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The Steinbeis Magazine

Achieve More Through The Network!

Feature Topic: Networks
Insights from Steinbeis experts into recent projects

New Ecosystems Stemming from Digital Transformation and Networking
Keeping an eye on opportunities and challenges

Turning the Spotlight on Surface Water
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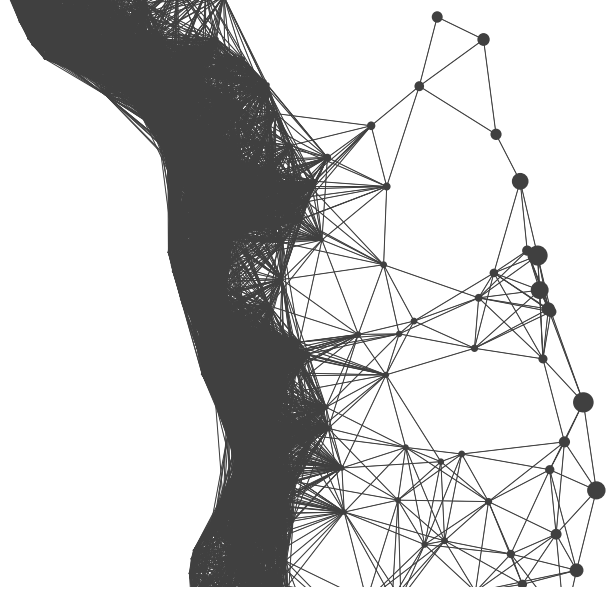
"Digitalization is the foundation upon which the innovative power of the future will be built"
An interview with Dr. Nicole Hoffmeister-Kraut, Baden-Wuerttemberg Minister of Economic Affairs, Labour, and Housing

02 | 2017



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Dear Readers,

Dr. Jonathan Loeffler has been co-director of Steinbeis 2i GmbH since 2016, alongside Dr. Petra Püchner. Between 2000 and 2016 he was director of the Steinbeis-Europa-Zentrum in Karlsruhe. Loeffler has been working for Steinbeis for roughly 20 years. The focus of his work lies in supporting industry with innovation management, with an emphasis on small and medium-sized enterprises and the implementation of European research and innovation initiatives in the field of new materials, nanotechnology, optics, production technology, and the automotive industry.

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Innovation is stimulated through the exchange with others. Networking is an important foundation for this. There are extremely few areas of business that can survive without networking, but that does not make it a guaranteed key to success. It is only when people know exactly how to network, with whom, and when, that the notion of networking transforms into reality and fuels successful alliances. Strategies have to be developed but at the same time, companies have to be open to the unforeseen and even the accidental. One key business model that has emerged and developed in recent years is Open Innovation, a concept that the state government of Baden-Wuerttemberg is now investing more and more time and energy in.

Open Innovation means turning your back on established, in-house innovation processes and shifting deliberately toward opening up and working with external partners. For small and medium-sized enterprises, this is a major challenge because their internal know-how is central to their competitiveness. To open up to others, they need a specific reason to do so, or the pressure to do something has to be there – for example if the market requires changes in the existing business model. This is where coaching can help in order to introduce targeted innovation management to the company.

On the European and international level, the services provided by the Enterprise Europe Network have proved valuable in this respect. This network has more than 600 partners in over 60 countries, and its role is to support small and medium sized enterprises (SMEs) and research organizations to establish innovation alliances and market entry strategies and access financing mechanisms. The emphasis lies in providing support to individual companies.

The state of Baden-Wuerttemberg also acts as an innovation driver in the Vanguard Initiative, a consortium of over 30 European regions. Its aim is to drive industrial innovation forward across Europe in keeping with the idea of "leading by example." The key areas it addresses are efficient and sustainable production, 3D printing, nanotechnology, and bio-economy.

Given societal challenges and social innovations, the "quadruple helix" will become more important in the future. Quadruple helix describes the interplay and mutual influence of the economy, science, politics, and civil society. According to this concept, innovation can no longer be seen as a linear process starting in research and ending with market-ready products. Instead, it is a complex social process revolving around dialogue, an exchange which has an impact on all areas of life. An example of this on a European level is the European Innovation Partnership on Smart Cities and Communities, which looks at urban development and has established this helix in all projects. Another example is the CatLabs programme initiated by the regional government of Catalonia. These programmes change the nature of innovation and networks, raising them to a multidimensional level and placing more focus within processes on social considerations. They do this by looking at how different factors depend on interests, experiences, values, and qualifications.

We encourage you to be bold and proactive and become more involved in multidimensional networking! In this latest edition of TRANSFER magazine you can read about the different ways the Steinbeis Network is actively involved in networking.

With kind regards,

Dr. Jonathan Loeffler

New Ecosystems Stemming from Digital Transformation and Networking – Also a Challenge for Science

In times of increasing digital transformation and networking (DT&N), more and more people are talking about the emergence of new ecosystems. What do they mean by that? Are these digital or business ecosystems, or a bit of both? And to what extent does a concept revolving around the ecology help us explain technological and business developments?

Looking at DT&N not so much in terms of technological advancement, but as a change in the overall process of value creation, the use of internet technology to connect objects not only leads to new kinds of so-called Product Service Systems, it is also an opportunity for companies to raise the share of value they add by participating in multidisciplinary collaborative agreements beyond the boundaries of specific industries. When a number of companies work together on DT&N initiatives, this results in value-oriented, internet-based ecosystems (Weber/Lasi 2017). The role of technical platforms in this is to facilitate communication between companies and their customers. But setting up alliances is not just about technical solutions. It also has to be about companies sharing a common understanding regarding partnership-based development, based on a pragmatic approach toward different ways to add value together. DT&N thus facilitates the development of digital and business ecosystems at the same time. Seeing this development process as an ecosystem provides an analytical perspective that can help to explain the heterogeneity of structures, although it can also explain the sustainability of a collaboration.

In Ancient Greek, oikós meant house and sýstema described things that were "put together" or "connected." The ecologist Kurt Jax (2008) described ecosystems as "an assemblage of organisms of different types [species or life forms], together with their abiotic environment in space and time."

In business science, an ecosystem is defined as the community of all industry players (economic ecosystems or business ecosystems). One major area of research also involves "entrepreneurship ecosystems" as the social and commercial environment of local and regional entrepreneurship. Within the context of entrepreneurship, an ecosystem represents the factors that surround an entrepreneur (people, organizations, and institutions), so as a result these can influence entrepreneurs but they can also prevent them from engaging in entrepreneurial activity.

The definition of a digital ecosystem is perhaps less clear. Until now there has been little agreement regarding the exact demarcations of digital ecosystems and where they come into use. According to Dieter Masak (2008: 103), the overall goal of a digital ecosystem is to overcome complex, dynamic challenges in ways that are scalable and efficient. A digital ecosystem emulates the behavior of biologically complex systems in order to put in place a dynamically adaptable overall system (Masak 2008: 103). Apple is often pointed to as an example of a digital ecosystem. Unlike the biological definition of ecosystems, with Apple there is one important element that is missing, however: openness.

One special characteristic of ecosystems in the context of DT&N, as witnessed with the way so-called testbeds develop (see the articles on page 18 and page 32), relates to the economic and technological interpretations of ecosystem concepts. There is also a connection here to the biology of systemic openness. Analyzing value-oriented and web-based ecosystems is thus also a new challenge for science. On the one hand, it will be necessary to find a meaningful link between the existing approaches adopted in the economy and with technology. This would unveil the factors needed to conduct a comparative analysis of newly evolved ecosystems. Literature on the entrepreneurial ecosystem provides some useful pointers on different ways to identify the relevant attributes. Viewing things from a biological or ecological perspective can also help when analyzing the distinctions between cause and effect, as well as the dynamics of interaction within an entrepreneurial ecosystem (Borissenko/Boschma 2017: 7). Since DT&N ecosystems bring together a host of heterogeneous players from different industries and disciplines, it makes sense to take network dimensions into account. Methods used in network theory make it possible to analyze the stability and sustainability of such systems. They also help to identify different types of ecosystems (Borissenko/Boschma 2017: 13). The next step should be to define the ecosystem pertinent to DT&N from a holistic and interdisciplinary perspective.

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Feature Topic: Networks

Insights from Steinbeis experts

We are surrounded by networks – neuronal networks, biological networks, data networks, computer networks, electricity networks, travel networks, social networks, business networks... The topic of networks is so broad, it is practically unique. This is something that is understood by the experts at Steinbeis. For example, Dr.-Ing. Jürgen Jähnert, Managing Director of bwcon GmbH, explains why value creation networks are essential for the success of companies. Professor Dr. Peter Philippi-Beck, director of the Steinbeis Transfer Center Internationalisation – Equity Participation – Succession Regulation, joins Hans-Joachim Hölz, director of the Steinbeis Transfer Center Ravensburg District (and also Managing Director of WiR GmbH/Ravensburg and Steinbeis Transfer GmbH at Ravensburg-Weingarten University of Applied Sciences), to explain how networks are especially useful for supporting SMEs in understanding and implementing technology developments. Dr. Michael Ortiz, a project manager at Steinbeis Headquarters in Stuttgart, writes about a pilot project called Expert Network X.0 and describes the functioning of value creation networks. Stefan Gaier is director of the Steinbeis Consulting Center for Innovation Management, so he knows from his own experience how important it is to work in networks to boost the innovation competence of SMEs. Dr. Petra Püchner (managing director) and Heike Fischer (project manager) of Steinbeis 2i GmbH talk about their belief in collaboration as a means of accelerating innovation processes. How important it is to create a sense of trust for both companies and entrepreneurs is the topic discussed by Uwe Haug, an authorized clerk at Steinbeis Headquarters and managing director of Steinbeis Transfer GmbH at Reutlingen University, drawing on the example of a model project called Innovation Angels. Heinz Pöhler, Professor Dr. Georg Kleiser, Professor Dr. Walter Commerell, and Professor Dr. Peter Renze of the Steinbeis Competence Center for Sustainable Energy (KNE) introduce a network for sustainable energy systems and explain why they are convinced that the only way to use energy efficiently and save money through the best possible solutions is to adopt a holistic approach. Dr. Marlene Gottwald and Patrick Weber of the Ferdinand Steinbeis Institute present the Industrial Internet Consortium, a network for multidisciplinary cross-sector digital transformation. In an interview with the director of the Steinbeis Research Center Technology Management North East, Frank Graage talks to TRANSFER about the management of networks, the advantages they offer, and the risks. Carsten Rasner, director of the Steinbeis School of Management and Innovation (SMI) at Steinbeis University Berlin, joins Gabrielle Spiller, an alumna of Steinbeis SMI, to explain why learning new things requires good networks, also looking at the role played by personal contacts in building useful networks. Finally, Beate Wittkopp, director of the Steinbeis Transfer Center TransferWorks BW, explains her belief that business enterprises have to network if they want to win against global competitors.

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The Role of Networks in the Process of Digital Transformation

How to make creative destruction something positive

A term on many people's lips these days is "digital transformation," which actually encompasses a number of processes that run in parallel. These will have a lasting impact on society in the years to come. According to Dr.-Ing. Jürgen Jähnert, director of bwcon, which is a member of the Steinbeis Network, to succeed in the future companies will have to think and act in terms of value-creation networks.

Digital transformation has basically already been happening for decades and digital solutions have been signposting the future direction since the introduction of data processing, driving innovation in the economy as well as public administration and other areas of society. At the moment, however, this transformation process is taking place hand in hand with a number of other technology trends, all of which are more or less directly linked to information technology, and even among themselves, they're undergoing a convergence process. The most important trend relates to future travel solutions, or mobility. This does not just mean ongoing developments that we already know about today in the field of transportation (automobiles, public transportation, and passenger travel), but also the next-generation mobile communication infrastructure (5G), including mobile end device developments. Another trend worth highlighting is cloud computing. This refers to the "recentralization" of IT resources along with the industrialization of IT. As a result of this process, IT services are developing into standardized mass products. A further new trend relates to big data/data analytics. This is about the systematic gathering of data from a wide variety of sources. This data is linked to individual application scenarios and evaluated efficiently. It is then used as a basis for acquiring new knowledge through data analytics and in turn, this forms the basis for services with the potential to add value. Cloud computing and big data/data analytics are thus a fundamental starting point for new, data-driven business models. The next trend in this area revolves around cyber-systems and physical systems. This is where sensors and actuators are connected to the internet to create an internet of services and physical objects – the Internet of Things, or IoT. It's the overall interplay between the communication infrastructure, cyber/physical systems, and the cloud/big data/data analytics that then provides a foundation for new value-creation models. These converging technologies will enter into use in almost all areas of our society in the future. For instance, in the textiles industry, items of clothing will be fitted with sensors that are linked to the internet, new ways to add value will emerge based on data-centric business models, and – as we're already witnessing in the traditional field of mechanical engineering – entire value chains will undergo sweeping change. In industrial markets, another trend that is emerging is 3D printing and in combination with the trends outlined above, this will open the door to completely new realms of opportunity.

All of these developments are going full steam ahead, providing an entry point for nearly all companies, government authorities, and indeed any area of society to unveil major opportunity in the future. This will entail a rethink for companies and new ways of operating, especially in a country like Germany, which has such high outlays on salaries and where businesses face the increasingly difficult challenge of standing their ground against the global competition. The new technologies are coming face to face with established industries and rigid value chains, but they do make it possible to make incremental improvements, for example through further process automation. The fact that so many German companies have succeeded in becoming global leaders in niche markets shows that these incremental innovation processes have already been taking place in many areas for some time. They have been highly successful.

Then there's an aspect already identified by Schumpeter: the "creative destruction" of innovation. This typically happens when a new technology makes it possible to ambush and replace established value-creation models through a completely new way of thinking or acting. Treading

this typically more disruptive path of innovation is extremely challenging, especially for companies with a successful history and an established company culture. Indeed, many companies have not trodden this path in the past, or not trodden it enough, despite their comfortable market position – or perhaps precisely because things are so comfortable. There are a number of leading companies that have been partially or completely routed by the competition within a very short space of time. Examples include Alcatel, Kodak, Nokia, and the communications division of Siemens. So what challenges will companies have to deal with in this time of technology transformation? It's worth noting that these (and other) technology trends will need to converge and be introduced to specific application areas together if established approaches to value creation are to be moved forward. This could and indeed will lead to further fragmentation. This is a multifaceted problem. The complex nature of this problem is not just due to factors such as company culture, but also how firms collaborate with other firms (even potential competitors – sometimes called frenemies). It's also due to the actual process of entering new fields of business.

In recent decades most companies have continuously become more specialized and extended their core competences. This provided a solid foundation for their extraordinary success in global competition. But this approach and the skills firms have acquired will no longer be enough to grasp the new opportunities that will arise, or to defend the position they've fought for. In the future, the central challenge for all companies will be to remain the successful specialists they were until now and find a way to think and act beyond the horizon – both inwardly and outwardly. The only companies that will succeed in the future will be those that can think and act in terms of value chains and know how to systematically seize the opportunities this behavior leads to. This doesn't just apply to global companies, which are already able to think and act in networks (especially within the organization), but small and medium-sized companies will also have to find ways to network, and they will have to do this much more intensively than they have until now. Doing this takes a multidisciplinary approach and thus a new way of communicating within the company. It also calls for a different mode of interaction with customers and suppliers, plus a completely different approach to competitors. It can also be expected that completely new partnerships will be entered into between different enterprises. Innovation processes will then not be primarily restricted to the four walls of a company, they will also take place between companies. For many business enterprises this requires a major leap forward in the established corporate culture. Especially contact between major companies and smaller firms can and will provide essential and fruitful ideas for everyone involved. But for this to work, people will have to enter into a partnership of equals – something few have achieved until now.

Networks, especially when they're formal and well organized – and if possible spanning technologies, industries, and different sizes of companies – are an important factor in establishing new levels of trust, which will be crucial for this new way of collaborating. Things first start to work when people line up and set up personal contacts. This instills trust, providing a basis for a kind of openness that has been uncommon until now. It not only takes a change in company culture; a firm also has to "import" the right experience, knowledge, skills, and ideas. To leverage this mediator role, which instills trust and grants companies access to knowledge, skills, and new ideas, networks make use of special techniques, a means of introducing and working alongside collaborative innovation processes. These techniques are methods such as design thinking, effectuation, and even LEGO Serious Play. This brings different parties together and allows them to focus on topics in an atmosphere that permits the representatives of the different companies to interact and generate ideas. And this allows new methods of value creation to develop.

When people embark on this process, other specialist skills are needed, as are alternative organizational structures. Frequently, more financial resources are required, too. This is another area in which networks have an important contribution to make, becoming a proactive facilitator and orchestrator of the required resources. Networks also face another challenge during this process, because they also have to develop themselves. Until now, networks were often organized around a technology or sector of industry, but given the diversity of the challenges and possibilities described above, the next task will be to allow markets to develop and become bilateral or multilateral. In these markets, it will no longer be possible to make such clear distinctions between providers and users. Also, different players from within the network will generate creative ideas for their own future development. As a result, it will become increasingly important for a company to get involved in networks and proactively provide input to the innovation processes taking place in those networks. It will also need to assume the simultaneous role of a consumer and a producer (prosumer). This way, and only this way, a company can turn the relentless process of creative destruction into something positive.

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Dr.-Ing. Jürgen Jähnert is a director of bwcon GmbH, a member of the Steinbeis Network. The services of the enterprise provide support with the application of strategic technology. bwcon manages a variety of networks spanning different technologies, companies, and organizations. It also advises individuals, enterprises, and organizations; it coordinates research and innovation projects and stages events; and it organizes projects that help with networking, thus providing support with business startups. bwcon organizes the transfer of knowledge from the public domain into networks and is especially active in commercial transfer between different areas of knowledge in the private economy.

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"Forming collaborative networks is the most promising answer to technology convergence"

An interview with Professor Dr. Peter Philippi-Beck (Steinbeis Transfer Center for Internationalisation – Equity Participation – Succession Regulation) and Hans-Joachim Hölz (Steinbeis Transfer Center for the Ravensburg District/WiR GmbH Ravensburg District/Steinbeis Transfer GmbH – Ravensburg-Weingarten University of Applied Sciences.)

What impacts do technological developments have on the success of a company and its future standing? To answer these questions, expert knowledge is required across a variety of specialist fields. To learn more about the best way to deal with these issues in business practice and examine the role networks play, TRANSFER magazine spoke to Professor Dr. Peter Philippi-Beck and Hans-Joachim Hölz.

Hello, Professor Philippi-Beck. You're the founder of a Steinbeis Competence Team for Technology Implementation and Business Optimization (C|T|B). This is a regional networking hub that helps its customers to spot technology trends, and it provides support in translating these trends into new business models, future products, and production processes. What was your motivation for setting up the team?

My work as a Steinbeis consultant regularly involved issues revolving around technology change and the impact this has on the future of a company. The projects mostly had to do with manufacturing design – in fact they still do – or how to translate technologies into products, or how to adapt the competitive standing of a company. The way I see it, these are all key success factors for the future of a company – especially in a region that's so heavily shaped by technology. The problems companies face involve so many aspects; this takes an expert understanding on an interdisciplinary level, and it was this that motivated me to set up the team of specialists. The Steinbeis competence team is called C|T|B and it looks at technology implementation and business optimization, pulling together specialists in product development, manufacturing design, and business development.

The partners of the C|T|B are the WiR in Ravensburg, the Fraunhofer Institute for Technology Trend Analysis INT, and Ravensburg-Weingarten University of Applied Sciences. What are the goals of this alliance?

Forming collaborative networks is seen as the most promising answer to technology convergence and the processes it's associated with. These networks work on an interdisciplinary level and again, their point of reference is application-centric technology transfer between research and development and how this is implemented within companies. Because of this, it's important not just to have expertise that spans different sectors of industry; the knowledge people draw on needs

a broad foundation and the business focus has to be on the future. This is why we're so pleased to have Fraunhofer INT on board as a network partner. It's in an ideal position to draw on research into technology trends and make predictions about long-term technology developments. The institution responsible for economic development and the promotion of innovation in the region sees itself as a linchpin and a facilitator working between network partners and different companies. Ravensburg-Weingarten University of Applied Sciences is also a project partner and this adds expertise in the field of research, particularly in development.

Turning to you, Mr. Hölz, the WiR in Ravensburg does a lot to promote SMEs in the region, providing support with innovation programs in keeping with market needs. It does this by lining up contacts with specialists, collaboration partners, transfer partners, universities, and research establishments. What are the challenges of setting up and managing such a network of experts?

One of the fundamental issues facing lots of companies at the moment is how sustainable their current business model is. Given megatrends such as e-vehicles, 3D printing, and Industry 4.0 – to name but a few – in some instances the entire business models of companies are under threat. Companies in areas such as mechanical engineering have to consider carefully whether the products they've been manufacturing along conventional lines until now could be replaced by printed parts in their current form, especially in the future. Solutions are needed, matched specifically to the individual company. But as I just said, this is increasingly only possible with an interdisciplinary approach and often this also has to work across a number of companies. One of the difficulties is to establish a basis of trust between the different companies; this makes it possible to tackle the increasingly complex technological issues together and do this without the fear of losing know-how. On the one hand, this entails strong requirements regarding the ability of the parties who are managing innovation and networks to act as facilitators. On the other, it also requires professional consultation from experts. The expertise this requires is supplied by our network partner, the Steinbeis competence team for technology implementation and business optimization (C|T|B).

It's particularly important for SMEs to recognize technology trends early, in fact it's crucial for their survival, but they often don't have the right resources. Is this where networks can lend a helping hand?

Philippi-Beck: Absolutely. Especially for smaller companies – digital transformation often fails because they don't have the resources. If a company only has 20 employees, it often finds it really difficult to pull together the resources to manage such a complex issue. But despite this, smaller companies still have to cope with changes in technology structures, just like the big companies. With a functioning network, it's easier to compensate for bottlenecks by transferring know-how and resources between the different network partners.

One of the key success factors associated with networks is trust. Is it easier or more difficult to engender trust and keep this sense of trust going in a region like Upper Swabia, especially given the influence of small and medium-sized enterprises?

Hölz: Geographical proximity and having so many companies that are owner-managed makes it easier to establish a sense of trust. We believe that the variety of the companies in Upper Swabia and the nature of the SME infrastructure have a decisive role to play in allowing these networks to function. The planning and setting up of the network with the WiR in Ravensburg, Steinbeis C|T|B, the university, and Fraunhofer is a good example of how well these structures function – the technology transfer process and the topics this transfer is based on undergo continuous improvement thanks to the feedback provided by the companies.

