TRANSFER

THE STEINBEIS MAGAZINE **02|19**

ECONOMY X.0

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DEAR READERS,

The disruption of established business models and the erosion of traditional markets have opened the eyes of many businesses to the fact that digitalization will fundamentally change industry throughout the world. There is a tangible sense in the current discussion going on in industry that something needs to be done about this – urgently. But often, the prevailing opinion is that as long as a company embarks on plenty of programs, and those all have something to do with digital transformation, then everything will somehow sort itself out. This kind of approach is of little help to business enterprises.

Digital transformation is by no means an end in itself! It's not about companies making sure they've "gone digital" with this or that process. These days, the aim of companies should be to align their business strategies and processes in such a way that they can even survive or succeed in an increasingly digital world in the first place.

To erect signposts for this new direction, the following guiding principles might help. Companies that have been successful in their respective markets for years already possess some excellent strengths. It is imperative that they remain conscious of these strengths in order to develop a willingness to think differently, based on this knowledge. To do this, it's important to detach oneself from product thinking, or the idea of selling products, and develop an understanding of how products only act as a physical manifestation of the power and potential – the competences – of the company.

The big question that needs to be asked is: What will these competences actually mean to companies in the future against a backdrop of intensifying digitalization?

One could be more specific with this fundamental question by structuring competences into external and internal factors. On an external level, competences are about developing a clear, new focus on the market. In concrete terms, that could mean no longer selling products for example, but rather selling the services that go with them or offering smarter products in the future in combination with digital services.

The job of management is to put flesh on this idea – or new orientation – in crystal-clear terms. Then, based on this focus, internal competences have to be adjusted by implementing the digital process patterns that will be needed for this new orientation and digitalizing existing processes. Sooner or later, whether this is actually carried out or succeeds will decide the fate of many companies and define their future-readiness.

This current edition of Steinbeis Transfer magazine provides you with examples of some completely different approaches to tackling new, future-oriented business. We hope you enjoy the read!

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CROSS-SECTION

ECONOMY X.0

Like **"INDUSTRY 4.0,"** one of the big catchwords of our time is **"ECONOMY 4.0"**. The two terms come from a different angle, but they both refer to the fourth stage of the **INDUSTRIAL REVOLUTION**, relating to **DIGITAL TRANSFORMATION** and **NETWORKING** within companies, beyond the borders of individual firms, at each stage of the **VALUE CHAIN** and in all sectors of industry. The result: a disintegration of boundaries as previously separate areas now converge. But this trend is now going further and developing into an **INDUSTRY X.0**, a phenomenon that not only involves **TECHNOLOGICAL** and **ECONOMIC,** but also **SOCIETAL, ORGANIZATIONAL,** and **ECOLOGICAL FACTORS.** What underlies this model concept, and what companies can do to succeed in this situation, are just some of the topics looked at by the **STEINBEIS EXPERTS** in our Feature Topic section.

ECONOMY X.0: A CHALLENGE TO BUSINESS AND SOCIETY

FOR BUSINESS ENTERPRISES, THE ECONOMY, AND SOCIETY, DIGITAL TRANSFORMATION INVOLVES CHANGE

In Germany, more and more people are using the term Economy 4.0 in the current debate about increasing levels of digitalization. Dr. Michael Ortiz, head of innovation and transfer management research at the Ferdinand Steinbeis Institute, now calls for the term to be extended – as part of a model concept called Economy X.0. His angle on key aspects of this highly complex concept is to consciously see Economy X.0 not as something that only encompasses technological and economic factors, but also societal, organizational, and environmental aspects.

Economy X.0 describes a process, as well as the target outcome of the changes that are currently sweeping through companies, business, and society. These changes are driven first and foremost by digital transformation, the intensifying prevalence of networking, and converging structures, systems, and technologies. But other aspects that should also be considered essential drivers of these changes include elementary structural changes on a societal, demographic, global-political, and ecological level. Not only is this affecting core areas of industry, key sectors within industry, and the public sector and services, ultimately it also impacts the political and statutory system, civil society, and every individual.

DECISIVE FACTORS: DIGITAL TRANSFORMATION AND CONVERGENCE

Digital transformation plays a key role on the journey to Economy X.0 as a process of continual and comprehensive digitalization and 'autonomization' in the economy, society, and organizations. On the one hand, this process is about continually enhancing the quantity, quality, and intensity of digital technology use, but on the other it is about communication and manufacturing processes, not just in the service sector but also in information processing.

An essential feature of digital transformation is the growing importance of data as a driver of these processes. The ability to gather, collect, and analyze relevant information and data from communication, everyday activities, production, and services – and then translate this into social, economic, or organizational action, simultaneously accessing huge volumes of information (big data) – is extremely important when it comes to competition.

For many companies, these processes entail a challenge to continually redefine and develop their business capabilities, and they need to consciously rise above the constraints of traditional value chains in order to exploit the diverse potential of digitalization, the data-driven economy, and networking. While established business models may lose their disruptive impact on markets, the opportunities to extend the reach of new business models – beyond implementing digital and smart technologies – will first need to be developed and then implemented, in most cases within a similar time frame.

But another feature of digital transformation is that through the internet, it promotes an ongoing multiplication of networks both within and between further social subsystems, economic sectors, technology fields, and organiza-

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ECONOMY X.0 DESCRIBES A PROCESS, AS WELL AS THE TARGET OUTCOME OF THE CHANGE THAT IS CURRENTLY SWEEPING THROUGH COMPANIES, BUSINESS, AND SOCIETY.

tional functions. A consequence of this is increasing convergence between sections of society and the economy, areas that were previously separate on a logical, structural, and procedural level, and increasingly, the traditional logic of action, function, and systems coalesces as a result of this convergence – managing interfaces and dealing with interdisciplinary action become completely new and connected fields of action. Digital solutions and convergence make it implicitly necessary to form networks on several levels, beyond the traditional boundaries of organizations and business enterprises. Key requirements in this respect are flexibility, agility, and an openness to possibility. The ability to work in networks with heterogeneous partners and increasingly form entrepreneurial business models on and through business platforms will become a core competence of business.

