

# TRANSFER

*The Steinbeis Magazine*

## Always On The Go

### Feature Topic: Mobility

Insights from Steinbeis experts into recent projects

### Focusing on Users

Steinbeis provides support with a user-focused approach to developing product variants

### Additive Manufacturing Tools for Industrial Production

Steinbeis team advises injection molding firm on 3D printing in manufacturing

### Climate Protection vs. Economic Viability

Steinbeis team publishes report on the energy-efficiency of real estate

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## Dear Readers,



Prof. Dr. habil. Günter Haag is director of the Stuttgart-based Steinbeis Transfer Center for Applied Systems Analysis (STASA) and is the founder of STASA GmbH. In 2011 the experts at the center won the Steinbeis Foundation Transfer Award – the Löhn Award, with the Institute Dr. Foerster for developing an automated process for detecting unexploded bombs.

To contact Günter Haag, write to [gunter.haag@stw.de](mailto:gunter.haag@stw.de).

Human development has been dictated by a continual rise in mobility in all areas of life. People move around between jobs, sectors of industry, and even different regions, and this mobility is often fueled by changes in the working world and residential patterns. As people change locations, they create traffic. The term mobility is used to describe the phenomenon of how people move around in their business and social environment, so this is intrinsically linked to a variety of decision-making processes made by different parties – and is reflected in the movement of people and goods.

On a regional or local level, much attention is given to reducing the negative impact of traffic, especially particulate matter pollution and noise, and carbon and nitrogen oxide emissions. It is not difficult to introduce so-called traffic-calming measures, neither in political terms nor when it comes to actual implementation speed limits can be reduced and road systems can be changed to keep entire inner-city areas as free as possible from cars. But one thing that is often overlooked is that being able to travel places without difficulty is an essential prerequisite for a fully functioning economy.

When planning urban areas and entire regions, the key priority is take the mutual impact of traffic control measures and regional developments into account during the actual planning phase. Improving public transportation as required means introducing measures that make it more appealing than personal travel solutions. One way to do this is to significantly improve multimodality. This means people can choose between different modes of transportation, such as trains, buses, cars, and bicycles, either between the places they live or between economic or industrial areas within a region. What is important is that intermodality is strengthened, so if different means of travel are needed in a certain sequence in order to reach a destination, they have to be coordinated and this keeps waiting times to a minimum and eases accessibility. There are many cases where such ideas have been at least partially implemented, but without the desired effect.

Using the kinds of innovative information and communication technologies that are now available to us, hand in hand with satellite-based systems, opens the door to completely new ways of solving such problems, however. Doing this means expanding the use of electric vehicles, cars with much more driver assistance technology, and autonomously driven cars. The task is to ensure that these are networked with one another and are equipped with adaptive traffic control mechanisms. By calculating traffic data in advance over a period of many hours, it is possible to work out the impacts of accidents, road closures, or major events. That way, drivers can be informed good and early about the alternatives.

By aggregating data from different traffic and environmental sources, general traffic can be adapted much more effectively to the individual needs of passengers, which makes traveling more appealing. This is especially the case when innovative ways are found to link up different travel solutions, giving people easy access to different transportation options – mobility concepts that are simple to switch to such as car2go, taxi services, buses, or trains. In the medium to long term, this would bring us closer to the goal of achieving significant improvements in the environmental friendliness of human mobility.

We can all look forward to the various challenges and possibilities that this offers to our society. This latest edition of the Steinbeis Transfer Magazine provides you with some interesting insights into the current projects in the Steinbeis Network, many with a direct bearing on modern travel solutions.

With kind regards,

Prof. Dr. habil. Günter Haag



## News from the Ferdinand Steinbeis Institute

### Projects aimed at promoting digitalization

The Ferdinand Steinbeis Institute (FSTI) is part of the Steinbeis Foundation and as a research faculty of Steinbeis University Berlin (SHB) it conducts research into digitalization. The experts at the FSTI are involved in a variety of projects revolving around digitalization, especially changes in industrial ecosystems and social structures. Three key projects have focused on these topics since last October.

#### Project: Mittelstand 4.0 – Kompetenzzentren Stuttgart

Duration: December 1, 2016 to November 30, 2019

This consortium project is backed by the Federal Ministry of Economics and Technology and looks at the transfer of existing technologies, implementation options, and people's experience with digital solutions introduced on a broad scale to business processes and value chains. The focus lies in small and medium-sized enterprises as well as manual trade companies. The experts at FSTI are working with bwcon on the project, mainly concentrating on two topics that affect a variety of areas: business models and service development.

The first phase involves workshops and interviews on the requirements of SMEs when it comes to digital business models. For further information on the competence center go to [www.mittelstandkompetenzzentrum.de/servlet/is/66278/](http://www.mittelstandkompetenzzentrum.de/servlet/is/66278/).

#### Project: Micro Testbeds in Commerce, Craft Industries, and Services

Duration: November 1, 2016 to October 31, 2017

Between four and six companies from different areas of industry and various stages of the value chain are joining forces to create a "micro testbed" with the aim of working together on a neutral, moderated platform run by the Ferdinand Steinbeis Institute. The companies' aim is to find ways to be a successful part of value creation, building on digital solutions and networks.

As part of the project, four micro testbeds are being funded and these will be implemented in collaboration with the Steinbeis Digital Business Consortium. So far, four micro testbeds have been launched for the project and the first workshops start in April 2017. The project is being sponsored by the Baden-Wuerttemberg Ministry for the Economy, Employment, and Housing.

#### Project: Resource efficiency through additive manufacturing at SMEs (RAM-SME)

Duration: October 1, 2016 to December 31, 2016

The FSTI team has been working in collaboration with the chair of Information Systems 1 at University of Stuttgart and conducted a concept study on the topic of resource efficiency through additive manufacturing (AM) at SMEs. The aim of the study was to ascertain the potential for AM to improve resource efficiency in SME manufacturing and, based on this, to make recommendations. The project was sponsored by the Baden-Wuerttemberg Ministry of the Environment, Climate Protection and the Energy Sector.

Six business enterprises were surveyed, looking at products, production, and consumption. The result of the project is a set of factors which have an influence on resource efficiency, and these have now been transferred to individual phases of the AM value chain. These influencing factors are being used as a basis for further recommendations. One example of such an influencing factor is that post-processing should be determined during the design phase, for instance by deciding early on where to position support structures in order to save expensive post-processing and unnecessary materials later on in a process.

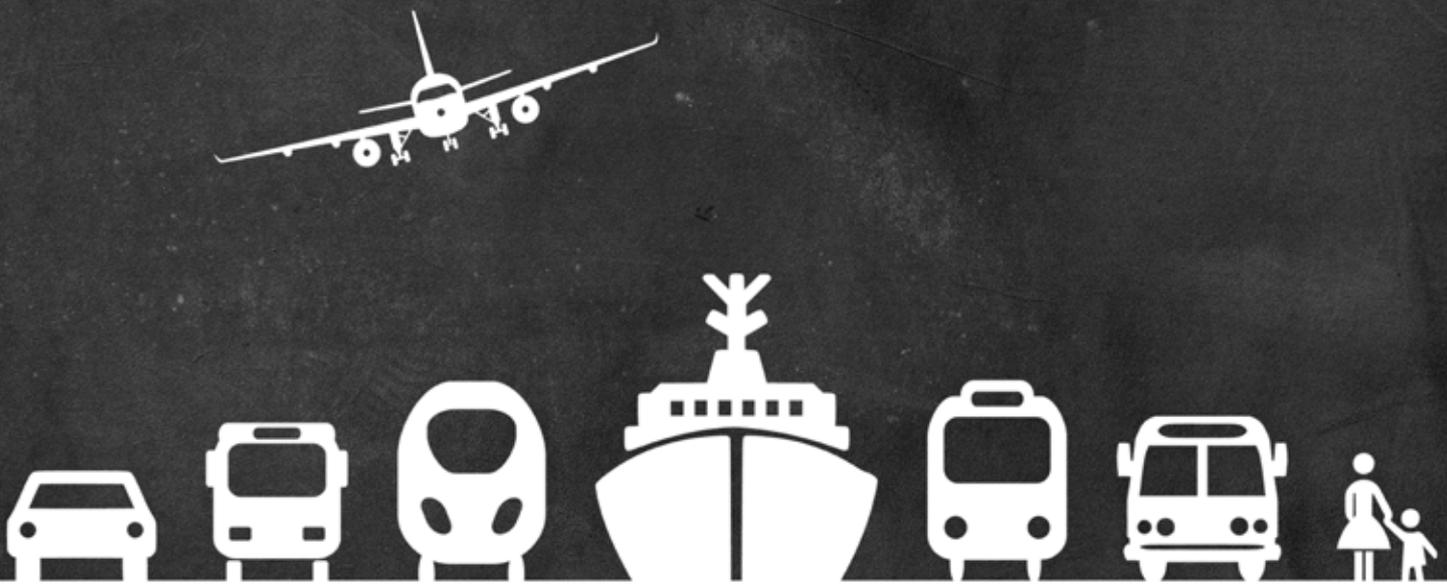
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Patrick Weber, Simon Hiller

Ferdinand Steinbeis Institute (Stuttgart)

[patrick.weber@stwi.de](mailto:patrick.weber@stwi.de), [simon.hiller@stwi.de](mailto:simon.hiller@stwi.de) | [www.steinbeis-fsti.de](http://www.steinbeis-fsti.de)



## Feature Topic: Mobility

### Insights from Steinbeis experts

When people use the word mobility, they're primarily referring to spatial movement – the moving around of living beings or objects within a physical space, building, or geographical area. The fact that mobility is now used to refer to much more than simply moving around is something our Steinbeis experts illustrate from a variety of angles in this edition of TRANSFER: Prof. Dr.-Ing. Lutz Gaspers, director of the Steinbeis Consulting Center for Land-Use Planning and Structure Development, explains how travel solutions have evolved over time. Prof. Dr. Peter Neugebauer, director of the Steinbeis Transfer Center for Automotive Testing at Karlsruhe University of Applied Sciences, considers the future of mobility solutions. Prof. Karl Schekulin, director of the Steinbeis Transfer Center for Process Development, examines the topic of mobility for the elderly and introduces us to an electrically driven walking frame. In an interview with Dr. Oliver Bühler and Dr. Daniel Ulmer, managing directors of Steinbeis Interagierende Systeme GmbH, we find out why massive volumes of testing data are indispensable for safe driving. There is also an interview with Prof. Dr.-Ing. Markus Stöckner, director of the Steinbeis Transfer Center for Infrastructure Management in Transportation, who tells TRANSFER about the importance of transportation to modern mobility. Prof. Dr. Dirk Lohre, director of the Steinbeis Innovation Center for Research in Transport and Logistics, outlines a procedure for forecasting the volatility of consignments in the general cargo market. Konrad Roth, director of the Steinbeis Consulting Center for Corporate Development and Social Space Planning, and Dr. Csaba Singer, founder of Hybrid-Airplane Technologies GmbH, introduce us to a patented, innovative hybrid aircraft. Prof. Dr. Walter Commerell, director of the Steinbeis Transfer Center called System Design, explains why the standard for functional safety in road vehicles, ISO 26262, is so important and how it is applied to utility and multipurpose vehicles. Prof. Dr.-Ing. Jochen Baier, the director of Mobility and Logistic, the Steinbeis Transfer Center, shows how current developments can be tested for their suitability as modes of travel in rural areas. Stefan Odenbach, project manager at the Steinbeis Transfer Center for Technology – Organization – Human Resources, reviews modern travel and mobility from the perspective of digital transformation in value chain processes.



## On the Road to Industry 4.0: The Transformation of Mobility

**Travel is not only a basic need, but also an expression of the freedom and flexibility of our modern age**

In today's society there are few topics that arouse such emotions and personal interest as the topic of travel, because mobility impacts each and every one of us. A wide range of necessary solutions have been proposed to improve the quality of modern travel solutions – changes that may be of existential significance to some individuals. Prof. Dr.-Ing. Lutz Gaspers, Director of the Steinbeis Consulting Center for Land-Use Planning and Structure Development, believes that in the future, mobility will still play a key role in many areas – for all of us as users, for the settlement patterns which have developed in recent decades and which are essentially designed for automobility, and for large swaths of our highly specialized economy, which benefits from advantages offered by different locations within complex production structures.

Travel is a topic which impacts our future and will continue to grow in importance in the coming years. It remains to be seen if cities and regions are positioned to fulfill their function of providing public services, and whether some locational advantages (including cost benefits) will develop as a result. Future mobility will not only require increasingly integrated land-use and transportation planning, but efficient infrastructure planning as well. As the fabric of society continues to shift, new patterns of mobility are already emerging – and meeting with more and more barriers. Getting about has become essential to the way we live and do business today. And in our global economy, travel solutions determine whether regions will remain competitive going forward. Personal mobility will determine whether people are able to pursue their preferred occupations and achieve the quality of life which they aspire to. However, current discussions surrounding resource scarcity and the desire for sustainability, especially with regards to travel solutions, are also changing how we understand and make use of transportation.

To ensure that we can remain mobile and make transportation sustainable, we have to be clear about what needs are served by travel solutions and which activities result in more traffic. This is the only way to select and allocate planning instruments that are capable of making

a specific and positive impact on mobility and traffic. Mobility means the possibility of carrying out activities in different locations. It is quantifiable – in terms of the variety of activities it opens up to an individual or entity by facilitating a change of location, as well as the distances covered and resources required per unit of time. Travel is a basic need and integral to our democratic system. The way we perceive and act on our system of values and the basic rights outlined in the German constitution would not be viable without our understanding of and attitude toward mobility. It is necessary for granting each individual their constitutionally safeguarded opportunities to be an active member of society. Which in turn means that we must have an efficient and effective transportation system. One indicator for measuring this effectiveness is the time needed to travel from one place to another. Everyone has their own personal time budgets – the amount of time they are actually willing to spend on traveling and therefore time in which they generate traffic. The time we have available for moving between locations on the one hand, and participating in activities on the other, imposes limitations. It has played and continues to play a key role in shaping travel and settlement patterns. And we can define an analogous mobility equation for the transportation of goods. Not every potential activity means transportation needs to be used. Traffic is not created until activities related to people or goods require a move from A to B.

And in addition to traffic as a means to an end, there is also traffic that is an end in itself – an expression of individual travel needs.

For centuries, there has been an inextricable link between the development of travel options and settlement and economic structures. In the 17th and 18th centuries, when cities were small compared to today, walking was the primary means of movement. This limited the expansion of municipal boundaries and slowed the growth of cities. It was the invention of new technologies such as the steam engine and new modes of transportation such as the railway in the mid-19th century that overcame this problem of space, time, and distance. New forms of production created an enormous demand for labor in the cities, which also began to expand. Efficient means of public transportation such as streetcars and commuter trains first made the massive expansion of cities possible. People could now cover much greater distances in the same time as would have been possible on foot. And this was what allowed them to choose to live further away. The centuries-old medieval cities finally burst their boundaries and spilled out into the surrounding countryside. These developments were later given the name industrialization, or the first industrial revolution. The second and third industrial revolutions followed, further transforming our methods of production, technologies, modes of transportation, types of housing, and the way we lived our lives. In the realm of transportation, this meant the invention of combustion engines, automobiles, aircraft, high-speed trains, and jet planes. Settlement patterns continued to expand in the following decades, as it became possible to travel greater and greater distances in a comparable amount of time. Suburbs and exurbs sprang up, and new forms of production (like just-in-time) that relied heavily on transportation were developed. However, the ever more effective transportation systems not only led to increasing specialization and boosts in overall efficiency, they also caused shifts in the value chain. Entire industries and regions were affected by structural change.

Today we are on the brink of a fourth industrial revolution, which is different from those that came before it – because for the first time we have had advance warning that a revolution of this kind is imminent. And the anticipated changes to mobility and transportation will not be any less significant than the transformation wrought by the previous industrial revolutions. Partially and fully automated driving, changes in the types of drives found in vehicles, the sharing economy and modern mobility services, rising user costs, increasing regulation of private vehicles, and our fundamental attitude toward travel and traffic have already emerged as factors shaping the transformation of our transportation system. Let us consider the problem of inactive vehicles. There are almost five million managed parking spaces in German cities – often in locations that could just as well be used to solve the problem of scarce accommodations in urban centers. In the average household, a car stands idle for around 95 percent of its service life. Compared to the cost of purchase, this is a relatively low degree of use; one starting point for future mobility strategies could be to aim for more efficient car use. It is estimated that there are around 150 million parking spaces available for the roughly 45 million registered passenger cars in Germany. And these spaces are often highly limited in terms of alternative uses.

In post-war Germany, rebuilding efforts were directed at creating cities that were optimized for cars and other forms of traffic. The urban

planners focused on traffic efficiency and continuously adjusted to meet the ever-growing demand. The primary reaction to the increasing volumes of traffic was to scale up the dimensions, with the construction of more traffic routes to counteract congestion on the roads. This expansion of transportation infrastructure served as an incentive for more vehicles on the road, which in turn led to more expansion. For decades, urban traffic management in Germany was dominated by attempts to improve the situation by building more traffic routes, which created more traffic – and only a limited improvement in travel. Current planning approaches view traffic and mobility as a holistic entity, no longer focusing solely on coping with existing traffic volumes, but also looking at why this traffic is generated and whether it can be reduced.

Approaches such as these are only possible by adopting interdisciplinary mindsets and methods. Traffic planners are also seeing a transformation in their job descriptions; today they are "managers of mobility" and the quality of their solutions depends on their ability to work across disciplines. This will help us to prepare for the changes around the corner. It will also help us to transform a vision of "more mobility, less traffic" into a daily reality.

Image: © Gaspers



Prof. Dr.-Ing. Lutz Gaspers heads up the Steinbeis Consulting Center for Land-Use Planning and Structure Development, offering his clients consulting in the field of spatial planning, consulting on the development of settlement infrastructure and municipal development, consulting on and analysis of demographic change, and mobility studies. His work at the Stuttgart Technology University of Applied Sciences also deals with issues

concerning mobility; his area of expertise includes spatial development planning, transportation networks, traffic development planning, mobility studies, IT in traffic planning, and integrated traffic planning.



Prof. Dr.-Ing. Lutz Gaspers  
Steinbeis Consulting Center Land-Use Planning and Structure Development  
(Meiningen)

su1330@stw.de | www.steinbeis.de/su/1330



## “Multimodal transportation solutions are growing more and more important”

**A conversation with Professor Dr. Peter Neugebauer, Director of the Steinbeis Transfer Center for Automotive Testing and Professor for Vehicle Electronics at Karlsruhe University of Applied Sciences**

How can a vehicle be protected from cyber-attacks? What will travel and transportation be like in the future? These are the types of questions examined by Professor Dr. Peter Neugebauer at the Steinbeis Transfer Center for Automotive Testing. The sustainability aspect of mobility also plays an important role in his research. He spoke with TRANSFER about these mobility questions – and more.

**Professor Neugebauer, the topic of modern travel has many different facets. What aspects are particularly interesting and important to you?**

At Karlsruhe University of Applied Sciences, our Institute for Energy-efficient Mobility is currently focusing on two aspects of modern travel solutions: vehicle security and the logistics of urban freight transportation. When I say “vehicle security,” I’m talking about data and system security – like the question of how well the electronic systems in a vehicle are protected against cyber-attacks by hackers. The BroadR-Reach standard will soon be bringing Ethernet technology into vehicles. We’ve all heard about the many cyber-attacks targeting the internet which is also based on Ethernet technology. Our research is looking at how we can help prevent similar attacks on vehicles.

And then we are also studying urban freight logistics – how we can make the final 100 meters of the route “smarter” in the future. The growing popularity of online shopping means that delivery traffic is increasing as well. We are examining how this delivery traffic can be consolidated in typical neighborhoods and reduced to a minimum.

**Sustainable travel is becoming more important than ever. How can the mobility solution you’ve described contribute to sustainability?**

If you consolidate freight delivery for an entire residential area into a single location – we call this a “hub” – different parcel services don’t have to go to each house, they can take all their packages to the hub. From there the packages can be delivered by automated vehicles based on the preferences of the recipients. The packaging waste also leaves the neighborhood via the hub – it’s collected there for pick-up by the waste-



disposal company. Having fewer vehicles on the road cuts down on the noise, particulates, and exhaust fumes in the residential area. This project – efeuCampus – is funded by the European Union and has been recognized as a flagship project by the government of Baden-Wuerttemberg.

**It seems like digital solutions touch every aspect of our lives. What sort of changes has it already brought to transportation, and what changes are still to come?**

Besides technical changes, there have certainly also been changes in our personal behavior, and of course there are infrastructure aspects as well. We don't think twice anymore about using the internet to check on traffic conditions, look up train and bus schedules, compare gas prices, or find out what we shouldn't miss at our next vacation destination. Just a few years ago, who would have thought that many of us would carry a tiny computer with us everywhere we go – in the form of a tablet or a smartphone – and be connected with the entire world? And when it comes to mobility, this opens up completely new opportunities for services related to travel or the vehicle itself.