Image: © iStockphoto.com/ipopba

Professor Dr. Peter Philippi-Beck

Hans-Joachim Hölz

Professor Dr. Peter Philippi-Beck is director of the Steinbeis Transfer Center for Internationalisation – Equity Participation – Succession Regulation. The Steinbeis Enterprise offers its customers consulting and support with management succession, mergers and acquisitions, the planning of funding concepts, and the development of business models against the backdrop of technological trends. The center is part of Steinbeis C|T|B.

Hans-Joachim Hölz is director of the Ravensburg District Steinbeis Transfer Center, managing director of WiR GmbH Landkreis Ravensburg, and managing director of Steinbeis Transfer GmbH at Ravensburg-Weingarten University of Applied Sciences. His work mainly revolves around providing support to companies with the implementation of innovation projects and helping them to leverage knowledge and technology transfer between science and academia on the one hand, and trade and industry on the other.

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Expert Network X.0

Networking that adds value

Business concepts like Industry 4.0 have to take the already advanced and continually advancing trend of digital transformation into account, not to mention the process of continually accelerating convergence between different fields of technology, sectors of industry, and entire areas of the economy. Dr. Michael Ortiz, who is managing a Steinbeis project called Expert Network X.0, describes how this can work in practice. The idea of the project is to enable manufacturers and experts to join forces and offer their services and Industry 4.0 solutions together, especially across fields such as measurement and test equipment, work station systems, operational installations, software systems, and factory planning.

Digital solutions and convergence make it implicitly necessary to form networks on several levels, beyond the traditional boundaries of organizations and business enterprise. Key requirements in this respect are flexibility, agility, and an openness to possibility. Steinbeis promotes value-adding networking by initiating and moderating regional pilot projects. This allows companies and key players from a variety of markets to work together in the long or short term by forming groups, networks, or platforms. The aim is to develop new offerings, but also to try out and implement new business models or technologies.

One such project is called the Expert Network X.0. The catalyst for this initiative was the realization of the producers involved in the collaboration that it would already be impossible for them to sell their Industry 4.0 solutions through established selling – at least not without changing something. If anything, when they offered or introduced their products to customers, detailed advice had to be provided because the new solutions would entail sweeping changes in company processes, systems, and organizational structures. They would also require workers to acquire new skills. The management and technology experts also recognized that without a detailed understanding of the services offered by producers, it was becoming increasingly difficult to sell their consulting services, especially in the different areas of Industry 4.0 – ranging from project planning to organizational development, change management, and strategic skills development.

Selling and consulting have overlaps, so offering clients highly individual services that fit their requirements like a glove requires close interplay between producers, technology experts, and management experts. Establishing digitally networked manufacturing structures and fostering business competence not only entails supporting customers while they are selecting or configuring suitable solutions, or planning projects, but they also need help with the introduction of new technology, business models, or new work environments within the company – partly through coaching, partly through workshops and consulting in the course of live processes. During the current phase of setting up the Expert Network X.0, the partners involved are working together on a common competence profile, business and consulting models, coherent sales and marketing strategies, and a sustainable network structure. The unique selling proposition (USP) will have to revolve around the networked know-how of the key players involved: The network provides a uniform

Expert Network X.0 founding members

- Ambright GmbH
- Elabo GmbH
- KLW Lutz & Co. KG
- Dr. Heinrich Schneider Messtechnik GmbH
- Ferdinand Steinbeis Institute
- Steinbeis Consulting Center for Manufacturing Systems and Processes
- Steinbeis Consulting Center for Entrepreneur Excellence
- Steinbeis Transfer Center for Factory Planning
- Steinbeis Transfer Center Technology – Organization – Human Resources (TOP)
- Steinbeis Transfer Center for Systems Engineering

interface for customers, pulling together flexible project partners with the right skills, spanning the entire range of required services, offering individual solutions with "a batch size of one," granting access to the comprehensive range of services offered by the over 1,000 Steinbeis Enterprises in the Steinbeis Network, yet still agile enough to develop and react quickly to current market developments.

Pulling together a meaningful competence profile through all of the partners involved in the network is essential in order to show clearly where there are overlaps with other key players. This is also important so that the services offered are more visible to clients. Developing a shared competence profile for the overall network underscores its compatibility with other possible network participants, especially given the group's intention to expand. The Expert Network X.0 was first unveiled to a pubic audience at the Hannover Messe trade show in April 2017. The network has its own website for the network partners to showcase their competence profiles and portfolios of services. The network will determine further processes and optimize the services it offers by taking part in initial pilot projects.

Steinbeis headquarters and the Ferdinand Steinbeis Institute are helping to coordinate the launch of the network by providing support and moderation at networking meetings and workshops. In the future, the aim is for the network to take care of coordination itself and when the time is right, a separate legal entity will be created for this.

Image: © Patrick Schöpflin

Dr. Michael Ortiz gained a PhD at the University of Mannheim in the field of comparative innovation systems research. As part of his research and teaching at the University of Mannheim and the University of Oldenburg, Ortiz has been involved in the topics of innovation research and management, knowledge and technology transfer, regional knowledge economies, business and organizational sociology, Europeanization processes, comparative macro-sociology, and qualitative empirical methods. Since 2013, Ortiz has been a project manager based at Steinbeis headquarters in Stuttgart, working in business and strategy consulting, transfer management, business competence analysis, the setting up and supervision of Steinbeis Enterprises, digital transformation, and a variety of studies and evaluations.

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"By pooling specific core competences, we can exploit the maximum potential to innovate"

An interview with Stefan Gaier, director of the Steinbeis Consulting Center for Innovation Management

For many years, the Steinbeis Consulting Center for Innovation Management has been overseeing the networking of small and medium-sized companies as part of the ZIM program (the government's central innovation program for SMEs). This program is funded by the Federal Ministry for Economic Affairs and Energy (BMWi) and its aim is to pool the know-how and skills of medium-sized technology experts, research institutions, and universities. It certainly works: On May 18, a ZIM network called Subsea Monitoring, which was set up by the Steinbeis Enterprise, was honored by the BMWi for its outstanding commercial contributions to the success of research and development projects. TRANSFER magazine spoke to Stefan Gaier, director of the Steinbeis Consulting Center involved in the project, about the importance of networking for innovation at SMEs in general, and how this is reflected in the success of this specific project.

Hello, Mr. Gaier. How can individual enterprises belonging to the German Mittelstand benefit from networking?

Small and medium-sized companies are often leaders in their field of technology. They typically offer individual components within a specific technology market. But for any company, there often comes a point where it runs into technology barriers, especially if it wants to combine individual components with other system elements. It may also have conceptual difficulties in designing end-to-end or single-source solutions for a specific application. Even the most successful SME can be simply too small to deal with the technology challenges and industry needs of a global market.

In which fields of technology or sectors of industry have you set up networks? What's the main emphasis of your networking activities?

It can't be a coincidence that the collaborations we oversee involve the kinds of technology that are moving people at the moment – things like modern travel solutions, digital transformation, and energy supply. In the field of electric vehicles, for example, a network called LOHCmobil is currently being set up and managed. The aim of this network is to provide help with the development of zero-emission drives for marine vessels and railway vehicles, so they can be integrated into future travel systems. Then there's an alliance called InQ (Intelligent Quarter) which looks

at digital transformation against the backdrop of changes in the energy supply and travel solutions. Drawing on these changes makes it possible to develop products and business models for the urban districts of the future. A variety of companies and research bodies are involved in the collaboration networks we manage, looking at the specific development of innovative products. By pooling their specific core competences, we can exploit the maximum potential to innovate. As well as research and development, another important area is how the innovations are marketed and sold. We help companies develop business models and support them in setting up shared selling structures. For example we used the iMod network to found a spin-off selling company that now acts as an international system supplier providing autonomous infrastructure solutions.

The Subsea Monitoring network was set up by your Steinbeis Enterprise under the ZIM program, and it's just won an award from the BMWi. Can you tell us more about the project?

The Frankfurter Allgemeine newspaper ran a story on the Subsea Monitoring project two years ago and described it as a "high-tech diving expedition." That's not far wrong, since the 20 partners in the network do indeed develop and market high-tech products, so-called subsea monitoring systems. These are used to assess, observe, and monitor the existence of raw materials under the sea, as well as environmental conditions and the infrastructure. There are three key areas: the detection and mining of marine raw materials, the use of marine energy sources, and the monitoring of environmental parameters. Together, they hold huge growth potential for companies involved in deep sea technology. The problem is, there's no real leader in Germany in terms of system suppliers, basically because the companies are too small. This is reflected by their small share of the global market. German companies do produce individual components such as sensors and communication systems. But in terms of the overall systems customers require for deep sea activities, which are highly complex, the German companies couldn't previously supply what they needed. That's now changed. The Subsea Monitoring project allowed us to pull together a network consisting of different companies involved in the area, and that made it possible to combine their individual competences and emerging technologies to create systems, which also fueled further developments for individual products. This made it possible to put some big R&D projects in place with a budget of over 10 million euros; specific key components and products have now been developed for the German marine technology market and these have been combined into overall systems. One example of this is SMIS ("subsea monitoring via intelligent swarms") – an innovative system for the efficient, autonomous monitoring of large underwater areas based on swarm intelligence. The system encompasses several underwater vehicles, an underwater tracking station, and a surface vehicle. These are used by a research vessel or, if necessary, a shore-based control station and everything is monitored on the basis of swarm techniques. The thing that's unique about this system is the way it uses swarms, even down to a depth of 6,000 meters. The system can be used for deep sea marine research but it can also be applied to commercial marine systems, so this is a highly promising development that addresses lots of important markets: marine raw material extraction; long-distance exploration for a variety of pipelines, energy cables, and communication cables; or airplane wreckage searches. Another result that has emerged from the work of the network is a underwater testing field. This was created for developing and testing new marine technology. And this is just the first step. The plan for the future is to set up an underwater technology center. Some important foundation work has also been carried out on creating a brand and PR. The network had its own trade show booth at the important Oceanology International show in London. For the first time, an important objective was achieved at this trade show by establishing a brand to go with the network. It was a successful opportunity to convey "Subsea Monitoring made in Germany" branding and gain awareness. This branding will be systematically developed, and it will be a major opportunity for the network to position the systems developed through the network and promote these in international markets.

Just one final question: What would your advice be to a small or medium-sized company if it's toying with the idea of tapping into the benefits of a collaboration network for its own purposes?

Companies are more than welcome to contact our Steinbeis Consulting Center. We'll check if there's an opportunity to work with an existing network or whether it might make sense to set up a new network.

Image (left): Professor Uwe Freiherr von Lukas and Stefan Gaier at the Network of the Year award ceremony organized by the Federal Ministry for Economic Affairs and Energy © Subsea Monitoring Network, Rostock
Image (right): Products developed by the Subsea Monitoring Network in use at sea © Kraken Power GmbH, Bentwisch

Stefan Gaier has been an active member of the Steinbeis Network for many years. In 2005 he set up the Steinbeis Consulting Center for Innovation Management, of which he is also the director. His SCC helps public bodies with strategic planning and innovation projects; it also provides companies with management consulting services and funding advice. The emphasis of his work lies in managing strategic projects and helping companies to network in the high-tech sector.

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Open Innovation Strategies for Small and Medium-Sized Enterprises

Collaboration helps accelerate innovation

For SMEs, opening up in-house innovation processes can be crucial for their competitiveness. Cooperations make it possible to pool a wide variety of competences and quickly launch successful products with the support of others. Steinbeis 2i GmbH has been conducting a project called "Open Innovation for SMEs in Baden-Wuerttemberg" involving a variety of event formats and coaching sessions aimed at raising awareness of open innovation. The project, which has now been successfully implemented, examined the specific challenges, processes, and strategies of open innovation at small and medium-sized enterprises.

According to the 2015/2016 Innovation Report issued by the German Chamber of Commerce and Industry, 47 percent of the companies it surveyed stated that open innovation is a key strategy for coming up with innovations. Micro-businesses with less than ten employees are especially likely to view open innovation as a good way to come up with ideas. Opening a strategic door to innovation processes at a company in order to actively introduce and use external know-how requires the right internal and external structures, plus a correspondingly open approach to innovation management. It is becoming increasingly clear that investing in such methods is worth the effort, especially given the growing importance of open innovation strategies to competition. Digital solutions also hold tremendous potential in this area.

The "Open Innovation for SMEs in Baden-Wuerttemberg" project, which is backed by the Baden-Wuerttemberg Ministry of Economic Affairs, Labour, and Housing, shows that small and medium-sized enterprises in the state are already good at using collaboration to accelerate innovation processes or bring in external knowledge from outside the company. Although companies fear that their intellectual property will be used without authorization (plagiarism) and that expenses and profits will not be shared fairly, around half of the 120 SMEs surveyed felt that the main problem would actually be finding a suitable partner for their projects.

SMEs therefore need support while trying to line up collaborative projects, if not also in order to define the right strategy for entering into an open innovation project. Often companies only start to overcome hurdles when the urgency to do something becomes critical for extrinsic reasons, for example if there is a shift in competition or if customer requirements change. Business coaching can help identify hurdles and find suitable alliance partners. Engendering a sense of trust in open innovation is of central importance for SMEs, but they need help to do this.

The majority of companies surveyed for the project by Steinbeis 2i already apply classic open innovation methods ("Open Innovation 1.0"). For example, the following ideas are already considered par for the course:

- Shared research and development plans
- Use of funding programs (such as the ZIM program or SME Innovative)

- Involvement in business clusters
- Use of support offered by state agencies
- Knowledge and technology transfer, for example via Steinbeis Enterprises or universities
- Shared development of products with the support of customers
- Licensing in or out of know-how

Almost all of the companies said that they are involved in R&D projects. According to 75 percent of the respondents, the reasons for these co-operations is that they need to be involved in new developments but they do not have the resources to do so by themselves. Two-thirds of firms also use collaboration to strengthen their own market standing. Another motivation is access to new markets, which for over 50 percent of the companies was an important reason for alliances. For example, sharing know-how and technology through license agreements is seen as an effective way to introduce products to other regions or sectors of a market.

There are a number of factors relating to market pressures that motivate SMEs to enter into open innovation. If a market is experiencing shake-out, the only way to survive may be to join forces with business partners, share resources, and shoulder risks in order to introduce new products or enter new markets. This is one reason why the main point of alliances is often to engage in R&D with others. For this to work, SMEs need to establish a basis of trust and become a partner of equals. This is why one popular approach is to seek bilateral alliances with other SMEs. These are kept simple by maintaining the focus on the same market, and they do not try to avoid calculated risks. A key issue in this respect is safeguarding intellectual property during collaboration. One particular challenge SMEs point to is when they collaborate with large companies. In such instances, SMEs worry that if things go wrong, their proprietary rights may not be watertight enough to shield their solutions from plagiarism. As a result, they would like more support in exercising their rights.

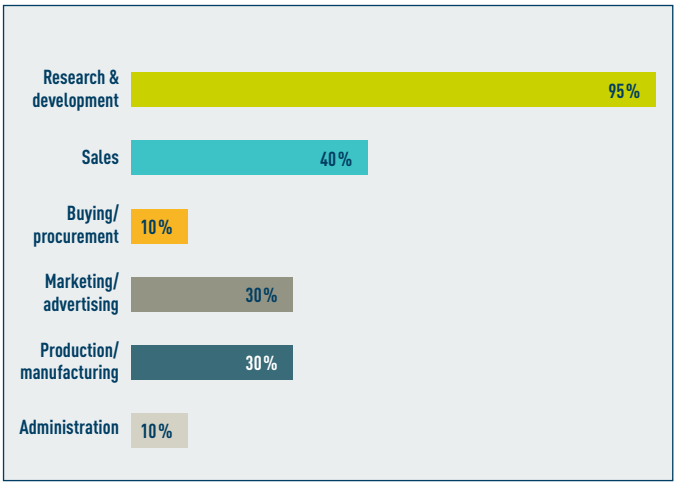

Image (left): The organizers of the open innovation congress of Baden-Wuerttemberg (left to right): Andreas Richter (Chief Executive of the Stuttgart Chamber of Industry and Commerce), Dr. Nicole Hoffmeister-Kraut (Minister of Economic Affairs, Labour and Housing Baden-Württemberg), Dr. Petra Püchner (managing director, Steinbeis 2i GmbH), and Prof. Dr.-Ing. Dr. h.c. Norbert Höptner (Commissioner for Europe for the Baden-Wuerttemberg Minister of Economic Affairs, Labour and Housing)

Image (right): Areas of business involved in collaboration. Results of the SME survey conducted by Steinbeis 2i GmbH (S2i).

Coaching offered by Steinbeis 2i GmbH (S2i)

The open innovation coaching offered by S2i helps SMEs find a footing in the context of global innovation, pinpointing areas where it would make sense to open up the company. The steps involved in defining a strategy are:

1. Assessment of the current position within the open innovation ecosystem:
   - Position in research and innovation
   - Position in terms of
     - Company competences: knowledge assets, technologies, operational infrastructures, IP with respect to value chains and markets
     - Market competences: requirements and expectations of the market and society in general, competitive innovations, technology trends/new ideas

2. Definition of a suitable position within the open innovation ecosystem: mapping of an ecosystem radar showing potential partners of strategic relevance to the company (firms, R&D, business clusters, technology platforms, etc.). This culminates in an open innovation strategy and the steps that need to be taken to implement the strategy in keeping with goals.

Dr. Petra Püchner

Heike Fischer

Dr. Petra Püchner is managing director of Steinbeis 2i GmbH, where Heike Fischer works as a project manager. Steinbeis 2i works in the field of innovation and internationalization and is a partner in the Enterprise Europe Network of the European Commission, which currently involves 600 partner organizations in over 50 countries. The aim of the network is to provide support to companies with all issues relating to business in Europe, innovation, research, and technology transfer. It also helps companies exploit the findings of European research. Steinbeis 2i as a partner in the Enterprise Europe Network works in collaboration with the manual trades association Handwerk International, bw-i, the Ministry for Economic Affairs, and six chambers of industry and commerce.

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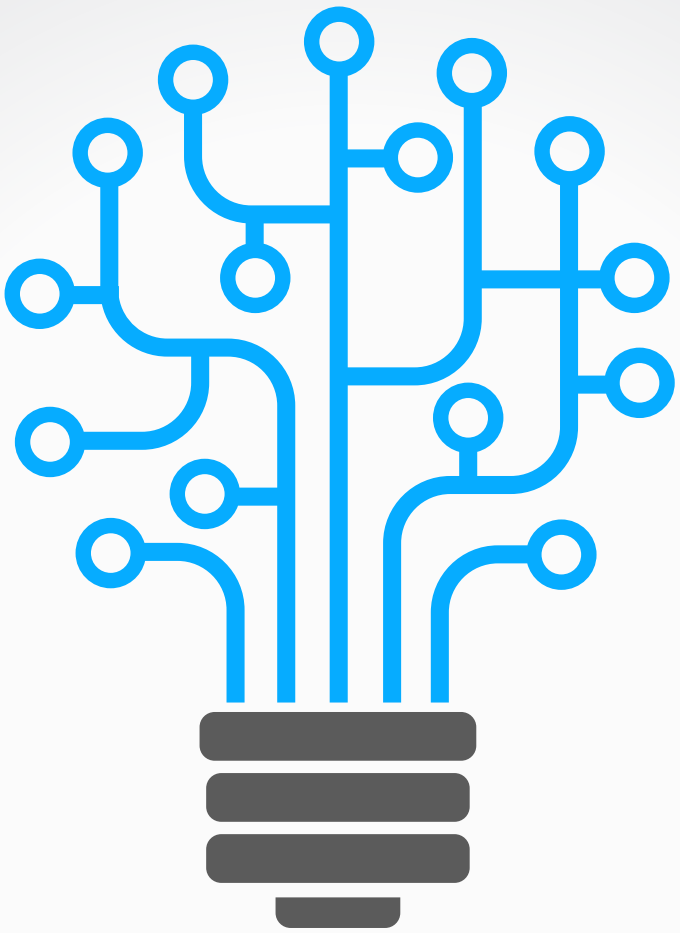

Innovation Angels Create Space to Innovate

Providing more support for companies sharing technology know-how

A Baden-Wuerttemberg initiative called "Business Technology Transfer Dialog" has fueled a new concept for a model project to introduce Innovation Angels to help bolster knowledge and technology transfer between enterprises. Aimed primarily at SMEs, the idea is to line up experienced innovation experts from industry to provide support with innovation projects. Steinbeis is responsible for managing the project.

Technologies are converging faster than in the past, the borders between fields of technology are now fuzzy, and technologies are mutually dependent. It is also increasingly important to source technologies internationally. The German economy is highly dependent on exports, but firms still feel desperate about the dearth of disruptive ideas and ways to use innovation to stay ahead of the game or even extend the lead.

The overall amount of money now invested in research and development in Germany is mainly accounted for by companies themselves. Even if most firms aim to exploit the potential offered by technology for their own products and services, this potential does not have to be limited to internal use. Sometimes ideas are not intended for immediate use, or they cannot be leveraged in isolation, or they would deliver more or subsequent value by deliberately exploiting their potential with business partners. One way to do this is to engage in "moderated partnerships," which work on a different level from customer-supplier relationships due to the approach toward realizing opportunity together (as well as leveraging synergies and sharing risk together). Companies can be brought together based on the way they add value or the type of benefits – across different fields of technology, and not just because they share the same technology base.

Until now, there has been no systematic approach toward moderating and steering transfer between companies, at least not in Baden-Wuerttemberg. As a result, a pilot project has now been launched to draw on the experience of successful innovation experts (typically experienced business people/CEOs) and use tried-and-tested Steinbeis instruments to develop methods and processes for transferring technology on an intercompany basis. A key priority will be to establish a foundation of trust and thus provide a "safe place" for entrepreneurs and companies. As is usual with Steinbeis projects, it goes without saying that this will also involve exploiting the opportunity to transfer classic processes from primary sources.

First results already show that there is clearly discernible demand among companies for new approaches to collaboration. Companies are increasingly willing to (and sense the necessity to) unearth hitherto unexploited technology potential and work with others on adding value. This value also helps improve their competitiveness. The priority must be to explore new avenues – especially with the economy currently doing so well – to prepare businesses for the future.

Image: © istockphoto.com/VLADGRIN

Uwe Haug is an authorized signatory officer at Steinbeis Headquarters and Managing Director of Steinbeis Transfer GmbH at Reutlingen University. His main areas of work are the setting up and supervision of Steinbeis Enterprises, internationalization of the Steinbeis Network, and the ongoing development of transfer models.

