and those that will shape and establish future business (through exploration), as described by Gilbert and Eyring (2010).

The goal of the Excubation SIG is thus to bolster the competitiveness of technology companies from Baden-Württemberg by providing them with an effective instrument for implementing transformational innovation initiatives. This would involve improving their ability to adapt to strategic challenges, especially when it comes to implementing transformational fields of business in parallel to existing business processes (organizational ambidextrousness). The bwcon experts also recommend effective structures, referring to a technique called "the excubation of semi-autonomous teams of entrepreneurs." Such structures would improve the efficiency of used resources and reduce risks in the early development phases of transformational innovation initiatives.

The fact that key technology companies in Baden-Württemberg consider it important to bolster competitiveness – and strike a healthy balance between the advantages of an agile startup organization and the resource advantages of established technology firms – is reflected by their involvement in the SIG. Originally set up in the fall of 2013, the companies working with the SIG include SAP, HP, Mahle and Carl Zeiss. This industry consortium is being moderated by Heinrich Siemers, director of innoWerft Technologie- und Gründerzentrum Walldorf Stiftung GmbH, an "incubation" spin-out on the SAP Campus.

At previous workshops, discussion took place between top managers from a selection of technology companies, investors' representatives and consulting organizations, with the support of the Institute for Strategic Innovation and Technology Management (IST) at Constance University of Ap-

plied Sciences. The participants looked at key issues relating to the development of module-based methodologies. These could be used to introduce excubation as an alternative model of innovation along the lines of a requirements analysis. Excubation is being considered as a technique to manage semi-autonomous teams of entrepreneurs. These would be systematically "excubated" from the existing (parent) company into temporary spin-outs. If the strategic fit is good, they could be spun back in to the organization at a later point. This provides technology companies with an effective instrument of organizational restructuring, allowing them to develop transformational business fields. A particular benefit of this model is that companies gain access (at least indirectly) to organizations able to offer them external resources – organizations it would otherwise be uneconomical or inappropriate to approach. At the same time, the approach is less risky, both for the team of entrepreneurs and for the technology company. The model thus makes it possible to improve resource allocation and thus also the financial viability of transformational business fields (Gilbert and Eyring, 2010). The aim of the initiative organized by bwcon is thus to develop appropriate methods and tools.

Image: Alternative innovation model


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“For industry, internationalization stopped being a one-way street a long time ago”

An interview with Jürgen Oswald, CEO of Baden-Württemberg International

Mr. Oswald, as the person in charge of Baden-Württemberg International (bw-i), you'll be the first to know that internationalization is coming along well in the German economy. What opportunities and challenges do you see for small and medium-sized enterprises (SMEs) in Baden-Württemberg? And in particular, what obstacles do you believe these companies need to overcome?

Time and again on our delegation trips abroad, I get to see what major opportunities there are to go international. On the one hand, it allows companies to access new sales markets and enjoy new growth. On the other, they can benefit from the lower production and procurement costs, or access to raw materials, especially in newly industrializing countries. I find one advantage particularly important: International competition promotes companies' ability to innovate. Companies with foreign operations spend almost twice as much on R&D as companies with no overseas activities. Ultimately, companies that make the step abroad safeguard their competitiveness and jobs back in Germany.

But internationalization also has its challenges, especially for SMEs. One should not underestimate the cost of management in developing and implementing an internationalization strategy. Target markets have to

be defined, the specific conditions in each market have to be understood and risk has to be analyzed – and to do this, you need the financial resources. Another challenge is the bureaucracy, the rounds of approvals and property rights in each of the target countries. For a company with 150 employees, this is no mean task. This is why the bw-i has set up its own office in China – one of the most important growth markets. The office is in Nanjing to help SMEs from Baden-Württemberg enter the market.

bw-i celebrated its 30th anniversary in 2014. How has the nature of your work changed over the past three decades?

Our company was set up in 1984 as the Baden-Württemberg Export Foundation. Its aim was to help SMEs with their export activities. As the years went by, we took on new activities. The last time was in 2004, when we were given the job of helping universities and research institutions in the state with internationalization. By the way, this combination between business on the one hand and science and research on the other makes us unique in Germany. In terms of company support, our focus has now shifted. It used to be about helping small and medium-sized companies to enter new foreign markets, whereas now the em-

phasis lies in exploring collaboration between Baden-Württemberg and foreign companies, as well as universities and research establishments. The programs offered by bw-i also make a contribution to more intensive exchange between business and science and academia.

It's not just business that is subject to more global competition than ever before, the same applies to science and research. bw-i helps universities and research establishments in Baden-Württemberg with their internationalization efforts. What challenges does this process bring for the German university and research system?

It's right to say that globalization is resulting in increasing competitive pressure for our universities and research establishments; they're competing for the best grey matter and the best collaboration partners. Since more than 90 percent of global knowledge comes from outside Germany, we have to tap into this potential knowledge for our research and work, with the best scientists and most innovative researchers, in all corners of the globe. At the same time it's important to improve the appeal of Germany to foreign scientists, professors and students. This is linked to another challenge in internationalization for our education: Science and business need a new, up-and-coming generation of highly educated people who are versed in internationally relevant issues – and to answer this demand, the universities have to offer the right degree programs and become more international in all areas. This ranges from setting up international partnerships and exchange programs to participating in cross-border projects with international partners, integrating international aspects into the curriculum and recruiting people with international experience. bw-i provides the universities and research establishments in the state with support and supervision to help with this internationalization process, providing relevant information, which helps create impetus, even across multiple establishments.

If the issue is internationalization, then one aspect that mustn't be forgotten is technology transfer. What aspects do you consider particularly important in this respect?

For industry, internationalization stopped being a one-way street a long time ago. In some areas it's now evident that the drive to establish a foundation of technological know-how – in countries like China, India and Korea – was so successful that the bedrock of leadership in future markets like electric mobility is no longer automatically in the western industrialized nations. As a consequence, it's becoming increasingly important for German companies to engender exchange with foreign partners in more challenging areas. We know from experience that this is much easier for big companies than our SMEs. As I said before, lining up collaboration abroad for small and medium-sized enterprises in the southwest is part of our core business. We organize events in Germany and elsewhere to provide a platform to facilitate technology transfer and kindle innovation processes.

Steinbeis and bw-i have been working together successfully for years now, on a variety of projects. Where do you envisage areas to develop this collaboration in the future, especially when it comes to technology transfer?

The two organizations have been collaborating successfully for some years, especially on strategically important projects. For example, we took internationalization of Micro-TEC Südwest (the leading business cluster) forward as part of the MicroTEC Worldwide and Pro-Excellence projects. Insights from these research projects also laid an important foundation for the request for proposals for the business cluster agency ClusterAgentur Baden-Württemberg (CABW). CABW was set up by the Ministry of Economy and Finance in late 2014 with the aim of making cluster management more professional, and it's receiving support from VDI/VDE, Steinbeis and bw-i. There's a further technology transfer collaboration on the horizon as part of CABW's activities. The different technologies and application areas provide a rich breeding ground for activities, often spanning different business clusters, and if these are cross-border, some of them will be jointly implemented by Steinbeis and bw-i.