In almost all market economies of the western world, digital transformation, the increased use of databases, autonomization, disruption, and networking impinge on societies with increasingly older demographic structures, with the often-discussed associated impacts and potential conflict in terms of innovative capabilities, people's ability to adapt, and the availability of skilled workers. The world of work is changing dramatically as work environments and the private world we live in start to converge, and the cut-off between our professional lives, leisure time, and our home lives becomes more and more blurred.

The completely new degrees of freedom enjoyed by individuals also entail new pressures, which will need redefining and renegotiating. In many sectors of the economy, the familiar interplay between producers and consumers is disappearing and making way for a relationship between system administrators and users, and this could lead to an adjustment – the old roles could be turned on their heads and make way for completely new roles and rules. Optimized, inherited, and completely new skills will be required to manage the digitalized, networked, and autonomous workplace, and these will at first need to be reflected across the board in education, training, and qualifications. Important issues regarding productivity, assessment, and remuneration for performance have every potential to create conflict. In addition, far-reaching questions arise regarding the future definition of value creation. There are already substantial areas of production and service provision where aspects such as IT applications, automation, and autonomization have marginalized product and service costs. These will be joined by essential questions regarding the distribution of value creation. And then there are business models which deviate entirely from familiar proprietary solutions and increasingly span distributed and usage-based offers. Finally, environmental considerations will shape interactions between the economy, society, and technology – much more so than until now.

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"I WOULD PLEAD FOR MORE EMPHASIS ON THE CONCRETE BENEFITS WHEN CONSIDERING THE POTENTIAL OF DIGITAL TRANSFORMATION."

AN INTERVIEW WITH PROF. DR. CLAAS CHRISTIAN WUTTKE, DIRECTOR OF THE STEINBEIS TRANSFER CENTER FOR SMART SERVICES – INNOVATION AND DEVELOPMENT

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Digital transformation can be particularly challenging for small and medium-sized enterprises. The question is why, especially given that SMEs are supposed to be so much more adaptable. This is the issue looked at by Prof. Dr. Claas Christian Wuttke, professor at Karlsruhe University of Applied Sciences and director of the Steinbeis Transfer Center for Smart Services – Innovation and Development. Wuttke is closely involved in both smart products and smart services, so he knows how they can be efficiently introduced to markets.

Hello Professor Wuttke. Digital transformation in industry is spawning new products, services, and thus also new business models. In what ways do you expect this to have an impact on processes at small and medium-sized enterprises?

I have the impression that lots of German companies see digitalization as a challenge – which is completely unlike the situation in places like East Asia, where any form of digital technology is greeted with enthusiasm. Of course that could also be because data and personal protection are a big priority for us. But there's also a lot of emphasis on the cost of digitalization. It doesn't help companies to hear all the positive predictions about the economic impact of digital transformation.

I would therefore plead for more emphasis on the concrete benefits when considering the potential of digital transformation. The question is whether – based on the available information, or information that can be gathered in the short term – a new service could be offered. Of course this is particularly appealing when a new service immediately allows new revenues to be generated. But consideration should also be given to the benefit within the company, such as improvements to value-adding and planning processes. This link between

IT'S IMPORTANT THAT EVERYONE KNOWS THE GOALS AND RISKS ENTAILED IN INVOLVING CUSTOMERS AND THAT THEY TAKE THIS INTO CONSIDERATION.

digital transformation activities and direct benefit is particularly important for SMEs because you need amortization on investments with innovations. Another challenge faced by SMEs is that they often don't have big staff departments for developing new offers such as data-centric services. So it's difficult for them to free up the capacity to work on new services. If they get experts in the line functions to think up and develop services, there's a danger that these people can't step back enough from the constellations of conventional products or certain methods.

On the other hand, SMEs are typically closer to the customer. This is a major advantage within this context because it makes it easier to involve customers in identifying and developing new services. But it's important that everyone knows the goals and risks entailed in involving customers and that they take this into consideration.

For example, one risk is that customers want all the ideas that pop up to be implemented as soon as possible, or customers can't think far enough into the future because they don't really understand all the possibilities presented by digital technology. It's only when you're clear about the specific people that should be involved, when, how, and with which goals, that customers can be involved, efficiently and in keeping with the defined objectives – otherwise there'll be disappointment on both sides. That said, successful digitalization projects are not just about bringing customers on board, but everyone who's involved – especially staff. To do this, a similar approach can be used to customer integration.

One thing you just highlighted is that digitalizing production and products should, first and foremost, offer benefit – for companies and customers. But what specifically is the best approach when implementing new functions on digitalized products (smart products), or data-centric services (smart services) – especially if they're going to be "efficient and in keeping with defined objectives"?

The only smart products and smart services we get to see in the market are the new ones, or the ones that are a success in the long term. But it would be safe to assume that up to 80% of new services introduced to the market fail. Of course there are lots of reasons why this happens. But one thing is certain: With data-centric products and services, you need different development processes and different methods compared to classic tangible goods. Naturally, at the beginning of every project an analysis of the current status has to be carried out. Digitalization maturity models are certainly a good starting point for this, such as the Industry 4.0 guidelines suggested by the VDMA, especially if you want a good overview. But if you ask me, they're oriented a lot toward technology push, so they focus on what is technically feasible. Our method is oriented more toward market pull; emphasis is placed extremely early on the customer benefit offered by digitalization measures.