I think that the next big changes will be related to the Internet of Things. Traffic signs and routing systems will communicate with our vehicles and provide early information about traffic jams, construction zones, or dangerous traffic conditions. This will make driving safer, while at the same time paving the way for self-driving vehicles. But for a traffic light to communicate a red signal to my car, the light will have to be equipped with additional smart electronics. I don't know how many traffic lights there are in Germany – but enough that retrofitting all of them would be a kind of economic stimulus package in and of itself. We running automated driving tests in the Karlsruhe region in the coming months and we'll start working with our partners to make the traffic infrastructure smarter.

**The transportation industry also reflects the convergence of current changes in society with new developments in technology. In light of this, what do you think the future of industrial mobility will look like?**

Looking at my students, I see that they view travel in a far more rational manner than is often the case in my generation. They are focused on getting from A to B and using time as effectively as possible. In a city like Karlsruhe, this often means that bicycles play a greater role than cars. Looking forward, this leads me to conclude that car ownership will become less and less important. I think that multimodal transportation solutions – meaning different parts of a route are travelled using different modes of transport – are growing more and more important. The same applies to car-sharing concepts. Today it is already significantly more cost-effective to just borrow a car when you need it instead of owning one yourself.

Self-driving vehicles are already here – they are standard equipment in industrial facilities, production plants, and warehouses. They are mostly used to move commodities and goods. From this starting point, they will start appearing more and more in our daily lives – just think of automated vacuum cleaners and lawnmowers. The first vehicles without human drivers are already being used to transport passengers; in most cases we are talking about rail vehicles like the ones used to take people from terminal to terminal in airports. So the technology and the experience are already there – and in all likelihood, in a few years we'll see the first fully self-driving vehicles on our streets.

**Image:** In the efeuCampus project, the flows of goods and the associated waste streams of a typical neighborhood are consolidated in a hub served by automated vehicles. With fewer vehicles on the road, there is less noise and fewer particulates and exhaust fumes. © City of Bruchsal



**Prof. Dr. Peter Neugebauer** is Professor for Vehicle Electronics and Director of the Steinbeis Transfer Center for Automotive Testing at the Karlsruhe University of Applied Sciences. The Center provides set up and operation of Hardware in the Loop (HiL) test benches, design and construction of diagnostic systems, and development of software, test routines, and programs for electronic control units (ECUs).



Professor Dr. Peter Neugebauer  
Steinbeis Transfer Center Automotive Testing (Reutlingen)  
su1457@stw.de | www.steinbeis.de/su/1457



## Safeguarding Mobility – Including in Old Age

The mechanical engineering specialist Reiser AG has been working with Steinbeis experts on the development of an electrically driven walking frame

Demographic change is resulting in an aging population and this is raising the importance of mobility in old age. The Steinbeis Transfer Center for Process Development in Reutlingen has been working with the Veringenstadt-based mechanical engineering company Reiser and other partners in industry on an auxiliary electric drive system for walking frames. It should be easy to adjust and help more elderly people with mobility issues, thus improving their quality of life.

Walkers or walking frames help elderly or disabled people to move around in the home but they are also used outdoors. One important

factor when it comes to the medical aspects is that walkers help people with their balance, assuming they are physically and mentally in a

position to use a walker. More and more people now use walkers, especially as mobility becomes increasingly important in society. The walkers currently on the market tend to consist of a metal frame with three or (preferably) four wheels, two of which are typically fixed. The two front wheels are used for steering. The top of the metal frame is equipped with support handles or two separate grips with a separate lever that is clenched to activate a brake or even a parking brake on the fixed wheels.

The main disadvantage with walkers until now is that they struggle with small obstacles under the wheels (such as cobblestones) and cannot deal with steep inclines. A great deal of force is needed from a person who may already be disabled or weak, and in some cases users can no longer move. There is another aspect that is important in this respect: According to convalescence experts, it is much better from a therapeutic angle to recover skeletal function without too much muscle intervention. Patients who have had a knee or hip operation experience less discomfort if they can start moving around again with little effort. This is now possible, thanks to the auxiliary electric drive co-developed by the Steinbeis experts. As people need to grow stronger, the drive can simply be deactivated.

Testing of conventional walking frames on different surfaces has now shown that they also have another serious drawback. All three- or four-wheel walking frames used until now have a dangerous design flaw, which can result in people falling over. This is especially the case if walkers are pushed over a curbstone. This effect is nothing new: Office chairs with four wheels sometimes tip over; chairs with five wheels don't. As a result, the new walking frame, which has been given the brand name e-buddy, has a fifth wheel that also functions as an auxiliary drive wheel. This avoids tilting axis issues, thus eradicating this particular accident risk.

The aim of the development partnership was to adapt as many walking frames in the trade as possible by equipping them with an auxiliary, electrically driven wheel, ideally using the most simple technology possible at an affordable price. The first step for the experts involved research and analysis, based strictly on must-have requirements, must-at-least-have requirements, and nice-to-have requirements. These revolved around users with limited physical abilities. The reliability or safety of functions was of utmost importance, so even if users do something wrong, nothing bad should happen. It was interesting to hear what the biggest priority was for older users: no electronics and nothing over-engineered (in the way some modern cars or household devices are sometimes too complex).

While conducting their investigations, the project team placed emphasis on practical application. The key findings of a user survey flowed into the concept development stage of the walking frame:

- The auxiliary drive is equipped with a battery and a control box. These are fitted near the ground between the two steerable wheels, and the mounting mechanism works on an existing walking frame with a connection tube. This was important to fulfill the safety principle of "five-legged contact with the ground."
- The design is deliberately based on a small number of components, making it possible to keep the weight down to just 6.9kg, most of

which is accounted for by the battery.

- The entire auxiliary drive can be removed from the walking frame without tools thanks to a coupling system. Everything can be folded as usual and stowed in a car.
- The coupling system is 3D printed and can be used to attach the auxiliary drive to any standard walking frame. To make the system easier to assemble, the contact area of the coupling device is self-aligning.
- Walking frames can be used in the same way as now, even without activating the auxiliary drive. If the user is walking down a slope, the system gently brakes the wheels.
- The frame has a special pull function that makes it easy to walk over curbstones.
- Operating the unit is very easy. To switch the device on or off, there is a button on the handlebar with a thumb wheel next to it for adjusting the forward drive to any position as required. This has an automatic reset. The control switches can be placed on the left or right to suit the user.
- The battery pack is charged via a plug on the handlebar. To check battery life, there is a simple green-amber-red LED. The operating time is between 2 and 4 hours, depending on the terrain, and it takes between 3 and 6 hours to charge the battery.

The new walking frame constitutes an important diversification strategy for Reiser, which until now has concentrated on premium-quality machine assemblies. The firm has also started with serial production and the system patent is pending. The co-development was also a good example of the kind of project that would fall under new Industry 5.0 strategies: Simplification of functions has resulted in the most simple technology possible, simple operation, and low production costs.

**Image:** Easy to use even on gravel and when walking over curbstones.



**Prof. Karl Schekulin** is director of the Steinbeis Transfer Center for Process Development. The services provided by the Steinbeis Enterprise range from technological crisis management to consulting and innovation support, applied research and development, systematic design in product development, and the design and testing of prototypes. In 2016, Karl Schekulin was awarded the Steinbeis Foundation Transfer Award – The

Löhn Award for his contributions as a member of the Steinbeis network toward knowledge and technology transfer.



Professor Karl Schekulin  
Steinbeis Transfer Center Process Development (Reutlingen)  
su0076@stw.de | www.steinbeis-transferzentren.de

Reiser AG, Mechanical Engineering (Veringerstadt)  
www.reiserag.de



## “The driver should become redundant”

**An interview with Dr. Oliver Bühler and Dr. Daniel Ulmer, managing directors of Steinbeis Interagierende Systeme GmbH**

Will we still be driving cars in the future or will cars drive us? To answer this question, a colossal volume of test data has to be gathered and evaluated. The Steinbeis experts Dr. Oliver Bühler and Dr. Daniel Ulmer explain how this could be done and talk about the influence car data will have on our driving habits in the future.

**Dr. Bühler, Dr. Ulmer, you've been testing driver assistance systems and developing embedded systems since 2005. Building on this expertise, in 2012 you founded Steinbeis Interagierende Systeme GmbH. Your work involves understanding huge volumes of data and extremely complex algorithms – safely and with certainty, efficiently, and effectively. What is it that fascinates you so much?**

Oliver Bühler: With simulations, you can look at driver assistance systems in a completely different way compared to real vehicles. You do need to keep in mind that a modeled environment will trigger a somewhat different reaction from the assistance system during a simulation than in a real vehicle, but there are pretty efficient ways to examine this behavior in different situations and this can be automatically pushed to the limit. What impresses me is the way after 36 hours of simulation, harmlessly steering away from something can lead to a critical situation because the computer has been used to probe the thresholds of the driver assistance system. We're dealing with the very latest technologies here, not just from the point of view of testing but also in terms of our own software developments, because we're trying to come up with the best possible test results with the resources that are available to us.

**Advanced driver assistance systems can now not just make an essential contribution to driving comfort, safety, and energy efficiency, they can also proactively help with driving. What will the consequences of such developments be for the travel and transportation industry?**

Daniel Ulmer: The driver should become redundant. Studies have shown that young people would much rather play around with their smartphones than with cars, which have to be repaired, filled up with gas, and need 100% attention to drive. The moment the driver assistance system is intelligent enough to take over part of the drive, drivers can spend more time with their smartphones and the vehicle will even look after filling up with fuel and finding a parking space. Autonomous vehicles retain the appeal of cars for people who are actually only interested in getting from A to B and aren't necessarily that interested in the car itself.

**Before people actually start using driver assistance systems and cars start driving autonomously, a tremendous amount of simulation is needed, involving gargantuan volumes of data. What implications does this have for the kinds of “driver substitution systems” people are already talking about, especially if we want to**

### achieve the same levels of safety as autonomous vehicles with driver assistance systems?

Oliver Bühler: One important factor is lightening the burden on the driver and how we actually convey this idea of lightening the load. When they first introduced cruise control buttons, or speed regulators, the idea was to just relieve the driver of the task of pressing the gas pedal, but even then people misinterpreted it and there were accidents because some drivers thought they could leave the vehicle to drive without supervision. So this means the difference will be how much responsibility lies with the carmakers in allowing their customers to take their eyes off the road. If a car company wants to be sure that the vehicle is reacting properly in different kinds of situations and environments, and that the driver is allowed to take his or her eyes off the road, given the current state of technology this will only be possible by doing additional simulations and going through as many realistic scenarios as possible. That might sound easy, but the main factor driving the exploding volume of simulations is where and when the carmakers are going to be responsible, so in which environments and for how long their software will drive the vehicle.

**Dr. Ulmer, what's your take on this question: In the future, will the data held by a car have to put up with drivers, will the drivers feel put out by the car driving itself, or will it be more the case that drivers actually use data for their own travel requirements?**

I'm sure it will be the latter case. I say this because when you network vehicles, the data that's transmitted can be used to improve route planning and warn drivers of dangers. On the one hand this is because if data can't be used, the way things are at the moment autonomous driving wouldn't be possible, and on the other hand customers derive immediate value from the data.

Gathering data is an opportunity but it's also a threat, because any data that exists can be analyzed. Taking that as the basis, we all have to decide for ourselves to what extent we want to influence or dictate the way the vehicle is driven. It's quite conceivable that one day it will be possible to generate much more detailed and much more objective reconstructions of what's happening on the roads.

In technical terms, autonomous driving is thus only possible if you have an exact understanding of the overall situation. Whether this information is used for or against a driver, and how this would be done, isn't a technical decision. There was already plenty of discussion about using data to understand traffic when they introduced the German toll system on gantries over the autobahns.

Steinbeis Interagierende Systeme GmbH acts as a development partner on all kinds of projects related to the testing of embedded systems. Its work revolves around the planning, development, construction, and operation of test platforms for evaluating driver assistance systems.

#### Key areas

- Testing instruments for the functional testing of embedded systems
- Testing processes for the testing of embedded systems
- Testing of embedded systems with environmental detection sensor technology, especially in terms of their interaction with their environment
- Simulation of environmental detection sensor technology and connection to environmental models
- Automated evaluation of testing results
- Description, implementation, and realization of test cases for advanced driver assistance systems

The application of PC-based HiL simulations as a testing measure for advanced driver assistance systems or integrated systems in the automotive environment enables the setup of affordable testing platforms based on standard PC hardware and the connection of common fieldbus systems in automobiles like CAN, LIN or FlexRay.



Dr. Oliver Bühler

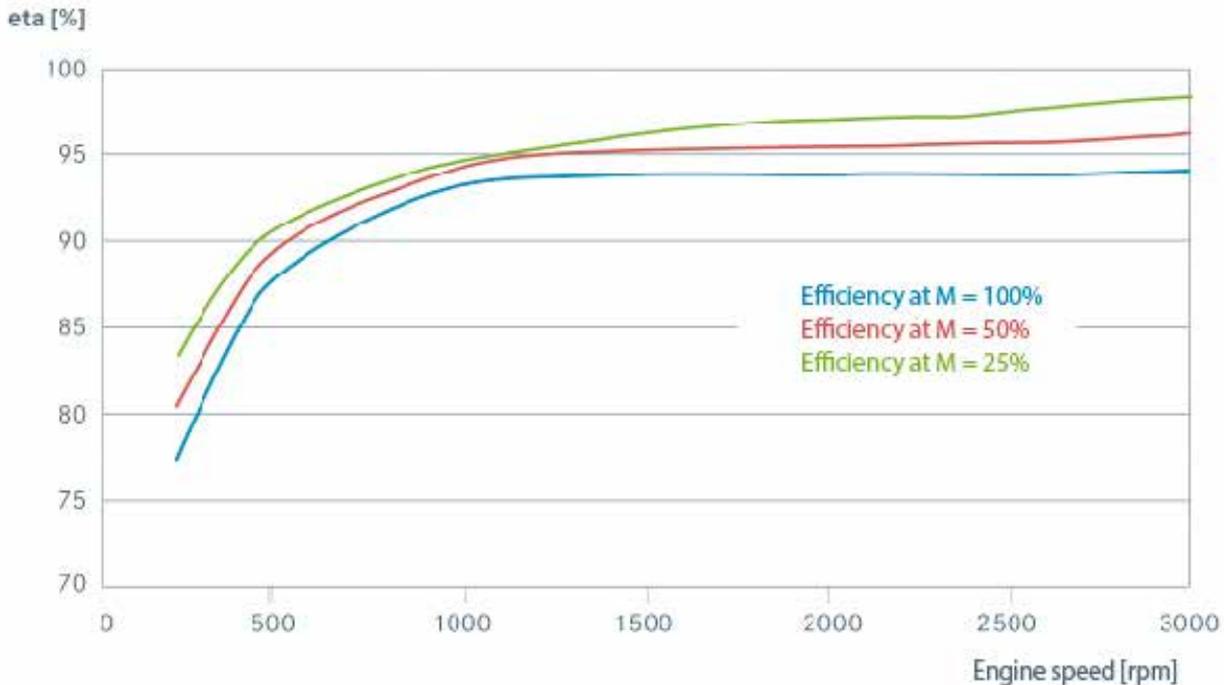


Dr. Daniel Ulmer

Dr. Oliver Bühler and Dr. Daniel Ulmer are co-managing directors of Steinbeis Interagierende Systeme GmbH. The Steinbeis Enterprise is a systems supplier and development partner for all kinds of projects related to the testing of embedded systems. Its work revolves around the planning, development, construction, and operation of testing strategies and test platforms for the evaluation of driver assistance systems. In 2015, the Steinbeis experts and Daimler won the Steinbeis Foundation Transfer Award – The Lohn Award for their joint work on the development of an innovative testing environment and development of software instruments for use in advanced driver assistance systems.



Dr. Oliver Bühler, Dr. Daniel Ulmer  
Steinbeis Interagierende Systeme GmbH (Esslingen)  
su1913@stw.de | www.interagierende-systeme.de



## Making Electric Vehicles Efficient and Safe!

### Steinbeis experts help ARADEX with the implementation of a functional safety standard

ARADEX is a specialist producer of efficient power transmission systems and has been working with the Steinbeis Transfer Center for System Design on a joint project looking at efficient and safe electric vehicles. The aim of both project partners was to integrate the many different process requirements into business and development systems. These are dictated by the particular focus of each sector of industry, from ships to cars (ISO standard 26262), commercial vehicles, buses, machines, and apparatus manufacturing (IEC61508).

ARADEX was founded in 1989 and has been working in the field of inverters for electric drives since 1992. In 2004 it also turned to mobile applications and in 2009 the focus shifted to traction drives. The firm is a supplier of drive chain systems used in ships but also has a focus on commercial and multipurpose vehicles. Its systems deliver between 50 kW and over 1000 kW per motor and its portfolio ranges from inverters to engines themselves, but also transmission systems and even mechanical couplings in vehicles. Overall, electric systems offer a variety of benefits: minimum particulates, the significant potential to reduce greenhouse gases, and a major reduction in engine noise. They can also be quicker when it comes to achieving financial savings than something like a car engine. One challenge that is common to all areas is achieving sufficiently high levels of efficiency – at every stage, from the battery terminals to the wheel on the road. This was especially challenging with the different loads encountered on this project. The systems have to operate for many hours at a time, albeit with low levels of partial load. To address this, ARADEX had developed a variety of drive solutions capable of delivering excellent performance, especially with low partial loads. Not only do they significantly reduce everyday electric power requirements, they also extend range – without the need for larger batteries. Sometimes they deliver such large improvements that batteries do not even need daily recharging after use. This, in turn,

means that less money has to be invested in setting up the required battery charging infrastructure. The firm is currently fitting a series of 12 meter/18 ton buses that have to be capable of driving along urban bus routes for 14 hours on one battery charge. These vehicles have already been working reliably in everyday use for years.

One aspect that is not (yet) a key priority, but will be important from a strategic standpoint in the future, is when to shift to electric drives that don't require magnets. ARADEX has been looking closely into traction motors for years, with a focus on asynchronous motors without rare earth magnets. They have been especially successful in the important partial load range, achieving respectable efficiency ratios for the otherwise extremely popular engines with permanent magnets. The top priority: the safety of products and efficiency. As a result, it was important for the company to integrate the right qualitative requirements into their business and development processes, particularly from other sectors of industry. To do this, the company approached the Steinbeis Transfer Center for System Design.

The System Design STC has been advising ARADEX on the implementation of ISO standard 26262, which governs functional safety in road vehicles. In the longer term, the clients of the systems supplier will need this



standard for their components in the drive chains of electric vehicles. One important aspect of the project was for both parties to agree how best to achieve this goal. It would be necessary to combine as many elements of the quality management system as are already in use at ARADEX with the process requirements of ISO standard 26262. As the company's activities are not limited to the automotive sector, it was also important to integrate the high standards of ISO 26262 in places where they would make sense in other industrial sectors. What this meant was that certain quality procedures could be used in all instances, while others would only have to be used as required, for a specific sector of industry.

The overall aim of the standard is to avoid systematic errors and minimize random errors in order to reduce residual risk. Standards play a normative role in requirements by raising sensitivity within companies to the importance of safety systems. One of the first steps for the Steinbeis experts involved in the project was to organize workshops in order to present the objectives and implementation options for such a standard on functional safety in road vehicles. This made it possible to discuss different ways to implement ISO 26262, looking not just at organizational factors but also processes. The big challenge with this project would be to fulfill different process requirements at the same time, for each specific sector of industry – for example there are ISO quality requirements, safety and quality requirements used in mechanical engineering and equipment construction, and quality standards for special vehicles. Also, processes with a bearing on quality and safety almost always involve extra work, so it would be important to integrate them efficiently into company processes. For a specialist like ARADEX, which works across several sectors, this could be a major headache, but at the same time it is a major opportunity to leverage synergies.

As the project progressed, workshops were held to analyze the different systems and processes used in management. The outcome was a gap analysis that made it possible for ARADEX to quickly put the right structures in place. The first gaps were filled by providing staff training for management through the Steinbeis Transfer Center for System Design. More evaluations will be conducted later on in the project and at that stage different approaches will be discussed and agreed again.

The role of the Steinbeis Enterprise is to take on aspects relating to the analysis and optimization of technical systems in order to help companies with the implementation and optimization of their development processes and methods. Factors such as "safety" or "functional safety" have an important influence on the development, production, and maintenance of equipment, machinery, and systems. The foundations for a safe system are laid when going through the first ideas for a product, and this continues when a product enters the design stages and testing. Normative rules are laid down, capturing the state of technology a company should adopt as its minimum standard. The Steinbeis Transfer Center for System Design provides advice and expert assessments on different ways to adhere to safety-relevant requirements.