Image: © bw-i



© bw-i

Jürgen Oswald has been director of Baden-Württemberg International (bw-i) since 2012. bw-i is the competence center for the internationalization of business, science and research in the state of Baden-Württemberg. A political scientist, Oswald was previously head of the units responsible for location marketing, business cluster policy and foreign trade at the Baden-Württemberg Ministry of Economy and Finance.

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Energy Efficiency Renovations. Who Foots the Bill?

Steinbeis study investigates the passing on of renovation costs for rental accommodation

According to an agreement signed by the two parties of the coalition government, the percentage of money invested in the renovation of rental real estate that can also be passed on to tenants will go down from the current rate of 11% of chargeable costs to 10%. This figure should also be limited to the period of amortization. The ruling is currently being implemented by the justice department. It is based on a false premise, however, regarding the actual revenues landlords can generate through renovations – this is the opinion of the experts at the Center for Real Estate Studies, a Steinbeis Transfer Institute belonging to Steinbeis University Berlin. Under the scientific chairmanship of Prof. Dr. Heinz Rehkugler and Prof. Dr. Marco Wölfle, the experts conducted a study which came to the conclusion that limiting the amortization of renovation costs weighs heavily on the revenues of landlords, which mostly become negative. They believe that the new law had a much greater impact on the financial standing of landlords than another hotly debated measure: rent control.

The basis of the project was a close examination of the financial viability of energy efficiency renovations. Drawing on a variety of possible rent price scenarios, the researchers at the institute developed a calculation model for simulating the profitability of measures based on different reference value models. This made it possible to estimate the impact – not just for landlords but also for tenants – of the following factors: increases in energy costs, renovation costs, increases in reference rental prices, the level of the original rent, the nature of financing and backing for completed renovations, the duration of the tenancy agreement after renovations. The calculation model showed that handing on 11% of renovation costs now and only 10% of costs in the future, did not actually correspond to returns of 11% and 10% in nearly any of the cases studied. If anything, according to the base model, the yield rate before and after tax was around 5.5%, with a relatively long amortization period of around 22 years. This had a particularly dire impact if, as is often the reality, it is assumed that the average rental agreement lasts 10 to 15 years. In such cases, renovations to improve

energy efficiency are practically never worth it if landlords want to rent out real estate again and the achievable rental price is less than the extra cost of the renovation. In re-renting situations when rental prices are indeed much higher than reference rates in the area, there is a strong incentive for landlords to "drive out" tenants with the threat of higher rent after renovations – and then charge more for rent, which they would not have been able to by continuing with the current agreement.

From the tenants' viewpoint the renovation costs they have to meet contrast with the savings they can make on heating costs. Even when renovations do make sense from a financial standpoint, the higher rent significantly outweighs the savings on heating costs for many periods, which is a burden on tenants. Since the costs that can be handed on to tenants are not linked to the savings they make, tenants will often not actually see net savings in the long term. Again, this strengthens the weight of the argument people use regarding short tenancy agreements:



Steinbeis Transfer Institute Center for Real Estate Studies (CRES)

A Steinbeis Transfer Institute, the Center for Real Estate Studies (CRES) was founded by the Freiburg-based real estate academy Deutsche Immobilien-Akademie (DIA) in mid-2008 before being taken over by Steinbeis University Berlin in December 2010. The increasingly complex nature of real estate – fuelled not only by real estate issues but also fiscal developments, marketing trends and economic factors – is changing the requirements and job profiles of professions in the industry. To succeed in the profession, it is becoming increasingly important to gain good qualifications and gather practical experience in specific fields. This is the motivation for the CRES to provide professional academic training for people working in the real estate industry through its state-approved bachelor's and master's degree programs.

Aside from providing vocational training, the CRES also engages in research into the real estate industry. Both the CRES and DIA are currently supporting several research assistants in their studies towards a doctorate in real estate topics.

Tenants pay for potential savings in the long term – savings they will never benefit from. For the tenants, the equation is basically the same as it is for the landlord: If tenants move out within 10-15 years of the renovation, and the renovation costs were handed on at the permissible rate, generally tenants have to pay more rent for the entire period than they can save in energy costs.

The German rental market reflects this dilemma. The renovation costs that are actually handed on to tenants are on average much lower than is permissible by law. The price just about stays level for rent, so increases in rent cancel out the savings that can currently be made on heating. The costs that can be handed on to tenants do not make it possible for landlords to make reasonable returns on their capital.

The Steinbeis study shows that the main drawback with the current law on handing on the cost of renovation work will also not be eradicated by the new amendment: It does not even start to solve the "landlord-tenant dilemma," it practically completely kills off any incentive for landlords to carry out energy efficiency renovations, yet it still does not prevent tenants from being unduly burdened with costs, nor does it prevent renovations being misused to evict tenants. This is because the handing on of renovation costs is still not in any way linked to how successful renovations were.

According to the Steinbeis experts, it would therefore be necessary to radically change the approach used to regulate increases in rental prices

after energy efficiency renovations. A model of proportions, linking the handing on of renovation costs to the actual success of the measures, would be a much better solution to the outlined problem. This would ensure that renovations are only carried out

- if they make sense
- if landlords make suitable yields on their capital investments
- if the renovations to save energy are not misused and tenants are not exploited

To keep promoting energy efficiency renovations, it would seem to make sense to leave the gains made by using public support in place, as an incentive to landlords.

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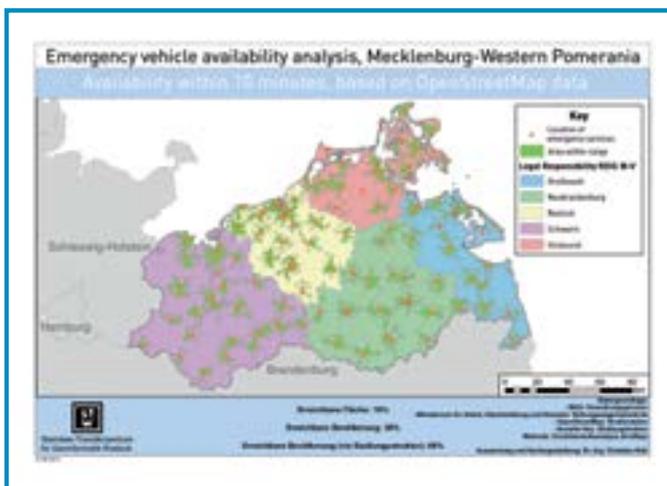
The full version of the study is available in German on the CRES website.