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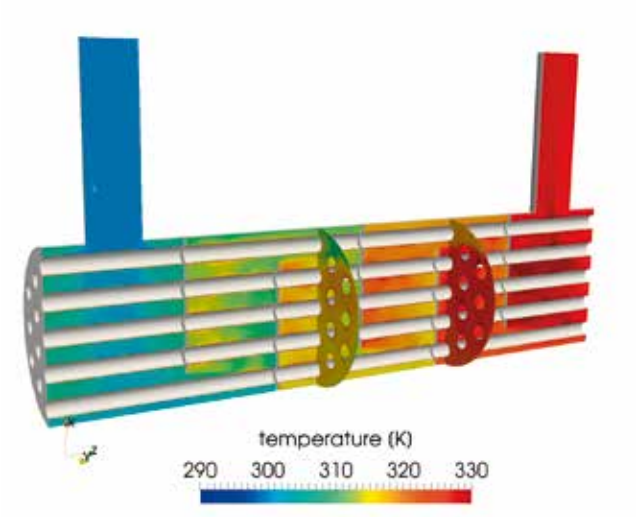

A Network for Sustainable Energy Systems

Steinbeis Centers join forces to set up a center of competence

Energy and energy efficiency topics feature in political, economic, and social discussion every day and the issues they raise are becoming increasingly important. There is broad agreement that we need to use energy resources more consciously and efficiently. How to actually do this in practice – and which role networks play in this – is shown by the recently founded Steinbeis Competence Center for Sustainable Energy (KNE).

From different professional sides a number of new approaches and suggestions on how to use energy more consciously and efficiently are already being shared, but these often only lead to an unilateral optimization of the total energy consumption. The KNE was set up on the initiative of four experts at Steinbeis Enterprises, whose motivation and objective is to push ahead the use of sustainable technology in industry, commerce, and local communities with the aim of establishing a long-term, reliable, ecological and economical viable energy supply. The four Steinbeisers are: Dipl.-Ing. Heinz Pöhler (Steinbeis Consulting Center: 4IES), Professor Dr. Georg Kleiser (Steinbeis Consulting Center: Energy-Efficient Manufacturing), Professor Dr. Walter Commerell (Steinbeis Transfer Center: System Design), and Professor Dr. Peter Renz (Steinbeis Transfer Center: Energy and Flow Engineering).

The KNE's goal is to reduce the energy requirements of its customers in the long term. The founders believe the issue of energy can only be approached from a holistic perspective by networking different core competences with the aim of identifying the most efficient energy-saving solutions. And this is exactly what the four Steinbeis Enterprises offer by bundling their knowledge and experience across a variety of fields to the benefit of customers. The services provided by the KNE reach from analysis to concept development and coaching on implementation. The center's portfolio ranges from industrial and public energy systems in the field of energy generation over thermal and/or electrical storage systems up to concept development of power distribution systems needed for thermal, cooling and electrical energy. For example, using waste heat and generating electricity through CHP plants and/or photovoltaic systems makes it possible to reduce energy consumption.

The center also looks at cross-sectional technologies such as lighting, compressed air and drives. The first step when analyzing existing systems is usually to carry out a stocktaking exercise. Thermographic analysis and energy measurements enable a quick identification of energetic heat sources and heat sinks. Other services offered to customers include simulations of specific components and systems to gain a more detailed understanding of complex interrelations. The benefit of this is that the effects of different changes on the complete system can be assessed in advance. This enables the design of manufacturer-independent and individual systems based on future requirements. At the same time, this ensures energy is put to sensible use, thus reducing investment outlays. Clients are provided with support in gaining energy certification for residential and nonresidential buildings. They can also receive help with providing evidence of completed energy audits (EDL-G) under DIN standards EN 16247-1 and EN ISO 50001. Support is also available for complex issues, expert reports, and official audits. The KNE also offers its customers detailed advice on funding programs and provides help with submitting applications to different financial institutions (i.e. German institutions like BAFA, KfW Bank, etc. or corresponding international ones). These banks also offer subsidies on certain services provided by the KNE.

Image: CFD simulation of a heat exchanger

Dipl.-Ing. Heinz Pöhler is director of the Steinbeis Consulting Center 4IES and has over 35 years of professional experience in planning and designing energy supply systems. Professor Dr. Georg Kleiser is director of the Steinbeis Consulting Center Energy-Efficient Manufacturing and an expert in the optimization of industrial energy systems. Professor Dr. Walter Commerell is director of the Steinbeis Transfer Center for System Design and a specialist in the field of storage systems and automation. Professor Dr. Peter Renze is director of the Steinbeis Transfer Center for Energy and Flow Engineering and works in the field of heat transfer and computational fluid dynamics (CFD). The four Steinbeis experts are the joint founders of the Steinbeis Competence Center for Sustainable Energy (KNE).

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The Industrial Internet Consortium – More Than Just a Network

Digital solutions spanning different sectors of industry: interdisciplinary and international

On the surface, the Industrial Internet Consortium (IIC) would appear to be just one of many networks revolving around the industrial internet and Industry 4.0 (connected manufacturing). But actually it is different – in terms of its make-up, structure, and the many goals of a whole host of national initiatives. This is partly due to its specific take on digital transformation, but it is also because of the emphasis the IIC lays on working across different sectors of industry. Further, the different parties involved in the IIC are highly diverse. This makes the alliance complex, but it is an efficient network of working groups and task forces, which are not just heavily involved in theoretical aspects, but are also actively involved in business practice.

The IIC was founded in March 2014 by AT&T, Cisco, General Electric, IBM, and Intel. It now has around 270 members from over 30 countries. The rapid expansion in members underscores the need for a suitable collaboration platform in the field of industrial internet. It is also a testament to the success of this platform. The IIC is an open and member-supported program and its members include companies, research institutions, and public bodies. Its stated goal is to promote the accelerated growth of the industrial internet of things (IIoT). The IIC defines the industrial internet as the internet of things, machines, computers, and people. It draws on powerful data analysis in order to facilitate smart business processes that change the process of adding value (Haltmayer/Lasi 2016). To this end, the IIC develops practical application scenarios for connecting physical objects with the world of digital technology, using internet solutions to apply these scenarios to different industries based on multidisciplinary methods. The focus of the IIC is to facilitate cross-industry interoperability and interconnectivity, also taking into account multidisciplinary requirements such as security, trust, and reliability.

To achieve its goals, there are a variety of working groups. These meet four times a year on a rotating basis in the United States, the Far East, and Europe. The IIC currently has 19 working groups spanning six broad areas: Business Strategy and Solution Lifecycle, Liaison, Marketing, Security, Technology, and Testbeds. One objective of the working groups is to look at the theoretical aspects of structural conditions. The idea is to provide a framework with different approaches to solutions, particularly with respect to interoperability and interconnectivity. For example, this has resulted in the development of industrial internet reference architecture (IIRA) to provide a common language for elements used in industrial internet systems and how each element relates to others. This common language should help developers decide which elements they will require for their systems, and this helps accelerate implementation. The IIRA operates beyond the boundaries of individual industries and IoT systems, which makes it easier to spot gaps and support interoperability between different components.

One of the main areas of activity of the IIC is testbeds. These are where companies join forces to collaborate across all sectors of industry. The approach is based on pragmatic partnership in order to introduce value-adding scenarios (hotspots) in actual business environments and experiment in ways not previously possible. The main focus of these activities lies in introducing mini application scenarios. This still allows for the use of existing technology, and the approach toward interdisciplinary collaboration allows new products and services in the field of digital solutions and networks to be developed (Weber/Lasi 2017). Interdisciplinary collaboration based on partnership is becoming an increasing important issue with the advent of the industrial internet of things, especially given its increasing complexity. Allowing a number of companies to work together results in internet-based ecosystems revolving around digital transformation and networking. A key enabler for setting up these ecosystems is the internet of things. The goal of the IIC testbed activities is to work

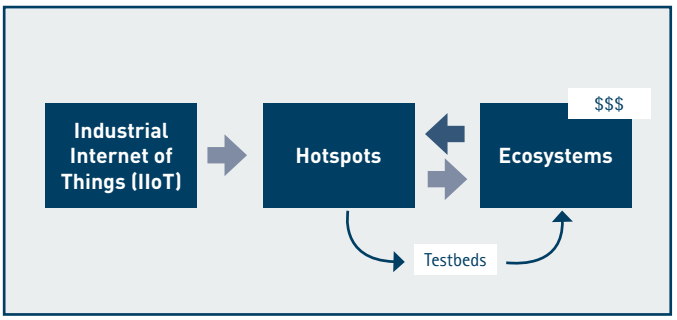

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Image (left): © iStockphoto.com/BlackJack3D
Image (right): Testbeds as enablers of new ecosystems

across industries to identify added-value scenarios and to use the testbeds to implement these on an experimental basis. The experience gained in the process can be applied to new ecosystems with a focus on adding value and using the internet.

As well as the working groups focusing on certain topics, there are also regional networks. These support collaboration between different members based on countries or regions. For example, the IIC offers a German Regional Team, which operates under the umbrella of Steinbeis. The task of the German Regional Team is to provide a network for German IIC members and offer small and medium-sized enterprises (SMEs) an early opportunity to play a role in developing the IIC. Aside from being able to interpret any lessons learned and gain access to the experience and expertise of the IIC, SMEs also have the chance to participate in actual implementation scenarios and testbeds. As a member of the Steinbeis Network, the German Regional Team is in a good position to benefit from the variety of expertise and methods offered by the consortium.

The IIC is also closely involved in various further national initiatives in the field of industrial internet/Industry 4.0. In 2016, the German chancellor announced a partnership between the Industry 4.0 Platform and the IIC at the international trade show in Hanover. Ever since, collaboration has intensified continuously. This has also involved working groups looking at the theoretical context (the compatibility of the two reference architectures, IIRA and RAMI 4.0) and issues relating to the practical aspects of using testbeds. The IIC and the Industry 4.0 Platform have also adopted the task of promoting collaboration between other industrial internet and Industry 4.0 initiatives. As part of the IIoT World Tour Event Series, the two partners are working with national IIoT organizations to coordinate local events in different parts of the world. The aim is to leverage synergies and raise awareness.

Dr. Marlene Gottwald

Patrick Weber

Dr. Marlene Gottwald is the Industrial Internet Project Coordinator at the Ferdinand Steinbeis Institute/IIC German Regional Team. Patrick Weber is a scientific assistant at the Ferdinand Steinbeis Institute and is responsible for research in the field of industrial internet/Industry 4.0. The Ferdinand Steinbeis Institute (FSTI) is a research institution for digital solutions and networking. The transfer projects conducted by the FSTI revolve around the increasingly overlapping areas of physical objects and embedded IT systems, in combination with comprehensive, internet-based networks, which are resulting in more and more change in industrial ecosystems and societal structures.

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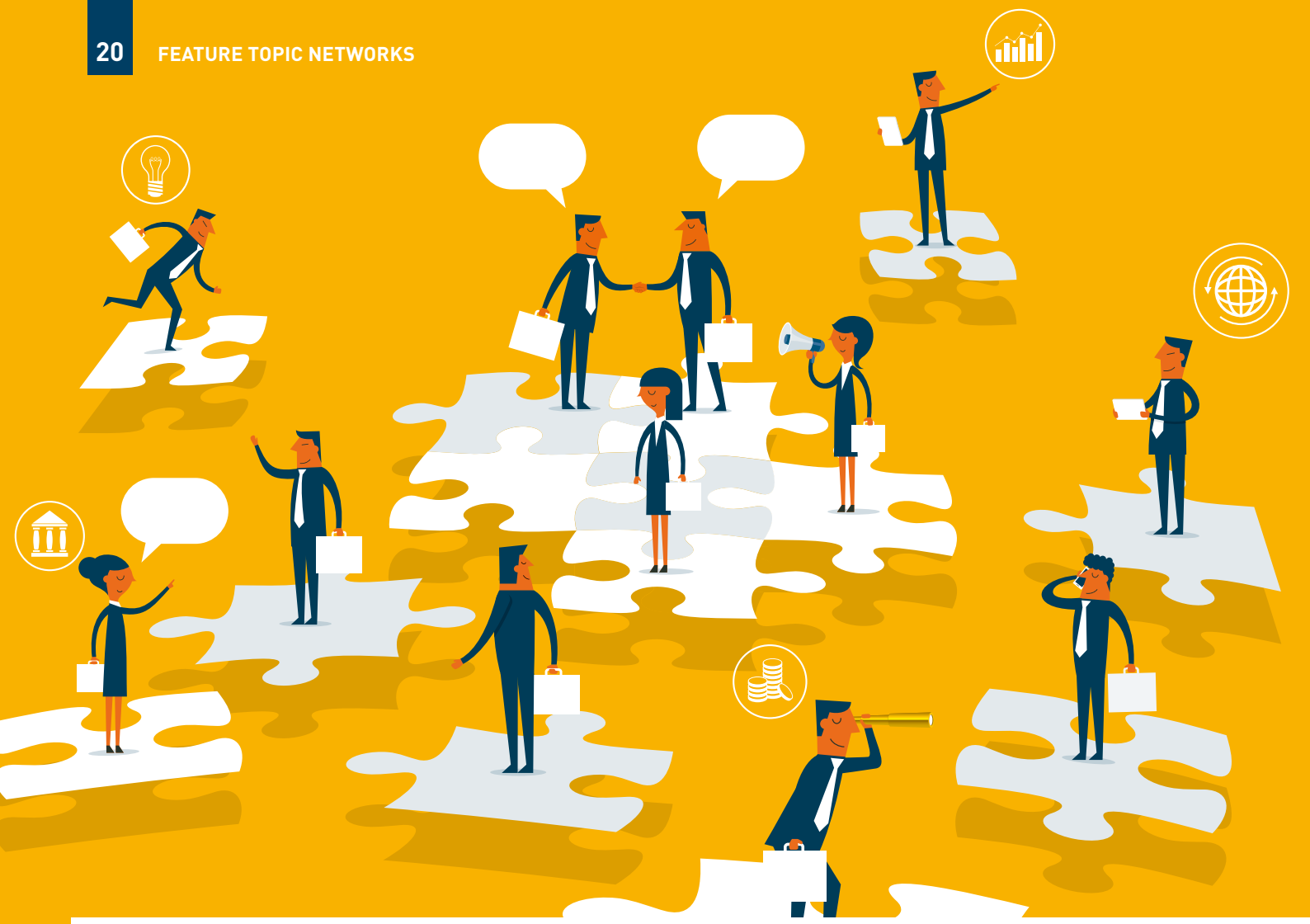

"Relationships have to be looked after, and it takes communication to ensure the network won't break down"

An interview with Frank Graage, director of the Steinbeis Research Center Technology Management North East

If networks are to be a success, what's the best way to manage them? What benefits does this bring about – and what risks? TRANSFER posed these and other questions to the Steinbeis entrepreneur Frank Graage, who knows networks from his own first-hand experience.

Hello, Mr. Graage. One of the main areas of work at your Steinbeis Enterprise is EU research, plus innovation projects, especially when it comes to management. An essential element of this is how to form and run networks. Why are networks so important to European collaboration?

The companies and research institutions in our region often lack professional partners with specific expertise. This can be found in other European regions. So one of the priorities is granting access to knowledge and technology, and allowing people to get to know potential clients and partner regions. Networks keep contacts going over time, and connections can be kept in place even after a project has finished. This strengthens international visibility and makes it easier to kick off subsequent projects, since it's no longer necessary to start from scratch and work out which partners to work with or what different development goals people are working to. It also helps minimize barriers, whether they relate to languages, different cultures, or structural factors.

As a member of the Enterprise Europe Network, we're in a good position to match up people who are new to European collaboration. We can pre-filter contacts and contact requests from other countries. This is particularly helpful for really small SMEs, which don't have the resources to look after their contacts in such networks on top of their everyday activities.

Networks have been a fixed part of everyday business for a long time. But with the current trends of globalization, the increasingly rapid rate of technological advance, and the breakneck speed of information exchange, networks have to be more and more flexible. What impact does this have on companies? And what role does professional network management have to play in this?

Network management comes in various shapes and sizes. It depends a lot on the aims of a network and the structure of its members. With more technology-oriented innovation groups, we see network management as a way to recognize different opportunities, and it should faci-

litate communication with the different parties in the network so they can quickly react together to new developments.

The role of network managers is thus not just to look after the administrative side of things but also – or mainly – to pinpoint trends in a sector of industry or between different sectors of industry. Their specialist reference points are then the experts in the network.

With networks there are not just benefits, they also entail a whole host of expenditures and risks. That's nothing new. But what do you see as the main risks posed to individual companies?

Compared to the benefits that can be enjoyed from a network, there are far fewer risks. Even if you do perceive certain risks, another thing you can say is that networks actually help to minimize risk because collaborative approaches allow lots of different parties to become involved. People can spot potential errors together. They can also bear the risks on many shoulders. The way I see it, the challenge with such networks is to ensure that they don't lose their focus, by which I mean the jointly defined purpose of the network. Each company has to occupy an unmistakable position and make its interests clear. There are lots of reasons to network, like an interest in gaining access to know-how, or new applications, or partners for development. Or a firm may want to enhance its reputation. One thing that's important is that people keep an open mind about the aims of a network and that they adjust to developments. As with any kind of relationship, these relationships have to be looked after, and it takes communication to ensure the network won't break down.

Your Steinbeis Enterprise doesn't just help other companies to set up and manage networks, it's also an active member of these networks itself. If I could play devil's advocate, do you ever get any work done?

If you're a service provider, networking is part of the job. There are research and development partners who are happy to help provide the service because we take care of coordinating the specialist tasks carried out by all the different people and take the load off their shoulders when it comes to organizing things and administrative tasks. We have a saying for this: You do the research, we take care of the rest. For us, networking is a bit like taking care of collaboration, defining topics, finding funding, supporting others with finding partners, moderation, and organizing groups.

We are and always have been an advocate of the Steinbeis Network. It's really easy to kick off collaboration with Steinbeis colleagues. For example, I successfully applied for a major consulting project in Tunisia with three Steinbeis Enterprises and we pulled it on board and implemented it. We still exchange notes about new developments and possible shared projects. Coordinating this has always been fun for me, although I'm aware that deriving satisfaction from a coordination function also depends a lot on your personality. At the moment I'm closely involved in a project with the new Steinbeis Consulting Center "Ressource Management." We're setting up a ZIM network for an integrated, multi-technology application for bioeconomics and renewable energy. Linking up the different value chains will probably make the individual technologies easier to market. We can't say more about it at the moment, but the network will help companies access new application areas.

The pace of economic innovation has accelerated significantly, resulting in hyper-competition. What can company networks do to support their members with the challenges they face – at home and abroad?

One thing we're noticing is that it's becoming more and more important to work across all sectors of industry. The opportunities presented by such technology systems, which is what some people call this, are something that can be exploited by introducing new business models. Networks can play an important role in promoting interdisciplinary collaboration, and they help develop new business models for working together. I believe this is where network management has a broader role to fulfill. The conventional setup with transfer partners from business and research is typically industry-specific. This makes it necessary to cast industry sights in different directions and look at other key players. To solve this, depending on the type of technology this has to be approached across different regions or internationally.

Take for example the technology needed to achieve environmental sustainability – in global terms we're way ahead when it comes to experience. This is where networks and network managers have a role to play in ensuring international transfer takes place and the new technology systems function. In global terms, the conditions in Germany are not extreme either in terms of the environment or population growth, so the areas applications can be used in and the potential offered by knowledge and technology are relatively limited. In other countries the climate and socio-economic conditions offer much greater market potential, and this needs tracking.

Image: © istockphoto.com/sorbetto

Frank Graage is director of Technology Management North East, a Steinbeis Research Center. His Steinbeis Enterprise offers its customers support with the management of EU research and innovation projects in the fields of health care, biotechnology, environmental technology and renewable energy, consulting and coaching on internationalization and innovation management, seminars and training courses on applying for EU funding, the management and application of research findings, and gaining access to partners through the Enterprise Europe Network and the Baltic Sea network ScanBalt.

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If You Don't Hone Your Networks, You're Not Worth Contacting

Steinbeis experts reveal how to network

Successful networking isn't ego-marketing, as Carsten Rasner, director of the Steinbeis School of Management and Innovation (SMI, Steinbeis University Berlin), knows. This message hasn't been understood by everyone – as an example involving Donald Trump shows.

Donald Trump believes in networks. In 2009, when he was selling his name to Ideal Health as part of a licensing agreement, he said, "I'm a big fan of network marketing." The US pharmaceutical company promptly renamed itself the Trump NetworkTM and registered the brand. After all, the real estate guru from New York, jury member of The Apprentice on TV and a highly paid public speaker, added a hallmark of success. And within no time, according to the Washington Post, the pharmaceutical sales reps working for Idea Health were seeing dollar signs. The size of the independent sales force shot up from 5,000 to 20,000.

Not everyone wants to be the US president, which may also has to do with Trump's decades of networking, but no one will deny that actively honing contacts is part of everyday business. Christiane Wolff, chief corporate communications officer at the communication group Serviceplan, also believes in the power of networks. Wolff is a Steinbeis Media MBA alumna who already started forging her own network in 2001. "I'm not entirely sure if I would go out and set up a purely female network again," admits the PR expert, because it's not right to just move around in the safe confines of women's circles. "For some topics, women's networks are still important, but societal change only happens if men are involved, too. I can no longer make distinctions between professional and private topics when I'm contacting people," says the native of Munich, pointing to private invitations as one of her most important sources of contacts.

Carsten Rasner, director of the Steinbeis School of Management and Innovation (SMI), also strongly believes that contacts are more likely to come to you than you having to go out to them. "You have to offer people something interesting; just making yourself look good isn't enough." By this he is also referring to written applications and job references, which people hardly believe anymore anyway: "I'm ten times more likely to believe someone I know personally than if I just see they have awesome contacts and references in digital networks." Rasner says networking has been "fiendishly useful" since setting up the Steinbeis school in 1998. A number of interest groups, such as the ProSieben TV group, other universities, the Bocconi University, or other academics and entrepreneurs who lecture at the Steinbeis SMI, have complemented and helped each other. "There are very few areas where networking works as well as it does in an education environment, where you really get to know each other well," he emphasizes. "You're more open with each other; it's different in work situations or at events after work." His recommendation is therefore simple: Studying creates the best networks!