**Image 1:** The efficiency of an asynchronous machine co-developed by ARADEX. The machine is used as a direct drive on cardan shafts in commercial vehicles. The important parts of the graph are the green and red lines in the areas with partial loads of between 20 and 50 percent. These reflect the actual conditions encountered on country roads and in urban traffic.

**Image 2:** © Sileo GmbH



Professor Dr. Walter Commerell is the director of the Steinbeis Transfer Center for System Design at Ulm University of Applied Sciences. The services offered by the Steinbeis Enterprise include the analysis and optimization of complex systems. The emphasis of work carried out lies in energy storage, automotive systems, and energy systems. As well as providing advice on processes and a variety of topics relating to processes and development in the

field of functional safety (ISO standard 26262), the center also offers model-based design and testing methods. Other services offered by the center include applied research and development, expert reports, and seminars.



Professor Dr. Walter Commerell  
Steinbeis Transfer Center System Design (Deggingen)  
su1430@stw.de | [www.steinbeis.de/su/1430](http://www.steinbeis.de/su/1430)



## “Probably the biggest challenge at the moment will be to solve mobility systems as part of an overall strategy”

**An interview with Professor Dr.-Ing. Markus Stöckner, director of the Steinbeis Transfer Center for Infrastructure Management in Transportation**

Mobility – being able to get around – is essential for any society to function properly. When looking at mobility, it's important to consider the overall system. Dr.-Ing. Markus Stöckner spoke to TRANSFER about the role played by transportation and what the future holds for roads and highways.

**Professor Stöckner, when people are asked about future travel solutions, they first think about electric vehicles and autonomous cars, but the overall transportation infrastructure also plays an important role. What do you see as the biggest challenges in the field of transportation at the moment?**

Just a first point: New travel solutions must not be an end in themselves. “Mobility” is about laying a foundation for the smooth functioning of society and its economic development. So we have to ensure that society's needs are met as well as possible, in keeping with the three pillars of sustainability: socio-cultural sustainability, safeguarding access to things like public amenities and education; economic sustainability, which means running mobility solutions in ways that make sense from a financial standpoint; and environmental sustainability, where sensible solutions must be found at the same time. We face a variety of completely different developments at the moment. A key aspect of this is the breakneck speed of digitalization in society. Just look at the growth of e-commerce. It will be extremely difficult to keep it going in the long term through conventional services, such as couriers, express deliveries, and parcel services. The number of individual journeys being made has risen, which partly requires connected mobility systems, and partly means we'll need completely different types of user information and user management. There are lots of methods already being tried out here. The crux of the matter is that modern travel has to be seen as a complex overall system, so the different fields within this system have to work together properly. You mention electric vehicles and autonomous vehicles; they're one important aspect, but just one factor among many. There are also ICT and ITS systems – which are now

ubiquitous – and then there are energy-efficient modes of transport, issues relating to energy provision, as well as the need for a transportation infrastructure that functions properly and is suited to requirements. There are some excellent Transfer Centers within Steinbeis working in these individual areas. But probably the biggest challenge at the moment will be to solve mobility systems as part of an overall strategy.

**The number of journeys people make as individuals is rising every year. What impact will this have on road planning and road construction in the future?**

Overall there has been a moderate rise in the number of individual journeys. One interesting aspect is the differences between these journeys, depending on certain criteria such as why journeys are made, the distances covered, or passengers' age profiles. It leads to some really interesting insights, especially when it comes to how young adults see modern travel. They no longer see owning a car as a major priority the way previous generations did. Their travel habits are multimodal. The growing number of older people is changing demand for different modes of transportation at different times of the day; the busy times in the morning and the evening might change in the future. There's also a clear trend toward riding bicycles, and in lots of larger cities we're already finding a significant portion of the daily traffic accounted for by bicycles. The first implication of this is that we'll only need new roads under certain circumstances and we'll have to lay more emphasis on using the existing infrastructure more intelligently. The appeal being made in political discussion is to preserve what already exists rather than build new things from scratch. There are a number of reasons for



this approach, but in terms of road construction it isn't entirely wrong when applied properly. For me, using what we have intelligently falls into two key areas, one to do with economic considerations and retaining the value of the existing road infrastructure, one to do with changing the nature of the overall network depending on what's required – for example by replanning existing areas to take new or adapted forms of transportation into account. We need to analyze things extremely precisely and see what user requirements will be like in the future so that we can react accordingly when it comes to action planning. So that means we have to develop planning strategies from the standpoint of wanting the overall system to be just about perfect not just focus on individual problems.

**One area you work in relates to the planning and development of expert systems, the kind of systems that are required to systematically capture and evaluate all information needed to maintain the roads within a road network (pavement management systems). What is the role played by such systems in safeguarding the effectiveness of the road infrastructure and keeping our society mobile?**

What we're doing here is just looking at one aspect of the overall travel system, but when it comes to the infrastructure it's an extremely important aspect. There have been lots of reports in the press about the desperate state of the transportation infrastructure in Germany, as well as the implications if part of it breaks down. There have indeed been some spectacular cases of this, such as the bridge in Schierstein which was completely blocked at times in 2015, and was then closed to trucks over 3.5 tons. When parts of the infrastructure disappear like this, it has a huge impact on reaching places, especially when the transportation system is already so vulnerable. It's inevitable there'll be traffic jams and, as a result, more diversions. The impact on the economy is huge, and actually the same applies to environmental damage because more fuel is used, generating more exhaust fumes. This effect can be translated to highly frequented transportation nodes in urban areas. The objective of the system we developed is to map the technical status of complex road networks in order to pinpoint clearly and objectively any current issues this highlights. Such systems should be in a position to forecast the status of networks over time so that strategies can be developed for maintaining the entire network, taking technical and planning factors into account. Based on this, you can then predict financial requirements. They can be used to determine the annual budget required to maintain a system, providing a basis for optimizing action plans. These are complex evaluations, because a whole host of different factors have to be taken into account and things like this are

not just about pressing a button; it's a system designed to be used in decision-making. But it does allow us to avoid unpleasant surprises involving sudden system breakdowns and design the infrastructure in a way that makes it easier to plan smooth operation and proper availability. An example of how this can work in practice was the financial requirements planning carried out for Munich, the state capital of Bavaria. The forecast we developed in 2012 has just been recalculated and confirmed. We're currently working on a project for the senate administration in Berlin looking at a strategic approach for systematically planning the maintenance of city roads. In Hamburg, we're looking at what would happen to the dockland area if there were extremely high volumes of heavy vehicles, which pose a particularly difficult challenge to expert systems. We're also playing a central role in writing guidelines for the Road and Transportation Research Association (FGSV).

**The roads of the future will be smart, environmentally friendly, and quiet. They'll measure damage and the weather conditions, they'll optimize traffic by communicating with cars, so they'll help avoid accidents, and they'll even generate electricity – is this a realistic aspiration?**

In technical terms, yes, this can be done and in fact a lot of this work is already underway. The question is, whether this will lead to any useful areas of application and result in business models. Somebody has to be able to derive benefit from using technology. This will be central to the market in the future and not every idea will actually result in a usable innovation. We shouldn't – in fact we mustn't – stop working on new ideas; we've got to keep pushing ahead with user-centric research, and we have to keep applying what we discover to "the road," in keeping with the whole concept of technology transfer. Having unorthodox ideas takes a lot of courage, and turning ideas into reality requires a willingness to take entrepreneurial risks. Without people with the right ideas – and the courage and willingness to take risks to make them happen – we won't make progress. I can't wait to see what happens and I'm excited about the future.

**Image 1:** A pedestrian-friendly city (Toronto, Canada) © Markus Stöckner  
**Image 2:** A multimodal setup in front of the main station in Münster © Markus Stöckner



Prof. Dr.-Ing. Markus Stöckner  
Steinbeis Transfer Center  
Infrastructure Management  
in Transportation (IMV)  
(Bruchsal)  
su1284@stw.de | www.steinbeis.de/su/1284

Prof. Dr.-Ing. Markus Stöckner is director of the Steinbeis Transfer Center for Infrastructure Management in Transportation at Karlsruhe University of Applied Sciences. The services provided by the Steinbeis Enterprise range from concept planning and development to pavement management systems, the strategic development of transportation networks, the drafting of maintenance plans for traffic systems, and expert advice on issues relating to quality management in road planning and transportation.



## Volatility in the General Cargo Logistics Market

### Steinbeis experts co-develop a forecasting tool

The Steinbeis Innovation Center for Research in Transport and Logistics is working alongside TLT Berlin as part of a 12-month research initiative sponsored by the State of Brandenburg. The aim of the project is to develop a model for predicting variations in parcel and shipment volumes in the general cargo market.

With general cargo, consignments can weigh anywhere between 30 kilos and 2.5 tons. The main task cargo companies face is how to group lots of small consignments with larger deliveries and still ship them over major distances. The market for general cargo has expanded rapidly over the last 15 years. One of the most noticeable effects of this change is that customers are looking for service providers who can "cover all the bases." This is because customers are eager to work with a single freight forwarder or parcel company, somebody who can look after all their cargo requirements. Another important need relates to short delivery deadlines, which are usually within 24 hours. To successfully address both parts of the equation – full service and quick delivery turnarounds – suppliers need sophisticated infrastructure and comprehensive networks. As the clients in these networks are based in all kinds of locations and their logistical requirements entail distributing shipments to recipients in similarly diverse locations, the providers of their logistical services also need their feet on the ground everywhere. Unlike procurement markets and classic outbound logistics, with general cargo and parcels there tend to be few unidirectional routes – networks go to and fro. As a result, all sites – which in network terminology are often referred to as nodes – have to be linked to one another on a daily basis.

Each site therefore feeds consignments into the network every day, whenever orders are received from clients. Independent of daily volumes, each site and network connection has to be kept up and running. As a result, the costs for each location and the cost of maintaining links between all sites has nothing to do with actual volumes – they're fixed. This is actually unlike the variable costs, which are extremely low.

The market for general cargo logistics is dominated by large companies and medium-sized cargo logistics cooperatives. At the moment, the 10 biggest market players have a market share of around 71 percent of the annual turnover of €6.7 billion (source: Kille/Schwemmer (2014), Top 100 der Logistik, p. 119). The general cargo cooperatives are typically formed by between 40 and 60 small to medium-sized logistics providers, who enter alliances to leverage synergies. A small or medium-sized company cannot compete effectively in the market due to the key customer requirement for nationwide coverage, so it has little choice but to join a cooperative. One consequence of the extremely high fixed costs for maintaining storage space and network connections is that competition is extremely price-oriented and margins are extremely low. This makes it all the more important to keep a lid on costs, maintain



high standards, or even improve quality, and one of the best ways to do this is to optimize volumes. And optimization means keeping volumes high and uniform. But another problem is that cargo volumes are dictated by external factors (i.e., contracts) and these are awarded to logistics companies on a daily basis (depending on distribution volumes).

One of the particular challenges with this arrangement is that the fixed costs jump up in steps. Costs are fueled by the nodes (distribution hubs) but also by connections between the nodes, for example if extra hands are needed for trans-shipments or extra units are needed for supplying depots. Currently, the daily fluctuations in volumes in the general cargo market can be between 30 and 40 percent. Because the distribution networks are so complex, it's unclear what causes this volatility. There are also so many clients in the market and these come from such a wide variety of industries that variations in volumes cannot be seen as an inherent feature of the system. Nonetheless, it does appear that the market has recently become even more volatile. Apparently, variations are random and cannot be predicted. This is a major headache for logistics companies, especially given the current situation with shipment variations of up to 40 percent (based on average volumes). Sometimes suppliers only see what volumes will be like just hours before deliveries are due to take place. This leads to a number of severe problems: When planning staffing levels, it's sometimes not possible to

quickly adapt the number of people needed at any given time. So if volumes are higher than average, units are overstretched and quality suffers; if volumes are below average, the personnel costs per consignment are too high.

It's also almost impossible to adjust technical capacity factors in the short term, such as storage space or vehicles; the problems are similar to those encountered with employees. Some capacity factors cannot be changed at all in the short term and this creates the risk of backlogs. Overall, the fact that volumes are increasingly volatile and it is virtually impossible to predict volumes means that people plan in too much capacity, simply because quality is important and people base estimates on peaks, not troughs. The problem with this is that unused capacity is expensive. Furthermore, if volumes are so low that capacity is underutilized, this weighs heavily on the environment. Although there is a tendency to plan in too much capacity, the increasing volatility has a detrimental impact on standards, since there are more peaks in shipment volumes that exceed available capacities. Quickly buying in additional capacity through the "temp market" is also a short-term solution and this can be particularly expensive.

Understanding the causes of the problems and being able to spot variations early can be a major help in allaying the problem and can thus raise competitiveness. The project team working on the current project have been successful until now in identifying and systematically capturing the causes. They discovered that there are a variety of reasons for variations in volumes. For example, one influence is the weather. In years when the spring is mild and sunny, orders for products like turf lawns (for DIY stores or private customers) are higher than in colder and wetter springs. Aside from public holidays and school vacations, other factors that can affect volumes are special promotions organized by retail chains. That being said, sometimes certain influences overlap, which makes it all the more difficult to identify the exact causes. The aim of the project at TLT Berlin is therefore to work together with the Steinbeis Innovation Center for Research in Transport and Logistics to develop a procedure for forecasting the volatility of logistics volumes and translate this into a forecasting tool.

Image: © industrieblick – Fotolia.com



Prof. Dr. Dirk Lohre is a lecturer at Heilbronn University and is director of FORLOGIC – Forwarding and Logistics Center, a Steinbeis Consulting Center, and a director of the Steinbeis Innovation Center for Research in Transport and Logistics, which are based at Heilbronn University. Both Steinbeis Enterprises offer their clients support with general cargo, contractual logistics, freight forwarding control, and green logistics and sustainability.



Prof. Dr. Dirk Lohre

Steinbeis Innovation Center Research in Transport and Logistics (Flein)

su1865@stw.de | [www.steinbeis.de/su/1865](http://www.steinbeis.de/su/1865)



## A New Way to Fly!

### Steinbeis provides support on the testing of a hybrid aircraft called "h-aero"

A startup from Baden-Wuerttemberg has developed a patented, innovative hybrid airplane that offers all the advantages of aircraft while still addressing the sustainability requirements of modern travel solutions – in keeping with the mobility trend. The concept is currently undergoing trials in an unmanned version. The Steinbeis Consulting Center for Corporate Development and Social Space Planning has been asked to provide support with commercial aspects of the project.

"Nothing can be more valuable than an invention whose time has come." This is how Dr. Csaba Singer describes his unmanned flying system, h-aero, which is a combination of an airplane, a helicopter, and a balloon. At first glance it reminds you of a drone or even a UFO. Despite this, Prototype One only has one thing in common with a drone: it's unmanned. Comparisons with a UFO are still valid, however, since Singer's flying device boasts a number of completely new flying features. Singer, who studied aerospace technology at Stuttgart University, registered his patent for h-aero as early as 2006. Within a couple of years NASA was showing interest in his invention and it became one of only around 1,000 projects worldwide to be considered as an alternative form of reconnaissance for providing a bird's eye view of Mars. Before long, an invitation arrived from Houston.

In late 2014, Singer applied for an EXI Startup Voucher as part of a plan to set up a company. Ever since he has worked alongside Konrad Roth, director of the Steinbeis Consulting Center for Corporate Development and Social Space Planning. Collaboration between the two parties revolves around the commercial aspects of the startup and planning of the overall undertaking. One of the biggest priorities at the beginning was funding. To help with this, the Steinbeis experts looked at a variety of funding options offered by the state of Baden-Wuerttemberg, the German federal government, and the EU. Initially the focus lay on non-refundable development subsidies or stipends for the entrepreneur

during the development phase. The same applies today, although this time for the ongoing development needed to get the prototype ready for serial production. There are also funding programs for getting sales and marketing off the ground. To date the team has successfully brought funding worth €120,000 on board for the new business undertaking, thanks to an EXI Startup Voucher, an EXIST Business Startup Grant from university funds, and innovation vouchers (Voucher A and B). Roth also played a central role in working through the commercial aspects of the medium-term business plan. All plans relating to product costs, turnover, expenditures, liquidity, and profitability were drafted and have been regularly updated during the past two years in close collaboration with the startup. The planning period was extended to five years. At the same time, the Steinbeis experts had to continuously take care of aspects relating to financial controls. In keeping with the current trend toward alternative energy sources and sustainability, collaboration between the Steinbeis Enterprise and the startup is focusing simultaneously on two key aspects: flying with renewable energy, and solving smog and particulate matter issues in large cities by using solar thermal technology. It was against this backdrop that the Steinbeis Transfer Center for Solar Thermal Energy Systems, based in Baden-Baden, was set up under the directorship of Singer in 2015. But now, let's get back to flying!

The thing that is new about h-aero is that it's based on a technology that has been the subject of joint research for over 20 years, involving Stuttgart University, the KIT, and a variety of industrial partners in the region. Singer describes it as "flying with renewable energy." His flying machine uses helium, which is incombustible and harmless. The helium is held in an elliptical balloon to provide natural uplift. As a result the aircraft requires negligible energy to create lift, so compared to current drone solutions, it can stay up in the air longer and carry much more weight. "The prototype can already carry three kilos for up to five hours right now," explains Singer, who first presented Prototype One to the world in 2016 at the ILA Air Show in Berlin. This is not the only advantage offered by his system, however. The aircraft produces no emissions, offers vertical take-off and landing (VTOL), and can fly to a maximum altitude of 4,000 meters. The wings are fitted with propellers driven by strong electric motors to provide the necessary thrust. During daylight hours, they can if necessary also be provided with extra energy supplied by solar panels. If it's dark, power can be supplied by one or several battery packs. The hope at the moment is that h-aero will be able to hover in the air for months at a time, so in the future it may be able to help with things like providing communication networks. This is a specific aspect that Facebook and Google are looking into. Despite this, Singer believes that there are enough providers of key technology in Germany to work alongside partners in the south of the country (Cyber Valley) and that this will give them a head-start of five years over the technology giants of Silicon Valley.

Since the ILA Air Show in Berlin, what was once a spin-off at Stuttgart University is now a proper startup. At the company, officially named Hybrid-Airplane Technologies GmbH (Ltd), since December 2016 a team of ten experts has been working on developing the prototype into a first hybrid unmanned aircraft that will be ready to go into serial production. The team is also working on launch plans with the Steinbeis Consulting Center for Corporate Development and Social Space Planning. The first clients have already been lined up and signed specific letters of intent. The next big challenge will be sales and marketing. To get the ball rolling, a sales workshop moderated by Steinbeis specialists was organized in March. The aim was to pull together the insights gained up to now and discuss them with potential clients to work up a sales and client structure, sales channels, selling instruments, and systems for processing sales.

Looking at travel requirements over the coming decades, as well as the necessary changes these will bring in terms of technical systems, the main priority will not be the fact that h-aero can already do a lot more than the most powerful quadcopters on the market. Nor will it be about showing that the technology can provide spectacular shots using 25-kilo cameras from Hollywood. Instead, the big story is that h-aero now makes it possible to carry the kinds of loads and make the kinds of journeys that are currently handled by weather balloons, airborne mineral detectors, pollutant measuring devices in big cities, airborne equipment used by the police, minefield detectors used by the UN, or even wildlife surveying equipment used by the Max Planck Institute. Larger versions of h-aero are currently under development, and in the future they should be able to help with setting up communication networks at short notice. "They'd make radio masts superfluous," says Singer. h-aero is a flagship technology, especially

given societal shifts toward an ecologically and socially responsible market economy, the transition to alternative energy sources, electric vehicles, connected manufacturing (Industry 4.0), and the growing demand for sustainable solutions. The decisive advantage with this new technology lies in its outstanding flight duration and its excellent safety record. If something starts to go wrong with h-aero in technical terms, it slowly hovers back down to earth like a parachute.

Experts believe the market for unmanned aviation systems holds tremendous potential in the coming years. By 2020, the commercial market for load-bearing drones will generate sales of USD 127 billion. According to Frankfurter Allgemeine newspaper, the value of the global drone market itself will rise by 50 percent by 2021 to hit USD 12 billion. Hybrid-Airplane Technologies already has a product in the bag that is ready for production and geared to future requirements. This was possible because its time had come, but also because the competition never sleeps. "One good thing about the aerospace industry is that in principle, and ignoring any commercial considerations, it's a learning curve – so it means that we're all working together. The third dimension holds the greatest untapped potential in physical terms for the whole of humanity. I'm sure that this collaboration will become even more effective in the future," says Singer, who is certainly a man of conviction.