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Reaching Patients when Every Second Counts Steinbeis analyzes roadside and air rescue systems

The debate surrounding a possible amendment to rescue services legislation in the state of Mecklenburg–Western Pomerania has shown that emergency access to patients from the air or on the highway and the quick transportation of patients to a medical center are key factors to address. With complex medical support and procedures, the health care guidelines of medical associations stipulate tight time slots within which emergency patients have to reach centers. The Steinbeis Transfer Center for Geoinformatics was given the task of analyzing the actual accessibility of centers in Mecklenburg–Western Pomerania using GIS data.



Analysis of availability of roadside rescue services using OpenStreetMap data

In a relatively large state like Mecklenburg–Western Pomerania, major distances have to be covered between different emergency centers, the location of an emergency and a suitable hospital, so there is no guarantee that agreed time slots can be adhered to. Given this situation, the Südstadtklinikum in the south of Rostock invited Steinbeis experts to conduct a time-location analysis and examine existing emergency services data and the supply infrastructure using geo-information systems (GIS) and geo-data. This had to be plotted and illustrated for routing and availability purposes.

The experts evaluated the transportation modes used by the emergency services on the highways and in the air. Drawing on a variety of techniques and GIS tools (an "availability analysis" using OpenRouteService, OSM data, ArcMap tools and ArcGIS online), a comparison was made between geo-data and the road network in order to assess the quality of results. Using different approaches made it possible to ascertain which areas could be reached within a specific timeframe. The resulting polygons were superimposed on the boundaries of rural districts. Availability could be calculated for each pocket of inhabitants by multiplying the outlying areas by the population densities.



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Saskia – an app that helps with the pronunciation of sibilants

Student project on a concept to help children with speech difficulties

Lisps are common in childhood, when some children have problems with the formulation of sounds. Saskia is an interactive toy that helps with lisp therapy. Lukas Dürrbeck, a student at the Würzburg-based Steinbeis Research Center for Design and Systems, has been working with experts to develop an app that will provide an innovative approach to speech therapy.

Saskia is a snake that invites children to practice with it. The app itself is actually integrated into a soft toy which gives it a personality. This aspect of the design is an important factor as the children with the lisp then become involved in a dialogue with a "real" character who would like to help them with their speech impediment. As the child plays, it provides itself with therapy in a totally natural way.

The exercises with the snake complement regular lisp therapy. The child is taken through a series of exercises to improve listening so that the child recognizes correct pronunciation and reinforces the right lip and

tongue movements. The smartphone app analyzes the frequency of signals from the microphone. The highly accurate software recognizes if an S is mispronounced, reacting with corresponding questions, answers and suggestions.

It makes sense to use smartphones for this kind of application because they are so widely available. Parents can use the software without having to pay for extra hardware, thus providing meaningful support to the work carried out by the speech therapist.

The application was developed as part of a degree project carried out by Dürrbeck at the Steinbeis Research Center for Design and Systems. With support from partners in industry and science, it can now be launched in the market.



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Seeing Right Through Data

Steinbeis student develops concept for a new group reporting system

How much turnover was made in individual areas of the business, throughout the whole group of companies? Which products have we sold and in which periods? How high was the direct product profitability for a specific group of products and could the costs be met? These were the issues looked at by Martin Pantel for a degree project as part of his studies toward a Master of Science in Controlling & Consulting at the School of Management and Technology, which belongs to Steinbeis University Berlin. Pantel's project was sponsored by MAGE Solar AG.

MAGE Holding includes four business divisions spanning four areas of technology: roof and construction systems, solar and water technology, facades and solar assemblies, and fixtures. MAGE Solar AG is responsible for photovoltaic products and is experiencing rapid growth. This is reflected in the operational setup of the organization: As a result of its growth, the business structure and processes change frequently, and reporting systems have to be adapted accordingly. New factors can have an influence on current and future reports, as well as internal and external reporting requirements. Given the situation, it was necessary to take a closer look at the underlying approach taken to reporting, and to make adjustments where necessary. In particular, one interesting approach for MAGE Solar AG to consider is the central storage of data. There was particular interest in a multidimensional "data cube" for use with analysis and evaluations. This data cube could allow for logical illustration of data, with each dimension of the cube providing easy user access.

One of the key goals for Pantel during his master's degree was to investigate the existing IT systems landscape at MAGE Solar AG and come up with a concept for possible ways to introduce a data cube within the company. MAGE Solar AG would derive value from having a uniform basis of data and this would improve decision-making in senior management. Furthermore, it would be of benefit to MAGE Solar AG to have automatically produced reporting data which is not just current, but also easy to interpret.

A key aspect of Pantel's project was to develop a concept for the data cube in such a way that reports would generate the right data. Ideally, data would have to be produced automatically and be understandable and up to date. Pantel also had to consider the eventuality that new units or business areas may be set up and these would also have to be included in reporting systems. This would be an opportunity to add value for MAGE Solar AG by keeping the reporting process flexible and make it easy and efficient to manage. To establish a foundation for implementing the data cube concept – in keeping with the outlined requirements – Pantel developed a theoretical model for the different reporting di-

mensions. These included different classification hierarchies. While looking at possible approaches, the priority for Pantel was to do justice to the situation and requirements of MAGE Solar AG, focusing primarily on various feasibilities within individual dimensions and ways to integrate this into the reporting system to make evaluations. Overall, it would have to be possible to implement requirements laid down later by senior managers and do this quickly in keeping with quality expectations and objectives. Based on the database model that was developed, Pantel examined different concepts and indicated next steps toward a possible implementation.

The results of Pantel's work speak for themselves. The company now has a comprehensive, standardized and multidimensional model that generates meaningful content and can be used in MAGE Solar AG group reporting. Once the concept has been implemented, it will be possible to create reports with full access to cost accounting. The data cube means that reporting data can be evaluated and exported for the entire MAGE Solar Group. The system also provides senior managers and people responsible for sales issues with an additional instrument of analysis and control.

Image: © fotolia.de/Kentoh



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Employee-friendly company culture

Development planning

Age-appropriate
workplace design

Age-appropriate
work organization

Age-appropriate
working hours



Occupational Health Care Management: The Benefits to Workers and Companies

Steinbeis Transfer Institute develops concept for older employees

In 2009, the German federal office of statistics predicted that the number of people of a working age in Germany would fall by around 35% from 49.7 million in 2010 to 32.6 million in 2060. This trend can hardly be avoided, even with a much higher number of people entering the country and an extension of the average number of working years. Even today, some sectors of industry are noticing a deficit in new workers. Demographic change in Germany will result in a rise in the average age of workers. So it can only be in the interest of companies for older employees to stay on at work for as long as possible and remain healthy. Given all of these issues, the experts at the Villingen Institute of Public Health (VIPH), a Steinbeis Transfer Institute belonging to Steinbeis University Berlin, have developed a concept under the leadership of Dr. med. Lotte Habermann-Horstmeier: aBGM (which translates literally as "age-appropriate occupational health care management.")