This is a belief shared by Professor Dr. Benedikt von Walter, who also lectures at the Steinbeis-SMI. Although he's a professor for the digital economy and management, he underscores the advantages of "old school" networking, especially in the classroom. "The Steinbeis students are such unbelievably interesting people, so for me – just like with any good network – it's also about give and take." Whenever possible he tries to make his sessions like a workshop, so that the course participants can input with their own specialist knowledge and start to form lasting relationships. But he does also point to the theory postulated by the American sociologist Mark Granovetter: "His research on the strengths of weak relationships is a classic. As early as 1971, he was describing logic that can still be observed today in digital business net-

More successful networking – five tips from Christiane Wolff, Chief Corporate Communications Officer at Serviceplan

1. Why am I actually doing this? To come into contact with the right people, first of all you need to work out what exactly you want to achieve.
2. How much time (and money) am I willing to invest in building my network? Before you walk into the local golf club or marketing association and stage an international event, scrutinize the finances.
3. Do your homework. Ask your peers and people you look up to which platforms they prefer to use.
4. Test different events – and be prepared to abandon them if they're not relevant.
5. Finally, perhaps not an obvious one: Take visiting cards, turn up early and eat beforehand. Holding only a glass makes conversation easier and it's better than talking with your mouth full!

working." Aside from strong ties, there are also passing or weak ties, which may not be so close, but they perform an important bridging function, especially when it comes to lining up new contacts or obtaining information.

Dr. Katja Nettesheim, who is an avid collector of business contacts and also works as a Steinbeis professor for Digital Media Management, has developed her own methods for working with social networks. "I hardly ever contact people I haven't already had a point of contact with: I also feel uncomfortable if I get a contact request from someone I don't know, not without good reason." Also, her most valuable contacts are never "network powerhouses," who apparently go systematically from room to room at events and get every single visiting card, even introducing themselves to people "for the hell of it," whether the other person thinks it's appropriate or not. "The links or multipliers in my network are all the sorts of people I would never have thought would be like that," she says with surprise. Nettesheim says these people are gifted networkers, but they do so for genuine reasons and are actually interested in people.

Maybe Donald Trump and his business partners can take a leaf out of their book. The supposed mentor once held up a promise to the independent salesmen of the former company Ideal Health, saying, "The Trump Network offers people the opportunity to achieve their American dream." But then the Trump Network deliberately allowed the license for his name to lapse after two years and shortly afterwards the company was sold to Bioceutica. Their relationship selling had run out of steam and the three owners and other employees of the Trump Network filed for bankruptcy. Some people still kept on going, claiming the downfall of the Trump Network was because of the financial crisis, but most of the people who were affected complained that Trump had not actively intervened to help "his" network. They also said he did nothing when it became clear that the unilateral approach adopted in relationship marketing was a one-way street. Maybe one contributing factor to all the misery was that the people who were contacted failed to see a fit between Trump and "his" offering: multivitamin products and urine tests.

Image (left): Steinbeis SMI Networking: Long-lasting contacts develop easily in learning situations.
Image (right): Teaching sessions similar to workshops are a good way to get to know fellow students and their strengths

Carsten Rasner

Gabriele Spiller

Carsten Rasner is director of the Steinbeis School of Management and Innovation (SMI) at Steinbeis University Berlin. The Steinbeis-SMI offers a variety of executive bachelor's, master's, and MBA programs for business management students, lower-level managers, senior managers, specialists and entrepreneurs, laying emphasis on sound theory, methods competence and future developments.

Gabriele Spiller completed a Media MBA at Steinbeis-SMI and currently works as an arts editor and freelance journalist. Spiller has a previous degree in communications and having worked in media marketing and business development for around 20 years she is intimately familiar with the world of business. She also studied to become an arts publisher in Zurich, qualifying with an M.A. in Art Education. Spiller regularly writes for international daily publications and specialist formats, focusing on the arts, travel and general psychology.

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"The variety of different outlooks and expertise within the team allows so much energy and momentum to unfurl"

An interview with Beate Wittkopp, director of the Steinbeis Transfer Center TransferWorks BW

With so many networks now available, it can often be a dilemma for companies working out which ones are right for them. Yet networking is crucial for any company to succeed, as Steinbeis expert Beate Wittkopp explains.

Hello, Ms. Wittkopp. Your Steinbeis Enterprise goes by a motto: "Boosting competitiveness by bundling forces." Why do you find it so important to "bundle" for your projects?

Our motto reflects my personal conviction that the only way to be fast enough to take on the competition is to use our resources efficiently. Given the way networks work through the internet, this is now even more important and the way I see it, it's a good fit with the new culture of open collaboration across different disciplines and organizations. Ultimately my notion revolves around collaboration – aimed precisely at this goal of bundling the right viewpoints and expertise and leveraging synergies. If I'm running a firm and I want to be perceived properly in a world of global competition and position myself successfully, I need to "join forces" in the true sense of the term. If you just take a look at the younger generation, the people now embarking upon a career, you'll notice how important co-working is to them. It'll be interesting to see how this work culture develops over the years.

Your Steinbeis Enterprise, TransferWorks BW, stands for specific implementation, for results with and through transfer – transfer of what? And what role do networks play in successful transfer or in your success with TransferWorks BW?

Technology networking, and even cultural networking, are a fundamental part of collaboration with partners, so they've also become part of global competition. This has changed the way transfer happens and increasingly it's shifted transfer into value-adding networks. To keep developing, discourse is needed, which is why it's always been important for companies to look beyond the boundaries of their own company or current client projects. These networks are also the place they'll find the right allies for the sweeping change that's now affecting all sectors of industry, and with digital solutions this change is picking up even more momentum.

My particular interest lies in the overlaps between different networks. These are the places the specialties, different competences, and cultures dovetail. It's like a kind of short-circuiting – continuously triggering new potential. This is how a major number of disruptive innovations happen. Of course sector-specific know-how still matters, but it's the variety of different outlooks and expertise within the team that allows so much energy and momentum to unfurl. This insight is completely changing organizations and processes at the moment and it's also bringing about radical changes in the work environment! As part of the business initiative called Baden-Wuerttemberg: Connected (bwcon), we have a special interest group called Future Work which looks closely at these new working models and career models. The networks within the Steinbeis Network provide a starting point by offering access to our 6,000 experts, offering a huge amount of diversity in terms of specialist knowledge and cultural know-how, as well as strategies and different kinds of people. This puts us in a good position to cope with change. I think we Steinbeisers are still not really making proper use of the actual transformation potential offered by our network. We could make even more use of the opportunities to collaborate in our everyday projects, and from what I've experienced until now that creates an extremely positive impression among clients. What I'm referring to is things like the projects run by the Steinbeis headquarters, the Enterprise Competence Check (ECC), or the Just Test(bed) IT initiative being spearheaded by the Ferdinand Steinbeis Institute. These are new ways to work with new industry players, within new consortia, for new target groups. I'm currently working with the Steinbeis-Europa-Zentrum and Dr. Petra Püchner on a new way to use bundled network expertise in transfer projects. The aim of the initiative, which is called "The Other Angle on Innovating – Women in Technology Transfer" – is not just to reach out to women within the organization in order to network skills, but also to share the diversity of expertise and convey this to customers outside the organization. We're building on a common business platform for a different way of innovating.

Your goal when you set up your Steinbeis Enterprise was to offer your clients a network within Baden-Wuerttemberg. Why did you decide to make it specifically within this region?

I see a lot of opportunity in Baden-Wuerttemberg, with its economic diversification and the diversity of networks that have developed through this. I came here for career reasons straight after university from the north of Germany, mainly because it was here that these new approaches to resource management first started to emerge. The projects I was involved in have taken me from urban development and regional development into communal and regional economic development, spanning all kinds of initiatives on securing competitiveness across the state. At each stage I expanded my contacts and networks and developed my own business profile. And this allowed me to get to know the state and appreciate it for what it is, and I developed my own view of Baden-Wuerttemberg. This was ultimately what fueled my idea of setting up my TransferWorks BW, so I could concentrate on the ecosystems of new technologies and new work environments. The business revolves around my own networking expertise, stemming from a large number of multidisciplinary projects and my personal contacts with the trade associations, local government, and groups of specialists, but also within companies. This allows me to react extremely specifically to the needs of the client. To do this I start on the doorstep – within the Steinbeis Network. Since setting up the company I've been looking for chances to collaborate specifically with other Steinbeis Enterprises and I have indeed had some really good experience in projects through this. One platform that's really important in Baden-Wuerttemberg for the key areas I work in is a state initiative revolving around women in what the Germans call "MINT" professions (math, IT, science, and engineering). The initiative is being spearheaded by the Ministry for Economic Affairs and the network now spans 50 partner organizations in all areas of business. It revolves around a strategic action plan for tapping into new potential to find specialists in MINT professions. The current focus lies in digital transformation. If you look at the other states of Germany, this program has already become a role model for them.

What sort of problems do your customers ask you about and how does networking help you find a solution?

Some of my projects actually stem from the fact that there's such a diversity of networks. For a company, it can often be a dilemma working out which ones are the right networks. They're under tremendous pressure managing the everyday business, so they lack the resources to branch off into different areas. This is where I can offer the right support and work as a bridge-builder to help the individual companies. Most queries are about building platforms and appealing to a target group. Usually this involves working out who's the right expert for a specific topic, often across different sectors of industry and organizations, and then bringing them on board and getting them to work in a team so they can work together successfully. I focus on the matching process – the balancing act between the topic and the people. There's so much potential out there waiting to be discovered, but even before the project gets underway you need a lot of energy and enough leeway to work out the right constellation. One thing that appeals to me personally, time and again, is being able to work across different disciplines and designing "micro-networks" based on different personalities for each specific project.

Personal networks, social networks, business networks – everything's networked. Where do you see the opportunities and hazards in this development?

Networking through the internet unleashes major potential in all sorts of ways. But offline contacts will still deserve the right time and space – emotion only comes into the equation when you can look someone in the eye, not when you see an emoji. Yes, technology can be a driver and the work environment can be the interface, but all aspects of our everyday work are now affected by this. I surf all over the world! We connect at the drop of a hat, for business purposes or privately. But if you're not involved in a core field of IT these days, you need digital experts. That's because networking through the internet is not just about connecting, it's also about participation. It has a fundamental impact on how we communicate, through a variety of channels. Digital transformation is taking us into a real culture change. But the discussion going on in society is still catching up with what's actually happening. I'm worried about this for a number of reasons, because we can see a clear trend here with gaps emerging in society. Our companies are opening up more and more and banking on collaboration, but there are some groups in society that are cutting themselves off and harking back to the old days. We can't close these gaps just by networking, but we can eliminate some of the causes and ensure people have access to education and equal opportunities. The opportunity lies in how knowledge and information are handed on and shared. With the right foundation, we'll be in a position as a society to actively shape change.

Image: © iStockphoto.de/FredFroese

Beate Wittkopp is director of the Steinbeis Transfer Center TransferWorks BW. The services offered by the Steinbeis Enterprise span a variety of transfer methods in the field of digital transformation, equal opportunity strategies against a backdrop of cultural change within companies and society, talent scouting in math, IT, science, and engineering, and initiatives with a focus on technology-driven networks. Wittkopp plays an active role in the Steinbeis Network as a member of the ECC group and the Just Test(bed) IT initiative. She is a member of the LVI (the association of regional industry in Baden-Wuerttemberg) and LR BW (the Baden-Wuerttemberg Aerospace Forum); she represents the LVI on a state initiative called "Women in MINT Professions"; and she is an advisory board member of the lightweight construction association Leichtbau BW. Wittkopp works with a number of strategic planning groups at the Baden-Wuerttemberg Ministry for the Economy, Employment, and Housing with a focus on digital transformation and equal opportunities. As a board member of the Future Work special interest group, which comes under the umbrella of the Baden-Wuerttemberg: Connected (bwcon) initiative (a promoter of high-tech in the state), Wittkopp is closely involved in the development of agile working models and career models.

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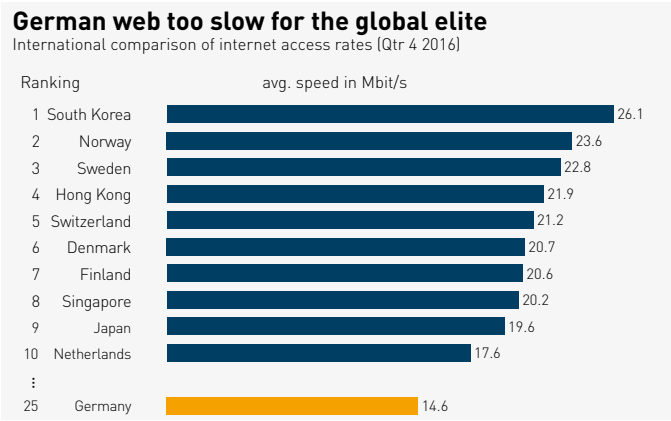

SMEs are Slipping Through the Net!

Networking without a network

How well is Germany faring when it comes to internet broadband access, especially for small and medium-sized enterprises? Answer: It's middling! We're standing on the sidelines when they crown the broadband champions and the gap is widening, simply because the cable network is not being expanded quickly enough. Why is it taking Germany so long to expand its broadband network, and what impact is this having on the economy and the huge number of SMEs in the country – the German Mittelstand? Stefan Odenbach, a project manager at the Steinbeis Transfer Center Technology – Organization – Human Resources, provides the answers.

According to recent studies conducted by BITKOM and statistics websites like STATISTA or the website of the Federal Ministry of Transport and Digital Infrastructure (BMVI), there's one thing everyone agrees on: Germany has a lot of catching up to do compared to the international competition, even versus non-EU countries. The main reason for this is the technology being used. Rather than investing in the much more future-ready technology of fiber-optic networks, Germany is channeling more time and energy into expanding VDSL technology. This is for cost reasons and because the starting point is still the existing infrastructure.

As of 2016, under ten percent of German firms with fewer than 500 employees had internet access of more than 50 Mbit/s. This is like a millstone around the neck of enterprises investing more time in digital transformation. An example: An innovative technology firm based in the Black Forest or a rural area somewhere in the hills of the Swabian Alb (well away from cities) would like to market its products or data services internationally. Not a problem in a world of global digital technology, or so you'd think. But even attempts to reach out to potential partners or carry out video/telephone conferencing via the internet (with clients or suppliers in the United States, India, China, or France) is extremely difficult if you only have 3 to 6 Mbit/s. It's also inefficient with all the interruptions or waiting for data to load. In fact it's actually embarrassing for a company that wants to portray itself as a technology leader.

Often, technology leaders have fewer than 50 employees, and they're not in a position to uproot and ask staff to travel an extra 50 or even 100 kilometers to work every day. Relocating a company may sound like the logical thing to do in such circumstances – so it can enjoy the full benefits of modern, digital business – but in financial and logistical terms, it's a nightmare. If doing business on the telephone is already a stumbling block, then migrating IT services or ERP software to the cloud – or setting up connections for salesmen and service operators to work from home – is almost inconceivable. In summary then: The limited availability of broadband internet is seriously hampering innovation!

A key technology at the moment is the new broadband cellphone standard, which is designed specially for digital solutions and is rapidly gaining in importance. Most of the cellphone providers are currently upgrading their networks to 4G. The new technology makes it possible to surf or download data via smartphone or tablet with speeds of between 100 and 300 megabits per second. With 5G technology, data speeds will rise to between 1 and 10 gigabits per second (Gbit/s). Aside from significantly improving data transfer (tenfold), 5G offers a solid foundation for new applications due to the extremely low lag times of under one millisecond. This makes it possible to connect a large number of end devices to each other. Quick reaction times could be a life-safer for some solutions to enter mass production, especially when it comes to driverless vehicles.

Overall, this brings us back to a familiar problem with the chicken and the egg: Is the German Mittelstand so under-digitalized because the internet is like the slow lane on a data highway, or are digital business models simply inconceivable under such technical conditions – so people keep traveling on the analog highway? The fact of the matter is, this situation must not become permanent. There are suitable alternatives to the traditional cable-based networks. It's a silver-bullet answer: a 5G cellphone network!

Image: Source www.statista.com

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 helps companies and organizations to: raise productivity, reduce costs, and analyze, evaluate, and turn around businesses; manage and monitor the finances of partnerships, investments, and company divestments; analyze, evaluate, and run training instruments; analyze management accounting instruments and process cost controls in companies and organizations.

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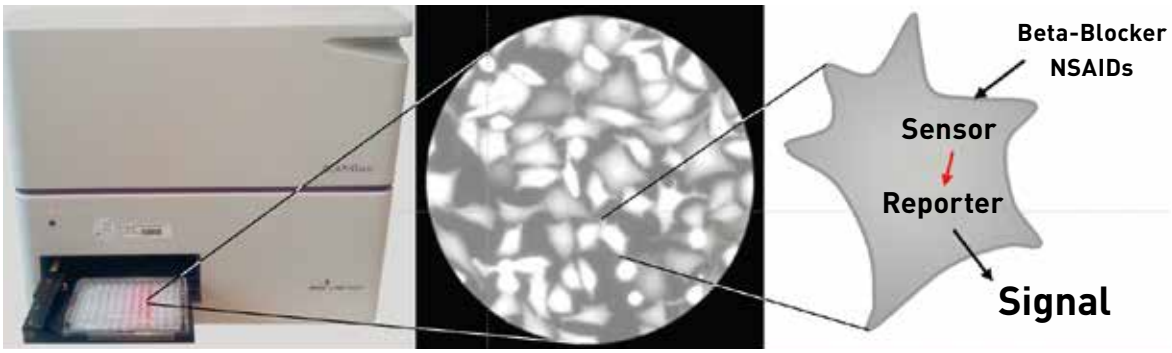

Turning the Spotlight on Surface Water

Researchers quantify the ecotoxicological impact of pharmaceuticals in real time

Demographic change in industrial nations is fueling stronger demand for pharmaceuticals. We are already seeing major volumes of substances with pharmacological effects entering the waste water system and sewage treatment plants. These substances are rarely removed effectively, and as a result organisms in surface water are increasingly exposed to a harmful cocktail of drugs. The Steinbeis Innovation Center for Cell Culture Technology has been working with the Steinbeis Transfer Center for Ecotoxicology and Ecophysiology as part of an interdisciplinary consortium. New kinds of biosensors have been developed, now making it possible to detect pharmaceuticals in water more effectively and determine their impact. The sensors allow scientists to assess the effects of pharmaceuticals in the drug classes of beta-blockers and non-steroidal anti-inflammatory drugs (NSAIDs) in real time, providing highly specific and highly sensitive measurements.

Medicines do not just have nasty side effects on people, they can also harm fish. Even concentrations of several µg per liter of water are enough for a drug like the painkiller Diclofenac to damage health. Ecotoxicologists and environmental chemists are constantly trying to work out how to quantify the increasingly diverse occurrence of drugs in water and estimate their negative impact on the environment.

As part of a network project call EffPharm, biologists, biochemists, and analytical chemists at a variety of institutions have been tackling this issue together. The project is being sponsored by the Federal Environmental Agency and coordinated by the Tübingen-based ecotoxicology expert Prof. Dr. Rita Triebskorn (Steinbeis Transfer Center for Ecotoxicology and Ecophysiology; the Institute of Evolution and Ecology (EvE) at Tübingen University). Dr. Manfred Frey, director of the Steinbeis Innovation Center for Cell Culture Technology at the University of Mannheim, is spearheading a working group that has for the first time succeeded in developing cell-based biosensors for two of the identified drug classes. These sensors make it possible to identify the primary binding of substances with target molecules (receptors) in supposedly clean waste water in real time. The project also received the support of Dr. Marco Scheurer from the Water Technology Center in Karlsruhe. Scheurer demonstrated that the new kind of biosensors detect a high percentage of the compounds. Previously, identifying these compounds using chemical analysis was expensive and time-consuming. The testing methods also cover the effects of unknown compounds and metabolites with biological effects that cannot be detected by chemical analysis. This is extremely important given the ecological significance of pollution. The University of Tübingen team working under Professor Rita Triebskorn and Professor Heinz Köhler, from the working group looking at the physiological ecology of animals, were able to prove how sensitive the biosensors are. The sensors can even detect the extremely low concentrations of drugs at which initial damage can be caused to water organisms.

The recently developed biosensors offer a variety of benefits compared to previous methods. Unlike conventional so-called reporter gene assays, the sensors detect the primary impact of chemicals on cells in real time, thus avoiding misleading information possible by interfering with the transcription/translation machinery which requires up to 48 hours until a signal output can be measured. Within seconds of coming into contact with drugs in a sample, the biosensor cell lines emit a florescent signal. The new testing systems are extremely sensitive in the nanomolar range down to one millionth of a part per thousand, making them comparable with chemical analysis. Because they focus on effect mechanisms, they can also show the impact of future beta-blockers and NSAIDs, even if their chemical composition is not yet known. As a result, the researchers expect the new technique to be applied to future monitoring programs aimed at assessing water quality and the cleansing effectiveness of sewage treatment plants. The methods should fill an important information gap regarding the occurrence of drugs in water and their impact on the health of organisms found in water.

Image: The principle of the new biosensor: The receptor binding of drugs immediately generates a fluorescent signal in exposed cells; this can be quantified using fluorescent photometry. Images: Manfred Frey

The study can be viewed by going to http://dx.doi.org/10.1016/j.watres.2017.02.036.

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"Digitalization is the foundation upon which the innovative power of the future will be built"

An interview with Dr. Nicole Hoffmeister-Kraut, Baden-Wuerttemberg Minister of Economic Affairs, Labor, and Housing

Big data, digital solutions, and networking are all terms that reflect a trend toward what many Germans now call Industry 4.0. What they don't express is how comprehensive and radical this structural change will be for the economy, not to mention society in general. TRANSFER magazine spoke to Dr. Nicole Hoffmeister-Kraut, the Baden-Wuerttemberg Minister of Economic Affairs, Labor, and Housing, about the opportunities and threats of Industry 4.0.

Hello, Dr. Hoffmeister-Kraut. You've highlighted Industry 4.0 as a key issue for economic policy in the years to come. Where do you think we are on the map at the moment? Thinking in particular about the Mittelstand, the 500,000 small and medium-sized companies in Baden-Wuerttemberg, how are they faring with digital transformation and networking? What do you see as the opportunities for such firms?