Image: © Hybrid-Airplane Technologies GmbH



**Konrad Roth**



**Dr. Csaba Singer**

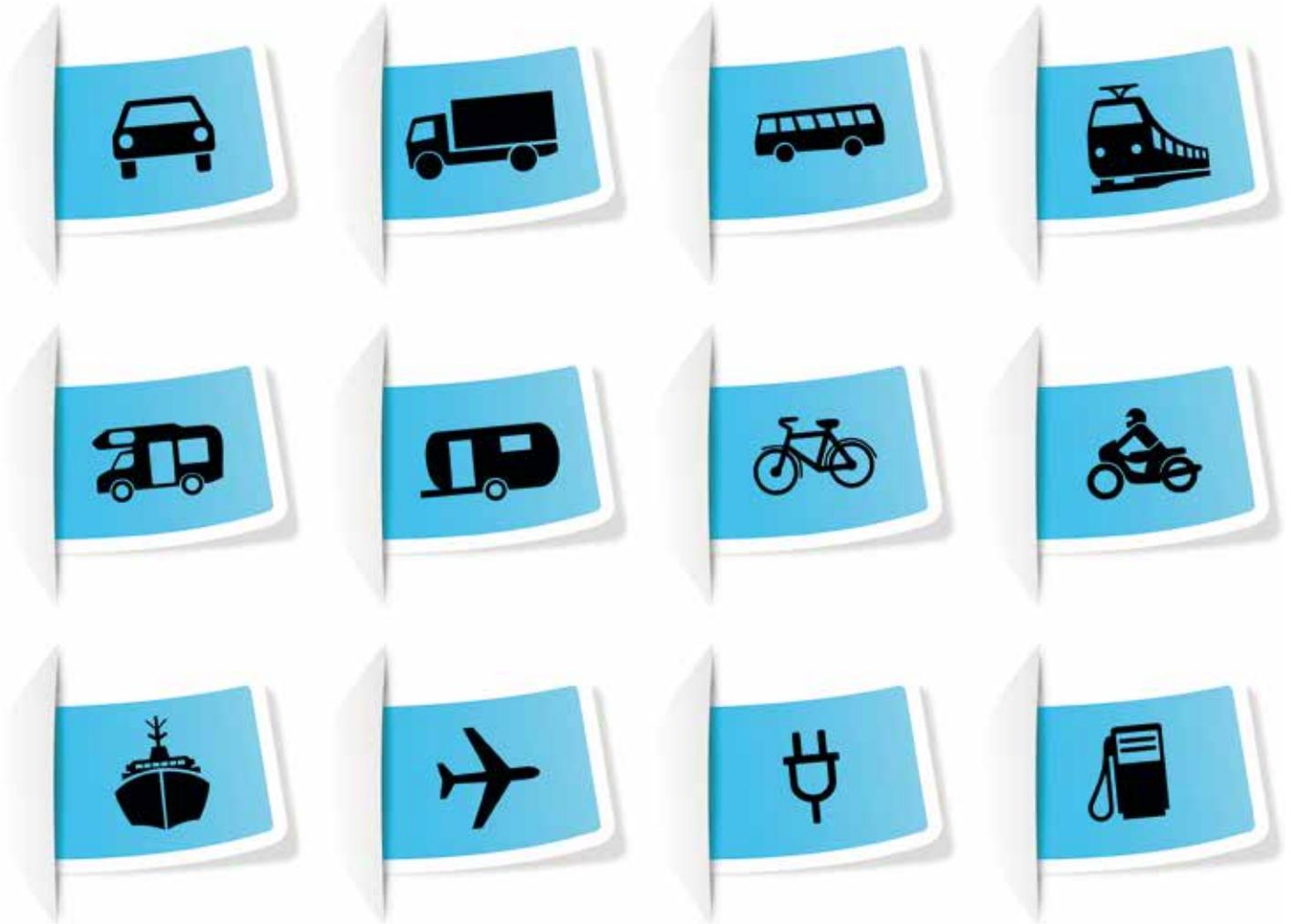
**Konrad Roth** is director of the Steinbeis Consulting Center for Corporate Development and Social Space Planning, which offers customer solutions spanning the entire spectrum of business administration. The consulting carried out at the center revolves around corporate development and the planning of areas used by society.

**Dr. Csaba Singer** is the founder of Hybrid-Airplane Technologies GmbH and director of the Steinbeis Transfer Center for Solar Thermal Energy Systems.



Konrad Roth  
Steinbeis Consulting Center  
Corporate Development and Social Space Planning (Au am Rhein)  
su1803@stw.de | www.steinbeis-beratungszentrum-karlsruhe.de

Dr. Csaba Singer  
Hybrid-Airplane Technologies GmbH (Baden-Baden)



## Putting Travel Solutions Through Their Paces

### Steinbeis experts determine the impact of mobility trends

To convey the general need to travel around freely and make this understandable, statistics are needed. It doesn't matter whether people need to move around in cities or out in the countryside, people have the same requirement everywhere. In rural areas, people may not be prone to jump on a bicycle and ride for miles at a time; instead the automobile and public means of transportation are more important. Mobility and Logistic, a Steinbeis Transfer Center, is now entering new territory itself by researching and assessing current travel trends and examining how applicable different ideas are to rural areas.

In the specific field of logistics, the team at the center is looking at freight forwarding on public roads. Everyone who buys products through the internet would like their goods to be quickly and safely delivered to their home. But what consequences does this have in the logistics industry? This is the question that the experts were hoping to answer at Mobility and Logistic, the Steinbeis Transfer Center.

Electric vehicles feature heavily in conversation these days and lots of people and companies "want a piece of the action," or at least don't want to miss the boat. In rural areas, too, electric vehicles certainly have a role to play. But expectations with e-cars are vastly different to cars with gas or diesel engines, so this makes it all the more important to scrutinize the areas where such vehicles would be used. Accordingly, the Steinbeis Transfer Center has been conducting a project aimed at

evaluating electric car use in the Black Forest. This involved closely examining a variety of vehicles, setting up local infrastructure including charging stations, and assessing data at three campuses belonging to Furtwangen University (HFU): Furtwangen itself, Schwenningen, and Tuttlingen. To determine the role electric vehicles could play in rural areas, a number of criteria were considered: the specific nature of the local infrastructure, service and maintenance factors, environmental influences (temperatures, energy consumption with lots of hills), and subjective experiences. After comparing the technical data and car options, the project team concentrated on four vehicles: the Mercedes B-Class, the Renault Zoe, the Nissan e-NV200, and the smart fortwo. Each vehicle was used in an entirely different way: Classic cars made it easier for employees and students to switch between different campuses, so they could be used a bit like a company car. The van was

used by the university postal service for moving goods around, although it was also used for trade fairs and medium-sized loads needed by technical services.

Summarizing people's experience during the project, unfortunately things did not look good for electric vehicles. There were multiple negative impacts resulting from the local environment. Just one example that particularly stands out is battery life. If one compares rural with urban areas, journeys in the country generally last several miles and there are more hills to drive up and down. Also, winter temperatures are usually lower – sometimes significantly so. This was particularly the case with the area chosen for the study, which was the upper areas of the Black Forest. The battery range under such rural conditions can be half the distance achievable in cities, and this is extremely unsettling for drivers. It is also worth noting that the charging time below freezing temperature can be three times longer. Accordingly, the results of the project were frightful, especially in the winter. Generally the best results were achieved under predictable and controlled conditions involving short journeys. If critical factors such as the impact of temperatures, battery life, and charging times can be worked out in combination with the right price, there is nonetheless little doubt that this technology has a role to play in our modern infrastructure.

But public transportation networks are also an important aspect of modern travel in rural areas. As these typically depend on subsidies, it will be particularly important to coordinate communication with neighboring communities and local transportation cooperatives. The team is currently looking at internal evaluations of critical connections – work already carried out by local transport companies to arrive at any optimizations that could be made in cooperation with the authorities in rural districts. If it still appears that transportation is poor, or there are critical shortcomings in the public network, alternatives will have to be looked into, such as setting up "community coach clubs" or different setups for sharing rides.

As part of another project, the Steinbeis Transfer Center has been looking closely at the issue of parking spaces for trucks. When truck drivers cannot find a free parking space, they have to keep driving. They then risk breaking the law on maximum time at the wheel (ignoring fatigue issues – which in the worst-case scenario can result in an accident). Alternatively, they have to park in unofficial off-road areas. When a driver spends too long at the wheel, this is logged automatically on the digital tachograph and violations can result in a hefty fine. To avoid this, drivers often try to find a place to park a long time before their official driving hours come to an end. This costs drivers valuable driving time – when they could be on the highway transporting goods. This is ignoring environmental issues. When trucks spend a long time looking for a place to park, they often drive up and down parking lots and this results in higher carbon emissions. The Steinbeis Transfer Center has worked out that a truck that has to drive off the highway five times looking for a place to park for the night emits approx. 10.6kg of greenhouse gases. Extrapolating this number for one truck for the whole year, this is the equivalent of more than 3 tons of CO<sub>2</sub>. That is the same as using an extra 1000 liters of diesel each year. Parking a truck in unsafe areas (away from illuminated parking lots or away from the highway) is a risky undertaking for drivers, the trucks themselves, and of

course the cargo. According to losses calculated by the German insurance industry, around 300 millions euros' worth of cargo were stolen in 2015. An EU study estimated that the damage resulting from stolen goods across Europe amounts to over 8 million euros. One way to reduce these losses would be to provide help with parking lot planning (especially for people working in logistics planning), for example by booking parking spaces, or planning contingency areas along driving routes, or both.

Ultimately, it is the freight forwarding companies that have to meet the cost of inefficient parking space searches. They also have to pay for the additional insurance premiums. As part of the EU project, the Steinbeis Transfer Center Mobility and Logistic conducted a study on the topic of truck parking in Germany and the rest of the EU. This involved a survey of drivers, freight forwarders, and parking lot operators, with questions about processes, experiences, and personal opinions. It was important for the body at the European Commission (DG Move) to gain a realistic overview of the issues faced on highways in Europe. Unfortunately, the findings provided sober reading: All stakeholders want to identify a solution for the problem of trying to find parking spaces for trucks, but nobody wants to pay for it.

Image: © JiSign – Fotolia.com



**Prof. Dr.-Ing. Jochen Baier**



**Kay-Uwe Zimmermann**

**Prof. Dr.-Ing. Jochen Baier** is director of Mobility and Logistic, a Steinbeis Transfer Center at Furtwangen University (HFU). The key areas worked in at the Steinbeis Enterprise include mobility management, logistics support, and process optimization.

**Kay-Uwe Zimmermann** is a member of the team working on the "Travel Solutions in Rural Areas" project at Furtwangen University (HFU). The aim of the project is to find a sustainable and environmentally friendly way to address the travel needs of HFU staff and students and apply this to other rural areas.



Professor Dr.-Ing. Jochen Baier  
Steinbeis Transfer Center Mobility and Logistic (Furtwangen)  
su1922@stw.de | www.steinbeis.de/su/1922



# DIGITAL TRANSFORMATION

## Digital mobility – future or true reality?

**Or: How a raw diamond can be grinded**

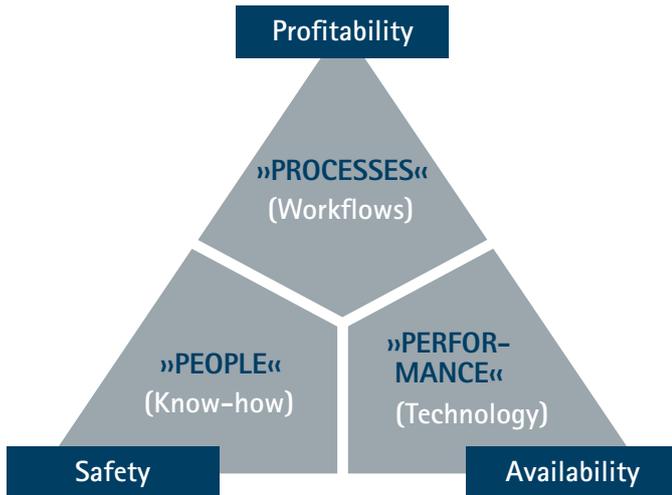
Digital transformation and Industry 4.0 (connected manufacturing) have been creeping around in the corridors of business, research, and politics for some time now – not forgetting the corridors of society and social fields. But what does digitalization have to do with mobility? This is one of the issues being examined by the Steinbeis Transfer Center for Technology – Organization – Human Resources in Ravensburg.

Reports appear in the media every day about digital solutions and Internet 4.0 (the Internet of Things), and many reports are highly creative, probably because these are the latest buzzwords. Also, Germans do like to use English terms rather than explain something in German – or else something may not sound creative or “innovative” enough. The terms already familiar to Germans include the Internet of Things (IoT), big data, cloud computing, business process management (BPM), artificial intelligence (AI) and robotics, 3D printing, smart factories, and e-mobility. All have something to do with IT or they help with IT. So in essence they’re related to digital solutions used in business processes or for adding value, plus the many things these involve. The overall aim: to compete in markets more efficiently. Many companies (of every size) are becoming more and more involved in these issues, in a quest to determine which digital technologies work best for them. According to a recent BITKOM study titled Digital Office, it is quite clear that many firms are on the lookout for ideas, but they are not necessarily actively doing something. Why is that?

Many years ago, Albert Einstein had a theory about this, saying that the purest form of insanity is to leave everything as it is and at the same time hope that things will change. It’s almost as if lots of businesses are in a kind of waiting area, hoping that the ideal solution will just pop up and all kinds of problems to do with the organization and running of the business will simply disappear. But simply pressing a button and finding the right digital solution is more than utopian, as was the dream of the paperless office. Paradoxically, in an era of digital solutions people print more documents now than ever before.

One key question one has to ask is what does digitalizing value chain processes have to do with modern mobility solutions in the first place? In business, mobility lies at the heart of all activities. This is because globalization used to be mainly about physical presence, in all areas of the world – through products, services, or people. These days, companies like Uber and Airbnb can be extremely successful without even owning physical assets. Digital business models are increasingly moving into the spotlight, and the practically limitless scope of scalability and availability relates back directly to one of the core areas of competence within such digitalization strategies: the mobility of processes, people, performance, and perspectives, as well as quick and loss-free data and information exchange. We cannot (yet) physically teleport ourselves from one place to another, but thanks to broadband internet we can send information around the world in seconds and thus share information much faster than by word of mouth.

This leads to a new model that has proven its value in practice. It is based on a magic triangle, and if necessary it can be extended to include a fourth dimension for psychological aspects. This would turn the triangle into a diamond. Cutting and finishing raw diamonds to add individual facets and create a sparkling stone would be an appropriate task of value creation for any company. Every company would surely like to sparkle and shine with its services and performance, and even the dry German language can relate to such allusions.



So what does mobility in an era of digital technology actually mean for an organization, independent of its sector of industry? One way to convey the benefits and tasks involved is to look at a typical project with a medium-sized craft business (building renovations). The handcraft had a tradition of using paper (dirty environment, little time, notes quickly scribbled on scraps of paper). But at the same time, it was becoming more and more important to document processes, sometimes with added photos to provide evidence to insurance companies of water or fire damage. Craftsmen are typically open to new technology but in this case the setting was less "innovative" – it was about digital support while moving around on construction sites. In this case, help came in the form of a digital solution tailored to specific requirements – an eWorker® to map analog and digital processes, combined into a single, end-to-end, transparent process. So there were SmartPens with digital paper, if needed combined with smartphones, tablets, or both. This way photos could be automatically added to documents. The result: a simple and economical method for capturing mobile data and processing it electronically, creating archives that were reliable enough for review purposes in a document management system (DMS). This is not science fiction. It is state of the art – and the results are usable right now.

Many companies have been sitting on their own raw diamonds for years but they don't dare to start cutting or polishing them. Diamonds may be the hardest material on this planet, but one bad cut can suddenly shatter something that is almost perfect. It takes years of experience and advanced manual skills to cut a stone into a finished diamond. And this is why companies should bring the right experts on board as they embark on the journey toward mobile digital solutions.

Image 1: © Coloures-pic Fotolia.com

Image 2: © Stefan Odenbach



Stefan Odenbach is a project manager in the field of digital solutions at the Steinbeis Transfer Center for Technology – Organization – Human Resources. The Steinbeis Enterprise offers support with raising productivity and reducing costs within companies or organizations; business analysis, company assessments, business evaluations, and business restructuring; the management

and financial monitoring of collaborative agreements, investments, and company divestments; the analysis, assessment, and implementation of training instruments; the analysis of management accounting instruments; and the analysis of costing and process cost controls in companies and organizations.



Stefan Odenbach

Steinbeis Transfer Center

Technology – Organization – Human Resources (TOP) (Ravensburg)

stefan.odenbach@stw.de | www.steinbeis.de/su/0151

## And the winner is...

### Voting for the best TRANSFER article in 2016

As in the previous year, it was you who picked our winner: The article featuring "Extracts from the diary of a startup" was voted best article of 2016. Our congratulations go to the authors Mario Buric from the Stuttgart-based Steinbeis Consulting Center Business Start-up, and Sonja Johanna Döring and Alex Müller from no/academy, also from Stuttgart. Further congratulations go to Charlotte Schlichting from Nersingen, a student at Steinbeis University Berlin, who won the vote on the 2016 articles.

The emails received at the TRANSFER office almost set our inbox on fire: More than 600 readers took part in the vote. After counting all the votes,

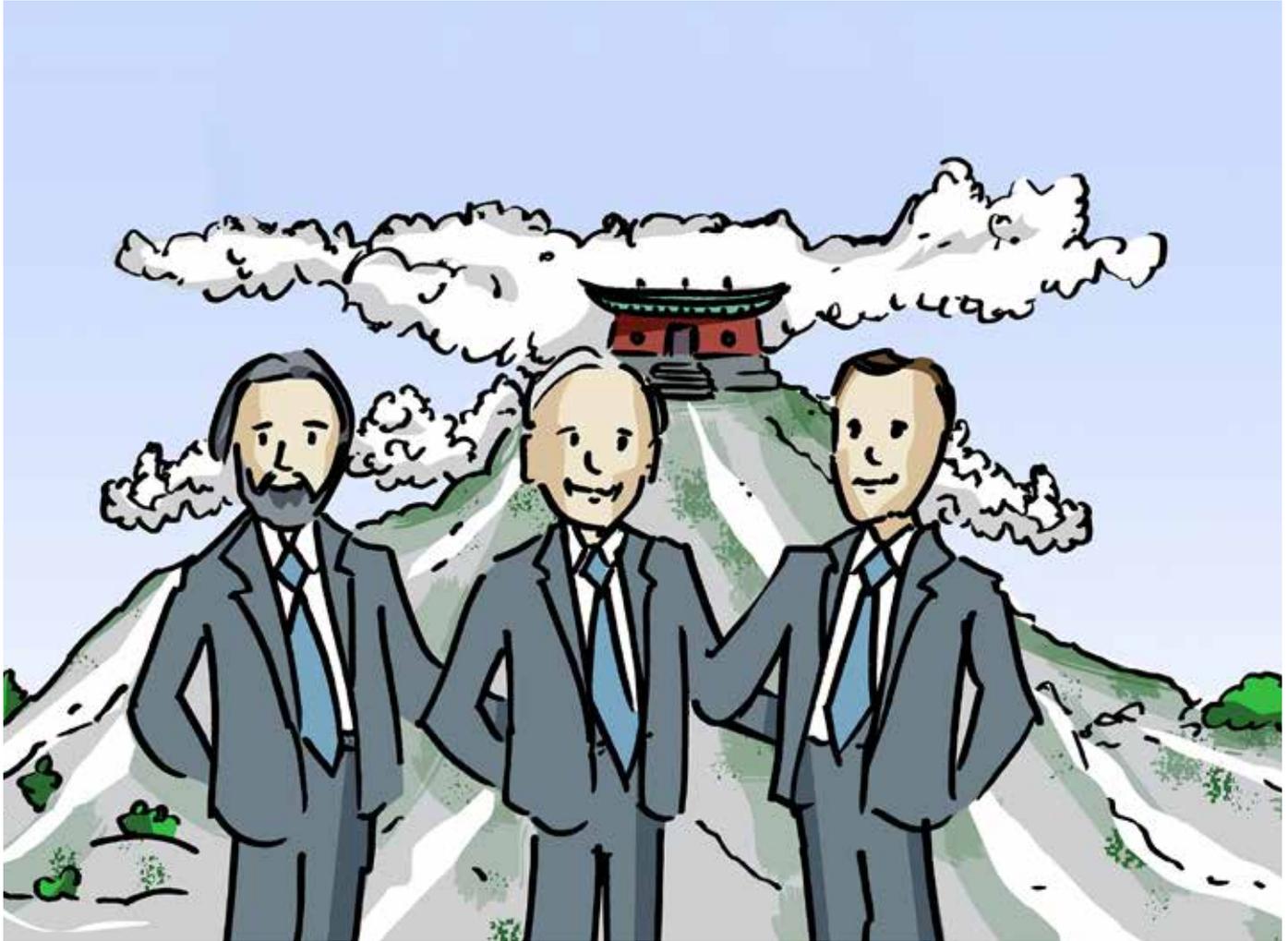
we had a clear winner: 101 votes went to "Lessons Learned: The Road to Self-Employment is Not What People Expect," one of the articles under the featured topic of entrepreneurship in the 3/2016 edition of TRANSFER. In the article, Sonja Johanna Döring and Alex Müller, the founders of no/academy, joined Mario Buric, a startup consultant at the Steinbeis Consulting Center Business Start-up, in describing the long and sometimes arduous journey of turning an idea into your own startup.