When you're analyzing your own competences, this should not be limited to Industry 4.0 technologies in production and products. To work out some initial ideas for new products or services, it helps to ask what offers were made to customers, during which phases of the product life cycle, and what business models these were based on. I also think it's extremely important when generating ideas to know which data-centric services have already been successful in the market. To help with this, we're maintaining a structured collection of smart services for use in the machine and plant construction industry, which is continually expanding of course. If there's more than one idea, it's important to formulate it in such a way that all aspects of the offer can be understood and tried out. To do this, certain prototypes of digital services are used. Aside from a customer journey map, there's an offering diagram, which allows you to work

through the functions and sub-functions the service is supposed to offer. Many digital services are provided through an ecosystem involving several partners. There's a motivation map which highlights the specific interests of each partner, and these are visualized on a system platform. And finally there's a product service blueprint. This allows you to map how tangible goods interact with a service when it's actually delivered. This makes it possible to recognize any issues before it's too late. Using prototypes – intensively and early in the process – provides a foundation for agile development processes.

If the ideas behind the new digital services are made tangible, covering all aspects, it becomes easier to assess the customer benefit and implementation outlays – not just in terms of costs, but also of timeframes and potential obstacles. And it's important to recognize the effort involved in implementing individual services and take this into account. Take machine and plant construction, for example: Connecting your machines to an IoT platform is a huge step – whether you're the user or the provider – but as a rule, this also makes it possible to line up a whole range of new services. This enables you to define a digitalization strategy, which will create additional revenues step by step, or result in savings, or both, and as a result it will be financeable.

What, in your opinion, defines whether a production system is future-ready, and what requirements does it have to meet to be successful?

With all the changes that will happen, a core requirement of a production system will still be that it should offer high availability levels and reliable quality. This is also reflected in the fact that many industrial smart services aim to safeguard or enhance availability and quality with things like condition monitoring, predictive maintenance, remote servicing, smart process optimization, etc. Also, there will be increasing emphasis on the requirement to offer flexible production. There are also already services on the market for this; they revolve strongly around networking and are often based on new business models – for example performance-based contracting, smart factory as a service, or platforms for trading production capacity.

A good ten years ago, I observed a pallet cage in component production being filled to the brim with information, physically, just to satisfy product liability guidelines – data generation and storage without any actual benefit. These days, lots of companies are already protocoling all the production data they generate so they can use the information afterwards for things like quality issues. In the future, data is sure to be used more immediately and more systematically. Many of the requirements placed on production systems will still be in place but step by step, digital solutions will help us do a better job in fulfilling them.

Smart products, smart services, smart factories – what influences do you believe these developments will have on value creation within companies?

I'll come back to my example with the machine and plant construction industry, because I know it well. The operators of smart factories can expect cost benefits through efficiency improvements, and as a result: sales growth. But sooner or later these effects will diminish because of growing competitive pressure from other smart factories. One prerequisite of commercial success will be production supported by digital technology, especially in a country like Germany with its high wages.

But I believe it will be different with smart products and smart services. The successful companies have already recognized that unlike classic, tangible goods, there's still major potential to be achieved in this area in terms of growth and higher returns – and these things will be achieved. Some companies are already generating around a third of their turnover through services – although that's not all through data. Nicola Leibinger-Kammüller, chairwoman of the managing board of Trumpf, expects – for the foreseeable future – half of the current revenues of around three billion euros to be generated through services and new business models. This shows where the journey is taking us.

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THE PROJECT WILL HELP FORGE STRONGER NETWORKS BETWEEN REGIONAL, NATIONAL, AND EUROPEAN INITIATIVES


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SMART ANYTHING EVERYWHERE – DIGITALIZATION FOR EVERYONE

DIGITAL INNOVATION HUBS: A KEY INGREDIENT OF DIGITAL TRANSFORMATION

Working in collaboration with Hahn-Schickard, Steinbeis 2i is offering companies access to Smart Anything Everywhere (SAE), a strategic initiative of the European Commission. The aim is for all companies in Europe – independent of size, sector of industry, or location – to derive benefit from the full scope of digital innovation and leverage this to improve their products, processes, and services. Digital innovation hubs will play an important role in this by helping companies to become more competitive by introducing the very latest digital technologies.

Since September 2017, Hahn-Schickard and Steinbeis 2i have been taking part in an EU project called Smart4Europe, itself part of a Horizon 2020 initiative called Smart Anything Everywhere (SAE). Their role is to represent the interests of industry in Baden-Wuerttemberg. The project will help forge stronger networks between regional, national, and European initiatives. The teams are using a technology radar system to identify emerging technology, and they are sharing trade show booths to pave the way for new business relationships. "The success of the SAE initiative is based on a three-pronged approach: access to modern digital technologies, contacts with comprehensive sources of expertise across Europe, and funding for SMEs, for example in the form of cascaded funding. But the initiative is much more than a pot of funding. It's a lively community that regularly shares ideas and presents the results of joint projects at conferences and trade shows. That's something we all benefit from," emphasizes Dr. Stephan Karmann, Business Development Expert at Hahn-Schickard and a member of the Smart4Europe coordination team.

The consortium consists of seven institutions from Germany, France, the Netherlands, and Hungary. Steinbeis 2i is responsible for spearheading "outreach and sustainability" activities and is working with other project partners on a communication strategy to involve national and regional initiatives and investors. They also want to reach out to other key stakeholders.