Indeed, I do see the topic of digital transformation as a key area of economic policy. Lots of firms in Baden-Wuerttemberg are already making good progress with digital transformation and networking. Our economy is highly diverse and the same is true for the level of digital transformation: These companies already include a large number of digitalization pioneers, but there are also digital newcomers, plus businesses that are somewhere in the middle. The opportunities are huge, for example for new products and services, for new kinds of value chains, for efficient production and innovation processes, but also for new business fields and business models. This applies to all sectors of industry and the entire state. I see potential for industry and the manual trades, retailing, the hotel and catering sector, and the service industry. Digital solutions can also open up new opportunities in terms of the work practices, for example with better ways to achieve a work-life balance by adopting digital and flexible employment models.

Manufacturing is a pioneer of the structural change toward a digital and networked economy. Other sectors of industry such as the manual trades or retailing are only just putting the necessary processes in place. What does the state do to support these enterprises? And what sort of personal commitment do you think will also be necessary from these companies?

To support companies in the state with the digital transformation process across all sectors of industry, I've launched the Industry 4.0 Initiative. In collaboration with the initiative partners, we've agreed ten areas of action which we intend to work on together over the coming years. These include the topics of fostering innovation, supporting startups, IT security, training and continual professional development, and Work 4.0. We want to support companies with digital transformation in ways that match the target group, which means we start with the initial status and degree of digitalization.

For the digital newcomers among the small and medium-sized companies, we have our digital pilots offering initial pointers on digital transformation and providing them with help in developing individual solutions. Our offering also ranges from materials providing information to digitalization workshops and individual kick-off consultations.

Our digitalization bonus is aimed at small and medium-sized enterprises that are already one step further and have the kick-off phase of the digital transformation process behind them. This digitalization bonus is our way of providing help with the implementation of actual digitalization projects within the company, plus any related training for employees.

We have digital hubs to spread digitalization within the economy and promote ports of call for digital transformation in the different regions of Baden-Wuerttemberg.

By doing this we're making collaboration easier between established companies and startups at the grass roots level, and we're also offering a port of call for questions regarding digitalization.

The companies are asked to become actively involved in digital transformation themselves, to exploit the opportunities it brings, and to master the challenges it involves. This is because it's the foundation upon which the innovative power of the future will be built. Collaboration and a culture of startups are playing an increasingly important role in this.

The proponents of digital change see it as an opportunity to compensate for the skills shortfall, whereas the critics are concerned that low-paid workers or workers with qualifications that are not based on future needs will have to fear for their jobs. What changes will there be in future requirements regarding professional qualifications?

Without question, digitalization will change the world of work radically and with that, the demands placed on employees. For Industry 4.0 to work, sufficient numbers of specialists are needed with the required digital know-how. To achieve this, we have to prepare all groups of employees for the future world of work – including the semi-skilled and unskilled. For many employees, in the future they will need a strong ability to act independently, interpersonal skills, self-organization, and a knowledge of information and communication technology. The task of training and employee development today is to prepare for the work environment of the future.

The Learning Factories 4.0, which are backed by the state, can prepare apprentices – but also people on training courses – for the digital production of the future. The employee development portfolio offered in Baden-Wuerttemberg also includes several projects in the field of digital transformation, as well as continuing professional development. For example, the starting gun has already been fired for projects aimed at shaping company change processes through digitalization, as well as projects aimed at digitalizing master craftsmen training in the manual trades. There's a vocational training contest at the moment for model project ideas; it looks at ways to introduce and implement digital curricula, how to design teaching and learning processes, and how to intensify collaboration between firms offering apprenticeships and vocational schools. By doing this, we're laying a foundation for specific project development.

Industry 4.0 requires an understanding of and a broad public acceptance for the technologies that drive it and the business models that shape it. On both counts, people outside "the scene" seem to have a sometimes extremely ambivalent understanding and often they're quite negative. How important was your initiative in this regard for running the Baden-Wuerttemberg 2017 Week of Industry in June of this year?

The Baden-Wuerttemberg Week of Industry stems from industry dialog. Partners from industry and the trade unions agreed a common mission statement and guidelines. Our stated objective is that Baden-Wuerttemberg should also remain a strong industrial location in the future. The industrial enterprises in our state – mostly small and medium-sized firms, and often family-run businesses – make a significant contribution to the affluence of the state and often they're also involved in social activities and take social responsibility. The action week allowed us to show that industry is diverse and has an impact on almost all areas of life. We wanted to raise public acceptance and visibility. The large number of events that were registered confirmed that there's strong interest among companies, research institutions, museums, trade associations, and the chambers of commerce, although this is also the case with organizations such as vocational schools. As a result, the activities were extremely multifaceted, across the entire state. There was a strong turnout for the topics of digitalization, the future, training and Industry 4.0. There were factory tours to allow people to take a peek behind the scenes. I'm certain that the Industry Week was an excellent way to show that digital transformation does not just pose a challenge, but also offers lots of opportunities for Baden-Wuerttemberg.

Change spanning different industries and technologies, as with the shift toward Industry 4.0, takes a climate which allows new ideas to be thought of, in existing and new companies, with the aim of engendering successful products and services – from (hidden) champions of industry and startups, supporting and driving change with redesigned products and services. How do you see Baden-Wuerttemberg in this regard?

In an age of digital technology there are often more young and adaptable companies, perhaps more so than previously, and they act as a catalyst of market change and innovation. This is why our many global market leaders are increasingly involved in the startup area. A fierce competition flared up some time ago in the battle for the best startups, at home and abroad. Baden-Wuerttemberg has to take on this competition even more aggressively. We want to pool our strengths more effectively as a startup region and promote this. When it comes to the development and funding of scalable business models, internationally the goal is to be on the highest echelon. And we're not starting from zero. The number of startups may be in decline, throughout Germany and on a regional state level, but in Baden-Wuerttemberg there's a clear trend toward new firms with innovative business concepts and the potential to grow – so this is a pleasing trend toward genuine startups. As a state, we also already have an established portfolio of proven funding programs and competition formats, for example the innovation and consultation vouchers. Recently these were added to by things like the new Hightech Digital innovation voucher. But for me it's also about other new activities that will make Baden-Wuerttemberg even more appealing and dynamic as a startup region. That's what the focus will be on at our startup summit on July 14 and the trade show in Stuttgart.

Image: Wilhelm Mierendorf

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Public Private Partnership in Asian Vocational Education

Steinbeis experts provide advice as part of GIZ project

For the past three years, the German Society for International Cooperation (GIZ) has been involved in a policy dialog project revolving around vocational training in Asia. The project is called the "Regional cooperation programme to improve the training of TVET personnel in ASEAN countries." Abbreviated to RECOTVET, it involves ten countries in the ASEAN region. The Steinbeis Transfer Center InnoVET has been providing advice on a subproject.

The subproject required 17 members of the Regional Cooperation Platform (RCP, an alliance of university and training establishments in ASEAN countries) to design concepts for public private partnership (PPP) in vocational training. Wherever possible, these are being introduced as pilot projects. A multinational research and development project has also been launched to identify the structures and opportunities for such an initiative.

The Steinbeis experts took the concept and the implementation ideas as the starting point and compared it to the German dual education system, since the PPP method should also place emphasis on practical aspects of vocational training. The task proved to be extremely long-winded, because drafting the model involved discussing ideas with 17 partners. The output of the project was a report that highlighted how PPP methods are being approached in the different countries involved in the project, which models could provide an ideal foundation for implementation, and how difficult it is to motivate companies to play an active role in such initiatives. It has not yet been possible to implement specific actions. This will, however, be necessary in order to make a practical and tangible contribution to quality improvements in vocational training.

The current plan is to start introducing the new methods in the fall of 2017 in Malaysia, Indonesia, Thailand, and China. This should provide flagship projects for the region.

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Microfinancing and Crowdfunding for Business Founders

Steinbeis experts provide consulting services for state bank MikroCrowd program

Since May, startup companies in Baden-Wuerttemberg may be eligible for support under a new funding program called MikroCrowd, which is offered through the state bank (L-Bank). MikroCrowd is a combination of microfinancing and crowdfunding. The program is aimed at small startups which need up to 10,000 euros of funding. They can receive low-interest, bullet loans. Interest payments are monthly. When startups apply for the loan they receive professional consultation from the L-Bank and the startup advisors of the ifex consulting network. This includes consultants from Business Startup, the Steinbeis Consulting Center that provides support to people thinking of starting a business under the EXI Startup Bonus program.

The funds provided through the MikroCrowd initiative can be used to cover expenditures incurred while setting up the company or ongoing costs. The program offers two options. Option 1, the so-called MikroCrowd, offers funding at the beginning via a platform called Startnext. Startups register their project on the platform at the same time as submitting an application on the partner page of L-Bank. Once the funding they have attracted hits a threshold of 50% of overall capital requirements and they pass checks carried out by L-Bank, the rest of their funding is provided as a loan. Depending on the amount of funding and the number of crowdfunding contributors, there is also an expenses allowance. Option 2 is microfinancing. Under this option at least 20% of total capital requirements must be provided through personal capital. L-Bank then provides the rest of the funding as a loan.

The financing offered under the program offers a variety of benefits. Funding donors also make a commitment to buy the product or service. This makes it easier to estimate cash flows and actual market interest. The funding threshold provides a degree of certainty – for the business founder and the bank. The maximum level of funding is 50%. But, more than anything, crowdfunding platforms offer access to a wide audience via social media and the partner network.

For further information on the MikroCrowd program and how to submit applications, go to www.mikrocrowd.de. For an overview of EXI Startup Bonus advisors, who also provide advice to MikroCrowd program applicants, go to http://steinbeis-exi.de/beraterpool.

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The Do's and Don'ts of Introducing Knowledge Management

Steinbeis experts provide support on the analysis of an automotive client's level of maturity

An interesting assignment for the team at the Steinbeis Consulting Center for Knowledge Management in Augsburg: A carmaker asked the consultants for support with the introduction of a knowledge management system. The challenge was not just to manage general information and how knowledge was shared; recertification under the new ISO standard 9001:2015 meant that the company would have to improve how it dealt with knowledge. By analyzing the maturity level of systems, the Steinbeis experts were able to gauge the current situation and provide the client with a made-to-measure knowledge management proposal.

Analyzing the level of maturity of a company provides a snapshot of the status quo with respect to knowledge management. This allowed the Steinbeis Consulting Center for Knowledge Management to develop a practical tool for introducing knowledge management in all areas of the business quickly and without complication. Analysis also provides a comparison between the current situation and the target scenario, and this can be used as a basis for planning specific actions and next steps.

When the experts analyzed the maturity level of the automotive customer, in the area of the business that was evaluated they were already in a good position to start using holistic knowledge management. The "actuals" with respect to knowledge development and innovation were an exact match with the "targets." Deviations were also only minimal when it came to the strategic direction of knowledge targets, the IT systems that had already been introduced, and the current status of knowledge within the company. The maturity level analysis did however reveal shortfalls with respect to leadership and management support, business processes, and staff satisfaction and motivation. The areas in which the company had the most catching up to do were collaboration and communication.

Understanding the status quo enabled Christina Stoisser and her team of Steinbeis experts to conclude that although things were already quite good, previous knowledge management initiatives had not succeeded in improving information sharing in the company as much as had been hoped. The software at the company was not doing enough to support collaboration. This was leading to process errors and even creating work, with a knock-on effect on the satisfaction of employees, who felt demotivated. A lack of support from senior management was only making the situation worse. The company was in danger of entering a downward spiral, and this put all previous knowledge management initiatives at risk.

To do something about the situation, it was important to build on what had already been achieved. In essence, the division of the company had all the tools it needed to manage knowledge professionally. The tools just needed linking up properly. The solution came in the form of a knowledge dashboard, which all existing stand-alone solutions could plug into via special interfaces. Instead of going through up to ten login procedures, staff now only needed to identify themselves once. They could then access the entire knowledge database of the company, whether they needed data from sales or customer service. Any new documents that were created were automatically fed into the overarching system and no longer had to lie fallow on local disk drives or in personal folders. This also meant that from now on, only one record of each file would exist – the most up to date.

"The value this added in working with the fountain of knowledge available in the organization became noticeable on day one," explains Christina Stoisser. Employees reported significant time savings when looking for the right information, using project documentation to interact with others, or gaining approvals. The noticeable benefits the new system delivered resulted in rapid acceptance among employees. Another source of motivation came from senior management, who became actively involved in the flurry of information exchange through the knowledge dashboard, also providing support during the introduction phase with an internal marketing campaign. As a result, instead of resignation, within a short time employees were brimming with enthusiasm for the realigned knowledge management concept.

Image: © iStockphoto.de/RPFerreira

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Just Test(bed) IT – The Successful Way to Add Value

A review of the Steinbeis Engineering Day 2017

Organized by the Ferdinand Steinbeis Institute (FSTI) in collaboration with the German regional team of the Industrial Internet Consortium (IIC), this year's Steinbeis Engineering Day was an invitation to take part in an experiment: Just Test(bed) IT. The aim was to work with the companies at the event to develop a pragmatic approach toward digital transformation and networking ("D&N") and design cross-industry, value-adding scenarios based on partnership.

The event was an opportunity to introduce delegates to the concept of the testbed by drawing on practical examples supplied by the IIC. It was also a chance for everyone at the event to discuss personal ideas and issues regarding D&N and move forward with the topic. "None of us know where digital transformation and networking will take our companies, and that's why we want to use the day to start the journey together and play a proactive role in successfully implementing digital solutions and networks." The opening talk by Professor Dr. Heiner Lasi (director of the FSTI) was an invitation to the audience to take the name of the event to heart – Just Test(bed) IT – and work together to identify a common approach for introducing digital solutions. As Lasi explained, Just Test(bed) IT is about finding ways to recognize opportunities, get involved, and work with others on a pragmatic implementation in the real environment of a company, and perhaps also accept that there is a risk of failure.

The possibilities created by collaboration across companies and different sectors of industry were described in a lively discussion involving Professor Dr. Heiner Lasi, Dr. Marlene Gottwald (FSTI), and Dirk Slama (Bosch Software Innovations, IIC Steering Committee member). Drawing on the example of the Track-and-Trace Testbed coordinated by the IIC, Slama explained the advantages of collaborative, interdisciplinary alliances, showing how the benefits are also there to be enjoyed by big companies. Even for a company like Bosch, there is little point trying to work out and implement ways to solve the problems of the industrial internet of things (IIoT) on its own, said Slama. Success is much more likely if several companies collaborate and work in partnership, across all sectors of industry and different disciplines.

The starting point for the Track-and-Trace Testbed, as well as other testbeds, is a general issue – something that could be solved by drawing on internet solutions and something that could generate even more added value. A central aspect in initiating a testbed is what the IIC likes to call a hotspot. The IIoT is an important enabler for cross-industry interoperability, interconnectivity, and trust. The testbed approach allows companies that want to work with other companies on successful problem-solving scenarios to join forces and tackle interdisciplinary issues together. Sometimes this means that firms will rub shoulders with the competition, and the FSTI has recognized that one key success factor for such testbeds is a safe environment. The aim is to commercialize the companies' common experiences with web-based and added value-based ecosystems.

The approach used for the testbeds was described and discussed by using a selection of three IIC Testbeds. Benjamin Mang (TE Connectivity Ltd) emphasized that it is important to work with other parties, particu-

larly when it comes to IIoT. When launching the Smart Manufacturing Connectivity Testbed, which focuses on brown-field sensors, one of the key challenges was connectivity, although there were also issues relating to machines, sensors, software, the cloud, and related communication. These could only be addressed by allowing several companies to work together as partners. Drawing on the example of the IIC Smart Factory Web Testbed, Dr. Kym Watson (Fraunhofer Institute for Optronics, System Technology, and Image Exploitation IOSB) highlighted another benefit of testbeds: (international) visibility. All testbeds currently available through the IIC are presented and discussed with a public audience at quarterly consortium meetings, and this has resulted in a variety of valuable contacts at other companies, explains Watson. In his presentation on the IIC Testbed Communication & Control for Microgrid Applications, Reiner Duwe (Real-Time Innovations, Inc) emphasized that the experiences people have had with existing testbeds can be used to work out best practice and that this can be made available to other companies. The pragmatic approach taken with the testbeds also makes it possible to quickly implement any solutions that arise.

"What these examples have in common is not necessarily the technology, but the fact that interdisciplinary and cross-sector collaboration resulted in new added value scenarios," concludes Lasi. Given this experience, the testbed model is not just important for big companies. Actively becoming involved in a testbed is a particularly good way to apply specialist know-how in a way that adds value, especially for small and medium-sized enterprises, and this allows the tool to become a useful part of a value-oriented ecosystem. To reduce barriers to entry and eliminate potential language barriers, the Ferdinand Steinbeis Institute has been working with the IIC German regional team on a special micro testbed concept for small and medium-sized enterprises (SMEs).

The second part of the event was a chance for the delegates to introduce their own testbed ideas and enter into new partnerships. To do this, teams involving different companies had already identified hotspots with a particular relevance to SMEs before the event. There was then what the organizers called a testbed bonding session to stimulate lively discussion about the pinpointed hotspots with the aim of being more specific. This resulted in some promising interdisciplinary and cross-sector approaches for putting other Testbeds in place. These are now being looked at in more detail by the FSTI and transferred to specific Micro Testbeds.

Testbeds presented at the Steinbeis Engineering Day 2017:

- IIC Testbeds:
  - IIC Testbed for Smart Manufacturing Connectivity for Brown-Field Sensors | Participants: TE Connectivity (lead), SAP, ifm, and the OPC Foundation
  - IIC Testbed for Communication and Control for Microgrid Applications | Participants: Real-Time Innovations Inc., National Instruments, Cisco
  - IIC Smart Factory Web Testbed | Participants: The Fraunhofer Institute for Optronics, System Technology, and Image Exploitation (Fraunhofer IOSB), Korea Electronics Technology Institute (KETI)
  - Joint IIC/Industry 4.0 Platform Testbed for Production, Performance and Management | Participants: Bosch Software Innovations GmbH and others, SME moderation: Ferdinand Steinbeis Institute
- Micro Testbeds:
  - Micro Testbed on a Multimodal Operator Assistance System | Initiators: Mittelhessen University of Applied Sciences (department of mathematics, science and informatics) in collaboration with the Steinbeis Digital Business Consortium
  - Micro Testbed for Cloud-based Maintenance Concepts | Initiators: connectavo GmbH in collaboration with the Steinbeis Digital Business Consortium
  - Micro Testbed for Optimized Commissioning in the Cloud | Initiators: The Steinbeis Consulting Center NuCOS, STASA Steinbeis Angewandte Systemanalyse GmbH in collaboration with the Steinbeis Digital Business Consortium
  - Micro Testbed for Smart Solutions Development | Initiators: TQU Business GmbH in collaboration with the Steinbeis Digital Business Consortium
  - Micro Testbed for Supporting Manual Workers with Data Glasses | Initiators: The Steinbeis Consulting Center Research. Smart.Technologies in collaboration with the Steinbeis Digital Business Consortium
  - Micro Testbed for Smart Process Monitoring using Smart Watches | Initators: aucobo GmbH in collaboration with the Steinbeis Digital Business Consortium

Images: Uli Regenscheit, Stuttgart

Subject to approval, video excerpts of the talks (in German) can be viewed online by going to the Steinbeis media library at www.steinbeis.de/en/media-library

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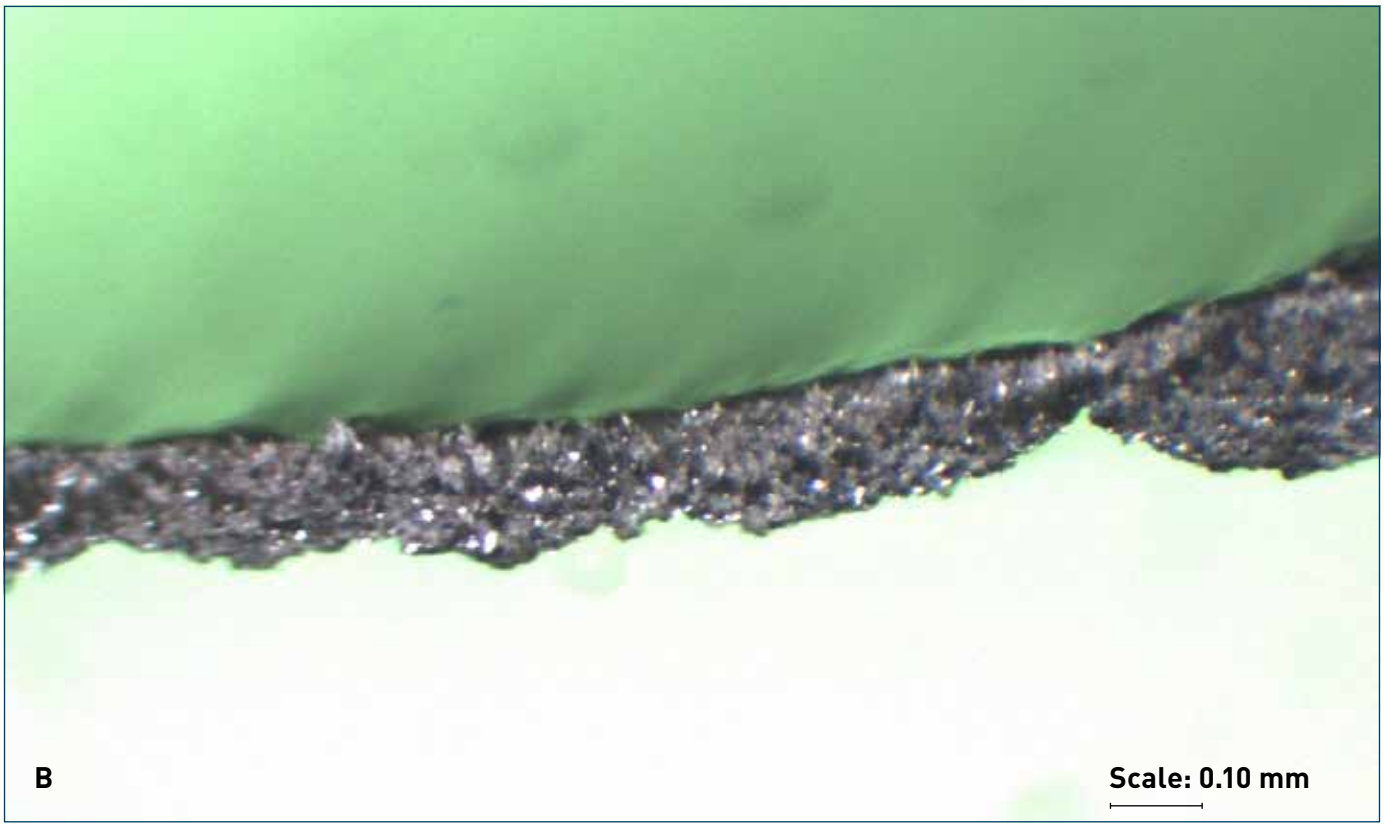
Full Steam Ahead for Basalt Fiber Production

Steinbeis experts develop process for purifying and activating basalt fibers

Melt basalt and it creates a material consisting of several minerals called basalt fiber. These minerals are primarily of natural volcanic origin, or in technical terms: They are geogenic. Unlike glass fiber and carbon fiber material, basalt fibers can be produced using processes that save resources. The supply is also practically limitless. Compared to CFRPs and GFRPs (carbon fiber-based/glass fiber-based reinforced plastics), the life cycle of basalt fibers from extraction to recycling requires much less energy in production, and the process is also much less demanding in technological terms. To make more use of these advantages in material production, the Steinbeis Innovation Center for Intelligent Functional Materials, Welding and Joining Techniques, Implementation has been working on a new process for producing basalt fiber thermoplastic tapes. The project is part of an initiative backed by the ZIM, the governmental innovation program for small and medium-sized business.