Marina Tyurmina

Steinbeis Headquarters (Stuttgart)

marina.tyurmina@steinbeis.de | www.steinbeis-transfermagazin.de



## A Shaolin Monastery for Managing Product Life Cycles, Smart Factories, and Digital Solutions

### Steinbeis experts launch training to become a PLM Principal Consultant

Digitalization, smart production (Industry 4.0) – these are topics that everyone seems to be talking about at the moment. That's all right, because if Germany misses out on the digital solutions trend, the impact on local business would be colossal. Some of the high-profile success stories one hears create the impression that smart products or self-controlling production are no longer such a difficult challenge. But in reality, things are very different. For companies to develop smart, mechatronic products and introduce them to the market, what is needed is horizontal integration. Offering new, product-based services entails developing digital twins. These are operated in parallel to real products. In keeping with this, a company needs ways to plan how information is generated or is allowed to flow around the business, and this needs the support of modern software. In essence, what this means is that a company needs product lifecycle management (PLM). To train specialists for the demands of PLM in business, the Steinbeis Transfer Center for Computer Applications in Engineering has joined forces with Steinbeis University Berlin (SHB) and now offers a training program to qualify as a Certified PLM Principal (SHB).

PLM is a broad discipline that affects many areas of digital technology in companies, from modeling to information networking, software functionality, and processes at every stage of the product and production life cycle. Succeeding with digital transformation takes a disciplined approach to PLM.

To acquire the right skills to implement PLM, an excellent understanding of the relevant business processes is required, especially product

development, order processing, and production. Broad specialist knowledge is also needed in the fields of IT, software architecture, and all software solutions currently on the market. To implement PLM, certain skills are also required: an ability to think in abstract terms in order not only to resolve the sometimes implicit and explicit differences between target and actual business processes (and how these are actually implemented), but also in order to work on an interdisciplinary level and understand which departments or areas need to be involved.

Not everyone involved in applying PLM needs the complete battery of qualifications. Nonetheless, every PLM project should have at least one principal consultant involved, equipped with the necessary qualifications. There are already many highly capable PLM consultants working in the market, but few have the required official qualifications to assume the role of a principal consultant. There are two reasons for this. First, there are not enough suitable training options, and second, a broad understanding of business processes and methods is required to apply PLM. This understanding has to be so broad that with current resources and techniques it is practically impossible to acquire.

These are the issues addressed by the Certified PLM Principal (CPP) training program offered by the Steinbeis Transfer Center for Computer Applications in Engineering. Its course is based on a new way of looking at PLM, which assumes that information flows within a company just like materials, so it is part of a network. Flow and networks have to be planned and designed. The new Steinbeis course has been pulled together as part of a collaboration between Siemens Industry Software GmbH (SISW), Karlsruhe University of Applied Sciences, and the professorial chair for virtual product development (VPE) at the University of Kaiserslautern. The project is being supervised by three professors, Jörg W. Fischer, Martin Eigner, and Bernd Langer, who are also running the course modules and overseeing work carried out on projects.

Jörg W. Fischer, who is a partner of the Steinbeis Transfer Center for Computer Applications in Engineering, uses an analogy to explain the benefits of the CPP program: the martial arts practiced by Shaolin monks. "There are very few excellent consultants working in PLM. In keeping with this analogy, they've got many years of often painful experience under their belts doing street fighting, but they lack systematic martial arts knowledge. As a result, they find it hard to share their knowledge, if at all. The young and talented consultants following in their footsteps now have to go through the same painful experiences and learn by doing, engaging in a lot of fights." The CPP training represents a new school of thought, similar to Shaolin Kung Fu. Suitable candidates with the right talent and a bit of experience can offer more after half a year's training in a Shaolin Monastery than a street fighter with twenty years of experience. With the CPP program, this will now be possible for PLM.

The CPP training is currently going through its first round and is being offered exclusively through SISW. SISW has sent its top consultants to take part in the program, one of whom is Thorsten Neumann, who already speaks positively about the program after the first couple of months on the course: "The program gives the course participants an understanding of information flows and networks within companies. It creates a better understanding of the entire task of a consultant, not just focusing on technical skills but also placing plenty of emphasis on methodical approaches. As students on the course, it puts us in a position to work beyond just designing a technical solution, which we're generally familiar with and have had practice with. Instead, we can map and plan information flows independent of the specific system." This provides added value for the customers of Siemens, with professional consulting based on solid technical know-how, all underpinned by a methodical approach that revolves around the actual industrial process. Neumann is also already applying his newly acquired skills directly to his

everyday work. For his current project, which involves document management at a medium-sized enterprise, he is approaching the topic from other angles, and not just focusing on features and functions. One of his colleagues on the CPP course is Daniel Schnurr, who is also deriving benefit from what he is learning. "The angle taken by the instructors and their practical experience and methods can be applied directly to projects we're working on, and because they refer to actual cases, you get to think outside the box," concludes the Siemens consultant. Schnurr finds the methods and approaches they learn a valuable addition to techniques already used at the company, adding that the initial extra work involved is justified given the results, which are clear and efficient when it comes to everyday use.

The CPP program allows students to learn about various core topics affecting industrial processes in a number of industries, how to systematically analyze process and information flows, methodical solution planning, the skills required to leverage personality, and how to initiate the required change processes within a company.

To qualify for the program, applicants need at least four years' experience working with PLM in industry, the ability to think logically and abstractly, excellent presentation skills, and an understanding of PLM in different areas. Skills are assessed as part of an interview process with the program professors.

Certificates for the course are issued through Steinbeis University Berlin (SHB). Training as a CPP counts as a degree major at SHB and earns 15 ECTS credits. The training course is based closely on Steinbeis project competence principles. These revolve around the fundamental assumption that knowledge in itself has huge potential, but that success is ultimately dictated by how that knowledge is applied to a given situation and managed by the individual. Course participants are taught the fundamentals in classroom sessions along with methodical skills; these then have to be applied to a PLM project, which is also assessed.

Image: © Susanne Ferrari Design

The next course is scheduled to start in September 2017. For further information contact:



Prof. Dr.-Ing. Jörg W. Fischer  
Steinbeis Transfer Center Computer Applications in Engineering (STC-RIM)  
(Karlsruhe)  
[joerg.fischer@stw.de](mailto:joerg.fischer@stw.de) | [www.steinbeis.de/su/61](http://www.steinbeis.de/su/61)



## Focusing on Users

### Steinbeis experts help mechatronics specialist take a user-focused approach to developing product variants

2E mechatronic has specialized for over 15 years in developing innovative mechatronic products in the fields of sensors, precision injection, and microsystems technology. The company has continued to grow throughout this time and has made a name for itself in the automotive and medical technology industries. 2E mechatronic came to Steinbeis for assistance in pinpointing new application areas for a specialized capacitive tilt sensor. Together with the Frankfurt-based design agency iconstorm, the Steinbeis Transfer Center Management – Innovation – Technology (MIT) helped to develop a user-focused product architecture that would allow for appropriate product variants, also adapting the company's in-house innovation process.

Many companies, especially SMEs, complain of insufficient market success despite their products and solutions being highly innovative. As they see it, they did everything correctly: They established a systematic innovation process within their company, and chose to pursue the innovation in question based on the lead user approach, meaning that the product was developed and built to solve a specific customer problem while taking the needs of other customers and target groups into consideration as much as possible. But the product still fails to sell enough units to cover the costs of the innovation process. This is because new customers demand individual adjustments to existing solutions so they can tailor them to their own application. These adjustments create additional costs – a vicious circle that in many companies leads to (too) many different variants of a product, with correspondingly low returns.

Uwe Remer, CEO of 2E mechatronic, is also more than familiar with this tough scenario: "If we want to keep bringing innovative products to market, we have to make changes to our technology-oriented innovation process." It was this realization that led him to turn to Management – Innovation – Technology (MIT), the Steinbeis Transfer Center. The challenge the Steinbeis experts were tasked with solving: How can 2E mechatronic find more customers for its innovative products without

having to develop a new product every time to cater to customer requirements?

An analysis of 2E mechatronic's innovation process showed that its design was typical for technology-oriented companies. A linear process based on the stage-gate process was used to highlight weaknesses, usually at a point where developments had to be based closely on the customers in order to reflect their requirements. This is typically in the creative concept stage or early on in prototyping. Expanding the stage-gate process to include methods and tools based on design thinking and human-centered design – an approach used in software development that allows users to be closely involved early on in the innovation process – makes the innovation process more attuned to customer needs. Relevant information on users and their requirements – in terms of how they would use the new product for their specific application – is collected, sorted and evaluated, before testing using prototypes early in the development process. These user-focused considerations complement the standard technology-focused approach and enable targeted development of tailored product variants, dramatically reducing the risk of focusing too strongly on only a small number of potential customers.



This approach, known as human-centered innovation, was pursued at 2E mechatronic and applied to the pilot project of a capacitive tilt sensor. The project team began by systematically identifying new groups of applications, associated market segments, and any conceivable use cases based on the tilt sensor's known applications. For instance, since the tilt sensor is already used to determine the position of excavator shovels, a use case of "measurement of wind rotor blades" can be extrapolated from this. Based on this systematic approach, new criteria can then be derived: measuring rotor blades places additional demands on the sensor's casing in terms of the choice of material, design, and several other considerations. In this early concept development phase, simple prototypes were developed to try to meet these requirements. At this stage, a few use cases that originally looked promising were ultimately rejected, since developing these variants turned out to be too costly or technically complex. Contacting potential future users at an early stage is an important step: Not only does it greatly reduce the risk of developing a product that will not be wanted by enough people, it also helps define user requirements so they can be met in the final product. With the modified innovation process, these important steps were not only carried out in linear succession, they were applied repeatedly in an iterative process until everyone involved was satisfied with the solution in question and the next phase was approved.

"Making our technology-heavy innovation process more strongly focused on users has made it a lot easier pinpointing suitable target customers," says Remer of this process. "But we also want to have a tool that will let us apply the process to other products in the future," adds Stephan Huttenlocher, project manager at 2E mechatronic. To make this

possible, the Steinbeis team and iconstorm developed a tailored toolbox of methods spanning four components: a user matrix, use cases, a user description, and a benchmark. "Now we're in a much better position to hit a home run with our products," believes Remer.

The project team was less surprised by one particularly finding: The new application areas that were determined for the tilt sensor, and the resulting add-on product functions, required skills not everyone at 2E mechatronic could offer. "We're not data experts," concedes project manager Nico Philipp. "So we have to rely on external partners to offer customers a comprehensive solution." Remer sees this as a positive: As a true believer in networking, he has no problem cooperating with other companies – quite the opposite, even if this partner structure affects 2E mechatronic's current business model. "If our customers want a smart sensor from us and we need to find important new partners to deliver its functionality, then we'll find them and adjust our business model accordingly," states Dr. Andreas Pojtinger, 2E mechatronic's technical director, with a sense of calm. "Our aim is to add value, as uncompromisingly and efficiently as possible."

"The continuing trend toward individualization requires a company to have ever-more flexible and diverse products and processes – and the possibilities opened up by digitalization are exacerbating this," comments Prof. Dr.-Ing. Günther Würtz from the MIT Steinbeis Transfer Center. "That's why we're certain that for companies to stay successful in the market, the innovation process – which is the most important process in the company – must also employ a user-focused approach such as human-centered innovation." 2E mechatronic has now successfully adopted this approach and has the tools it needs. There's only one more thing that's important for the company now: "just do it!"

Image: © MTS Maschinentechnik Schrode AG, Hayingen



Prof. Dr.-Ing. Günther Würtz  
Steinbeis Transfer Center Management – Innovation – Technology (MIT)  
(Stuttgart)  
su0438@stw.de | [www.steinbeis.de/su/438](http://www.steinbeis.de/su/438)

Uwe Remer  
2E mechatronic GmbH & Co. KG (Kirchheim/Teck)  
[www.2e-mechatronic.de](http://www.2e-mechatronic.de)

Jochen Denzinger  
iconstorm GmbH & Co. KG (Frankfurt)  
<http://iconstorm.com/>



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### Refresher Course on Practical ECC Skills

#### Steinbeis experts offer new training method

The Steinbeis Enterprise Competence Check® (ECC) is becoming increasingly popular among consultants, 100 of whom have now received ECC training and are thus qualified to use ECC methods for their consulting projects. The ECC experts have now introduced a new service for these consultants: Practical ECC Training.

Practical ECC Training is aimed at consultants who have already received prior training but would like to refresh their knowledge and apply it to live business cases. The course revolves around practical application of the tool and interactive assessment of survey data. The main topics covered during the three-hour training session are project design, managing participants, pinpointing strengths and weaknesses, and determining different ways to start competence consulting sessions by

focusing on solutions and methods of implementation. The course participants are taken through a live analysis of a specific case study.

At first, two courses will be offered per year. The course is free for members of the Steinbeis Network.

Consultants interested in registering should write to [ukcl@stw.de](mailto:ukcl@stw.de). For a list of planned training courses go to <http://steinbeis-ukc.de/schulung>.



Moritz Tzschenscher

Steinbeis Headquarters (Stuttgart)

[Moritz-Rudi.Tzschenscher@stw.de](mailto:Moritz-Rudi.Tzschenscher@stw.de) | <http://steinbeis-ukc.de/en>

### The 2017 Hilzingen Business Founder Day

#### Steinbeis expertise to be showcased at regional startup event

In 2015, Rupert Metzler, the mayor of Hilzingen, a rural community outside Constance, started an initiative for business founders. What started out as an "open surgery" session at the town hall has become so popular and has witnessed such rapid growth in the demand for ongoing advice that it has shifted up a gear. The Ministry of Economic Affairs, Labor and Housing is now on board alongside Steinbeis. The idea is simple: Steinbeis consultant Winfried Küppers offers an initial consultation at the open surgery session in the town hall and takes note of requirements. Depending on the questions raised, he puts the budding entrepreneur in touch with a specialized Steinbeis Center. In some cases an interdisciplinary approach is adopted.

According to mayor Metzler, "The variety of topics covered by the Business Start-up Steinbeis Consulting Center, the depth of the advice given, and

the high level of professionalism are highly valued by individuals, companies, and the community as a whole." The next step was to run a full-scale Hilzingen Business Founder Day on May 21, 2017. In collaboration with the state ministry, various highlights were planned for entrepreneurs. Aside from expert talks, the event offered the participating institutions (chambers of commerce, universities, and Steinbeis of course) the opportunity to showcase their services and experience. A small number of meeting tables were provided, enabling visitors to talk face-to-face with the experts at the event. The event closed with workshops, where a selection of Steinbeis Centers demonstrated their expertise and answered questions from business founders and young entrepreneurs.

To see the current agenda for the Hilzingen Business Founder Day go to [www.steinbeis-exi.de/events](http://www.steinbeis-exi.de/events).



Ralf Lauterwasser

Steinbeis Consulting Center Business Start-up (Stuttgart)

[ralf.lauterwasser@stw.de](mailto:ralf.lauterwasser@stw.de) | [www.steinbeis-exi.de](http://www.steinbeis-exi.de)

## Successfully Value Selling Business-to-Business Products That Require Detailed Explanation

### SHB graduate develops successful sales campaign

What's the best way to sell business-to-business (B2B) products that need careful explanation and emphasize the value they add? What are the challenges faced by a differentiated premium supplier in showcasing the value it adds? Why is that suppliers with superior solutions have to compete on price with companies with inferior solutions? These were the key issues looked at for a project carried out by Oliver Heining, a Steinbeis University Berlin (SHB) graduate. The name of his project: Business Field Development – Security. Heining worked on a series of transfer projects and his master's thesis as part of a Master of Business Administration (MBA), which was sponsored by the security systems provider Bosch Sicherheitssysteme GmbH.

The Bosch security systems specialist is a manufacturer and supplier of solutions used in buildings. These include fire alarm and voice alarm systems, as well as intrusion detection systems, video surveillance systems, and access control solutions. In recent years, the security business field had not met the commercial expectations of the company, particularly for core security products (intrusion detection systems, video surveillance systems, and access control solutions).

This was the challenge Heining decided to take on for his degree project. His aim was to raise the market share and profit margin in Bosch's Security division. Drawing on a McKinsey problem-solving method, Heining first of all came to the following conclusions: The Bosch video surveillance systems and access control solutions offer added value in a number of ways versus the competition's solutions, which are often just low-performance, low-cost alternatives. Conversely, even the most simple option offered by Bosch provides added value versus the competition's solutions. Despite this, when an offer is submitted, customers often fail to perceive this added value. As a result, on the one hand contracts are won by competing on price – so in essence clients buy Bosch because they get the lowest price but they still benefit from added value, which they may not realize when they buy. This basically hands away any opportunity to generate higher sales revenues, and the higher profit margin is lost. On the other hand, Bosch loses the opportunity to gain market share. If another supplier succeeds in communicating the value added by the solution they are offering, the customer will often decide not to buy Bosch.

For Heining, it was clear from his analysis that his project would need to revolve around clearly communicating added value to the customer. To this end, he worked out three actions that needed to be taken:

- Raise market share by improving product marketing
- Raise market share by communicating benefits and added value
- Raise profit margins

To see if these actions were actually realistic on a practical level, Heining implemented his ideas in his sales region over the course of his degree project. His numbers were successful, confirming that his logic was right: He successfully raised the number of incoming orders by 65% with a 350% rise in the share of new accounts. The (direct) margin contribution was two to four times higher, depending on the category. A comparison with other sales regions in Germany showed that his achievements were above average. For example, compared to the average, the share of new accounts was 170% higher and the margin contribution was 46% higher. Qualitative feedback from customers and other members of the team also underscored the success of the actions implemented by Heining.

The SHB graduate will now continue implementing the successful results of his project: In his new role as Sales Manager for Europe in which he looks after "new verticals," he will apply his new action plan to new business models and vertical markets.

**Image (left to right):** Rainer Gehring (Steinbeis), Oliver Heining (Bosch), Dr. Gregor Schlechtriem (Bosch), Prof. Dr. Christoph Metzger (Steinbeis)



Sarina Gehring  
School of Management and Technology at  
Steinbeis University Berlin (SHB) (Filderstadt)  
su1859@stw.de | www.steinbeis.de/su/1859

Oliver Heining  
Bosch Sicherheitssysteme GmbH (Stuttgart)  
oliver.heining@de.bosch.com | www.bosch.com



## Networked To The Power of N

### A look back at the Steinbeis Products Seek Producers exhibition: Digital media in Karlsruhe

Inform, exchange ideas, meet new people, share knowledge – in a nutshell, these are the main benefits of the unique series of Products Seek Producers (PsP) exhibitions, the latest of which took place on January 27. This special Steinbeis event, staged on the premises of the Karlsruhe Chamber of Commerce (IHK), added a new twist to innovation this year. The main topic of interest was digital media, a form of technology that transcends many different fields and which will play an important role in the future affecting numerous aspects of entrepreneurial value creation.

Aware of this, the Steinbeis Foundation joined forces with the Steinbeis Innovation Center Know-How + Transfer, the Steinbeis Transfer Center Infothek, Karlsruhe IHK, DIZ | Digital Innovation Center, and the Innovation Alliance of the Karlsruhe Technology Region. The exhibitors at the event showcased 55 technologically advanced solutions, exchanged views with other experts, and engaged in conversation on specialist topics with the 150 or so people attending the event.

Organizing the exhibition in a dynamic city like Karlsruhe, which is not only home to universities and scientific bodies but also industry, was a clever move. "Selecting the location for the event was carried out just as methodically as the planning of the main concept behind the exhibition," explains Wolfgang Müller, director of the two Steinbeis Enterprises that organized the event. Both of Müller's centers are based in Villingen-Schwenningen, and he adds that "the IT cluster in the area is ideal for probing the digital potential of companies before highlighting the ways that solutions can be implemented further down the line. PsP provides a meeting place for the kinds of key players who need to get to know each other and work out future strategies together." Underscoring the lack of alternatives, especially in the field of digital innovation, Dr. Stefan Senitz (Karlsruhe IHK) says: "Companies that ignore digitalization and digital media run the risk of being squeezed out by completely new products, services, or business models – no matter what sector of industry they operate in."