DIGITAL INNOVATION HUBS – A GATE TO DIGITAL TECHNOLOGIES AND EXPERTISE

Digital innovation hubs (DIHs) are a fundamental part of the European Commission's digital technology strategy. As regional entities, they allow firms to gain access to digital technologies and skills, to try out innovative concepts, to train

SME FUNDING OPTIONS THROUGH THE EUROPEAN UNION (SELECTION)

- I4MS: an initiative aimed at digital transformation in the manufacturing industry → https://i4ms.eu/opencalls
- Cloudification of Production Engineering for Predictive Digital Manufacturing → https://www.cloudifacturing.eu/open-calls-general/
- TETRAMAX – Technology Transfer Experiments – Customized Low-Energy Computing (CLEC) powering CPS and IoT → https://www.tetramax.eu/ttx/calls/
- SmartEEs for Application Experiments (incl. organic electronics) → https://smartees.eu/smartees-call-for-projects/
- MIDIH – Manufacturing Industry Digital Innovation Hubs → https://midih.eu/opencall_2.php
- FED4Fire – Federation for Fire Plus backs projects with a focus on the internet of the future. → https://www.fed4fire.eu/opencalls/
- ACTPHAST – Accelerating Photonics Innovation for SMEs and Research organizations → https://actphast.eu
- INNOWWIDE offers funding for internationalization projects involving European SMEs and startups to bring them to the forefront of international markets. → https://innowwide.eu
- IPA4SME offers financing of up to €15,000 for assessing and protecting intellectual property rights for SMEs certified with a Seal of Excellence as part the Horizon 2020 SME instrument. → http://ipa4sme.eu/apply
- The European Innovation Council and further Horizon 2020 initiatives → http://ec.europa.eu/research/eic/pdf/ec_eic_factsheet_032019.pdf

and educate personnel, to spot marketing opportunities and funding options, and to exchange views within networks. Steinbeis 2i and Hahn-Schickard are also using these hubs to bring industry players together across Europe and Baden-Wuerttemberg, as was the case at the Digital Innovation Hubs event in Stuttgart on May 14, 2019. The event was attended by more than 70 representatives of DIHs. It provided an opportunity to forge networks between initiatives in Baden-Wuerttemberg and the neighboring countries of France, Switzerland, and Austria, to compare concepts, to talk about different experiences, and to prepare future shared activities. The patron of the event, Dr. Max. Lemke of the European Commission (DG CNECT), introduced the pan-European context of DIHs and their development potential from the point of view of the Commission. Talking on behalf of the Baden-Wuerttemberg Ministry for Economic Affairs, Dr. Peter Mendler emphasized that a common and well-coordinated network allows hubs to deliver sustainable benefit to the economy on a regional, national, and European level.

The organizer's critical assessment – from an SME perspective – is that regional and national DIH funding is primarily aimed at bolstering industry and different sectors on a local level, especially if it helps small and medium-sized business enterprises with digital transformation. For example, the seed financing provided to ten DIHs through the state program in Baden-Wuerttemberg only runs for the first three years, and the general feeling among the participants at the event was that as a timeframe, this is much too short. They also felt that it will be extremely difficult – especially in such a short time – to implement a complex digital transformation strategy for businesses in parallel to setting up sustainable structures with a self-supporting financing concept for the DIHs.

On the EU level, aside from the Smart Anything Everywhere digitalization initiative, support is also available through ICT – Innovations for Manufacturing SMEs (I4MS) initiative.

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The project is being funded through the EU's Horizon 2020 research and innovation program under grant agreement 761448. For more information on the project, go to the website: https://smartanything-everywhere.eu

#TECHOURFUTURE: THE SOCIETAL IMPORTANCE OF AN ECONOMY 4.0

THE FERDINAND-STEINBEIS-INSTITUTE REMOVES TECHNOLOGY TOPICS FROM THE IVORY TOWERS OF SCIENCE

Involving society in the trend toward Economy 4.0 is important for two reasons. On the one hand, many emerging technologies in the field of "autonomization" and digital transformation cannot take effect without society. On the other, society can have a decisive influence on how and in which areas new technologies enter application. But what is the best way to involve society, and what needs to be in place for this to work? This is the question being looked at as part of a macro testbed called Technologie*Begreifen ("Grasp Technology") organized by the Ferdinand-Steinbeis-Institute (FSTI), part of the Steinbeis Foundation. Dr. Marlene Gottwald, a senior research fellow at the FSTI, explains why we need to be more daring and experimental when it comes to involving society in the implementation of future technological visions.

Interesting the general public in technology topics and encouraging them can be quite challenging, especially in Germany, where a lot of technology trends – such as artificial intelligence, autonomous robots, and self-learning machines – are seen as the projects of the elite and "far-removed." There are not enough suitable, comprehensive sources of information, and this creates another barrier for society in trying to come to terms with the latest technological developments. Exchanging ideas about technology in society and getting people involved in public debate will only work if everyone understands the underlying technological principles and the full spectrum of application scenarios.

But this is about more than accepting new technologies. Technology is not something that exists beyond the realms of society, independent of the influence of people, and it is thus not something that can only be accepted or rejected (Petrella 1990). Quite the opposite: "Values, strategies, and decision-making do affect and influence the essence and nature of technological development, and how technology is disseminated and introduced" (idem: 19). In addition, research found in the literature is often driven by the ambition of influencing acceptance among a specific target group. To make an informed decision, an understanding is needed first, independent of the outcome of that decision. At the same time, research on technology acceptance has found "that knowledge is a prerequisite for adopting an attitude/opinion or forming a willingness to take action, and it can help raise the level of understanding, allay reservations, discover different ways of using things, and objectively weigh up costs and benefits" (Schäfer/Keppler 2013: 43). Sharing knowledge can thus also be a tool for creating acceptance.