Basalt fiber-based reinforced composites (BFCs) containing thermoplastic matrix materials are beneficial to resource-efficient lightweight construction, offering advantages not just in terms of the material itself, but also with respect to processes and engineering. Until now, this potential has scarcely been exploited. Previously, the properties of basalt fiber were not stable due to the geogenic extraction process, and this material has not yet found widespread application in industry. Recent advancements in material analysis now make it possible to inexpensively and quickly analyze the heterogeneous composition of individual basalt rocks and thus enable commercially viable batch production with uniform fiber quality. Only now is it possible to apply the outstanding material properties of basalt fiber to specific technologies in ways that allow production to be safeguarded over an extended period of time. As a result, there is comparatively little information on the different ways to use basalt fiber technology for material reinforcement purposes, especially when it comes to the design of boundary layers between the fibers and the surrounding matrix, although the same applies to the surface reactions of basalt fibers.

"Our research at the Steinbeis Innovation Center Intelligent Functional Materials, Welding and Joining Techniques, Implementation based in Dresden has involved pursuing a number of avenues," explains Dr.-Ing. habil. Khaled Alaluss, co-director of the center. "We designed technology models and methods for splaying fibers, and in parallel to this we developed a process for cleaning and activating the basalt fiber surface. Both parts of this research fed into the resulting overall process for producing the basalt fiber thermoplastic tapes." The researchers first focused on establishing the technological foundations required for running simulations on basalt fiber tapes, also looking at a selection of preconfigured components. The experts also conducted a series of tests to develop, examine, and optimize different ways to clean and activate the basalt fiber filaments. This involved a variety of treatment processes, which were evaluated in terms of effectiveness using an assessment system developed for laboratory measurements. The Steinbeis experts then worked alongside project partners to integrate suitable processes into laboratory equipment. As a result of the project, the experts have now created an experimental setup for producing BFC tapes.



Oleg Nuss, who has been conducting the research for Steinbeis, explains the details: "The basis we took for development was an approach involving overlaying chemical binding energy with polarized covalent bonding mechanisms. To raise electron bonding, plasma arcs have to be used to add binding energy to the desired purification effects." To achieve this, laboratory-scale experiments were carried out on purification and activation. This revolved around a specially developed method for analyzing the results, looking at the angle of contact, the direction of strands, and speed. The final step was to put the findings into practice. The results were handed on to the Institute for Lightweight Engineering and Polymer Technology (ILK), the partner in Dresden that has been developing the production technology. For the project team, this involved investigating a variety of plasma processing configurations and different process parameters for producing the basalt fiber thermoplastic tape. Once combined with plasma treatment, the process was much more stable, delivering throughput rates of between 1.0 and 2.0 m/min. The experiments involved producing several hundred meters of basalt fiber thermoplastic tape, and the project partners at the ILK used this to develop a demonstration plant. Comparisons showed that without the plasma treatment, it would not have been possible to produce untreated basalt fiber thermoplastic tapes or set up the demonstration plant within a reasonable time frame, let alone with a sensible volume of materials.

Using basalt fiber thermoplastic tapes made with fibers that had already been plasma-treated allowed the researchers to produce a homogeneous fiber layer with parallel strands. "The basalt fiber thermoplastic tapes that have already been produced clearly show the positive effects of plasma treatment: The tapes that haven't been plasma treated have significantly inferior mechanical bonds, such that the tapes already start to break down into individual fragments when they're rolled or even undergo simple handling – especially along the fibers," highlights Prof. Dr.-Ing. Gunnar Bürkner, who is also a director of the Steinbeis Innovation Center. It was not even possible to conduct a simple bending test with unidirectional clamping – the tapes were clearly not stiff enough. The results are better after subjecting the basalt fibers to plasma treatment. The fibers are meshed better into the material matrix, and this improves the bond between the matrix and the fibers. Tapes offer an extremely effective mechanical bond and with this, excellent stiffness properties. Analysis of the results clearly shows that using plasma treatment simplifies basalt fiber processing and improves process stability, now making it possible to produce basalt fiber thermoplastic tapes for industrial applications.

ZIM
Zentrales Innovationsprogramm Mittelstand

Image: Comparison of a lateral section of fibers with matrix materials: a) with plasma treatment b) without plasma treatment

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Giving a Strategic Helping Hand to New Ideas

SHB student designs innovation process for multi-departmental platform projects

Innovation, technological progress, and fostering new ideas based on existing competences – key factors that motivated HOERBIGER Holding AG (Zug, Switzerland) to adopt a new approach in its corporate business development (CBD) department in 2014. The challenge faced by the group was also taken on by Sigune Suttner as part of her MBA degree at the School of Management and Technology at Steinbeis University Berlin (SHB).

HOERBIGER is considered a hidden champion in compressor technology, drive engineering, and hydraulic systems. Its key markets lie in the energy sector with an emphasis on the oil, gas, and processing industries, as well as the automotive sector and mechanical engineering. The firm decided to launch interdepartmental expansion initiatives to achieve profitable, sustainable growth, by continuing to explore new markets even beyond its core business.

The corporate business development project spanned a number of areas including mergers and acquisitions, with a focus on inorganic growth, although there was also a special project team focusing on organic growth. Working for this special project team, Sigune Suttner was faced with the task of putting new structures, processes, and tools in place to create a balanced portfolio of innovation projects revolving around new technologies, products, business models, and markets. The aim was to drive innovation from a top-down perspective – starting with the market and technology trends – but also bottom-up, by building on existing know-how and technology. Company competences and different areas of the business needed to be transparent and accessible to others, potential synergies needed to be leveraged, and strategic know-how needed to be expanded.

For her project, Suttner drew on insights gathered from the theory learned during her degree, which ran in parallel to her full-time work. Already at the start of the project, she succeeded in developing a concept for an innovation system that took four different aspects of innovation into account: the strategy, the processes, the organization, and company culture. The aim was to foster innovation, provide inspiration for visions, and underscore corporate thinking. A central pillar of the system would be a holistic process of innovation, establishing a framework for growth and innovation projects. The MBA student developed this process by drawing on theoretical concepts and "best-in-class" examples from industry, also working in close collaboration with different departments and corporate divisions. The starting point for the process is the growth and innovation strategy. This goes hand in hand with an analysis of market and technology trends. Next comes a so-called search field analysis, identifying and selecting promising ideas and business cases before working up specific business scenarios. Finally, the innovation projects have to be launched, basic prototypes need developing, and then products can enter serial production before being transferred to the operating units.

Suttner concentrated on the early phases of the process and examined innovation sourcing. This plays a crucial role in subsequent implementation since these phases lay a foundation for new growth by supplying expansion options. The first step is to define overall directions, generate ideas, and then translate concepts into concrete innovation projects. The priority here is to consider and address market risks and technical uncertainties. As a result, the student's process offers a modern tool kit of methods, with plenty of leeway to pinpoint powerful ideas. It also makes it possible to establish systematic procedures, evaluation models, and methods of quality assurance, thus paving the way for efficient implementation.

Looking back, Suttner's project was a complete success. The early phases of the process were harmonized based on a uniform procedure across the entire group. It now provides a basis for collaboration across different departments and divisions, opening the door to knowledge- and idea-sharing. This creates synergies and "multiplies knowledge" across the company. The processes and procedures themselves are designed to be quick and cost-effective, with a focus on breakthrough innovations and networking. The approach makes it possible to introduce existing technologies to new markets and scale up new technologies in existing ones; it also allows for completely new technologies in new markets. Suttner's project thus made an important contribution to the innovation portfolio of the CBD department, offering a variety of ideas and projects at various stages of completion, many with the potential to deliver profitable and sustainable growth to the corporation. One of the first market-ready products in the portfolio is currently being prepared for introduction.

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China's Medical Supply Chain in Times of Change

Steinbeis Consulting Center produces study on the Chinese biomedical market

The Chinese medical supply market is dictated by an imbalance between the regions of the country along the Pacific coast, which have gained in prosperity, and the provinces in the West, which in many regards are behind the times. More than 200 million migrants have left the West to find jobs in the East. Many of the medical needs of West China are still answered by "peregrine doctors." Asia Technology Consulting, a Steinbeis Consulting Center based in Stuttgart, recently completed a study for an agency of the Federal Ministry for Economic Affairs and Energy called German Trade and Invest (GTAI). The study provides a detailed profile of the future Chinese biomedical market.

The Chinese government is addressing the regional development imbalances in the country through a growing number of urbanization programs. It is also quickly creating the infrastructure for transportation and business, as well as medical supply structures. Over 90% of the Chinese population already has access to rudimentary health insurance, and the network of provincial hospitals is already being expanded to provide easier access to modern diagnostic treatment, which should also be available in outlying regions thanks to telemedicine. One contributing factor in this respect is the massive progress the nation has made in the field of IT. The country's BeiDou GPS system will consist of 35 satellites by 2020, and over 600 million Chinese mobile devices and computers are already geared to the independent system.

There are also plans to concentrate over 80% of pharmaceutical production on only four regions by the year 2020. These will be the metropolitan areas in and around Beijing, Shanghai, Guangzhou, and Chengdu. In 2016, these regions only accounted for around 60% of market output. Taking the current 5-year plan as the starting point (2016-2020), the aim is to establish four clusters encompassing 500 universities and research centers. These should train 150,000 graduates each year. 100 high-tech parks will be constructed, focusing on life sciences and medicine. These will become home to 7,500 bio-enterprises with over 250,000 employees. Working in collaboration with other businesses, the idea is to register more than 3,200 patents for new active ingredients. One third of the ideas should be based on enhancements to traditional Chinese medicine.

To fund this and other major projects, nearly 1,000 state startup funds have been set up, offering around 3,000 billion yuan (approx. 500 billion euros) in capital. Further capital is being made available through state banks, private and foreign funds, and venture capital companies.

The Steinbeis study was based solely on official information issued in Chinese, most of which revolved around the Chinese government's official strategy laid down in the current 5-year plan. The study also includes short profiles and the website addresses of hundreds of Chinese pharmaceutical companies. It highlights the incredible speed the Chinese government is moving at in restructuring the country. This restructuring presents many different areas of potential to German companies. The Steinbeis Consulting Center Asia Technology Consulting is specialized in assessing the technological framework for such opportunities. This involves sourcing and evaluating information supplied in Chinese.

Image: © iStockphoto.de/7postman

The 66-page study has been published in English and can be downloaded for free by going to the GTAI website: http://www.exportinitiative-gesundheitswirtschaft.de/biotechnologie-china.

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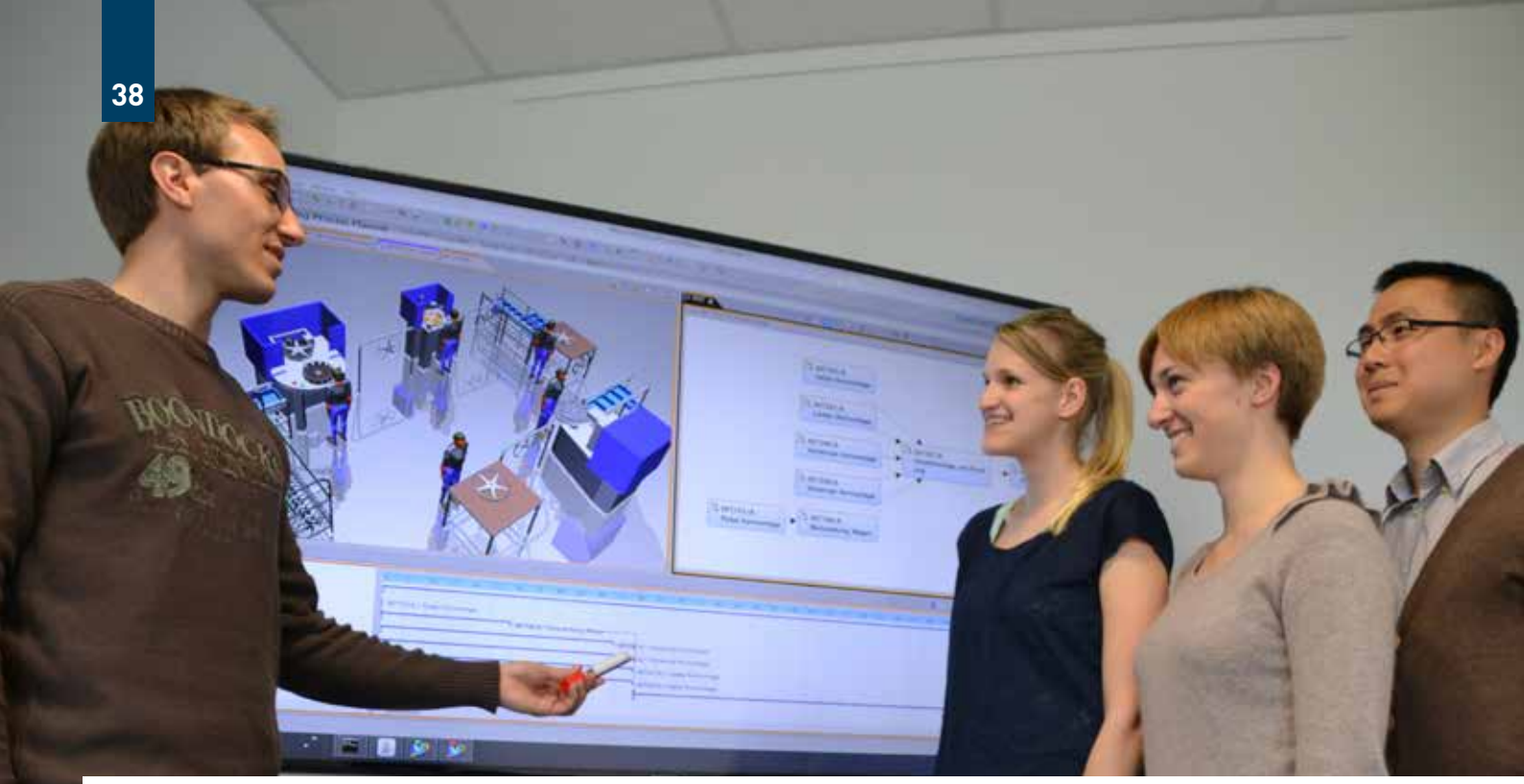
Welcome to the Steinbeis Network

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

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

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



The Starting Point for Implementing Digital Transformation: Excellent Teaching

Steinbeis experts develop tool kit-based PLM teaching module PLM-Tactile

Digitalization in combination with Industry 4.0 (cyber-physical systems and the Internet of Things) will decide the destiny of German industry. A successful transformation within a company requires the horizontal integration (also known as lateral integration) and the design of product and project information flows based on lean principles. The implementation of this transformation requires skilled young professionals capable of comprehending the creation of information and the information flow within a company. In addition, their qualification has to include the knowledge and practical application of methods of product lifecycle management (PLM). The Steinbeis Transfer Center for Computer Applications in Engineering developed a modular system based teaching module in collaboration with Karlsruhe University of Applied Sciences and Siemens Industry Software GmbH. The toolkit will be made available to universities and universities of applied sciences.

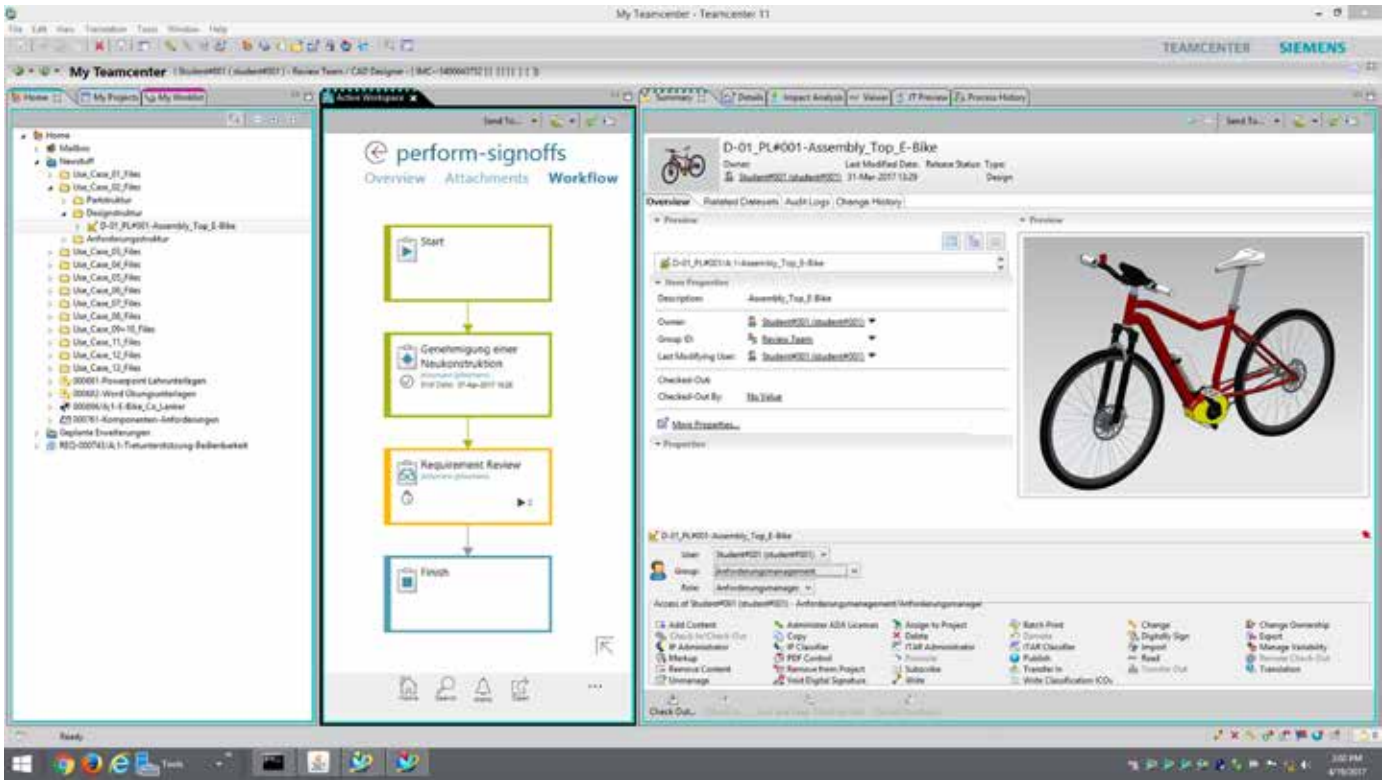
Product lifecycle management (PLM) is offered as an interdisciplinary topic to university students and will be a familiar part of everyday work. PLM methods enable companies to correctly map their product development process (PDP) in order to become leaders in digitalization. In daily company life, topics such as change management and requirement management bring together professionals of a variety of fields. In these cases where it is crucial to combine knowledge of engineering, business administration, IT and other fields - PLM training is essential to speaking the same language.

The PLM teaching moldule „PLM with Teamcenter and Active Workspace in Training" (or PLM-Tactile for short) was developed under the leadership of Professor Dr.-Ing. Jörg W. Fischer at Karlsruhe University of Applied Sciences. The module sets out to show the methodological approach of the PLM idea.

PLM-Tactile consists of several modules for use in lecturing. Each module is assembled to focus on the main priority of different educational facilities and may be extended to include further information. The teaching methods used for the module are based on the kind of use case scenarios encountered in industry. PLM-Tactile provides a case study to develop an e-bike on a PLM platform including CAx applications. As its name suggests, PLM-Tactile can make product lifecycle management more tangible and easier to understand. The case study allows students to complete tasks by working with the digital twins of the e-bike and the associated bicycle factory. During the exercise, they have to adopt the different roles performed in the product development process. The goal is to enter the growing e-bike market. The case study leads the students through the individual phases of product development using the V-Model according to VDI guideline 2206.

The teaching module was developed at the Steinbeis Transfer Center for Computer Applications in Engineering. Jörg W. Fischer is a partner at the center: "Our Steinbeis Transfer Center and Karlsruhe University of Applied Sciences were the ideal partners for implementing this idea – Karlsruhe has been prioritizing this area for five years now, with its master's degree on computer-integrated product and process development, and these are important topics for digital transformation." To develop the teaching module, the Steinbeis Transfer Center formed a network spanning a variety of universities and universities of applied sciences. Siemens Software GmbH was also involved as an expert in technology and processes.

"To implement a software-assisted course is a challenge for any individual professor," explains Fischer. "PLM lectures should equip students with the skills they need to work with confidence in the digital PEP scenarios of the future." To do this, professors have to work their way into different topics touched on by PLM, starting with requirement ma-



nagement and culminating in after sales and reutilization. If a course needs to be supported by exercises, it is necessary to realize the digital process chain in a PLM system and to develop a suitable scenario for the exercise. "It´s especially in this area where the professors need support with PLM-Tactie", continues Fischer.

PLM courses are aimed at students of engineering, economics and IT degree courses at universities and higher education establishments of applied sciences. Due to the modular design, it is easy to integrate the teaching module into bachelor and master degree courses. The aim is to provide professors with a wide choice of contents to develop their own PLM lectures. For each of the ten core PLM topics, there are modules as well as exercises and instruction videos. Each module can be used by a university to match their given situation, and the modules may be adapted as required. Prof. Dr.-Ing. Ute Dietrich of the University of Applied Sciences in Berlin (HTW Berlin), which is now using PLM-Tactile to include the topic of PLM in its own lectures, says: "This lecturing modular system and the exercises they come with are excellent; they've provided us with the ideal foundation. The use cases in particular go down really well with our students and they scored highly in evaluations. We plan to introduce more module items in the future, step by step."