The organizers and numerous exhibitors and attendees were unanimous in praising the opportunity for personal interaction – meeting up face to face. However, that does not mean that meeting up virtually is out

the question. Gennadi Schermann, director of DIZ and also an exhibitor at the event, highlights the value of the trade show with an example: "Even in an era of digital solutions, at DIZ (the Baden-Wuerttemberg digital innovation center), we value the best-practice approach of personal exchange, just as much as regional heritage and the fundamental aspect of state-wide networking. Our role as a partner to PsP is based on conviction, and our experience on the actual day of the event was extremely positive." For Konrad Roth, who heads up the Steinbeis Consulting Center for Corporate Development and Social Space Planning, which was also an exhibitor at PsP, personal contacts at the trade show were important because "time and again, you unexpectedly meet new people, either spontaneously or by chance."

Pointing to the specific opportunities and prospects for all kinds of companies, Schermann explains one of the key insights stemming from the eventful day: "We see significant potential to move things forward in the field of digital media – for everyone from individual entrepreneurs to global players. This is not just about cost efficiency. There's potential to introduce new products and innovative business models – ideas that were previously impossible – so for businesses it offers significant added value." The path to success, and the primary areas Schermann has identified, are clear. "It all boils down to networking. With technology you have to look beyond current horizons and ensure everything revolves around the user, in order to generate maximum benefit for the customer and keep Baden-Wuerttemberg a leading player as a region of innovation. This is why DIZ activities focus on creating awareness, supporting SMEs, and helping people with digital competencies forge connections with small and medium-sized firms across the region."



Just how difficult it is to work entrepreneurially and succeed in focusing on the future, especially given the nature of the digital revolution, is demonstrated perfectly by the view expressed by Stefan Senitz, who is strongly in favor of challenging previous ways of thinking: "New competitors who nobody had previously heard of are entering the market. It's no longer impossible for something like an IT company to pose a threat to a major automotive company. To meet the challenges, we can no longer afford to think in conventional terms." Wolfgang Müller is one person who has long recognized that there is a need to come up with the right innovations, especially in the field of digital media – which can be communicated by explaining and advising people in different ways. He considers it a given that when it comes to digital media, a culture of innovation is needed in all areas of society, and that this will safeguard affluence in the long term. What this means in concrete terms is that the challenges, which are de facto, already need to be reflected in forward-looking education policies. The plea would be for digital technology to be more closely integrated into the education system and for the teaching of certain topics to be expanded – at a variety of institutions, from primary schools to universities. "Innovation and technology transfer require the right overall parameters. Creating these conditions is one of the responsibilities of public bodies. This is because, ultimately, investments in things like the right infrastructure – such as broadband internet or funding programs for research and development – have an impact on society as a whole," says Stefan Senitz, pointing to the close interplay between the state and business, plus the central role this plays in engendering a healthy climate of innovation.

The major overlaps between general and individual interests were also reflected in the opinions expressed in the speeches and specialist talks given by the presenters at Products Seek Producers, which tackled the issue of digital media from a variety of angles. To prepare the audience for the speeches they were about to hear, the vice-president of Karlsruhe Chamber of Commerce, Heinz Ohnmacht, gave a welcome

speech, which was followed by a warm welcome from the state government, represented by Günther Lessnerkraus, Assistant to the State Secretary at the Baden-Wuerttemberg Ministry for Economic Affairs. Claus Paal, member of the regional parliament and business policy spokesperson for the state parliamentary group, then joined Prof. Dr. Michael Auer, Chairman of the Steinbeis Foundation Board, in telling the audience more about the concept, the guiding principles, and the aims of the series of trade shows, especially with respect to their significance for technology transfer.

Specialist talks were then given on the different ways that expertise can actually be shared in practice, providing insights into interdisciplinary views of science and academia: Prof. Dr.-Ing. Bernhard Kölmel (Pforzheim University), Niklas Kühl (Karlsruhe Institute of Technology (KIT)/ Karlsruhe Service Research Institute (KSRI)), Armin Harbrecht (aramido), Detlev Lalla (Steinbeis Consulting Center Denkwerk, DHBW Mannheim) and Ralf Haack (Steinbeis Consulting Center for Digital Finance & Performance Management) shared valuable insights with the exhibitors, attendees, and organizers on the specifics of transfer implementation, also taking audience questions. It was no coincidence that so many leading figures from politics, science and academia, and business responded to the invitation from Steinbeis to share their thoughts on modern digital trends: "Steinbeis is involved in technology transfer in its purest form – its success confirms that Steinbeis is doing the right things," says Stefan Senitz, explaining the unique competence of the Steinbeis Network.

The large number of sustainable ideas, new insights, and suggestions provided by the people at the event were easy to summarize: "We have to think beyond the borders of individual sectors of industry in order to encourage networking. New ideas, good conversations – it's about tackling issues together and integrating as many networks, business clusters, and associations as possible," explains Gennadi Schermann. Markets are globalizing, resulting in shorter innovation and product life cycles that make it necessary to act quickly: "Innovations are our livelihood, so we can't afford to miss developments. The Southwest must be a driver, especially in the field of digital solutions," adds Stefan Senitz, highlighting the expectations Baden-Wuerttemberg has of itself. At the same time, he points to another crucial factor: "People have to feel motivated, they must feel driven to do something, otherwise even the best digital solutions are useless." Building on this, Wolfgang Müller notes: "One thing must not be forgotten. Innovation begins in the human mind and, independent of how things develop, this will still be its source in the future." Even in times dictated by extremely fast developments and complexity, one thing will stay the same: People will always be the pivotal point of technology, transfer, and application.



Marcel Reiner  
Steinbeis Transfer Center Infothek (Villingen-Schwenningen)  
su0252@stw.de | [www.steinbeis-infothek.de](http://www.steinbeis-infothek.de)



## Smart Cities: Integrated Solutions for Smart Cities

### Steinbeis-Europa-Zentrum shares results of European projects

Cities play an important role in protecting the environment. They are centers and drivers of innovation, partly because they have every potential to bring the representatives of key interest groups around the same table. In recent years, more and more European projects referring to innovative urban models have been set up and promoted as "smart cities" and thanks to European funding, some successful solutions have been developed. Steinbeis-Europa-Zentrum has already been involved in a variety of EU and smart city projects for a number of years and is keen on sharing its results, so they can be used by other cities and made available to the market.

The sustainable development of urban areas requires innovative, efficient, and user-friendly technologies and services, especially in the fields of energy, transport, and information and communication technology (ICT). Cities have a variety of challenges to address such as to meet economic, political, societal, energy-related, and environmental requirements. These include integrated planning, monitoring and communication with all of the stakeholders involved, in ways that match the given objectives. These parties include municipal representatives, urban planners, architects, energy providers, energy consultants, construction companies, investors, business enterprises, homeowners, and tenants. Steinbeis-Europa-Zentrum works with European cities on strategy planning, strategy implementation, and the exploitation and dissemination of any solutions that are developed. It does this to ensure that other cities derive benefit from these projects.

Smart City Lighthouse projects were set up by the EU based, among others, on the principle of creating "observer cities." These cities track developments in lighthouse cities before applying solutions to their own local issues. One example is a project called REMOURBAN, in which 22 project partners are working together on the development and assessment of a regeneration model for accelerating the smart urban transformation thanks to the lighthouse cities of Valladolid (Spain), Nottingham (UK), and Tepebasi/Eskisehir (Turkey). Two observer cities, Seraing in

Belgium and Miskolc in Hungary, will then use the project results for plans in their own cities. Dovetailing energy, mobility solutions, and ICT should help significantly accelerate the use of innovative technologies, promoting not only processes but also commercial solutions aimed at improving resource and energy efficiency. A number of efficient heating and air-conditioning solutions will be introduced in urban areas. A significant proportion of private journeys should be replaced by travel on public transportation by introducing smart grid solutions or traffic management systems. Urban renewal revolves around people, since they are the key to developing smart cities and of course they are the primary beneficiaries of improvements. Steinbeis-Europa-Zentrum's role in the REMOURBAN project is to identify the replicability potential for other cities and to draft market introduction strategies in Europe. For example, the Steinbeis experts have identified major market potential for the new urban regeneration model. It offers guidelines and help with selecting the optimum business model, technologies, and related instruments. The target markets for the new ICT platform are local and regional authorities and public authorities. The platform offers information tools for energy, operational infrastructure, waste management and sustainable transport solutions combined with integrated infrastructure, and such it makes it possible to create sustainable cities and develop efficient services. Finally, there is also market potential in low-temperature district heating (LTDH) systems, which are seen as the next generation

of district heating solutions. They will make it possible to achieve significant improvements in the energy efficiency of DH systems. One study conducted by the experts found that the system is still being set up in many European countries, but that it is already considered a breakthrough in the UK.

With the project TRIANGULUM, smart city methods are being applied, tested, and evaluated in flagship cities like Manchester (UK), Eindhoven (Netherlands), and Stavanger (Norway). In parallel to this, city concepts being used in the observer cities of Leipzig (Germany), Prague (Czech Republic), and Sabadell (Spain) are being analyzed. The project is being coordinated by the Fraunhofer Institute for Industrial Engineering (IAO) and project partners, which include SEZ. On the basis of insights gained to date, the various parties have now drafted guidelines for future urban development projects. These include recommendations for the observer cities; this makes it possible for smaller cities such as Sabadell in Spain to take part. Another EU project run by the CITYFIED consortium has resulted in the development of a systematic model for renovating urban areas, making it possible for other cities to plan and implement their own projects. Steinbeis-Europa-Zentrum has also conducted a survey in the city of Ludwigshafen on the Rhine and the metropolitan region Rhine-Neckar, with the aim of examining difficulties of a less technical nature. Aside from financial impediments, other identified difficulties include organizational, legal, social, and cultural issues. The city of Ludwigshafen has found some successful ways to refurbish urban areas. For example, a coordinated energy contract has been agreed between a residential real estate developer and an energy provider. Aside from Ludwigshafen and the metropolitan region Rhine-Neckar, Steinbeis-Europa-Zentrum has also successfully introduced the city of Ludwigsburg to the CITYFIED cluster. The cities are now involved in know-how transfer across Europe, sharing their own expertise with others.

### Smart and Sustainable Cities: European policy and financing

The European Commission and the German Federal Government want energy consumption to be reduced by 50 percent by the year 2050. By 2030, greenhouse gases should be reduced by 40 percent compared to 1990, and by 2050 this should go down a further 80 to 95 percent. The proportion of renewable energy should then hit 27 percent by 2020, coupled with an energy efficiency target of 20 percent. To achieve its environmental goals, the European Union has introduced funding programs which have been dovetailed with strategies defined under the Strategic Energy Technology (SET) plan. For example, the European research and innovation program Horizon 2020 is helping to promote the development of smart solutions for use in European cities with the aim of making public areas safe, sustainable, more healthy, and greener.

Smart cities and communities: <https://eu-smartcities.eu>  
[www.smartcities-infosystem.eu](http://www.smartcities-infosystem.eu)

### Urban development on EU level

Steinbeis-Europa-Zentrum is actively involved in the following EU urban development projects:

#### REMOURBAN

REgeneration MOdel for accelerating the smart URBAN transformation  
[www.remourban.eu/](http://www.remourban.eu/)

#### CITYFIED

Towards high performance energy districts across Europe  
[www.cityfied.eu](http://www.cityfied.eu)

#### TRIANGULUM

THE THREE POINT PROJECT - DEMONSTRATE. DISSEMINATE. REPLICATE.  
[www.triangulum-project.eu](http://www.triangulum-project.eu)

#### BRICKER

Energy reduction in the public building stock  
[www.bricker-project.com](http://www.bricker-project.com)

#### mySMARTLife (starts May 2017)

Transition of EU cities towards a new concept of Smart Life and Economy  
[www.mysmartlife.eu](http://www.mysmartlife.eu)

#### NETfficient

Implementing the future of smart energy storage and management on the island of Borkum in Germany  
[www.netfficient-project.eu](http://www.netfficient-project.eu)

#### OptEEmAL

Optimised Energy Efficient Design Platform for Refurbishment at District Level  
[www.opteemal-project.eu](http://www.opteemal-project.eu)

#### R2CITIES

Residential Renovation towards nearly zero energy CITIES  
[www.r2cities.eu](http://www.r2cities.eu)

#### SmartEnCity

Towards Smart Zero CO<sub>2</sub> Cities across Europe  
<http://smartencity.eu/>

**Image:** Steinbeis-Europa-Zentrum organized a workshop to draft strategies for using the results of research carried out as part of the REMOURBAN smart city project. ©SEZ



Anette Mack, Valerie Bahr

Steinbeis-Europa-Zentrum (Stuttgart)

[su2016@stw.de](mailto:su2016@stw.de) | [www.steinbeis-europa.de](http://www.steinbeis-europa.de)

[https://www.steinbeis-europa.de/smart\\_and\\_sustainable\\_cities](https://www.steinbeis-europa.de/smart_and_sustainable_cities)



## Beckoned by the Market in South America

### SHB alumnus launches hi-tech products in Brazil

Adriana Diaz del Pinal Laidig describes the fact that she now lives in Stuttgart at the age of 30 as nothing but a sequence of coincidences. After graduating from high school in her home country of El Salvador, she studied advertising and public relations in Pamplona, Spain. She then worked for the giant producer of consumer brands, Unilever, which sent her to Shanghai for a two-year internship. It was there that she bumped into her future husband, a German, with whom she moved to Stuttgart. A friend in Stuttgart recommended the master's degree at the Steinbeis School of International Business and Entrepreneurship (SIBE), part of Steinbeis University Berlin (SHB). Without hesitation, she applied for the degree program. Around the same time, the Wissler Group offered a degree project to SHB. The project involved launching its products in Brazil, and Adriana Diaz del Pinal Laidig was the ideal candidate. After all, she speaks seven languages.

Wissler Management und Technologie GmbH is a group of companies based in Friedrichshafen and it has several subsidiaries. At first glance, the high-tech products of its companies do not look related to each other but actually, they all have something in common: carbon fiber components. For her project, Adriana Diaz del Pinal Laidig went to take a closer look at the Brazilian market on behalf of two of the companies. The first was altek, which develops and produces carbon nozzles used in agriculture to spray pesticides onto crops. The second was CarbonSports,

which makes racing bicycles aimed at the premium segment, so they are used in races such as the Tour de France. One of the stars the SHB student has now talked shop with at a trade show is Jan Ullrich!

The project carried out by Adriana Diaz del Pinal Laidig was part of her degree program and the key task was to analyze the Brazilian market on behalf of both subsidiaries, altek and CarbonSports. After this, she was asked to help with the launch. It was ascertained that Brazil offered strong potential for the bicycles targeted at the premium segment: According to a forecast issued by the World Bank, by 2025 the proportion of potential customers looking for luxury products will be 18%. The CarbonSports sales strategy revolves around this target group, and the company is currently implementing this strategy.

The Master of Science in International Management runs in parallel to full-time work and it provided the young globetrotter with essential support during her project. One particularly helpful seminar for Adriana Diaz del Pinal Laidig was Finance Management, since it offered an opportunity to draft a business plan for the project. Of course, another important aspect was the period of study abroad, which took Adriana Diaz del Pinal Laidig and her co-students to "her" market of Brazil. The official program involved seminars on growth markets and intercultural management. There were also tours of international companies such as the producer of agricultural machinery New Holland. Adriana Diaz del Pinal Laidig decided to take part in a project-related program to complement her studies abroad, and SIBE and the partner university in Brazil (Faculdade da Indústria IEL) provided support lining up helpful contacts for this. These included regional distributors and the German international chamber of commerce AHK.

Looking at the international resume of a student like Adriana Diaz del Pinal Laidig and the developments of German SMEs – the Mittelstand firms striving to enter the international stage – they make a good match. Internationalization projects that allow German firms to recruit people from the target country, or in this case a similar culture, can also help with market entry and this has been a successful element of the program at the Steinbeis School of International Business and Entrepreneurship for years. SIBE recently started a program called Going Global, which allows companies to recruit specialists with an exact match for their requirements. The program also offers supervised business development projects, which are conducted in combination with an online degree: the M.A. in General Management/MBA (USA).

**Image:** Adriana Diaz del Pinal Laidig (right) with colleagues at the Eurobike trade show.



Jan Frederik Klom  
Steinbeis School of International Business and Entrepreneurship at  
Steinbeis University (SHB) (Berlin)  
su1249@sttw.de | www.steinbeis-sibe.de

## Succession Planning from a Long-Term Perspective

### Steinbeis helps metalworking company sell its business

Every year in Germany, as many as 80,000 family-owned businesses face succession issues. If the owners' children have different career aspirations, internal succession may no longer be possible. Usually, the only remaining option is to look outside the company; the family and the business enterprise simply have to go different ways, and the company's management and capital are transferred to a third party. Thankfully, help with this process can be provided by the Steinbeis Transfer Center for Production and Quality in Furtwangen.

Finding someone suitable to take over a small or medium-sized business (SME) is an extremely complex process. Succession planning should therefore not be started too late and must be carried out professionally. For a potential buyer, acquiring a company that already has a reputation in the market is a useful alternative to setting up a new company or expanding existing operations. It also makes it easier to achieve turnover and revenue goals.

This was a familiar situation for HEGO, a metalworking company based in Gosheim. Last year, HEGO approached the director of the Steinbeis Transfer Center for Production and Quality, Prof. Dr.-Ing. Jürgen Schmidt, in its search for a potential buyer. HEGO produces precision-lathed parts for use in a variety of industries, and has 12 employees. The starting point of the transaction process for Schmidt was to determine a reasonable market value for the company. It's quite normal for there to be big differences between the expectations of the seller and the buyer when it comes to market value. Nonetheless, one thing always holds true: A company is only worth what somebody is willing to pay for it.

Different company valuation methods provide ways to determine a business's value. One approach that is particularly well suited to SMEs is the "multiples" method. This starts with the earnings before interest and tax (EBIT) of the last few years. Then, extraordinary revenues and expenditures are removed. What is left is a value that can be factored up by so-called finance multiples. For the process to work properly, you have to use multiples that are specific to the sector of industry, and these multiples are regularly updated and published on the internet. As HEGO has a turnover of less than €50 million, it is classed as a "small cap" company, and its field is mechanical engineering. The corresponding multipliers for July/August 2016 lay between 6.7 and 8.3. This resulted in a top-level value for the company which had to be recalculated to allow for net financial liabilities by subtracting interest-bearing liabilities from surplus liquidity.

The resulting final value is generally the maximum acquisition price. The next step was to take this company value as a starting point and draft a meaningful profile of the business enterprise. This is used to identify, approach, and select potential buyers. Jürgen Schmidt set about getting in touch with buyers, who in this case ultimately ended up being Viktor and Alice Lepp. He then provided support to both the buyers and the sellers with the sales negotiations. In coordination with HEGO, the Steinbeis Transfer Center helped the Lepp family draft a business plan that would allow them to apply for a loan. To finance a company acquisition, it is generally good to fund around 15% of the transaction through personal equity. The remaining 85% of the required capital can be topped up by public funding programs backed by the state or government, or it can be provided by a "high-street" bank. In this case, the family's bank submitted a proposal to a state funding bank, which in Germany is often a bank like KfW (or in Baden-Wuerttemberg, L-Bank). Depending on the specific program, a certain percentage of the loan is underwritten by a special guarantee bank. As the Lepps were from the metalworking industry, they could point to many years of experience at a similar company. As well as a realistic business plan, this was an important prerequisite for gaining financing from the banks for the acquisition. From start to finish, the project took around a year until everyone involved finally reached their goal. The HEGO metalworking business was acquired by Viktor and Alice Lepp on January 1, 2017.

Image: © fotolia.de/Beeboys



Prof. Dr.-Ing. Jürgen Schmidt  
Steinbeis Transfer Center Production and Quality (Furtwangen)  
su0120@stw.de | www.stw-proqua.de/

HEGO Machining Technology Metalworking Factory Hermle Bros. GmbH (Gosheim)  
www.gebr-hermle.de/



## How Coaching Can Prevent a Resignation

### Steinbeis consultant advises managers on career progression

Does having a personal coach actually make a difference? This is the kind of skepticism Birgit Nüchter often faces as director of the Stuttgart-based Steinbeis Consulting Center for Leadership Competence. There are extremely few scientifically sound studies that confirm the actual benefits of her work. According to the Marburg Coaching Study conducted in 2013, the German market for personal coaches currently consists of 8,000 individuals. And these days there seem to be coaches for everything, from money coaches to wellness coaches, partnership coaches, public speaking coaches, not forgetting a variety of things like Shamanic coaches and other colorful characters. It's hardly surprising coaches have become "part of the furniture" in the HR repertoire of many German companies and a growing number of small and medium-sized companies now also include coaching in their HR plans. This is where business coaching comes in, which in itself is already multifaceted. And this is where the services offered by the Steinbeis Consulting Center also come into play.