TECH OUR FUTURE
#TECHOURFUTURE
TECHNOLOGIE*BEGREIFEN

The first #techourfuture event on the topic of "Future autonomous flying – over country and people" will take place at the Technik Museum Sinsheim on November 16, 2019.

For further information go to: www.techourfuture.de. The project is sponsored by the Baden-Wuerttemberg Ministry for the Economy, Employment, and Housing.

DIGITAL AND TECHNOLOGICAL LITERACY AS A PREREQUISITE FOR CITIZEN INVOLVEMENT

Independent of the opinion-forming process, the focus is turning to enabling society or giving society permission to question technology topics and make decisions independently, and people now use the term digital or technological literacy. According to Paul Gilster (1997), who coined the term, digital literacy is about more than the ability to understand or use information from different digital sources: "Digital literacy is about mastering ideas, not keystrokes" (Gilster 1997). Digital literacy is thus about a certain mindset and has less to do with a specific skill set.

This contrasts with technological literacy, which can be seen as the ability to use, manage, assess, and understand technology (International Technology Education Association 2007: 242). To involve society in developing into an Economy 4.0, it is necessary to promote both digital and technological literacy. This can be achieved by imparting knowledge over and beyond pure technological competence and encouraging people to develop their own ideas – or maybe even visions – of the nature and application of technologies.

An example of how future technologies can be a topic of social interest can be found in Finland, which launched an initiative called the 1% AI Challenge. Its original goal was for one percent of the Finnish population to understand what artificial intelligence is and know what it can be used for – within the space of one year. This goal was achieved quickly. Yet the initiative did not start with a large-scale project underpinned by a detailed plan. Instead, coding courses were organized for children on a small, ad-hoc basis, revolving around actual needs (Merten 2019).

JUST GIVE IT A GO

This method is also being adopted for a pilot macro testbed project called Technologie*Begreifen ("Grasp Technology") at the Ferdinand-Steinbeis-Institute. The Technologie* part of the name stands for

» **WHAT IS THE BEST WAY TO INVOLVE SOCIETY, AND WHAT NEEDS TO BE IN PLACE FOR THIS TO WORK?**

the overarching level, including several individual technologies, commercial and/or societal models, and the progressive convergence of technologies (especially beyond digitalization). With the support of the Baden-Wuerttemberg Ministry for the Economy, Employment, and Housing, the Ferdinand-Steinbeis-Institute is daring to engage in an ambitious experiment in which it aims to enable society to grasp future technologies – and the term "grasp" can indeed be taken literally. As part of a series of innovation events on three selected technology topics, members of the public (ranging from school children to senior citizens, technology fans, and those perhaps not so familiar with technology) can gain a general understanding of technology principles and see how different technologies can be used and what impact they have. Under the hashtag #techourfuture, participants at the one-day events are accompanied by experts and scientists and allowed to try out and "get their hands on" the very latest technological developments. They can also independently think through their potential and different ways of using them.

The aim with #techourfuture is to create a neutral platform that not only imparts the knowledge required to assess, understand, use, and manage technology – in keeping with the principles of technological literacy – but also makes it possible to develop and discuss ideas in keeping with the digital literacy principles of Gilster and Eshet (2002).

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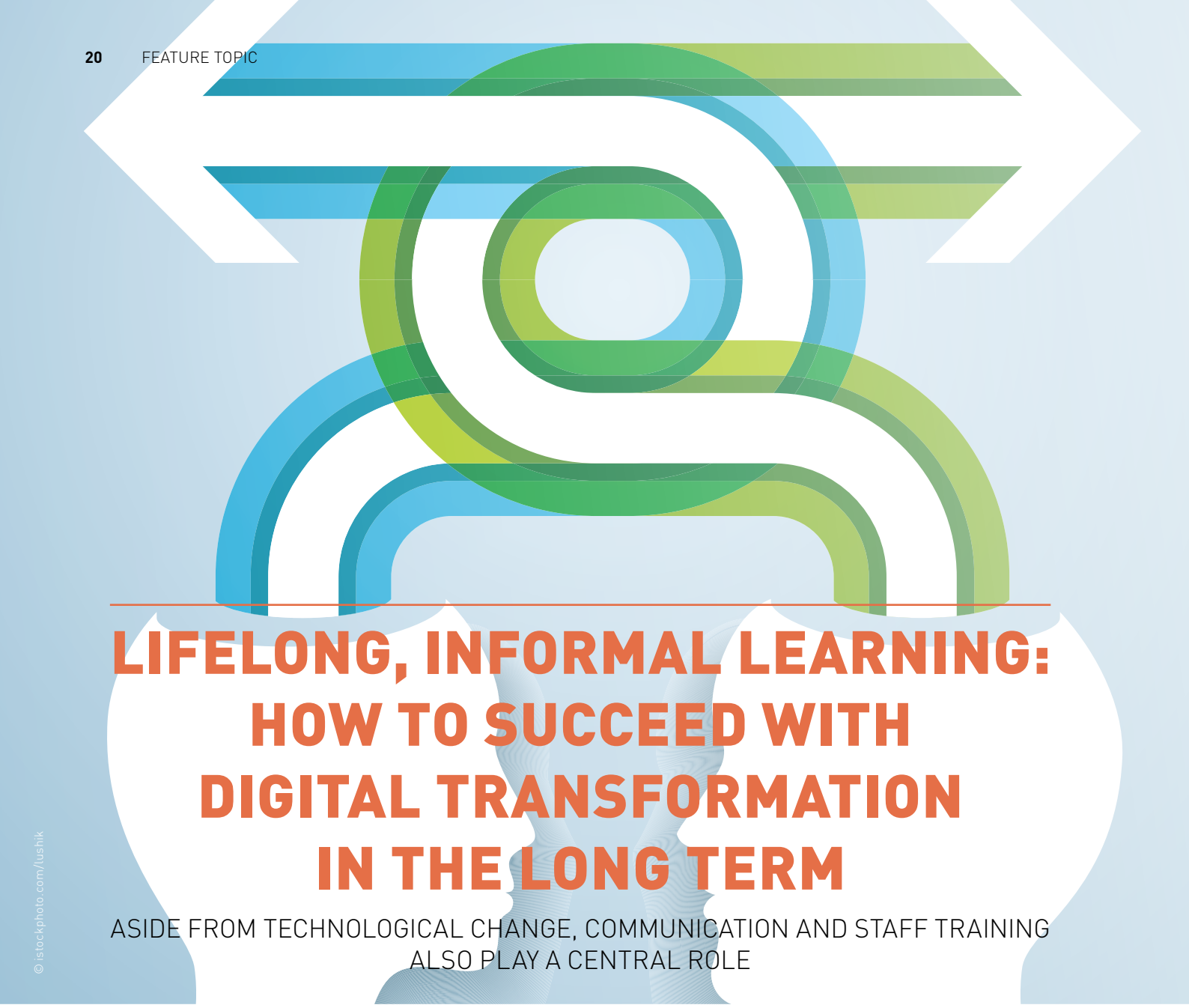