For companies that want to support their increasingly aging workforce and keep them fit to work in the future, it's not enough to simply offer their employees one-off occupational health activities. It is doubtful whether they will be either effective or efficient because, by themselves, initiatives have little discernible impact. Instead, it is important to see occupational health care management (OHM) as a holistic activity. OHM goes far beyond conventional activities of health promotion within companies. It involves establishing an overall health promotion framework at the company or institution, which has to be combined with meaningful preventative and health promotion measures at the individual level.

Given the fact that society is getting older, effective OHM should now always be about providing "age-appropriate" OHM. This was the thinking behind a concept called "age-appropriate occupational health care management" (aOHM) which was developed by the Villingen Institute of Public Health (VIPH), a Steinbeis Transfer Institute. The idea was based on strategies and instruments used by the German Network For Workplace Health Promotion (BKK. Maintain Employability. Strategies and Instruments for a Long and Health Working Life. BKK Federal Association, 2007). Central to the success of an aOHM within companies are the inclusion of company management and workers, a positive and cooperative leadership style, and a company culture based on mutual appreciation.

re

Health programs

Continuing professional development

Return to work

One of the first steps when planning an aOHM is to record the changing age profile of the company by conducting an "age structure analysis." Based on this, a checklist can be drafted to capture key areas of action. This provides a snapshot of the current work and employment setup within the company, taking the current and future age profile into account. This analysis should also include the results of a "work ability index." This shows how people see their own ability to work (now and in the future). To create an understanding for key issues, a workshop can be offered to workers to look at age and health topics.

Based on this approach, aOHM can be customized to the individual company and it can have an impact on many areas of the business. To successfully introduce concrete measures, it is essential to coordinate development plans and this should be underpinned by an integrated, holistic strategy for the whole business. Actions in different areas have to be carefully dovetailed:

- If workstations and working environments are to be designed ergonomically, they should be continually adjusted to changes in people's physical ability to perform certain tasks. This helps prevent improper physical workloads.

- It is also beneficial to older people if work and procedures can be made more adaptable. This can involve changes in tasks and workloads which offers people greater variety and makes it easier for them to learn new things. In such contexts, it can be advantageous to have team members of different ages. Improving work organization includes measures aimed at reducing time pressures.
- It is increasingly important to offer older workers activities that allow them to define their own working hours in keeping with concepts of work-life balance –something that is also well received by younger employees. It may be worth considering moving away from shift work since older shift workers are much more likely to fall ill. If possible, the planning of shift rosters should revolve around health promotion.
- Depending on the operational requirements, it may be possible to introduce company health programs and offer checkups and preventative medical examinations. Other possible measures include setting up communal sports activities, canteens with health foods and instruction on "anti-stress strategies." Health care programs generally have a long-term impact, but only if the necessary prerequisites are fulfilled within the business.
- It is often misunderstood how effective continuing professional development can be as part of aOHM. Companies with a policy of offering training to all employees, simultaneously, independent of the age group, often expand the understanding of everyone involved. This helps protect older workers from excessive workloads since they can be reallocated to alternative areas of the business.
- Effective aOHM also includes step-by-step reintegration when an employee returns to work after a long period of absence for health reasons. As people get older, the number of sufferers of chronic illness increases so it becomes all the more important to introduce options to successfully return to work.

Small and medium-sized enterprises often believe that comprehensive OHM programs are prohibitively expensive for companies of their size. As a result, when the experts at the Steinbeis Transfer Institute in Villingen were designing their aOHM program, a key consideration was that the concept could be adaptable to any size of business. Whether occupational health care management is ultimately effective and financially viable for a company can be checked and assessed in an "outcome evaluation." Unfortunately, most companies reject this option for cost reasons, but even in this area there are ways for SMEs to limit outlays.

Image: age-appropriate occupational health care management (aOHM) includes instruments in many areas of the business.



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PATENT

“German companies should never underestimate the Chinese competition”

An interview with Elliot Papageorgiou, expert for the Steinbeis Symposium of Security in Business

Mr. Papageorgiou, protecting a company's information and know-how is increasingly entering public discussion. Your law firm, Rouse & Co. International LLP, is one of the leading IP consultancies in China. What work do you do to help companies in Germany?

German companies generally already have good advisors when it comes to intellectual property (IP) matters. Rouse mainly focuses on adapting IP strategies and processes for and to the Asian markets and especially China. The process requires acute awareness among German managers of the problems that may arise with the different approaches to a successful IP strategy in China. We examine the current IP strategies to identify weaknesses or potential for improvements, and we make sure we also devise a strategy for keeping track of and searching local competitors' rights. We also provide support with the implementation of the agreed strategies for monitoring competitors' IP rights. It is also important to have well-thought-out strategies on whether and when to challenge the competitors IP rights, and how to ensure IP law suits in China have maximum impact.

German companies have been operating in the Chinese market for some time now, but there are still challenges to be faced with the foreign business culture. What sort of problems do German businesses encounter in China?

The way I see it, the biggest challenge for German businesses in China is the same today as it was 10 years ago: Decisions are being made about China, and impacting their China prospects, based on experiences gained in other areas of the world. This begins with the strategy applied to deciding if and when to register IP rights covering China. In Germany, companies have a very effective system for IP protection and enforcement, some would say the strongest worldwide, so they only have to register the rights they really intend to use. In China, the IP system is weaker, so companies

have to register more rights, especially rights which protect against losing ground to competitors or even being taken over by them. One thing that has changed in the last 10 years is the massive explosion of IP rights filings by companies. This is a serious threat for Germany companies in China as they could be sued for infringing the IP rights of Chinese companies. In the past, the first (and often only) issue we had to address for clients was which measures needed to be taken to counteract Chinese IP infringements. Today we always start by searching whether the alleged infringers (which are probably best categories today as "competitors" or "potential competitors") have their own rights our clients need to avoid or invalidate. In the past three years, I've advised dozens of European companies that have found themselves as defendants in IP lawsuits brought by Chinese IP holders.

Based on current trends, how do you expect this situation to develop?

China quite clearly has to work its way up the manufacturing value chain – this is something that was recognized in the last two Five-Year Plans. There will be an increasing number of genuine innovations deriving from China, not just adaptations, or petty or cost-reduction improvements (what I like to call "imi-novation"), but real innovations. As a result, German companies will increasingly run into obstacles if they try to set up business in China. We cannot keep seeing Chinese companies as mere imitators, we have to change our Weltanschau and see them increasingly as competitors. Since the Chinese company CHINT successfully sued the French company Schneider Electric (a lawsuit which was settled for allegedly around 23 million dollars), Chinese companies are no longer scared of taking potshots at foreign Companies for IP infringements. I think this trend will continue and even intensify. I also expect more and more Chinese companies to file applications for patents internationally.