Detlef K. is 49 and has been a level-one manager at his company for over 10 years. He gets positive feedback, he was recently promoted, which came with a financial reward, he gets on well with his bosses and his colleagues, and he's in a job which he does well and enjoys. Looking around, not just at the place where he works but also at his friends, he has noticed that his co-workers and buddies have changed jobs or are actively seeking a new position. As a result, Detlef often wonders if he shouldn't look for a new job, too. If he doesn't do something soon, he might be too old to switch jobs later and he wouldn't stand much of a chance anymore in the employment market. Maybe he could earn a bit more if he went somewhere else, although overall he's actually quite happy with his current salary. Maybe he should dip his toes in the water and see if he'd do well at another company? In any case, he's noticed with the people he works with at the moment that everything has become a bit of a routine. He's managing his project all right, they work well as a team; if something does go wrong, they get it sorted. But Detlef doesn't want to keep working like this until retirement – it's just too long, life is too precious. And where's the challenge? But before he

goes off and does something silly, Detlef decides to talk to a business coach, somebody who was recommended to him.

His first coaching session with Birgit Nüchter took place at the Steinbeis Consulting Center for Leadership Competence. The first step was a stocktaking exercise to identify his motivations for making a change. As the case in hand involves vague feelings (boredom, a yearning for a challenge, comparisons with colleagues), Birgit Nüchter decided to use a coaching technique that involves images to connect with the parts of Detlef's mind that do not operate on a rational level. The method also makes it possible to stimulate older parts of the brain that can access feelings more directly, quickly, and reliably than logic going through lists of pros and cons.

Detlef pulled out three pictures: one for his situation in the past, one for the present, and one for the future. On each picture he highlighted aspects that worked for him. As Birgit Nüchter observed, it was important how he perceived the picture he chose for the future, saying things like "I can shape things, try out new things" and for the present he would say "something is growing and flourishing, but I'm not driven." Based on these insights, her coaching experience allowed her to pose systemic questions which encouraged Detlef to think about the reasons why he could not translate growing and flourishing in his present role into shaping and trying things out. Quite spontaneously, he came up with some ideas that were not only realistic, but could also be translated immediately into action. When Detlef went back through a couple of situations in the past, he realized that he always felt most in his element when there was a sense of adventure in his life.

The result: Detlef went away from the coaching session with the Steinbeis expert with a to-do list containing actions he could start right away:

- Go for a walk in the mountains all by himself
- Talk with his boss about an internal move and draft a long-term plan
- Ask to join a task force which was only formed recently and was looking for members
- Keep his eyes and ears open for situations offering more adventure and if applicable, "go for it"
- And last but not least, there was a major insight: "I've got a wonderful life, a great job, a fantastic family – I want to enjoy it more consciously."

After a single coaching session, Birgit Nüchter managed to resolve latent dissatisfaction and averted the potential resignation of an effective and respected manager. Weeks later, the picture Detlef chose during the coaching session to represent the future is still firmly in his mind. Whenever he feels things are in a rut again, he takes a look at it. This is no scientific study, but it does demonstrate how a conversation with a neutral coaching expert, using appropriate coaching techniques, can make a major difference.

Image: © Pixabay



Birgit Nüchter  
Steinbeis Consulting Center Leadership competence (Stuttgart)  
su2036@stw.de | [www.steinbeis.de/su/2036](http://www.steinbeis.de/su/2036)



## From Mythical Disruption to “Go for Disruption!”

### Steinbeis afterwork events in Berlin, Munich, and Stuttgart

Thanks to the work of Clayton M. Christensen 20 years ago, the term 'disruption' is now a unique description of how a powerful idea can turn everything on its head, destroying established business models to create completely new ones. Sadly, however, disruption is still more often wishful thinking than an everyday reality. The Steinbeis School of Management and Innovation (Steinbeis-SMI, part of Steinbeis University Berlin) dedicated one of its afterwork sessions, which are organized as part of the series of Steinbeis networking events, to this apparently paradoxical situation.

The session, which took place on November 29, 2016 in Berlin under the title From Mythical Disruption to “Go for Disruption!”, was attended by roughly 100 decision-makers and thought leaders working in management, marketing, the media, and general leadership. The aim was to discuss what firms can do to move beyond empty words and be genuinely innovative.

There were three fascinating keynote speeches at the event, each illuminating disruption from a different angle and raising some interesting questions such as whether disruption is an area where every company should want to succeed. The trend researcher and futurologist Matthias Horx kicked off the evening with a somewhat provocative examination of the topic and a plea for spirited evolution – in the hope that change can be something positive. Natalia Karbasova, digital assistant to publisher Dr. Hubert Burda and head of the Burda Bootcamp and Burda Hackday, drew on Burda examples to underscore how large companies can and must innovate now. Dr. Frank Danzinger, deputy director of Fraunhofer Supply Chain Services and manager of a project called Service Factory Nuremberg, described his first-hand experiences with Josephs®, an open innovation lab in the pedestrian zone in Nuremberg that

allows passers-by to witness the development of products and services and become actively involved in their creation and enhancements. The evening was an all-round success, thanks both to the speakers and the audience, which was enthralled by the speeches and gladly joined in the discussion before using the opportunity to network.

Steinbeis SMI has been running a series of Steinbeis networking events since the fall of 2015 under the slogan “Insights + Innovation@Steinbeis SMI.” The regular sessions take place after work, focusing on the topics of HR + Leadership, Management + Innovation, and Digital Media + Marketing. The current schedule of events could be found on the internet.

**Image:** Carsten Rasner, director of Steinbeis SMI, getting the afterwork event underway in Berlin.



Rita Autenrieth

Steinbeis School of Management and Innovation (Steinbeis-SMI) at  
Steinbeis University Berlin (Berlin/Munich/Frankfurt/Stuttgart)  
rita.autenrieth@stw.de | www.steinbeis-smi.de/afterwork

## High Performance, Attentiveness, and New Energy for Managers

SCMT event on "Business Impetus" on April 28, 2017

The work environment is becoming more and more stressful with less and less time to get things done. To cope with the increasing workload, digitalization, and constantly changing requirements, people need to be all the more attentive, conscious of their actions, and open. One attribute managers are increasingly expected to possess is mental resilience. The Steinbeis Center of Management and Technology (SCMT) invited managers to a Business Impetus event on April 28 with the theme "High Performance through Attentiveness – Intellectual Growth Capital to Fuel Your Success."

The keynote speech on the evening was given by Simone Langendörfer. Langendörfer has a wealth of experience in business enterprises, is an author, and gives speeches at symposia, conventions, and events organized by leading German firms, trade associations, and universities. For Langendörfer, attentiveness is a core competence when it comes to mastering the wide array of challenges and side-effects of digital

transformation. Attentiveness is without doubt the recipe for success when it comes to developing and improving modern management culture. As part of the Business Impetus event, Langendörfer demonstrated how managers can achieve consistently good performance, stay on the ball during periods of intense concentration, and acquire new energy in everyday situations.

The event took place in the Steinbeis House for Management and Technology in the Plieningen suburb of Stuttgart.



Sarina Gehrung

SCMT Steinbeis Center of Management and Technology GmbH (Filderstadt)

su1274@stw.de | www.scmt.com

## New MARKETING & MEDIA CAMPUS Gets Underway

Steinbeis SMI and HORIZONT offer part-time seminar program



HORIZONT, the German specialist magazine for marketing, advertising, and the media, is pooling its competence with the Steinbeis School of Management and Innovation (Steinbeis-

SMI) at Steinbeis University Berlin. Their combined services will fall under a new brand called MARKETING & MEDIA CAMPUS. With immediate effect, the alliance partners will be offering business seminars on the topics of marketing, media, and advertising.

Learning to develop new concepts, think outside the box, look beyond the horizon and transcend existing ways of thinking and working in order to fast-track your career – just some of the reasons people are signing up for the new MARKETING & MEDIA CAMPUS. The target group for the seminar program includes managers, young professionals, and specialists in marketing, advertising and the media. The program's main aim is to teach management skills to empower participants to build on their interpersonal skills, and to establish a foundation of knowledge in the fields most frequently encountered by marketing, communication, and media professionals. The seminars offered through the MARKETING & MEDIA CAMPUS span design thinking, smart data, the best of modern management and marketing, technology trends and innovation, and leadership for creative professionals. Plans are already underway to offer further topics and teaching formats.

"In times of rapid change, it's becoming more and more important to think outside the box and explore new territory as a business, but also to work on yourself as a professional and manager if you want to manage change successfully," explains Carsten Rasner, director of Steinbeis-SMI. The move allows Steinbeis to expand its continuing professional development activities to include open seminars. Now students also have individual seminars and training on business topics to choose from, over and above the bachelor's and master's degrees available at the business school. The collaboration allows HORIZONT to expand its existing range of convention services. "Our mission is to support our target group – which ranges from managers to young professionals and specialists – throughout all phases of their career. Personal development opportunities from a premium quality provider are a perfect complement to the existing, information-based portfolio of the HORIZONT media brand," says HORIZONT publishing director Peter Gerich, highlighting the aims of the collaboration.

The next topics and events:

### SMART DATA – MAKE DATA WORK

September 18 - 19, 2017 Frankfurt

### LEADERSHIP FOR CREATIVE PROFESSIONALS

November 7 - 8, 2017 Munich

All topics, dates, and booking options can be found by going to [www.marketing-media-campus.de](http://www.marketing-media-campus.de).



Rita Autenrieth

Steinbeis School of Management and Innovation (Steinbeis-SMI) at Steinbeis University Berlin (Berlin/Munich/Frankfurt/Stuttgart)

rita.autenrieth@stw.de | www.steinbeis-smi.de

## Care and Recovery in Old Age

Steinbeis experts provide academic input on interprofessional education initiative

Elderly patients receiving geriatric care often have more than one medical condition. Such patients require medical support and nursing care that accounts for these different conditions during convalescence. As a result, people in a variety of inpatient and outpatient professions – such as care workers, doctors, and physiotherapists – require a comprehensive specialist understanding of treatment options and medical care. The Geriatrics Quality Association for North-West Germany (QVG NWD) has launched an interprofessional training initiative aimed at improving the sharing of expertise between different professions so that key information on the individual health issues, abilities, and resources of elderly patients can be recorded and considered at an early stage in the medical care process. zeb/business.school, a Steinbeis Transfer Institute at Steinbeis University Berlin (SHB), is providing academic support for the project.

QVG NWD (Qualitätsverbund Geriatrie Nord-West-Deutschland e. V.) has a long-term goal of improving the standards of medical and nursing care for all outpatients and inpatients. In total, 50 facilities have joined the association. To improve the professional standards of all employees who help care for geriatric patients, QVG NWD is offering a targeted program of courses to all types of geriatric care staff.

Assessing the vocational training needs of the people in each occupational group is the starting point for the academic support being provided by the Steinbeis experts. The employees receive training with a focus on geriatric care, under the academic supervision of the experts at the zeb/business.school Steinbeis Transfer Institute. Individual facilities belonging to QVG NWD will also be forming interdisciplinary working groups which will draft a list of specific measures for improving the care of geriatric patients.

The project team will then review progress after four to six months to assess whether the measures have been implemented successfully and to understand any obstacles or difficulties encountered during day-to-day implementation. Patients and their relatives will also be surveyed using a questionnaire in order to improve the standard of geriatric care.

St Franziskus Stiftung in Münster is responsible for carrying out the training program on behalf of QVG NWD. In addition to the academic support being provided by the Steinbeis Transfer Institute zeb/business.school at Steinbeis University Berlin the State Center for Health Affairs in North Rhine-Westphalia (LZG.NRW) is providing financial backing to help with the assessment of the different training courses.

 Prof. Dr. Joachim Hasebrook  
Steinbeis Transfer Institute zeb/business.school (Baden-Baden)  
Joachim.Hasebrook@stw.de | www.zeb-bs.de

## Welcome to the Steinbeis Network

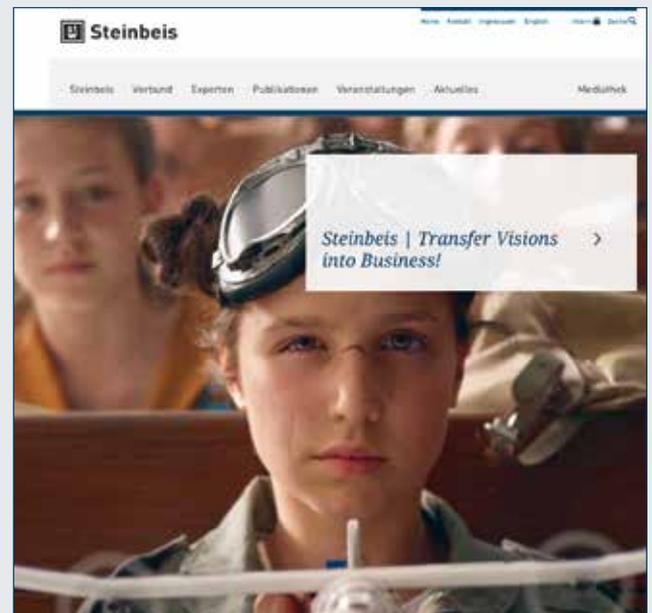
Steinbeis know-how: There are currently more than 6,000 experts actively involved in knowledge and technology transfer at over 1,000 Steinbeis Enterprises. The portfolio of services offered by the Steinbeis Network ranges from research and development to consulting, expert reports, training, and continuing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



Information on recently founded enterprises in our network can be found at [www.steinbeis.de](http://www.steinbeis.de)



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





## Additive Manufacturing Tools for Industrial Production

### Steinbeis team advises injection molding firm on 3D printing in manufacturing

Injection molding is regarded as one of the most important processes in modern mass manufacturing. Not only does it enable large manufacturing volumes of both identical and different parts, the production times are also much faster compared to other methods. Manufacturers use injection molding processes when making the move to series production. Currently, one of the major challenges here is the high cost of producing tools. Tools used in injection-molding require cost-intensive expertise in terms of design, production, testing, and validation. This process can sometimes be extremely protracted, requiring several months until the tool is finished. Introducing new production methods, such as additive manufacturing or 3D printing technology, makes it possible to quickly manufacture parts regardless of their design complexity. The IMAPS Institute for Material Applications & 3D Printing Solutions is a Steinbeis Consulting Center based in Karlsruhe, and conducts research into future solutions in this field.

Despite the relative lack of research into the potential uses of 3D printing, the Steinbeis team is confident that in future, the technology will help engineers to easily overcome challenges in production. The ongoing research is encouraging. A series of promising experiments was recently conducted in which 3D printing technology was used to produce injection mold inserts from polymers. These materials are both affordable and facilitate a relatively simple manufacturing process. This makes producing the mold inserts more cost effective. It also means different design variants of a product can be tested, with the number of repetitions in the development cycle falling significantly.

As most 3D printed mold inserts are made from polymers, the number of potential loading cycles is much lower than in metal inserts due to the polymers' low mechanical strength and structural stability. One problem that also affects short cycles is that molding processes involving polymer mold materials take longer than those using metal materials. This is primarily due to the polymers' poor thermal conductivity. Good thermal conductivity ensures that the thermal load that accompanies the melt when it flows into the empty space in the mold dissipates as quickly as possible. This safeguards the solidification and part-forming process, guaranteeing the quality of the parts during the short injection procedure. In order to confront this challenge of handling materials, the IMAPS Steinbeis Consulting Center is cooperating with partners from

it from PEEK in a 3D printing process using machinery from Apium Additive Technologies GmbH. PEEK retains its mechanical strength up to 260°C, making it one of the most thermally resistant polymer materials in engineering.

The injection-molded button parts made from various other materials (polyethylene, polystyrene, and polypropylene) all had melting points well below 260°C. One of the greatest challenges in this 3D printing solution is the time it takes to discharge the finished part from the mold. A metal mold insert usually requires 30 seconds from filling to discharge. By contrast, the 3D-printed PEEK insert takes four minutes to discharge the button parts for Merkel-Czeschner's customers. Although this delay is acceptable for the button parts in this case, the consultants from Steinbeis are aiming to improve the speed of the 3D printing mold insert. One solution currently being researched is to construct channels, hollow spaces, and heat transfer ribs in the mold insert to increase the cooling rate of the melt. This makes it possible to reduce the discharge time for each loading cycle.

The role of the team from the IMAPS Steinbeis Consulting Center is to advise injection molding firm Merkel-Czeschner with help from Apium Additive Technologies. Their current project aims to reduce material input costs, improve process speed, and save on tool production using 3D printing. One approach would be for the injection molding firm to use the 3D printing solution and operate the printer on site to develop and produce its own mold inserts. Since the mold insert contract would not be outsourced to an external service provider, this would help safeguard the confidentiality of their designs. Another promising development is the use of high-temperature polymers like PEEK to produce the mold inserts used in the injection molding procedures involving polyurethane and ABS. The properties of PEEK enable a longer thermal cycle, as well as a much greater mechanical strength than polymeric materials currently in use.

the 3D printing industry to develop and test new materials. These materials include polymers with high thermal conductivity, such as graphene, carbon nanotubes, graphite and aluminum. Provided they can be 3D printed, these polymer-based compounds will open up new possibilities for other branches of industry beyond injection molding.

The experts at Steinbeis offer their expertise in 3D printing to customers of all sizes and from all sectors. Merkel-Czeschner GmbH, an injection molding firm from the Rhine region near Karlsruhe, is currently battling with the problem of high manufacturing costs for the low-volume parts it produces for one of its customers. The mold inserts are currently processed from aluminum blocks, before being delivered to the injection molding firm by an external workshop. The average delivery time for the inserts is 90 days. These low-volume parts are sometimes elements within a product development cycle in which the design is changed gradually. Operations at the firm are currently constrained due to the delivery times, tool costs, and design variations. To improve this, the project partners designed a mold insert for a certain part (a functional component used as a button in a control system), before manufacturing

**Image:** PEEK mold insert in an injection molding chuck, ready for the load cycle. Manufactured using 3D printing, the mold insert is used for producing functional components. It can withstand up to 700 bar of operating pressure before failure. © Apium Additive Technologies/Julian Scholz



Brando Okolo, Tony Tran-Mai, Anastasia Oranskaja  
Steinbeis Consulting Center  
IMAPS Institute for Material Applications & 3D Printing Solutions (Karlsruhe)  
brando.okolo@stw.de | www.steinbeis.de/su/1979



## The Benefits that Craftspeople Derive from VFMEA

### Steinbeis Consulting Center achieves impressive results with its efficiency improvement instrument

There are plenty of quality improvement techniques to choose from, but if you need something that is suitable for a firm in the manual trades or an SME, something that is easy to implement and inexpensive, you will search in vain. With the introduction of the VFMEA, Professor Dr.-Ing. Ralf Hörstmeier, director of the Steinbeis Consulting Center for Applied Motion Technology (ABT) founded in 2011, established a practical method that lays a foundation for quality enhancements. The VFMEA was introduced in 2013, and ever since, a variety of craftsmen's workshop businesses and SMEs have benefitted from the method.

VFMEA is a German acronym for "waste, potential error, and influence analysis." The ABT Steinbeis Consulting Center has been involved in practical implementation of the method from the beginning and it can be applied to all kinds of industries and crafts. What makes the method special is that a company's owner works with the employees to identify errors and wastage, and this is used as a foundation for future optimizations. "We cover the overall structure and all areas of the business, so nothing is left to chance and no errors or examples of wastage are missed," summarizes Ralf Hörstmeier, adding that "other methods take more of a technical approach and look at individual areas, whereas VFMEA is a management tool; it's hands-on and easy to use. For example it uncovers gaps in communication within a business or encourages

people to improve processes, without significant effort or major outlays." Once the foundations have been laid, if necessary other quality methods and management systems can be used.

One company that benefited from using the tool was a long-established specialist workshop and typical Swabian business. Based in Stuttgart, the painting company Rücker was able to take full advantage of the VFMEA methods. The family-owned business, officially called Maler Rücker GmbH, was founded 30 years ago and is now in its second generation. Its slogan is "Color Brings Joy to Life" and the firm has 30 employees serving clients in the regional state capital of Stuttgart and the surrounding area. Its clients include both companies and private individuals.



Rücker offers a wide variety of specialist services including all kinds of renovation and refurbishment work, indoors or outdoors – whether adding something new, preserving the existing, or protecting the old. This can be anything from laying insulation in a loft to lining a basement, or even janitor services. As members of the local craft guild, the owner Ingo Rücker and his workforce have a duty to deliver “premium quality services and the perfect performance of specialist.”