LIFELONG, INFORMAL LEARNING: HOW TO SUCCEED WITH DIGITAL TRANSFORMATION IN THE LONG TERM

ASIDE FROM TECHNOLOGICAL CHANGE, COMMUNICATION AND STAFF TRAINING ALSO PLAY A CENTRAL ROLE

Digital transformation is often seen as just a technological process that focuses on digitalizing certain aspects of a business. Frequently, not enough thought is given to the need to achieve continual change, and factors such as communication, corporate culture, staff training and the learning culture are particularly likely to be undervalued. Professor Dr. Pia Sue Helferich and Professor Dr. Thomas Pleil, experts at the flux Steinbeis Transfer Center in Dieburg, explain why these factors play such an important role when it comes to succeeding with the digital change processes within companies.

When it comes to understanding digital transformation within companies – and rather than seeing it as a one-off project, actually engendering a fundamental willingness to embrace change in the company DNA – a crucial role is played by communication, company culture, staff training, and the learning culture. One important aspect of this is lifelong learning. When employees undergo lifelong training on the job, it not only safeguards their employability and job satisfaction, it also helps the company to stay competitive and flexible, so it can gear itself to any situation that may arise.

The concept of lifelong learning is nothing new, but the conditions that dictate our home and work lives have changed due to increasing levels of digitalization (Uhlig 2008, p. 13; Head et al. 2015), and this has an impact on lifelong learning. There are a number of ways to learn within a company, from informal learning to learning on the job, learning from colleagues, and formal learning such as courses or special training (Head et al. 2015; Tough 1979; Avergun and Del Gaizo 2011, p. 198–199). In recent years there has been a rise in interest in informal learning (Eraut 2004, p. 247). This is

mainly because everyday business involves a continual stream of new, smaller tasks or problems that have to be dealt with, and colleagues or online research can help solve some of these tasks, so learning effects are enjoyed by employees as an "incidental" benefit.

INFORMAL LIFELONG LEARNING NEEDS THE RIGHT COMPETENCES

Informal lifelong learning also means that learners have to take more responsibility for their own learning process and therefore need certain competences. These include capabilities such as direct or digital interaction with others or knowing how to assess available information sources. Digital technology practically makes information available in real time and this has to be found, filtered, logged and evaluated by learners. These competences are already being discussed internationally under terms such as web literacy (Wittenbrink 2012) or digital literacy. The reason these competences are important when it comes to informal learning is that they are not just part of personal interaction at the office. These are competences that bridge the gap between finding and knowing how to deal with information and digital interactions. It's also important how capable somebody is of processing and presenting information so that it can be used by others.

INFORMAL LEARNING: PART OF THE COMPANY CULTURE

It's against this background that more and more attention is being paid to the issue of how companies can promote lifelong learning among employees. Pia Sue Helferich and Thomas Pleil have been working with a team at Steinbeis on the following tips for companies. They are based on a survey of small and medium-sized enterprises in the communication industry (Helferich 2017).

- Networking and social relationships: For many, social relationships – both digital and in "real life" – play a key role in lifelong learning. Companies can support this by organizing internal events such as BarCamps or other learning and exchange events, using methods like the "working out loud" technique. But it's also important to maintain external contacts for lifelong learning, since this injects new knowledge into the company. This can be achieved by attending external events, and it's also important to manage digital networks through online communities such as LinkedIn, XING, Twitter and co.
- Give people enough time to invest in certain topics: Some companies give their staff weekly time budgets (e.g. 2, 3, or 4 hours) to concentrate on a topic of their choice. They then share this knowledge with co-workers.
- Don't see knowledge as an instrument of power: Sharing knowledge should be a core principle at a company and not be used as an instrument of power. A culture of giving and taking knowledge paves the way for lifelong learning.
- Foster personal projects: Some of the companies surveyed gave staff an opportunity to use company resources for their own projects, such as a hackathon for a good cause. This does take up company resources, especially at the beginning, but then it results in staff feeling more motivated and people becoming more involved or identifying more with everyday events at the company. It can also be used as a fountain of innovation.

These measures only represent a small number of examples of the actions companies can take to promote a corporate culture that allows employees to engage in lifelong learning.