The large number of German small and medium-sized enterprises, or Mittelstand, play a key role in Germany. Is it difficult for smaller companies to enforce their rights in China?

Not at all. To enforce IP in China, Mittelstand companies first have to ensure they own IP rights in China and this is precisely where many Mittelstand companies have catching up to do. If they register their rights, they are in an excellent position to impact the technology developments in China, and this in turn improves their chances of securing reciprocal licensing arrangements as well as protecting their market positions, their "Freedom to Operate" in China. Independent of their size, German companies can generally enforce their IP rights one way or another, however, I can see that there is a significant need among the Mittelstand for advice tailored exactly to their needs and challenges they face. There is major economic potential in this respect, not just in terms of technology transfer but also in terms of product exports and licensing. In my experience, of strategic importance in this regard is the work undertaken by organizations like, and especially the Steinbeis Transfer Center Infothek. Experienced partners and "knowledge-multipliers" are essential when it comes to preparing for IP challenges faced in foreign countries. I also believe that in future, it will be important to offer support to the Mittelstand by financial means – after all, the Chinese government offers Chinese companies various and diverse incentives and subsidies which enables them to acquire or secure, exploit and in the end enforce, their IP rights.

The number of Chinese patents being registered is rising exponentially. How do you see them in terms of quality and quantity?

In the eleven years I have now been working in China, I have seen some robust local invention patents, utility model patents and design patents, but also registrations that can only be described as "junk" or a case of "patent piracy". China is well aware that poorly targeted/incentivised subsidies are a blunt instrument for fostering innovation. Where subsidies are based on the number of filings, necessarily incentives will result in a situation where quantity trumps quality. Chinese authorities have started tightening the requirements for the grant of subsidies in an attempt to align the interests of the State in climbing the innovation value-chain, with the interests of individuals to secure monetary rewards. The current system will however be around for some time, so the quality of IP rights will remain a challenge faced by German companies with any business interests in or with China, whether supplying, sourcing, manufacturing or selling. All IP rights that are registered in China automatically become part of "prior art", meaning that they have to be considered assessing novelty and inventiveness of all inventions made and filed even in Germany. So the more such "prior art" that exists, the harder, arguably, it becomes for German inventions to meet the necessary standards of novelty and inventiveness. In short, German companies must update their search strategies for IP rights in China so that they become and remain aware of all relevant China origin "prior art". Additionally, this will also allow German companies to identify ahead of time where future threats from China may originate.

Tell us what your advice would be to German companies that want to enter China with their products: What should they think about? What's the best way for German companies to prepare themselves for future challenges in China?

Ten years ago I would have advised German companies to check if they have registered all the rights they do not want to lose. Now that approach is no longer sufficient, and I now recommend they carry out periodic "freedom to operate" searches to ensure they do not "trip" over Chinese IP rights. Going forward, German companies should never underestimate their Chinese competitors. To adapt one of Sun Tzi's stratagems in "The Art of War": Only if German companies know their own strengths and weaknesses, and know the strengths and weaknesses of their Chinese competitors, and choose their moment and venue of engagement in light of such knowledge, will they be successful in their IP battles in China!

Rouse & Co. International

Rouse is an international law firm that specializes in all kinds of questions relating to intellectual property rights, especially in relation to Asia and Southeast Asia. Rouse has offices in China, Hong Kong, Indonesia, Thailand, the Philippines, Moscow, Dubai and London.

Steinbeis Transfer Center Infothek

A Steinbeis Transfer Center based in Villingen-Schwenningen, Infothek offers a spectrum of services relating to property rights, from research to strategies, seminars, workshops and network projects. Infothek is the organizer of the Steinbeis Symposium on Security in Business which took place on May 12, 2015, in Villingen-Schwenningen.

Image: © fotolia.de/kentoh



Elliot Papageorgiou is a Partner in the law firm Rouse & Co. International LLP and has worked in Melbourne, Oxford, London, as well as stints in New York, in addition to spending the last 11 years in Beijing, Guangzhou and Shanghai. Elliot advises European companies on intellectual property (IP) rights strategies, on how to prepare for and successfully enter the Chinese market with their IP and how to protect and enforce their IP. He has been a speaker on four occasions at the Steinbeis Symposium on Security in Business, which takes place annually in Villingen-Schwenningen.

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The Road to Europe 2020

SEZ works on “Good Practices” in the internationalization of business clusters in the Alpine region

The economy in the Alpine region is dominated by SMEs involved in manufacturing. One way to shield companies from an economic crisis is through business clusters that promote international networking and an openness to new markets. AlpClusters2020, a project involving the Steinbeis-Europa-Zentrum (SEZ) and other partners in France, Italy, Austria and Switzerland, aims to promote business clusters in order to strengthen the competitiveness of the Alpine region and promote innovation.

With backing from Alpine Space, an INTERREG IV B program of the European Union, between September 2013 and the end of 2014, the SEZ joined forces with seven partner organizations in the Alpine region to network innovative business clusters in a total of six key regions. With the objective of improving transnational collaboration, the project partners analyzed and evaluated over 70 EU projects to examine the experience gathered with the implementation of activities specifically aimed at improving internationalization among cluster members.

What measures can clusters use to support SMEs with internationalization? To establish this, the project partners carried out a survey in the affected Alpine regions, interviewing cluster managers, representatives of the institutions involved in cluster policy making and political representatives. As a result, they pinpointed five instruments that could be considered successful practice.

In first place came pilot actions which actively involve SMEs in the project – for example, by setting up pilot equipment or demonstration facilities. Second was the cross-border promotion of projects. One form this could take is vouchers for forging cross-border contacts or the offering of backing for collaborative applications within the clusters with additional political support. The third instrument that was identified was the drafting of a cluster internationalization strategy. Cluster managers should work with cluster members to create a strategy to facili-

tate the effective internationalization of its members. For many clusters, this is a key prerequisite for sustainable cross-border collaboration. In fourth place came events such as networking days, cluster conferences and themed roadshows, but also delegation trips and joint exhibitions at international fairs. Finally, the fifth instrument that was identified was training, not only for cluster managers but also for SMEs themselves. For example this could be training on intercultural collaboration, R&D project management, innovation management or exchanging employees. Personal contacts are a key success factor in this respect, such that physically meeting up takes precedence over virtual interaction.

The findings were assessed and expanded at so-called AlpCafé workshops in the five affected regions. Finally, policy recommendations were pulled together for the European Commission to lay foundations for the funding period 2014-2020. These were presented publicly, including at a closing conference in Salzburg in October 2014 as part of the Alpine Space 2020 Conference. As a partner of the project, SEZ was responsible for the delivery of activities in Baden-Württemberg, for an analysis of experience with European initiatives and for working up the policy recommendations.