The Environment Campus at Trier University of Applied Sciences has also made use of the output of the Steinbeis project. For the first time, it now includes PLM in their own teaching. "We receive really good feedback from our students on the PLM teaching module. They really recognized quickly why the topic of PLM is important to them. We would never have been able to produce a teaching module without support, not of this quality or in such a short time," says Stefan Hirsch, a lecturer in the mechanical engineering department on the Environment Campus. The starting point on the university campus in Trier was PLM-Tactile, which it integrated into a master's module on product data management. This will be used as a basis for creating its own PLM Module after a further round of accreditation.

Core topics covered by the PLM teaching module:

- PLM fundamentals
- Fundamentals of product structures
- Request management
- Product structure management
- PLM project management
- Workflow and change management
- PLM costing
- Structural design with PDM
- Manufacturing process planning
- After sales and MRO

The teaching materials for PLM-Tactile are provided for free by Siemens in collaboration with the Steinbeis Transfer Center for Computer Applications in Engineering. The Steinbeis Transfer Center supports the institutions to adapt PLM-Tactile to their specific needs and gives advice to the Implementation of the PLM system (Teamcenter) which is necessary for the exercises.

Image (left): PLM in use in teaching: Students discussing the production process of e-bikes
Image (right): Workflow-based life cycle management at the Team Center

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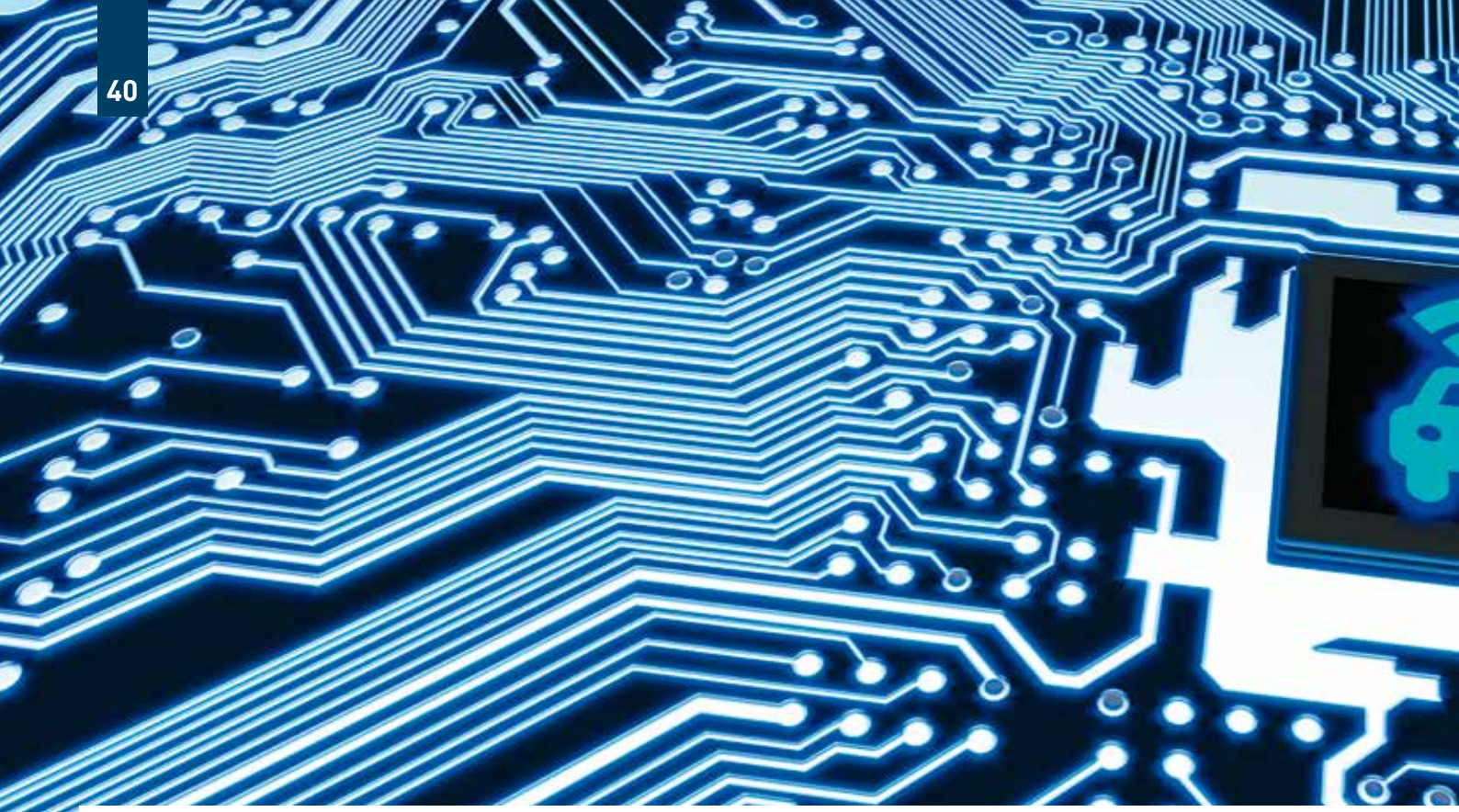


The Testing Aspects of Automated Driving

Steinbeis experts develop a framework to evaluate the robustness of electronic control unit software

The transition to fully autonomous vehicles, which would automatically assume total responsibility of the driving maneuvers automatically performed, is a major challenge for the automotive industry, especially when it comes to testing the safety of the new vehicle generations, at a time when they are still undergoing development. Intensive testing activities will be necessary to ensure that the functions of the electronic control unit work properly in any traffic situation. Steinbeis Interagierende Systeme GmbH has been providing support to automotive companies and their suppliers with systematic testing methods and tools for analyzing the robustness of their electronic control unit software. It is also responsible for running testing platforms worldwide.

According to the German Federal Statistical Office, despite the rising number of vehicles on the streets, the accident statistics show that there has been no rise in road traffic injuries or fatalities. One reason for this is the number of technical advancements in the passive and active safety systems now incorporated into vehicles. This is also partly due to driver assistance systems, which automatically intervene if they identify a critical traffic situation. The provided assistance can reduce the criticality of traffic situations – or at least can mitigate road accidents.

As vehicles move toward full automation, the vehicle manufacturers are taking over more and more of the responsibility for the driving maneuvers automatically performed by the vehicles over extended periods of time. This development will result in drivers being allowed to turn their attention away from the vehicle and its immediate surroundings, and to focus on something else instead – as the vehicle drives itself autonomously. As a result, in situations when the vehicle cannot cope with the traffic or is doing something wrong, automotive companies will no longer be able to rely on the immediate intervention of the driver. The areas in which these fully autonomous vehicles will need to operate are not like the previous scenarios encountered in the industry, where conveyance systems move around within defined areas. If a vehicle is being controlled automatically in the road traffic, it will have to handle a large number of completely different situations and varying conditions. Each drive will depend on a whole host of unknown external factors, all happening at the same time. These factors affect the quality of the information about the surroundings, which are provided by different sensors and are needed by the software of the electronic control unit as the basis for evaluating traffic situations. Despite all these uncertainties, the vehicle manufacturers will still have to ensure that vehicles are capable of reaching their destination, adhering to all kinds of traffic regulations. And even if they do get something wrong, they will have to be safe and not endanger passengers or other road users.

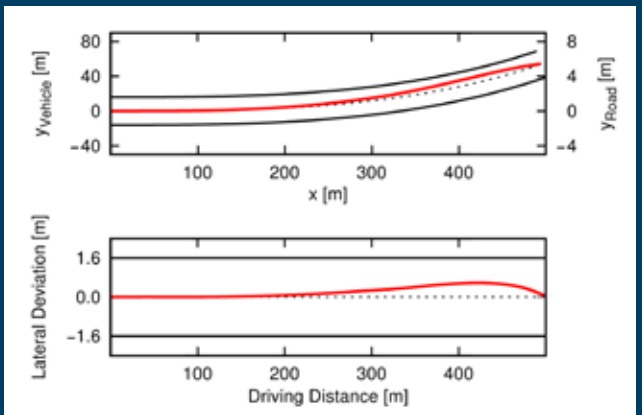
For automated driving, the various traffic situations and their temporal sequences in the road traffic represent a challenge where aspects of robustness must be taken into account. Steinbeis Interagierende Systeme GmbH has been researching new ways to automatically evaluate robustness. These have to take into account all of the different traffic scenarios and temporal sequences in order to evaluate the software of the electronic control unit in adherence to established standards of software testing. The aim of the project is to develop a tool-supported method for determining the functional limitations of a vehicle. If a vehicle reaches or exceeds its limitations, it will typically show a response deviating from the specification. The test throughput needed to do this is achieved by a resource-saving implementation, which allows the performant simulation of many thousands of test kilometers at the limits of the electronic control unit software.

For the current project being worked on by the experts at Steinbeis Interagierende Systeme, a framework called Gen4es.4L is being developed. This will make it possible to adapt the method to the project-specific requirements of the driver assistance function to be tested. This makes the framework ideal

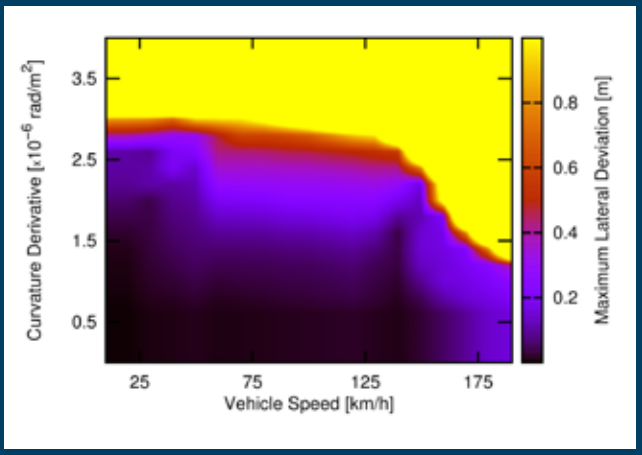
for the integration into the development and testing process. Gen4es.4L provides a stimulation of the test object on different testing levels as well as the determination and evaluation of the corresponding responses. "With Gen4es.4L, we can use evolutionary algorithms as well as random-based procedures combined with guided searches, so the driver assistance function we're looking at can be pushed to its limits," explains Steffen Wittel, who is managing the project. Another challenge the project team faced was how to test limitations in traffic situations that are similar to real life. To do this, Gen4es.4L enables traffic to be simulated by systematically accelerating and changing lanes. This automatically leads the generated simulation closer and closer to functional limitations. To continuously compare the expected outcomes with actual outcomes, this iterative approach requires an automatic determination of the expected vehicle response. To do this, Gen4es.eval offers different ways to analyze data and evaluate it hierarchically. It also makes it possible to influence the testing based on the response of the simulated vehicle from the viewpoint of an external observer.

Dr. Daniel Ulmer, member of the management board at Steinbeis Interagierende Systeme GmbH, sums up the value added by the new framework: "Plotting the multidimensional functional system limitations of a vehicle using Gen4es.4L allows an efficient evaluation of the electronic control unit functionality across different software versions. It also makes it possible to quickly visualize the system response, when the system is pushed to its limits. Based on this, decisions can be made about ongoing development of the functions provided by the electronic control unit software, and its impact can be analyzed."

Gen4es.4L in actual testing



The graphs show an example of the desired and the actual trajectory of the lateral control of a driver assistance function, which is supposed to keep the vehicle in the middle of the lane. The wheels of the vehicle should never cross the lane markings. By systematically varying the curve characteristics and the vehicle speed, it is possible to evaluate the control accuracy within the system context. This allows the applicable functional system limitations to be analyzed.



In this graph, 400 test scenarios were condensed into a single diagram to show that with increasing vehicle speed and curvature derivative, the driver assistance function can no longer keep the vehicle in the lane. Based on this finding, the next step could be to adapt the function so that it slows down the vehicle before it even reaches its functional system limitations, or the vehicle could hand over the control to the driver early enough.

Image: © iStockphoto.de/BeeBright

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New certification courses: Competence Coach (SHB) and Competence Trainer (SHB)

Employee development at the Steinbeis Transfer Institute competence institute unisono

In collaboration with the coaching network Competence on Top, the Steinbeis Transfer Institute competence institute unisono (kiu) introduced two new certification courses in January. The training to become a Competence Coach (SHB) and a Competence Trainer (SHB) is module-based and comprises a series of fast-track training modules. These courses offer elective modules for participants to mix and match their training according to personal priorities. Each participant can decide which modules they want to take, when, in which order, and at which location.

With the training to become a Competence Coach (SHB), the participants have the opportunity to build a solid foundation for a professional career as a business coach. This involves learning effective questioning and mediation techniques to support clients with change processes. Aside from applying and using methods in the safe environment of a training course, the modules share creative ways to use coaching techniques in client meetings and employee appraisals. Course participants are also introduced to innovative approaches to successful systematic coaching, plus tried-and-tested mediation methods for more challenging problems and behavioral patterns. Coaches are equipped with a comprehensive toolkit of methods to help people dealing with an existential crisis, conflict, or complex decisions.

With the training to become a Competence Trainer (SHB), participants open the door to a new world of professional seminar and workshop design. Competence Trainers are taken through the fundamentals of concept development, planning a successful event, and keeping all participants on a level pegging. This can involve changing personal behavior but also personal development. There is a toolkit brimming with ideas to allow trainers to design state-of-the-art seminars and ensure lessons learned are sustainable. Trainers also discover how to navigate their way confidently through the challenges of group dynamics and how to deal with interruptions. Both courses are based on a systemic-constructivist approach comprising components derived from experiential education, improvisation theater, and art therapy. The seminars also integrate aspects of NLP, hypno-systemic methods, and working with systemic structures.

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Award for Continuing Professional Development Project

Steinbeis certifies course for training concept

Services are one of those "hot potato" topics, not just for customers but also for the people who deliver the service. By looking at needs and desires from different angles, professional services can be transformed into a key area of investment for the future. Services make an important contribution to competitive differentiation, customer satisfaction, and loyalty. It was these ideas that motivated the mechanical engineering company Trumpf to launch a project called Fit for Service, which has now been honored with the German Education Award. The Steinbeis Transfer Institute competence institute unisono (kiu) joined forces with the Stegink Group Academy to develop a training course to become a Competence Services Advisor (SHB).

Course participants learn the defining features of professional services, how to detect and process customer desires and needs, and different ways to provide sales departments with active support. Aside from the detailed theoretical aspects of the course, one important topic that covers a multitude of areas is communication. The instruction given to service employees is based on the actual needs of business practice, with online workshops, a project report for the company, and a plan covering each participant's specialist training requirements. This prepares them for their extended role as experts at the interface between the client and the company. Trumpf, which is not just a mechanical engineering specialist but also a laser specialist, worked with the SteginkGroup Academy and the kiu Steinbeis Transfer Institute to focus on the career plans of older, more experienced service operatives and develop training options for them to become Competence Services Consultants (SHB). The certified training course will also be made available to other companies in the summer of 2017. The concept is part of the Trumpf Fit for Service project, which was honored with the 2017 German Training Award in the Innovation category in Berlin. The award recognizes outstanding examples of training and talent management. Henriette Stegink from the Steginkgroup Academy was also delighted with the award: "The training course allows us to meet domestic and international requirements and compensate for the growing skills shortage."

André Schleiter (Bertelsmann Foundation), Gerd Duffke, Mischa Kohler (both from Trumpf) at the 2017 German Training Award ceremony.

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The Quick, Quiet, and Low-Cost Road to an Eco-Friendly Future

Steinbeis Consultant provides support with the setting up of e-scooter sales structures

What's the quickest and most inexpensive way to travel a mile to work? This question resulted in the development of the business model for eScooter-fun.com. For Alexander Heinzelmann, a business founder and alumnus of Steinbeis University Berlin, answering this question properly would involve intensive research and many rounds of testing. And his answer? An electric scooter. But before Heinzelmann could get on with setting up his company, a number of key issues needed addressing that would be central to success. Support with this came from Doris Deichselberger, director of the Steinbeis Consulting Center for Change Management and Business Coaching – plus an EXI Startup Bonus.

Heinzelmann is totally enthusiastic about his modern travel concept: "Door-to-door, the car journey to work used to take me between 8 and 10 minutes. Using an e-scooter only takes 4 minutes," explains Heinzelmann. The ongoing cost of his e-scooter is also very reasonable. The electricity required for up to 1,000 kilometers on the road is only less than 5 euros. So in a nutshell, the e-scooter is quick but it's also eco-friendly, clean, quiet, and inexpensive.

The idea of entering into the commercial distribution of e-scooters first came to Heinzelmann after observing that his colleagues and friends also enjoyed using them. He had already been involved in various topics relating to business startups through his degree at the School of International Business and Entrepreneurship (SIBE), which belongs to Steinbeis University Berlin. The management degrees offered by SIBE lay emphasis on entrepreneurial thinking, an aspect which is reflected in the large number of alumni who subsequently set up a business.

Heinzelmann still had a number of unanswered questions about starting his own business, so he turned to the Steinbeis Consulting Center for Change Management and Business Coaching. After the first consultation sessions with Doris Deichselberger, who was his Steinbeis Consultant, the duo identified a variety of specific topics that would need discussing with e-scooter manufacturers to establish a sensible framework for the new business.

Once the target group and its needs had been captured, the emphasis of a subsequent fast-track consultation shifted toward topics relating to planning and designing communication instruments. The key priority throughout was visibility on the internet, and this raised a number of central questions: How will his target group find out about eScooter-fun.com and where? What's the best way to get the highest possible Google ranking? In what way will eScooter-fun.com be different from the competition?

Help through the Steinbeis Network from an experienced management consultant like Deichselberger gave Heinzelmann an important helping hand in setting up his company successfully. The young entrepreneur has already acquired a number of customers and his product has appeared at a variety of trade shows. "As well as her ideas regarding the actual project and lining up a variety of contacts through her own networks, the sessions with Ms. Deichselberger galvanized my resolve to pursue the discussed targets as agreed and make a success of it," concludes Heinzelmann. No exhaust fumes, no noise, no problems finding a parking space. With a winning formula like that, the product has already turned a few heads at the Steinbeis Headquarters in Stuttgart. And now, the Steinbeis Network head office also has its own e-scooter.

Image: © eScooter-fun.com

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Four Parties in One Network = Success

Steinbeis experts provide inventor with a helping hand entering the healthcare market

Dr. Michael Fürst, medical expert from the Upper Swabian city of Bad Wurzach, had been filing away at an innovative product with major market potential for a long time. His invention was a novel "posture pillow" that provided welcome pain relief in the area around the neck and the cervical spine. With so many people now working at a PC, the typical symptoms this causes have been commonplace for years. To implement his project, Michael Fürst sought professional support through Hock e.K., a Freudenstadt-based producer of medical cushions, and through the Villingen-Schwenningen Steinbeis Transfer Center Infothek.

A specialist medical practitioner, Fürst is regularly confronted by the causes, symptoms, and impacts of these conditions, and for a long time he was convinced there would be demand for his cushion but was frustrated by his attempts to find suitable support: "From a medical standpoint, I wasn't happy with any of the ideas I'd seen – when you use conventional cushions, the joints in the vertical arch can't be held in a relaxed position during sleep. They're skewed along the side and down the back, but the spine should be kept straight. Products should adapt to people's individual anatomy – not the other way around," he explains. This motivated the medical expert to do something himself and come up with an alternative. His focus lay in product quality, stability, and price.

The result: the iCLK – a German abbreviation for the "individual cervical posture cushion." The cushion comes in three sizes. The spine running through the neck is kept straight during sleep, which is good from a physiological standpoint because the iCLK adapts to the position of the user. This is achieved by attaching the cushion to the neck or head, making it possible to rest properly and relax when sleeping. The iCLK is kept in place with one or two ring fasteners of variable thickness. Fürst believed it was particularly important to use natural materials. The iCLK absorbs perspiration and is breathable, it uses skin-friendly materials, and it relieves pain and helps the user to relax.

The inventor was fully aware that successful products are not just about a clever idea and a coherent concept – other factors are also important. So he decided to draw on the experience of the experts at Infothek, the Steinbeis Transfer Center. "I'm so glad I got in touch with Steinbeis at an early stage of the innovation process. A strong sense of trust developed between me and Wolfgang Müller and our conversations were always productive," concludes Fürst. Müller, who is director of the Steinbeis

Center in Villingen-Schwenningen, was won over by the idea from the outset: "The initial contact was lined up by the state program SIGNO, who we work for as an accredited service provider. The first step they took was to ensure Dr. Fürst's idea was registered for patents and provide support. I was thrilled by the social benefits of the product – from the word go."

For Dr. Michael Fürst, involving third-party experts in the project turned out to be crucial: "It was simply too risky for me to rely on my layperson understanding of law, market launches, and technology – I needed a partner with expert knowledge," says the inventor. The Steinbeis experts in Villingen have decades of experience in managing the process of technology transfer and cooperating with a variety of working groups and specialist committees. Describing his recipe for success, Müller says, "We manage a know-how network on several levels. This allows us to provide professional answers to any questions that arise for our partners. And if we don't know the answers ourselves, we go through the Steinbeis Network and draw on the comprehensive know-how Steinbeis has to offer. For Steinbeis, it's practically an intrinsic obligation to lay all the facts on the table for our partners and highlight any potential problems that may arise in innovation management."

As well as benefiting from the support of the Steinbeis experts, the project was also a success because of federal support programs. Fürst was entitled to apply for further support through an innovation voucher (level A), which is only available to companies based in Baden-Wuerttemberg. The voucher allowed him to ask Steinbeis for support with professional market research. The research carried out by the experts examined the structures of the market and highlighted a number of potential collaboration partners.

The reaction to approaches made to potential project partners was so positive that Fürst was actually spoilt for choice. In the end, he decided to work with Hock from the North Black Forest city of Freudenstadt, mainly because it specializes in products in the field of healthcare, post-hospitalization convalescence, and fitness. "I was delighted that we were chosen because I was convinced by the benefits of the product and I believe there'll be strong demand. The iCLK is also a good fit with our own product portfolio," emphasizes Sladan Martinovic, CEO of Hock. "Actually it's unbelievable how many different aspects have to work in harmony these days just to take an original concept and translate it into a successful project," adds Müller, who beams with pride about all the things that have been achieved. "Without the network collaboration between Dr. Fürst, Mr. Martinovic, the state, and Steinbeis, this particular case would not have been a commercial success and the social benefits that the posture cushion most certainly has to offer could have gone to waste."