Rücker described the VFMEA method as “a welcome instrument for improving quality” and his firm is now an official pilot company for the method in his sector of industry in Baden-Wuerttemberg. “I’ve always wanted to do something about errors and wastage in my company but I just didn’t have the methods for systematically capturing and analyzing things,” explains the business owner. “Thanks to VFMEA, I now have the right tools at my fingertips.”

In keeping with the idea of being “helped to help yourself,” the company boss and his co-workers were supervised by Hörstmeier, who showed

them how to put their own company, structures, and processes under the microscope. This entailed examining organizational factors, communication, personnel, customer contacts, contracts, and procurement before looking for areas of wastage, their causes, any connections, and potential areas of improvement. “Starting the project with help from a supervisor completely fulfilled our expectations. The results included a list of errors and areas of wastage that we drafted as a group, and we’ve been using them ever since,” explains Rücker. “We’re now targeting specific areas to introduce measures, and this is a good starting point for our company to optimize processes.” Including employees in the process helps ensure it is widely accepted – as the managing director confirms: “The project went down really well and it really boosted commitment.” A project coordinator has also been chosen by the team members to provide support.

The Steinbeis consultant Ralf Hörstmeier emphasizes that the method requires only a reasonable time investment and is inexpensive. It provides a good foundation, and the final documentation comes with an individual list of actions, thereby enabling any company to decide for itself how it wants to take things forward. In anticipation of future developments, the next plan is to offer VFMEA apps to provide effective assistance with implementation. These highly practical methods have already been tested with small businesses offering electrical, painting, metalworking and woodworking services, and are currently being adapted for wide-scale use at companies in all sectors of industry. They will be introduced in collaboration with chambers of commerce and business associations. In some states of Germany, they may receive financial backing.

“Every company has the potential to improve, no matter how big or successful it is,” says Lena Strothmann, president of the Bielefeld-based Ostwestfalen-Lippe Chamber of Craft Industries, lending her support to the method. “Among other things, it’s about pinpointing the potential to save money and eradicate waste. That said, improvements in communication also make things a lot better.” Norbert Durst, innovation and technology officer at the Chamber of Craft Industries for the Stuttgart region, is sure of one thing: “Digitalizing business processes is a big topic at the moment – even for workshop businesses. But before you introduce digital solutions, other things have to be optimized first. VFMEA is a really good way for craftspeople to eliminate errors and waste in processes.”

Image: © istockphoto.de/Zlikovec



Professor Dr.-Ing. Ralf Hörstmeier  
Steinbeis Consulting Center Applied Motion Technology (Spenge)  
ralf.hoerstmeier@stsw.de | www.vfmea.de

Ingo Rücker  
Maler Rücker GmbH (Stuttgart)  
www.maler-ruecker.de

Martina Bauer  
Freelance journalist (Bielefeld)



## Climate Protection vs. Economic Viability

### Steinbeis team publishes report on the energy-efficiency of commercial real estate

Combating climate change is an enormous societal challenge and one of the most pressing tasks on the political agenda – especially with regard to the real estate sector. In Germany, political measures such as the country's 2050 Climate Protection Plan (Klimaschutzplan 2050) and amendments to energy conservation laws aim to make both new and old buildings more eco-friendly. In light of this, the German Property Foundation (ZfA) commissioned the Steinbeis Transfer Center for Energy, Building and Solar Engineering in Stuttgart to prepare an expert report on economic viability.

The report focuses on the energy efficiency of commercial real estate and analyzes the effects of a possible tightening of the German Energy Saving Ordinance (EnEV), Renewable Energy Heat Act (EEWärmeG) and current environmental policies.

Since the EnEV came into force in 2016, buildings' energy standards have been subject to stricter requirements. The EnEV regulation calculates and assesses the specific construction requirements of the building envelope for different forms of energy supply for three types of building – office buildings, hotels, and shopping malls – based on a representative building of each type. It takes the additional stipulations of the EEWärmeG into account and forms the basis for evaluating primary energy consumption and carbon emissions.

In their report, Prof. Dr.-Ing. Manfred Norbert Fisch – director of the Steinbeis Transfer Center for Energy, Building and Solar Engineering – and his team conclude that merely further tightening the EnEV in the context of the EEWärmeG for commercial buildings is not enough to achieve the politically desired environmental targets. Taking a comprehensive approach that also considers user-specific electricity demand instead of just the EnEV calculation makes this finding even clearer.

In the view of the Steinbeis experts, the targets that the German government aims to meet as part of the energy transition would be more readily achieved through operational optimizations, efficiency enhancements, and greater use of renewable energy in public heating networks and power grids.

The study conducted by the Steinbeis team makes several key findings. It also takes the view that the evaluation criteria of primary energy and specific heat transmission loss (HT') are barely understood in practice. The method of using a reference building (EnEV 2016) for energy evaluations of a commercial building design is also not practicable.

- The view of the Steinbeis team is that if the EnEV 2016 were tightened further, heat supply would no longer be possible with all energy sources or would place excessive demands on the thermal quality of the building envelope. As such, this would not be economical or adaptable to new technologies.
- Additional stricter regulations governing the thermal quality of the building envelope are not expedient.
- The use of photovoltaics to achieve the targets specified by the EnEV and EEWärmeG is highly relevant in terms of economic viability and saves fossil fuels.
- Medium-term carbon targets in the real estate sector require a higher proportion of "green energy and gas," especially when user-specific electricity demand is considered.

As well as these main results, the report by the Steinbeis team also includes a forecast and a series of suggestions. These include simplifying and improving existing laws and regulations as well as introducing a carbon label for buildings. Building performance should be examined while the building is in use, and financial incentives should be based on the actual carbon savings achieved.

Image: © fotolia.de/Johannes Spreter



Prof. Dr.-Ing. Manfred Norbert Fisch, Tobias Nusser  
Steinbeis Transfer Center Energy, Building and Solar Engineering (Stuttgart)  
su0327@stw.de | www.stz-egs.de



## Seeing Sickness and a Crisis as an Opportunity

### Steinbeis Consultant supports business founder with plans to set up a psychotherapy practice

**In 2007, a tumble down the stairs turned Caren Totzauer's life upside down. The once active mother suddenly found herself in a wheelchair. Still coming to terms with her new situation, she had to remain strong for her children and family. But she is not one to give up. Totzauer found someone who would help her, from the ground up, to cope with her change in circumstances, face the situation and use it, moreover, as an opportunity. To subsequently pass on this support and give courage to others, the superwoman decided to open her own alternative practice for psychotherapy. She was supported in this process by Doris Deichselberger, Director of the Steinbeis Consulting Center for Change Management and Business Coaching.**

Totzauer had already worked as a helper with incontinence problems and convalescence but she had noticed that she was only investing a fraction of her time in actually providing her clients with advice. The more pressing issue was the psychological situation. It was clear that she wanted to expand her know-how in this area so she began training as a psychological counselor and qualified as a hypnotherapist. In parallel to this she underwent training to become an alternative practitioner of psychotherapy.

Armed with her new know-how, the next goal was obvious: She wanted to set up her own alternative practice as a psychotherapist. The overall direction was clear from the outset. Her work would revolve around coming to terms with accidents, sickness, and personal crises, not just for those directly affected but also for their friends and families. Due to her own experience, she could work with clients as a partner of equals; she knew how different situations feel; she knew how to find one's bearings and how to cope. The fact that Totzauer was not going to let things get her down, is something she proved with admiration. By chance, she took up the sport of wheelchair curling. Just a year later, her ambition resulted in a bronze medal for Germany at the World Championships.

Despite all her specialist knowledge, there was one area she did need help with: customer acquisition. After some research, she discovered the Steinbeis EXI Startup Bonus, which entitled her to a free pre-startup consultation session. Thanks to the support of Doris Deichselberger, director of the Steinbeis Consulting Center for Change Management und Business Coaching, Totzauer received professional advice that helped her to define the scope of her services more accurately by focusing on sickness, crisis, and grief management. As she was assured by Deichselberger, "If you're convinced of your idea yourself, you'll convince others too!" In keeping with this, Totzauer decided to set up her own practice.

But knowing this is not enough by itself, especially if you want to be seen as an expert by your customers. Totzauer quickly realized that in modern times of social media, tools like flyers and business cards may still be used, but at the beginning the priority is to set up a professional website and have a good presence in the social media. Press coverage also plays an important role in making a name for yourself.

The ideas she was given by Deichselberger are already bearing fruit. Totzauer gives talks at hospitals and other institutions, and her experience and opinions are highly valued when it comes to sickness and crisis management. This has resulted in further speeches and partnerships, and in one hospital she already has a regular slot for sickness management counseling. In her practice, Totzauer uses psychotherapy and hypnosis. Since many of her clients have restricted mobility due to their medical condition, they cannot leave the home or are still in hospital, so she also makes house calls. She has also now started counseling and coaching clients online, by phone, email, or Skype.

Doris Deichselberger helped Caren Totzauer plan her long-term goals and was able to encourage her to think bigger and broader. In the meantime, Totzauer's goal is to offer counseling and therapy at more hospitals and give talks on sickness and crisis management at large conventions. The constructive advice she received and the many helpful tips have already enabled her to achieve her personal goal: Totzauer now shares her experiences with others affected by such circumstances, providing them with important help.

**Image:** A talk on sickness management at the RKU (University and Rehabilitation Clinics, Ulm) – Dr. York Bernhard Kalke (left), medical director at the Ulm Paraplegia Center and Caren Totzauer, alternative practitioner for psychotherapy and hypnotherapy.



Doris Deichselberger  
Steinbeis Consulting Center Change Management und Business Coaching  
(Stuttgart)  
[doris.deichselberger@stw.de](mailto:doris.deichselberger@stw.de) | [www.steinbeisberatung.com](http://www.steinbeisberatung.com)

Caren Totzauer  
Alternative practitioner for psychotherapy/hypnotherapy (Sulz a. N.)  
[info@heilpraktiker-totzauer.de](mailto:info@heilpraktiker-totzauer.de) | [www.heilpraktiker-totzauer.de](http://www.heilpraktiker-totzauer.de)



The NUCLEi partners pictured at the kick-off meeting in Vignola (Italy)

## Innovation models for the manufacturing and processing industry in Central Europe

### Steinbeis-Europa-Zentrum acts as partner on NUCLEi project

The most important European industries involved in automation and mechatronics are located in Central Europe. Although business in this area of industry operates on an intercontinental scale, the services relating to innovation in the field mainly have a regional focus. As a result, it sometimes takes a very long time for research findings and development results to transfer between different parties in the industry. An EU project called NUCLEi aims to make it easier for SMEs to gain access to the results of international research initiatives, so the latest research findings can be applied in commercial products and services. Steinbeis-Europa-Zentrum (SEZ) is one of the partners on the project.

The aim of the NUCLEi partners is to improve collaboration between science and academia on the one hand, and key market players on the other. To this end, they are setting up a collaborative ecosystem for promoting cross-border transfer activities. The task of SEZ is to work as a mentoring partner and provide help with the development and internationalization of all kinds of services relating to innovation.

The project requires close cooperation, and the first step involves 100 companies across seven regions. The main goal at this stage is to significantly improve collaboration with innovation partners in other project regions. Another aim is to cut the time-to-market for R&D ideas, not only those stemming from EU-backed research projects but also from other laboratories and businesses in Central Europe. In the medium

term, R&D expenditures and the number of patents registered by companies involved in the project should rise by between 2 and 3 percent.

NUCLEi is short for "Network of manufacturing clusters for enhanced open innovation in the Central Europe advanced manufacturing and processing industry", and the project has 2 million of EU backing from July 2016 to December 2018. The project falls under the INTERREG Central Europe program. The countries involved in the project are Germany, Italy, Austria, Poland, Slovakia, and the Czech Republic.



Sarah Mortimer

Steinbeis-Europa-Zentrum (Stuttgart/Karlsruhe)

Sarah.Mortimer@stw.de | [www.interreg-central.eu/Content.Node/NUCLEi.html](http://www.interreg-central.eu/Content.Node/NUCLEi.html)

## eHealthHub: Market Positioning

### Steinbeis 2i supports eHealth SMEs

The EU-funded project eHealthHub offers valuable, high-quality business services to European companies active in the eHealth field. It supports them to increase their visibility and strengthen their market positioning. Companies are also given legal and regulatory advice, access to investors as well as workshops on business modelling.

The main role of Steinbeis 2i GmbH as one of the project partners consists in planning, designing, and implementing nine eHealth roadshows. These events provide companies with a platform where they can present their products and services in front of a panel consisting of potential

clients, users and other business representatives such as CIOs working in hospitals or in pharmaceutical companies. Each presentation lasts five minutes.

The last workshop took place on April 6 at the MEDTEC trade show in Stuttgart. The project is being funded by the European Commission for three years and is coordinated by Ticbiomed, Spain.



Hicham Abghay, Dr. Mercedes Dragovits  
Steinbeis 2i GmbH  
Hicham.Abghay@stw.de | [www.ehealth-hub.eu](http://www.ehealth-hub.eu)



Full house at the Pitchlab event

## Building bridges in Mecklenburg-West Pomerania

### Steinbeis organizes Pitchlab networking event in Greifswald

The Pitchlab networking event, which began in Rostock, is all about adding value, stimulating new ideas, and encouraging people to leave their comfort zone in order to forge networks and get to know one another. Katja Wolter, who heads up the Institute for Resource Development, a Greifswald-based Steinbeis Research Center, has grasped the potential of the networking event and is now one of its patrons in Greifswald.

At Pitchlabs, speakers give a quick speech on their business idea, the underlying concept, and if they want to, their complete, crazy life story. "The key point is that it's about providing value for the audience," explains Maik Herfurth, who first established the format in Rostock. Pitchlab aims to bring the audience into contact with people on the same wavelength, irrespective of age, profession, status, or background. What's important is the experience and exchange of ideas.

The atmosphere at the evenings is relaxed and laid back, and participants address each other with the informal German pronoun "Du." As a result, from the outset there is very little of the typical northern

German reservedness and any fear of strangers fades into the background. With this format, even the most thick-skinned business leader can be asked difficult and totally direct questions – and the audience looks forward to hearing straight-up answers. There is also plenty of time for networking and honing contacts between and after talks. Pitchlabs are a chance for established businesspeople, potential startups, students, and many others to experience something new. It's a given that no-one leaves afterwards without new contacts. "If we achieve this in one evening, then we've done everything right. Then bridges have been built," emphasizes Wolter. This was palpable at the first event held in Greifswald in December 2016. Every seat in the auditorium in the BioTechnikum building was occupied, and the audience was brimming with enthusiasm. "We're establishing an efficient network across different locations in Mecklenburg and West Pomerania, thereby creating a knowledge-sharing infrastructure that's strongly focused on Mecklenburg-West Pomerania," underscores Wolter.



Katja Wolter  
Steinbeis Research Center  
Institute for Resource Development (Greifswald)  
[katja.wolter@stw.de](mailto:katja.wolter@stw.de) | [www.steinbeis-inre.de](http://www.steinbeis-inre.de)

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#### Roadmap Organisation Andreas Aulinger

2017 | paperback, b&w | 87 pages, German  
ISBN 978-3-95663-093-4

#### About the author

Prof. Dr. Andreas Aulinger is the professorial chair for Organization at Steinbeis University Berlin and the founder and director of the Steinbeis Transfer Institute for Organization and Management (IOM) in Berlin.



#### Leveraging Conflict for Innovation Wolfram Dreier

2017 | paperback, b&w | 59 pages, German  
ISBN 978-3-95663-111-5

#### About the author

Wolfram Dreier is a highly sought-after expert in the fields of conflict resolution, mediation, and innovation. He is also director of the Steinbeis Transfer Center for Human Resources Management and Corporate Communications. Dreier studied business engineering at Esslingen University of Applied Sciences and has worked for many years as an economic developer and promoter of innovation. He has also worked as a managing director for municipal economic development corporations.



#### Towards Best Practice in Photonics Outreach for Entrepreneurs Steinbeis-Europa-Zentrum, Opticsvalley (ed.)

2017 | paperback, color | 50 pages, English  
ISBN 978-3-95663-113-9



#### Towards Best Practice in Photonics Outreach for the General Public Steinbeis-Europa-Zentrum, Photonics-Cluster-Austria (ed.)

2017 | paperback, color | 42 pages, English  
ISBN 978-3-95663-114-6



#### Towards Best Practice in Photonics Outreach for Young People Steinbeis-Europa-Zentrum, Institute for Photonics and Nanotechnology of the National Research Council (ed.)

2017 | paperback, color | 66 pages, English  
ISBN 978-3-95663-115-3



#### Road2CPS Meike Reimann, Carsten Rückriegel (Lead authors)

2017 | paperback, e-book (PDF), color | 56 pages, English  
ISBN 978-3-95663-065-1 (print)  
ISBN 978-3-95663-117-7 (non-print)



#### The future of trans-Atlantic collaboration in modelling and simulation of Cyber-Physical Systems Sabine Hafner-Zimmermann, Michael J. de C. Henshaw

2017 | paperback, e-book (PDF), color | 98 pages, English  
ISBN 978-3-95663-112-2 (print)  
ISBN 978-3-95663-121-4 (non-print)

#### About the project partner

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



### The 12th Symposium on Business Intelligence. The Status Quo – Opportunities and Challenges

**A. Seufert, P. Lehmann, K. Freyburger, T. Becker (ed.)**

2017 | paperback, b&w | 204 pages, German/English  
ISBN 978-3-95663-116-0

#### About the editors

The editors work in a variety of roles for the Steinbeis Transfer Institute for Business Intelligence (IBI) at Steinbeis University Berlin. The Institute was founded in 2004 with the aim of gathering, developing, and networking knowledge between universities and business partners in the field of business intelligence. To this end, the IBI works with partners on a variety of application-based research projects, training courses, and events.



### HR Development Viktor Lau

2017 | paperback, b&w | 314 pages, German  
ISBN 978-3-95663-069-9  
2nd reviewed, updated, and expanded edition

#### About the author

Dr. Viktor Lau is considered one of the leading experts in the HR industry in Germany. Lau has written a variety of articles and books on the topic of HR, most recently Staff Appraisals. Dr. Lau has been working at Steinbeis since 2000. In 2016, he oversaw the setting up of the Steinbeis Consulting Center for Evidence-based Human Resources Management.



### Puppet Masters – Conflicts in Organizations

**Gernot Barth, Bernhard Böhm (ed.)**

2017 | stapled, color | 84 pages, German  
Mediation | Quarter I / 2017  
ISSN 2366-2336

#### About the editors

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



### A Quality Guarantee for Logo Design? Felicitas Knapp

2016 | e-book, color | 108 pages, German  
ISBN 978-3-95663-109-2  
This book is also available in print.



### Corporate Publishing in the Future Felicitas Knapp

2016 | e-book, color | 124 pages, German  
ISBN 978-3-95663-110-8  
This book is also available in print.

#### About the author

Felicitas Knapp studied journalism and public relations, culminating in a bachelor's degree in 2012. After a period working as a student in public relations, she completed a degree in electronic media at Stuttgart Media University with a focus on corporate communications. Since 2014 Knapp has worked part-time while still a student in graphic design and typesetting at Steinbeis-Edition. Her latest project, Formkavalier, is a first step toward self-employment. Her bachelor paper and extracts of the results of her master's thesis, which she wrote in 2016 while qualifying for a Master of Arts, are now available electronically.



### Industry 4.0 at SMEs – Are You Ready for the Future?

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Yvonne Hübner  
Steinbeis-Edition (Stuttgart)  
[edition@steinbeis.de](mailto:edition@steinbeis.de) | [www.steinbeis-edition.de](http://www.steinbeis-edition.de)



## Publication details

### Transfer. The Steinbeis magazine

The magazine on tangible knowledge and technology transfer

Edition 1/2017

ISSN 1864-1768 (Print)

Steinbeis GmbH & Co. KG für Technologietransfer

Willi-Bleicher-Str. 19

70174 Stuttgart

Fon: +49 711 1839-622

Fax: +49 711 1839-700

E-Mail: [stw@steinbeis.de](mailto:stw@steinbeis.de)

Internet: [www.steinbeis.de](http://www.steinbeis.de)

#### Editorial coordinators:

Anja Reinhardt, Marina Tyurmina

E-Mail: [transfermagazin@stw.de](mailto:transfermagazin@stw.de)

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#### Concept and design:

Steinbeis-Stiftung

#### Overall production:

Straub Druck + Medien AG, Schramberg

#### Photos and images:

Unless stated otherwise, photos and images were provided by Steinbeis Enterprises and project partners named in this magazine.

Cover picture: © iStockphoto.de/wundervisuals

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

191522-2017-01