INTERREG B

The INTERREG B program is used by the European Commission to promote transnational collaboration as part of the European regional development fund. With over 100 partners involved in 84 projects and EU funding of around €25 million, Baden-Württemberg was one of the most active regions involved in trans-regional collaboration within Europe in the last period of the program (INTERREG B, 2007-2013). For the 2014-2020 funding period, around €1.3 billion of EU funding is available under the INTERREG B program. Baden-Württemberg is involved in four parts of the INTERREG B program:

- Around €117 million of EU funds are available for the Alpine region. The co-financing rate for German partners is up to 85%. The regions that are involved are the states of Baden-Württemberg and Bavaria and other regions in Austria, Slovenia, Italy, France, Liechtenstein and Switzerland.
- The Danube region is a new INTERREG B cooperation area. Around €202 million are available for regions in 14 countries. The co-financing rate for German partners is up to 85%. The states of Germany that are involved in the program are Baden-Württemberg and Bavaria. Other countries that are involved are Austria, Czech Republic, Slovakia, Hungary, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Bulgaria, Romania, Moldavia, Slovenia and parts of Ukraine.
- Almost one third of the entire EU population lives in the Central Europe cooperation region. Around €247 million of EU funds are available for this region. The co-financing rate for German partners is up to 80%. The states of Germany that are involved in the program are Baden-Württemberg, Bavaria, Berlin, Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt and Thuringia. Other member states are Poland, the Czech Republic, Austria, Slovenia, Italy, Croatia, Hungary and Slovakia.
- The northwest Europe cooperation program spans some of the most innovative and economically advanced regions of Europe. Around €396 million of EU funds are available in this region, the biggest budget of all INTERREG B regions. The co-financing rate for German partners is up to 60%. The states of Germany that are involved in the program are Baden-Württemberg, Bavaria, Hessen, North Rhine-Westphalia, Rhineland-Palatinate and the Saarland. Other member states are France, Switzerland, Luxembourg, Belgium, the Netherlands, the United Kingdom and Ireland.

Depending on the region, the areas that are covered by funding include: strengthening of regional innovation resources; environmental and resource protection, reduction of carbon emissions, energy efficiency and renewables; sustainable transportation and networks; development of natural and cultural resources; governance and institutional capacities.

Image: © pixelio.de/Thommy Weiss



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Welcome to the Steinbeis Network

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



Information on recently founded enterprises in the Network on www.steinbeis.de



Information on recently founded enterprises in the Network on www.facebook.de/Steinbeisverbund



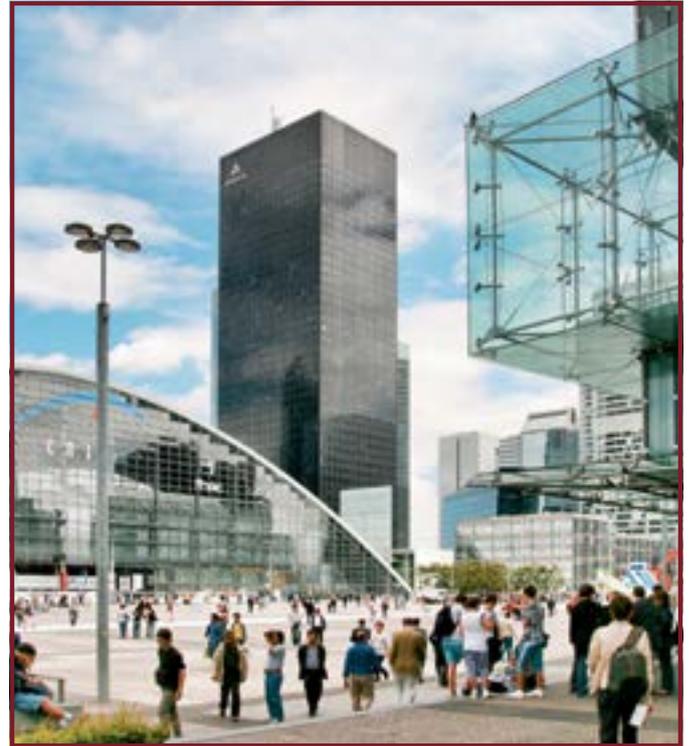
Certification Course to Become Specialist Mediator for Large Groups and Planning Processes

Collaboration between Steinbeis Transfer Institute and VBI

Demographic change, the road ahead to sustainable cities, the transition to renewable energy – just some of the challenges faced by municipal planners. Whether they work in the public sector or work for engineering consultants, planners are often confronted by diverging interests in the planning process. Ultimately, dealing with conflicting interests is part of their job. Also, citizen involvement is increasingly considered an important part of successful municipal planning. As a result, in cooperation with the German Association of Consulting Engineers (VBI), the Steinbeis Transfer Institute for Social Aspects and Law, which belongs to Steinbeis University Berlin, has developed a training course that culminates in certification as a specialist mediator for large groups and planning process in the public domain.

The energy revolution is also placing enormous pressure on the energy industry to change – by adapting internal processes on account of cost pressures, or by introducing measures to change the infrastructure as required by regulators. This fuels conflict, not just within companies but also with customers. As a result, there has been a sharp increase in dealing with citizen involvement processes and conflicts that may arise during public construction and planning projects. In many communities, efforts are already being made to engender a new culture of involvement, with special events and innovative active participation models such as online debates to call on local residents to play a part in planning.

The training to become a specialist mediator in large groups and planning processes in the public domain is targeted mainly at planning engineers who also consult, project planning managers, regional managers, people



working for the planning authorities, and people working in the energy industry. The first course finished in November 2014 and the next one starts in March 2015 in Leipzig.



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Fit for China! Three Steps to Successful Collaboration

Steinbeis Transfer Institute starts skills training

Collaboration between German companies and their counterparts in China has been intensifying for years, especially within Germany itself. Many projects are jeopardized by a lack of understanding of cultural differences, resulting in spiraling costs due to German workers being unprepared or ill-prepared for the "Chinese challenge." Founded last year, the Steinbeis Transfer Institute for East Asian Management and Culture is currently working on the development of a master's degree on Management Sinology. The training aims to pull together business administration, sinology, and regional and cultural studies to provide course participants with the best possible preparation for collaborative projects with Chinese companies.

As a first step, the institute is developing a new training program called "Fit for China!" which is aimed at current and up-and-coming managers who would like to prepare specifically for time in China or collaboration with Chinese firms. A three-part program, "Fit for China!" aims to allow participants to discover and understand China and plan activities in the country. The objective is to develop skills for China that allow students

to independently master the challenges of doing business in China, putting them in the position to contemplate their own actions within the context of Chinese culture.

The skills training is not restricted to intercultural differences, however. It also tackles specialist topics from a Chinese perspective, for example, innovation management in China, sourcing and the key issues of partnerships. The institute was successful in attracting experts from industry to contribute to the program by sharing their experiences in China. The language skills are being taught by the Confucius Institute in Hamburg who is a partner of the program.