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„AGILITY IS NOT SOMETHING THAT CAN BE PRESCRIBED, IT HAS TO BE LIVED OUT AND BELIEVED IN“

AN INTERVIEW WITH PROF. DR.-ING. KLAUS SCHLICKENRIEDER, DIRECTOR OF THE STEINBEIS TRANSFER CENTER FOR PRODUCTION PROCESSES, ROBOTICS, AND AGILE

↑ Robot KR30: a square-sketching test rig

Robots working alongside people as if it's nothing out of the ordinary – the shape of things to come in production. But a lot of things will have to change to get that far. Of course safety issues will need to be addressed, but more than anything it will be important to involve workers in this development from the word go, and their fears will have to be taken seriously. Just how and why agility cannot solve all problems by itself, is explained by Prof. Dr.-Ing. Klaus Schlickenrieder in an interview with TRANSFER. Schlickenrieder is closely involved in this area in his role as the director of the Steinbeis Transfer Center Production Processes, Robotics, and Agile, as well as his role as director of the Institute of Production Engineering and Materials Testing at Ulm University of Applied Sciences.

Hello Professor Schlickenrieder. Digital transformation and the automation of production processes are moving ahead in leaps and bounds, and more and more of the work carried out by humans is being taken on by robots. What implications does this have for the industry?

I think for the production base to remain in Germany and stand its ground on a global level, you need automation. And I believe that robots have an especially important contribution to make in this respect. They should be seen as an opportunity, since they can take the burden off people and carry out physically demanding or monotonous tasks – so they can practically free up people and let them take on other tasks that are more challenging. I also believe that Germany as a manufacturing economy actually needs robots at the moment to bring production that has already been shifted abroad back to Germany again. I think one problem with automation is that it will affect people who are perhaps not so well educated, the ones who are currently doing the more simple tasks. It goes without saying that automation fuels fear among these workers, which is why it's important to bring them on board at the beginning. When companies automate, they have to work with the people who are affected by the move and ensure that they create jobs that will allow employees to identify with the new role again and see things as an improvement. If they do this properly, I believe there's a good chance that employees will accept the move to automation. I'm not sure that

robots will create more jobs, but they will maintain the number of jobs currently on offer.

One of your main areas of focus is human-robot collaboration, or HRC. What do you see as the biggest challenges of HRC, but also opportunities?

One of the biggest challenges I see Germany facing in this area is safety. It's really important to make sure this aspect is dealt with properly. Other countries are less strict in this area, or they make fewer demands, which I think isn't right because the safety of human beings is the supreme good. But it's difficult to set up a safe working environment at the moment – one that allows robots to work at a company with people – because the standardization processes are still being worked on. I think this is one of the reasons lots of companies are grappling with HRC at the moment.

The second big challenge I see is with the employees themselves. The way I see it, at the beginning they're incredibly skeptical about robots, or HRC, which is entirely understandable because they're worried about losing their jobs. There's no doubting that it will be challenging to bring these people on board, but it will be necessary. Employees need to be shown the opportunities presented by HRC – for example, they can be freed up from physically demanding or monotonous tasks, and collaborative robots – cobots – can take on dangerous tasks for them. HRC machines can work more accurately; they can work more uniformly; they can work faster. But people can make better decisions and people can make judgments – and people should also make decisions. HRC has the ability to combine the benefits of both worlds – the world of human beings and the world of robots.

Which trends do you believe will dictate the future of industrial robots, and what will they mean for the world of work?

I think there are three major areas here. The first relates to classic industrial robots. Numerous experts are currently looking into this important topic to try and make the programming of classic industrial robots faster and easier. If they work it out, the application areas will broaden significantly. At the moment, industrial robots are used extensively in serial and mass production – so they're in big companies that have to produce in big batches. But the SMEs and manual trades are struggling in this area because it currently takes too long to program robots. If they can make that easier and quicker, the application areas for industrial robots will expand and SMEs will also be able to benefit from this. The second big trend is about mobile robots and mobile manipulators – HRC-capable robots on a mobile platform. They make it possible to automate things like transportation logistics and internal goods movement, quickly and effectively, in areas where muscle power

A Mitsubishi robot: a testing facility for automatically assembling garden valves

↑ Prof. Dr.-Ing. Klaus Schlickenrieder in the lab at Ulm University of Applied Sciences

The robot iiwa with an adaptable HRC grabber fitted with a camera on a testing rig used for quality control purposes →

is needed at the moment. And the third trend is the one I already mentioned: cobots. This is where people work alongside robots, which gives you an opportunity to enjoy the benefits on both fronts.

As I already mentioned, at the moment decisions are still made by people and I believe it will stay that way for the foreseeable future. I'm keeping a close eye on the developments going on in artificial intelligence, but I'm still quite skeptical as to when it will reach market maturity. I think I'll still be here to witness it when it does happen, but in the near future people will be indispensable in production if you want to make decisions.

Digital transformation is making companies question the areas of business they operate in and adapt the nature of organizations to the new challenges. Lots of companies believe the way forward is agility and value creation networks. What will they need to look out for if they move in this direction?

I can answer that by describing something I experienced myself. The most important factor is people, staff. Lots of companies see it like this: "Agile is hip, everyone's 'doing agile' at the moment, so I've got to do it, too." But what they underestimate is the cultural change this trend entails – within the company. You shouldn't start thinking agility will solve all your problems. It's just a different way of going about things. The problems are still there, just like they used to be, but now they're solved in an agile way and that takes time. If anyone believes agility will immediately put their profits up, they'll be a bit disappointed. What I recommend is that employees are involved right from the beginning and that you work through things step by step and tentatively try to understand what it means to be agile and what sort of impact, what sort of influence it will have on company culture. I observe small companies, which are much more adaptable, finding it easier to switch from the previous development approach to agile development. The big, more traditional companies, which have been shaped by hierarchies for many years, will find it difficult to make this transition. The other thing is that you need a lot of staying power. In my experience, it takes around five years for the culture of a company to change.