These days, (market) success is the result of a variety of processes, many of which are highly complex. For a company to succeed, it often needs a detailed understanding of factors and this understanding may not be available within the organization, or the benefits gleaned from know-how are only short-lived because of the shorter and shorter time frames of innovation cycles. This is why it is increasingly important to set up and continuously manage the networks that firms use for information and know-how sharing. Bringing the third-party expertise of networks on board provides access to new insights. It also makes it possible for a company to concentrate on its core competences, which will make it significantly more effective at tackling global competition. Nonetheless, one factor is still central to success: good fortune. But the bigger and more professional the network, the more likely it is to facilitate success through "systematic coincidences."

Image: Dr. med. Michael Fürst with a prototype of a cervical posture cushion

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Committed to Future Forms of Production

Steinbeis-Europa-Zentrum runs a support center for the Vanguard Initiative in Baden-Wuerttemberg

The Vanguard initiative involves around 30 European regions, which have formed an alliance to "lead by example" and boost innovation and industrial growth in the EU. The core topics being looked at by the network, which was set up in 2013 and has since expanded rapidly, include efficient and sustainable manufacturing, 3D printing, nanotechnology, and the bio-economy. Since early 2016, the Commissioner for Europe of the Baden-Wuerttemberg Ministry of Economic Affairs, Labour, and Housing has been working alongside the Steinbeis-Europa-Zentrum, which acts as his operating unit, to provide a first port of call for the Vanguard Initiative, primarily for business enterprises and research institutions in the state.

Multinational consortia consisting of companies and research institutions from the regions involved are working on innovative technology solutions and business models in their areas. The aim is to subsequently implement these models as pilot projects and to implement demonstration projects on a broader scale across several countries.

In specific terms, this will entail linking existing know-how and capacities relating to technology development and technology demonstration, focusing on areas holding plenty of promise across multiple regions. The main emphasis of the initiative until now has been:

- High-performance production using 3D printing, spearheaded by the Southern Netherlands, Flanders, and Norte
- Efficient and sustainable production, under the leadership of Lombardy and Catalonia
- Bio-economics: innovative use of non-food biomass, under the leadership of Randstad and Lombardy
- Nanotechnology, spearheaded by Skåne and Tampere
- Energy solutions in extreme environments (maritime applications), under the leadership of Scotland and the Basque region.

A number of individual projects have been simulated and set up to implement multi-region projects and introduce pilot plants and services relating to technology demonstration. Ultimately, the companies that should benefit most from the initiative are SMEs. The pilot networks and plants, and collaboration between the research and development partners in the member regions, allow companies to try out the new technologies and processes in their own production and if necessary implement these.

The aim is to develop business cases with the support of industry. As such, the Vanguard projects receive no direct or specific financing, so there is nothing like a funding program or a central fund. Despite this, at certain stages of implementation the projects will receive support and backup through the network. Companies and research institutions that would like to know more about the Vanguard Initiative or even become involved themselves are welcome to contact the Steinbeis-Europa-Zentrum, which has been acting as the Baden-Wuerttemberg Vanguard Center since 2016.

The information center is being funded by the Baden-Wuerttemberg Ministry of Economic Affairs, Labour, and Housing. Working alongside the ministry to provide support to those involved in the initiative, its objective is to create awareness of the initiative and the possibilities it offers to industry and research. Another aim is to make use of the opportunities presented by the network by lining up specific partnership arrangements with key players in Baden-Wuerttemberg.

Member regions of the Vanguard Initiative:

- Belgium: Flanders, Wallonia
- Denmark: South Denmark
- Germany: Baden-Wuerttemberg, North Rhine-Westphalia, Saxony
- Finland: Ostrobothnia, Skåne, Tampere
- France: Auvergne – Rhône-Alpes, Nord-Pas de Calais – Picardy, Pays de la Loire
- Italy: Emilia-Romagna, Lombardy
- Netherlands: Randstad, Southern Netherlands, Eastern Netherlands
- Austria: East Austria
- Poland: Lesser Poland
- Portugal: Norte
- United Kingdom: Scotland, Wales
- Sweden: Dalarna
- Spain: Asturias, the Basque region, Cantabria, Catalonia, Galicia, Navarre

Image: © fotolia.de/AA+W

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Inspired by Photonics

EU PHABLABS 4.0 project inspires the next generation

Light is one of those areas of technology that excites people. There are so many different sides to light, spanning a variety of fields. In fact, there are very few areas that the science of photonics does not overlap with, from energy transmission and energy control, to modern travel solutions, food safety, bio-photonics, health, IT solutions, Industry 4.0 (connected manufacturing) and aerospace. Relatively few are aware of the huge potential this field holds, despite the fact that light technology has been part of everyday life for a long time – in smartphones, the automotive sector, and even the ultra-optimized production of food and beverages. Steinbeis 2i GmbH is a partner of the consortium project PHAPLABS 4.0, and its goal is to change this.

One of the key goals of the EU project is to get young people to be inspired by science. The project partners plan to do this by involving adolescents and young adults in experiments and introducing them to new technologies. The target groups for the project are 10- to 14-year-olds, high school students (15-18 years), and other young specialists or experts (18+). The idea of PHAPLABS 4.0 is to develop and run 33 workshops and eleven so-called Challenger Projects through the consortium. For example, participants will make board games with lasers, solar cells that follow the sun, or laser cutters. The workshops are being tested in 14 pilot "FabLabs" with the aim of developing a reliable approach for the whole of Europe and teaching the skills required for the 21st century.

Pulling together the workshops and Challenger Projects will be a collaborative European project involving research and education establishments and members of the "maker culture." Steinbeis 2i and FabLab Karlsruhe are working on the project in Karlsruhe.

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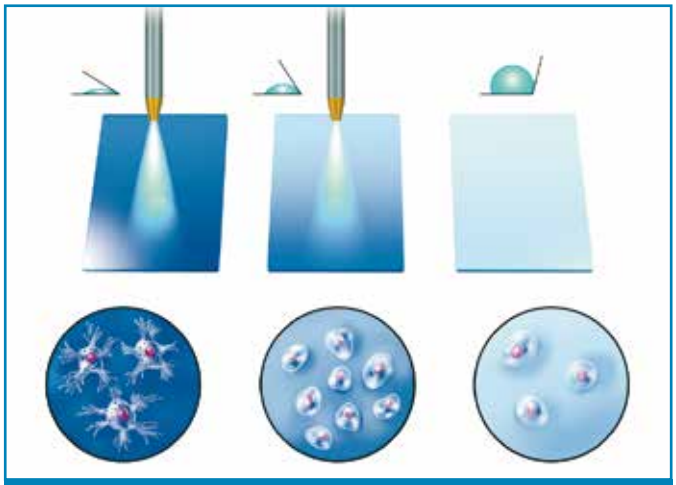
Using Implants Without Side Effects

Research team working on EU IMMODGEL project develops innovative hydrogel-based system

Implants often trigger undesirable immune responses. The partners working on the EU IMMODGEL research project have developed a system consisting of chemical and biological components to avoid such negative reactions in the future. The consortium consists of the universities of Heidelberg, Nottingham, and Strasbourg, the Brigham and Women's Hospital in the United States, plus a variety of SMEs from France, Estonia, and the Czech Republic. Steinbeis 2i is acting as the coordinator of the project and will manage administrative and financial aspects. It will also provide consortium partners with support on protecting intellectual property rights and sharing project results.

The emphasis of IMMODGEL lies in dental and laryngeal implants made from titanium. A system has been designed to be adaptable enough for use with any kind of implant, medical device, or transplant. Diagnostic tests were also set up to predict the immune responses of patients. The chemical and physical attributes of the design were then adjusted to avoid rejection, and for the first time implants could be adapted individually.

Working in collaboration with Protobios, a company from Estonia, the University of Heidelberg detected specific markers that can be used to capture the reactions of individuals to titanium. The results were used to work out the optimum combination of biomaterials and cytokines to inhibit inflammation. To exponentiate this effect, the University of Nottingham team analyzed the topography of surfaces and selected optimal microstructures for integrating into the final therapeutic solution. The other partners in the consortium have improved the formulation of the gel and developed an adhesive layer that will keep it on the titanium surface.



Different coatings trigger different cell reactions.
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The consortium partners discovered unexpected antimicrobial properties in the layer, and this led to the first patent submitted by the group in the field of polypeptide and hyaluronic acid coatings. The American researchers spearheaded by Prof. Ali Khademhosseini developed a "Foreign Body Response on-a-chip" system, which can analyze reactions to titanium under conditions similar to in vivo testing. The results of the project were presented at the closing conference during the TERMIS-EU meeting in Switzerland in June 2017.

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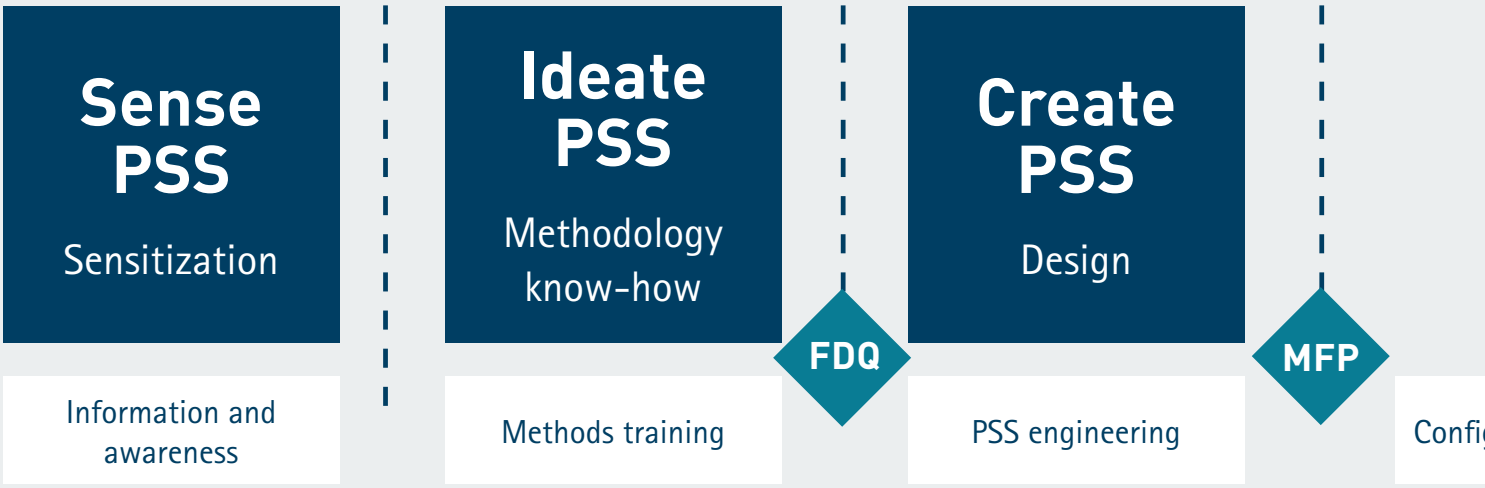


Digital Product Service Systems – New Business Models for Manufacturing Companies

Steinbeis experts conduct research into the use of Product Service Systems as part of the Use PSS network

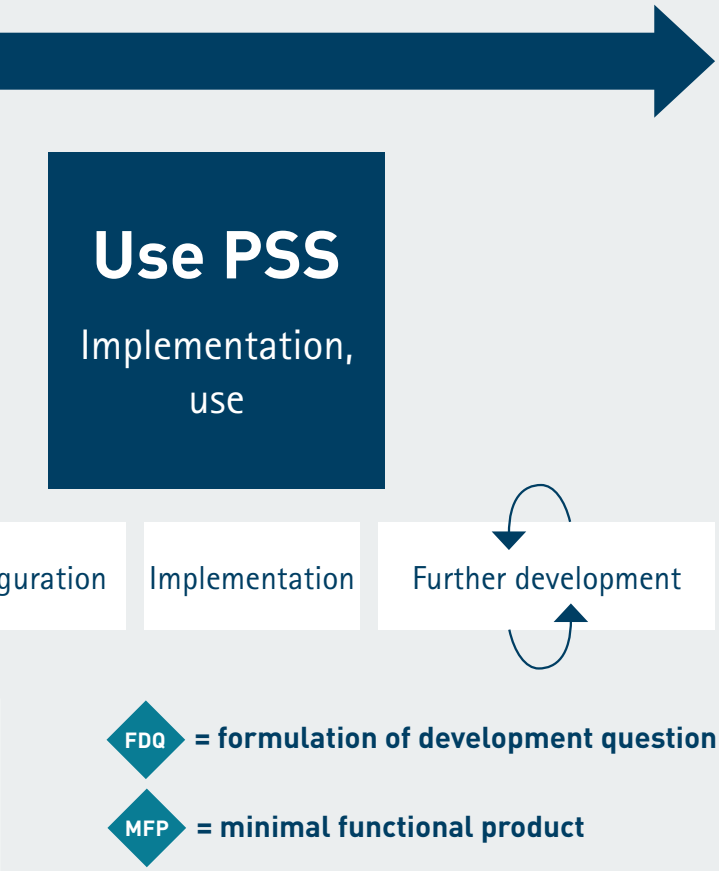
Digitalization is accelerating at an unprecedented pace. Everything regarding digital transformation revolves around the customer, whose expectations regarding products and the companies that supply these products have changed fundamentally. Previously the emphasis lay in providing tangible goods of premium quality, whereas in the future the customer will want solutions that do everything. One good way to provide capture-all solutions is to use a Product Service System (PSS). This is a system consisting of conventional product elements which will typically be expanded on during the product life cycle by adding digital services. The Federal Ministry for Economic Affairs and Energy (BMWi) is backing a consortium project called Use PSS. Its focus lies in the usability of PSSs in small and medium-sized business with the aim of helping SMEs to introduce smart solutions. These could combine tangible products with digital services as an answer to a variety of user requirements. One of the consortium partners is Pforzheim University, where they have developed a model for introducing Product Service Systems. The team at the university has been working with experts at the Steinbeis Innovation Center 2 Digital Business and carrying out testing involving real applications.

The project team aims to develop a best practice model that can be matched to the needs of the target group – SMEs – and then transferred to a variety of sectors of industry. Another planned outcome of the research project is to set up a PSS competence center in collaboration with bwcon GmbH, also an enterprise in the Steinbeis Network. The center would act as a first port of call and provide a networking springboard for all kinds of companies interested in transforming from a product supplier into a solution provider.

To address customer requirements in the long term and avoid lagging behind the competition, companies have no choice but to react to the sweeping developments being brought about by the advancement of digital technology. The only way to survive will be to adapt correctly to each new situation as it arises. For most companies, this transformation is yet to happen. The big challenge these companies will have to face is how to transfer new and innovative business models in a way that makes sense for the tradition or background of the company. To do this, businesses have to carefully examine their existing portfolio of products and services, completely rethink it, and if necessary go back to the drawing board. There must be no delay in discontinuing obsolete products or services to make way for new fields of business and customers.

For the team working on the Use PSS consortium project at Pforzheim University, which was spearheaded by Prof. Dr. Rebecca Bulander and Prof. Dr. Bernhard Kölmel with the scientific support of Alexander Richter and Johanna Schoblik, the starting point was to develop a four-stage model for creating a Product Service System. The four phases are:
1) Sensitize people to the idea (Sense PSS)
2) Share knowledge of the methods (Ideate PSS)
3) Design an initial Product Service System (Create PSS)
4) Implement and use it (Use PSS)

The model is aimed at individual companies or groups of companies. During the first phase, Sense PSS, people should work out what information they already have and the impact digital transformation could have on the company. The aim is to create awareness of the current situation and the need to take action. People can be made aware of problems by organizing talks and meetings, not just to look at digital trans-



The Usability Support Initiative
Use PSS is a project under a support initiative called "Simple Intuitive – Usability for SMEs." The initiative is part of a drive to focus on "Digital SMEs – Strategies for the Digital Transformation of Business Processes". The initiative is backed by the Federal Ministry for Economic Affairs and Energy (BMWi).

For further information (in German) go to **www.mittelstand-digital.de.**

Mittelstand-Digital

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formation itself but also to highlight the extent of the impact it will have on the company, its products, and its services. It is quite common for people to not realize that something needs to be done now, especially if business is flourishing and products are selling, since this will tend to overshadow everyday activities at the company.

The Ideate PSS phase mainly involves training users in order to share the methods needed to develop a Product Service System. This entails going into more detail with techniques such as Business Model Canvas, Blue Ocean Strategy, and Design Thinking. To develop a Product Service System successfully, it is recommended that at least one external specialist be brought in with sufficient experience of the methods involved. Their task is to coordinate and steer how different methods (or parts of methods) are applied.

During the design phase, Create PSS, the aim is to develop a strategy and one or several new digital business models during workshops. These should be attended by people from different areas, managers, and if necessary even customers of the company. It is essential at this point to look at the company from a variety of angles and take a different view of products. Customer opinions are extremely important, but so are the opinions of senior management and the views of employees at other levels.

During the last phase, Use PSS, the business model that has been developed is adapted to the specific customer, introduced, and if necessary redeveloped. At this point, ongoing operations and continuous improvements to the new Product Service System are the priority. Even after completion of the Create PSS phase, any ideas that are thought of and found to be good after testing are introduced to company development cycles and redeveloped until they are ready for the market. Key factors that need considering during implementation of the development project include ensuring that people focus carefully on developing a PSS that integrates all aspects from start to finish and that a service mentality is reflected in everything that is implemented.

The team at the Steinbeis Innovation Center 2 Digital Business is currently testing the model developed for the project in a series of workshops with the consortium partners involved in the Use PSS project. The feedback and evaluations carried out by these companies help the project team fine-tune the model to meet the needs of the SME target group. The consortium partners are placing emphasis on ensuring the model is as simple as possible to use. This is also to make sure it gains acceptance among the target group and delivers the best possible results.

The increasing number of overlaps between products and services is a door-opener to many opportunities to develop new business models, especially given the options offered by digital technology. Unexploited potential can be tapped into, not just with respect to the company but also in terms of existing products, and this can be translated into additional benefits for the customer. This is where digital Product Service Systems come into their own in mastering the challenges of digitalization.

Image: The initial PSS model. Source: B. Kölmel, R. Bulander, A. Richter, J. Schoblik: Product Service Systems – New Business Models for Manufacturing Companies; featured in the SME e-zine Digitale Geschäftsmodelle (Digital Business Models)

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The PET Method. Tracer Principle, Radiochemistry and Medical Applications

Hans-Jürgen Machulla, Ehab Al-Momani, Noeen Malik

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Prof. Dr. rer. nat. Hans-Jürgen Machulla gained a PhD at the University of Cologne and has worked on reactions to suprathermal radionuclides at the Jülich research center and Brookhaven National Laboratories (USA). After returning to Germany, he played an active role in setting up the PET centers in Jülich, Essen, and Bad Oeynhausen. He gained his postdoctoral qualification at the University of Essen. In 1989 he was appointed to the professorial chair for radiopharmacy in the development and clinical application of radiopharmaceuticals at Tübingen University. Machulla is currently director of the Institute for Radiopharmacy, a Steinbeis Transfer Center in Tübingen.

Understanding and Using Statistics. With examples of numbers from the real estate industry

Marco Wölfle

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Marco Wölfle

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His current research projects revolve around the efficiency of energy renovations and the efficiency of a variety of market models in the real estate industry. Wölfle's lecturing involves quantitative and qualitative research, the science of political economy, the financial markets, and business accounting.

The Future of Business Leadership Education in Tertiary Education for Graduates

Stefanie Kisgen

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2017 | E-book (PDF), color | 453 pages, English
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About the author

Dr. Stefanie Kisgen has a diploma in Chinese regional studies from the University of Cologne and Nanjing Normal University (China). She gained an MBA at the School of International Business and Entrepreneurship (SIBE) at Steinbeis University Berlin. Kisgen has been managing director and a partner of SIBE since 2015. In 2017, she gained a PhD at the Ludwig-Maximilian-University Munich (LMU) as part of a special research project, which was carried out by SIBE with the professorial chair for general pedagogy and education research at the LMU.

EuMaT Strategic Research Agenda. 3rd Edition – 2017

The European Technology Platform for Advanced Engineering Materials and Technologies – EuMaT

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About the project

In Europe, research on materials technology has been making major progress for years. But how can it face the challenge of international competition? The EuMaT Technology Platform provides a vehicle for helping projects related to new materials technology with planning, organization, and implementation. The vision: to ensure Europe leads from the front when it comes to the development and application of new materials technology!

The Transformation Map. The Quickest Journey from Being an Entrepreneur to Becoming a Life Shaper

Lars Öhler

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ISBN 978-3-95663-122-1
2017 | E-book (PDF), color | 66 pages, German
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About the author

Dr. Lars Öhler gained a PhD in business science and is co-owner of the Steinbeis Consulting Center for Entrepreneur Excellence, based in Stuttgart. In this capacity, he supports startups and small and medium-sized enterprises with the development of their company and the organization.

The Steinbeis Arena 2014-2016. Reference documentation

Steinbeis Foundation (ed.)

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About the publication

Three years, three arena events, three essential aspects of successful knowledge and technology transfer. With this documentation, Steinbeis takes a detailed look at the essential views represented at the arena events. It also explains the key statements made by the participants of the arenas and provides an outline of the most important points.

An Alternative View of Innovation. Women in Technology Transfer

Petra Püchner, Beate Wittkopp (ed.)

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ISBN 978-3-95663-053-8

About the publication

Dr.-Ing. Petra Püchner is a member of the management board at Steinbeis 2i GmbH. Beate Wittkopp is director of the Steinbeis Transfer Center TransferWerk-BW.

Both of the editors have been working in the fields of innovation and technology for several years. Given the people who take part in public events and give speeches, it would appear that there are not many women working in these fields. This apparent invisibility of women needs to change. This is because if one looks below the surface, there are many successful women involved in innovation in all of the key areas. And of course they also work for Steinbeis. "An Alternative View of Innovation" is a window to the talented women and the methods they apply to technology transfer. The book is a starting point for an initiative in the Steinbeis Network, which is expected to result in a higher profile and more networking of women involved in knowledge and technology transfer.

Instruments of Conflict Resolution

Gernot Barth, Bernhard Böhm (ed.)

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About the editors

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A qualified attorney and master of mediation, Bernhard Böhm is co-director of the Steinbeis Consulting Center for Business Mediation and 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.

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