There is also an intercultural workshop for teams spanning both nationalities. This revolves primarily around the issue of effective communication. The overall training program is open to members of the general public and can also be arranged as an in-house program for companies.



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What is the Value of “The New”?

Steinbeis Innovation Arena 2015

In the future, competitiveness will depend more than ever on companies' and workers' willingness and ability to bring about “The New.” Cries for innovation, for revolutionary developments and radical inventions are louder than ever and it seems like there has never been such intensive transformation. And modern society has learned to expect the unexpected, accepting that the only constant is change. Aware of prevailing disparities, at this year's Steinbeis Innovation Arena, which took place in the SpardaWelt events center in Stuttgart on April 22, 2015, Steinbeis posed a simple question: What is the Value of “the New”?

The format chosen for the event, which took place as part of the Max Syrbe Symposium, is based on the successful premiere of the 2014 Steinbeis Transfer Arena, with a strong focus on interaction. The inner circle of the discussion area was formed by representatives of science and academia, major companies, and SMEs, who were invited to take a critical look at whether innovation results in something better or simply something different. Joining in the discussion was a second circle surrounding the inner circle, contributing their own comments and discussion points. The outermost circle of the arena was made up of an invited audience, who was also allowed to take an active part in the discussion. The arena was moderated by Marcel Wagner (BR/Regio TV) and Tina Kraus (SWR).

Steinbeis is organizing the Innovation Arena in collaboration with the industrial association of the German federal state of Baden-Wuerttem-

berg (LVI), with support with the content and concept coming from Beate Wittkopp (Steinbeis Transfer Center TransferWorks BW). The arena was taking place against the backdrop of the recent Steinbeis Edition publication InnovationQuality. The Value of the New.

Arena participants

- Prof. Dr.-Ing. Rolf-Jürgen Ahlers | Board Chairman, Forum Luft- und Raumfahrt Baden-Württemberg e.V.
- Nadine Antic | Managing Director, GlobalFlow GmbH
- Prof. Dr. Werner G. Faix | Managing Director and Associate Member of the School of International Business and Entrepreneurship GmbH (SIBE) at Steinbeis University Berlin
- Sonja Fritze | Head of Development, Display Instruments and Head-up Displays, Robert Bosch GmbH, Car Multimedia
- Dr.-Ing. Toralf Kahlert | CEO, Pumacy Technologies AG
- Miriam Kamal-Specht | Founder and CEO, Yellow Frog, Guest Lecturer at University of Stuttgart
- Bernd Kussmaul | Managing Director, Bernd Kußmaul GmbH
- Prof. Dr. Dr.-Ing. Dr. h.c. Jivka Ovtcharova | Director of the Institute of
- Information Management in Engineering, Karlsruhe Institute of Technology
- Susanne Peter | Managing Director, Finanz IBM Deutschland GmbH
- Christine Regitz | Vice President, SAP SE
- Albrecht Stäbler | CEO, NovaTec Holding GmbH
- Jochen Wirth | Project Manager of the online simulation “Young founders” at the Steinbeis Innovation Center for Business Development at Pforzheim University

Event Program

4:00 p.m. First Arrivals
Allow us to welcome you with coffee.

4:30 p.m. Steinbeis Innovation Arena

6:30 p.m. Get-together
A chance to talk to arena participants and members of the audience after the official Steinbeis Innovations Arena has ended

Image: © shutterstock.de/watchara



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Steinbeis Networking Platform for SMEs Platform for companies to merge theory with practice

The third Steinbeis Entrepreneur Forum, which will take place on June 19, 2015, will focus on recognizing and developing core competences at SMEs. Organized by the Steinbeis Center of Management and Technology (SCMT) at the House of Commerce (Haus der Wirtschaft) in Stuttgart, the event will be an opportunity to discuss different experiences, supported by presentations organized in tandem.

The forum is open to anyone working for an SME, especially Steinbeis clients and partners, but also students and Steinbeis University Berlin graduates. The idea is to invite people to bring their own ideas relating to current issues so that the day in Stuttgart can be used as a communication platform.

Presentations will be made in tandem to explore each topic from different angles with an examination of the principles underlying a particular topic from a Steinbeis expert, directly followed by a report on the practical aspects of the same issue from a Steinbeis project partner. This

will be followed by round-table sessions with the speakers to discuss the topics in more detail. The moderator for the event will be Dr.-Ing. Walter Beck, director of SCMT.

Among the topics on the agenda are the following:

- Development of a consulting service for use in holistic business process optimization.
- The Steinbeis Company Competence Check®: Development of a tool for capturing and analyzing holistic business competences
- Global Application – decentralization of value chain activities while setting up an SCA Application Center in the USA

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



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Security. Protection. Trust.

4th Steinbeis Symposium on Security in Business

Protecting company know-how is key to successful competition. By sharing sensitive knowledge with third parties, companies often unwittingly endanger their existence. The fourth Steinbeis Symposium on Security in Business took place on May 12, 2015, in the convention center at the Schwenningen Health Insurance Company. The aim was to examine ways to effectively protect business know-how.

Even a failure of business partners to adhere to security guidelines can have a detrimental impact on everyday business. It is therefore important to identify security loopholes early and introduce the required measures. The symposium was attended by legal and business experts with national and international experience. They showed how small and

medium-sized companies can effectively protect their trade secrets and patents.

The event was being organized as part of a collaboration between Infothek, the Steinbeis Transfer Center, the IHK chamber of commerce in Schwarzwald-Baar-Heuberg, the Constance Chamber of Crafts and the German Aerospace Center.

For more information go to www.siz-wt.de.



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Technology Transfer under one Roof

Steinbeis and Karlsruhe University of Applied Sciences open building together

Karlsruhe University of Applied Sciences and Steinbeis have been working together successfully in the field of knowledge and technology transfer for many years. This is evidenced not only by the number of joint projects, but also by their strong presence on the university campus. The Steinbeis House Karlsruhe (SHKA) is now ready to provide a home for activities at the university, as well as for Steinbeis transfer enterprises and small and medium-sized businesses working in the field of technology and know-how transfer. The new premises will be opened during the Transfer Day in Karlsruhe, which will take place on June 11, 2015.

The building offers over 5,000 square meters of floor space, acting as a center of innovation not only for researchers at the university but also for SMEs. The building was commissioned by Steinbeis, who has worked on the concept in partnership with Karlsruhe University of Applied Sciences alongside the local SMEs that will be tenants. The building spans five stories and also contains a cafeteria, a seminar room and a modern equipment hall.

The construction of the Steinbeis House Karlsruhe has further intensified the partnership between Steinbeis and Karlsruhe University of Applied Sciences. The first tenants moved in at the end of 2014. The building will be opened during a visit from Theresia Bauer, the Baden-Württemberg Minister of Science. It promises to be a highlight for the Transfer Day on June 11, which will provide insights into collaboration between Steinbeis and the university.



To view the schedule before the day and register online, go to www.steinbeis-transfertag.de.



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Investments that Help Protect the Environment Green startups meet investors and business partners

Startups with green business ideas frequently lack the resources to make their products a success in the market. Companies at the Green Innovation and Investment Forum (GIIF) in Stuttgart were virtually handed help on a silver platter, thanks to valuable new contacts with investors and business partners. All they had to do in return was present their idea as convincingly as possible. The forum was organized by bwcon and Umwelttechnik BW, a state agency that promotes environmental technology and resource efficiency in Baden-Württemberg. The GIIF provides support to startups with green business ideas, even while they are still getting their business off the ground.

The GIIF works with two partner organizations: KIC InnoEnergy and the EU-backed Alpine Space project FIDIAS. The GIIF's aim is to link up startups with investors and business enterprises to make it easier to enter the market. Over the course of two days, 20 startups from the whole of Europe were given the opportunity to showcase themselves and their business concept to an audience of specialists at the Steinbeis House of Management and Technology (SHMT) in Stuttgart. Dr. Jürgen Jähnert, managing director of bwcon (a Steinbeis enterprise): "Before investors open their wallet, they want to be sure the technology actually works. So the founders have to provide a certain amount of reassurance – or at the very least be able to roll out a prototype ready for mass production."

On the first day of the event, the startups could gain free advice on startup issues such as funding, patent protection and business planning. "For us, getting feedback from the experts was extremely useful," says Dr. Günter Schneider, managing director of the Bietigheim company Storasol GmbH, which develops high-temperature energy storage devices. "After the coaching session, we overhauled our presentation again." On the second day, the entrepreneurs had to present their startup project to investors and business enterprises in a pitch lasting 10 minutes. The event was also attended by leading companies such as Bosch, Mahle and EnBW. "We're always on the lookout for technologies that Bosch can help on their way," says Heribert Uhl, Senior Investment Director at Robert Bosch Venture Capital GmbH. Uhl's company introduces startups to key players at Bosch subsidiaries. It also makes targeted investments in promising projects. There were also a number of investors at the event in the SHMT.

"As a European investor, we've always got our eyes peeled for promising business concepts," explains Dr. Christian Müller, CEO of KIC InnoEnergy Germany. "We already got to know some interesting startups while the shortlist was being drafted for GIIF."

In a keynote speech, Prof. Eicke Weber underscored the potential that innovative ideas have to enjoy market success. "For new technologies to be competitive and make it to the market at a reasonable cost, innovation and entrepreneurial spirit have to go hand in hand," said Weber, who is director of the Fraunhofer Institute for Solar Energy Systems (ISE). "Photovoltaic technology has developed along these lines in recent years and other technologies will follow in the years to come. This opens the door to exciting new possibilities for future investors."

When it came to market-readiness, there were major differences between the developments presented at the GIIF. The projects also covered a wide spectrum of areas. But one thing they all demonstrated to the same degree is that green business ideas are not just good for the environment, they also make sense from a financial standpoint. Many of the technologies that were presented save valuable resources and thus make companies more competitive.

This first Green Innovation and Investment Forum achieved its objective of bringing together investors and business partners without the hindrance of red tape. "We've forged a number of valuable contacts through the bwcon and Umwelttechnik BW network and hopefully they'll help us succeed with our market introduction," says Nadine Antic, CEO of Global-Flow. Her startup, which produces premium quality vermicompost in large volumes out of organic waste, went to the GIIF to find investors for its project. Two companies were honored with an award for the "Best Business Idea," which was also bestowed at the GIIF. The award comes with prize money worth €1,000 for each winner.

Image: The teams that scooped the award for the Best Business Idea, pictured with Dr. Jürgen Jähnert and Dr. Hannes Spieth.



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What will be the Impact of Additive Manufacturing? The 2015 Steinbeis Engineering Day

Be they cars, smartphones or clothing, an increasing number of products are now customized – one of the actual reasons for Industry 4.0, just so products can be made profitably in batch sizes of one. Additive production processes (3D printing) play an important role in this respect – one reason for the 3rd Steinbeis Engineering Day, which took place on April 15, 2015, in the Stuttgart House of Commerce (Haus der Wirtschaft). The day examined the impact additive manufacturing may have on business processes, IT systems and even business models.

Thanks to additive manufacturing, it is now possible to make small batches of products to high standards and still keep technical know-how inside the company. It also accelerates product development for individual customers, taking customer feedback into account throughout the entire product life cycle. Steinbeis has been examining the impact of additive manufacturing as part of a study conducted with the University of Stuttgart and Aachen University of Applied Sciences. The study aimed to answer the following questions:

- Is additive manufacturing just a new technology or does the whole value chain need to be redefined?
- Can things be "printed" directly from any CAD system or do special conditions need to be met?
- Will there be no more need for production knowledge in the future to make products using 3D printers?

Experts from trade and industry took a stance on these questions as part of the Steinbeis Engineering Day and attempted to look at the topic of additive manufacturing from a new angle.

Image: © fotolia.de/ulldellebre

For more information about the Steinbeis Engineering Day go to www.steinbeis-engineering-tag.de.



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Reader Survey 2014 Congratulations go to Berlin and Karlsruhe

The editors of TRANSFER would like to thank everyone for the response to our reader survey, which far exceeded our expectations. We received around 800 responses and are currently sifting through the results. We will be able to say more about the findings in the next edition of TRANSFER.

For now, we can already announce the winners of the survey. Claudia Püllicher, a graduate at Steinbeis University had lady luck on her side and the Berliner can look forward to her new digital companion – an iPad Air2. The article that received the most votes (by a long shot) was the interview with Professor Dr.-Ing. Jörg W. Fischer, project manager at the

Karlsruhe-based Steinbeis Transfer Center for Computer Applications in Engineering. The interview entitled "The Innovation Process Needs Flexibility and Freedom!" appeared in Edition 4/2014 as part of a feature on information and communication technology and is still accessible online by going to www.steinbeis-transfermagazin.de.



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Dr. Bodo Antonic is director of the Steinbeis Transfer Institute of Consulting on Health Care and support companies in the pharmaceutical and medical technology industry to operate successfully and sustainably in the changing environment of the health care industry.



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About the author

Thomas Eichberger is a qualified precision engineer, studied engineering at Furtwangen University and acquired an MBA at Steinbeis University Berlin. He gained his doctorate at SHB in 2014.



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Dr. Felicitas Mocny as a specialist in business ethics and director of the Institute of Corporate Responsibility Management at Steinbeis University Berlin.



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Marlene Gottwald gained her bi-national doctorate (cotutelle) at the University of Edinburgh and the University of Cologne. She has been a project manager at the Steinbeis Foundation since November 2014.



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Michael Lister is director of the Competence Center for Economics (WKZ), a Steinbeis Transfer Institute and has published a series of papers on bank management and management accounting.



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