As for value creation networks, Industry 4.0 addresses horizontal, inter-company value creation networks. But I think in practice this is a really difficult thing to implement. Despite this, I think companies do need to engage in networks and "think networks," because you can't do everything internally anymore. And with networks, companies have an opportunity to focus on their own strengths and be part of the market as a collective unit. Agile technologies can help you to set up these company networks and operate effectively within them, but they're not the only form of assistance.

Agility is not something that can be prescribed, it has to be lived out and believed in. It will never work if it's just imposed on people top-down; employees have to want it and understand how they can benefit from it. I believe it offers major advantages. But first, there's a rocky road ahead. Company management has to support this process, but it also has to be able to let go. One thing I often see is that the problem's not the employees but the people in the middle, although it's also in upper management.

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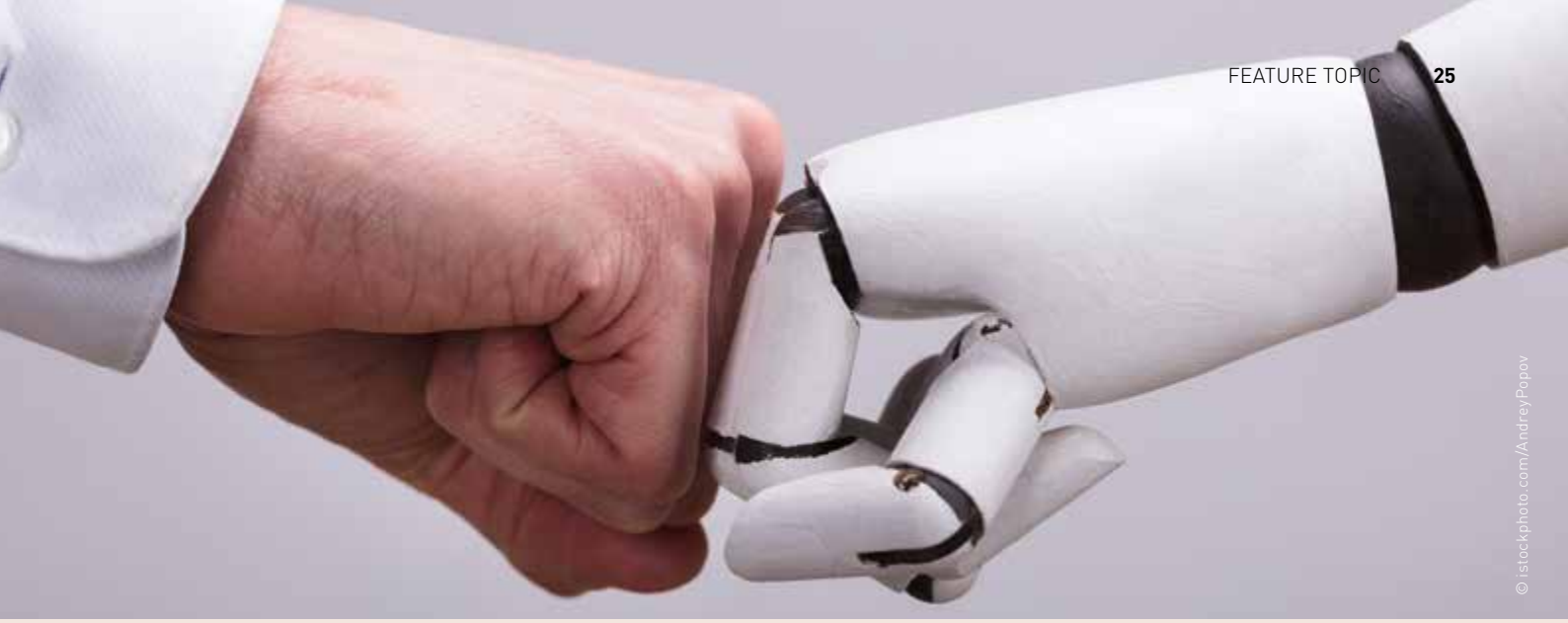

ECONOMY X.0: SMEs SHAPE UP FOR A DIGITAL FUTURE

THE BADEN-WUERTTEMBERG INDUSTRY 4.0 TRANSFER PLATFORM TRANSLATES DIGITAL TRANSFORMATION TRENDS INTO PRACTICE AT SMEs

Industrial trends are accelerating at an incredible speed. Within a short space of time, a variety of global techniques and technologies have become established, rapidly resulting in new products, applications, strategies, and business models. German businesses, especially small and medium-sized enterprises, are still finding it difficult to keep up. Since 2016, this has been the starting point for the Baden-Wuerttemberg Industry 4.0 Transfer Platform. Focusing on SMEs in Baden-Wuerttemberg, the initiative showcases the opportunities offered by Industry 4.0, paving the way for firms to embark on projects that are ready to be implemented.

One of the challenges with the initiative is addressing misconceptions regarding Industry 4.0 and digitalization and presenting a success model to provide a contrast to some of the damaging experiences companies had in the past. Traditional German businesses have a strong tendency to want to play things safe place and as a result, in many areas of business SMEs are presently extremely hesitant about current developments. Some companies have been running at near full capacity for up to ten years, the order books are brimming, and they have been so successful that it has left them with a false sense of security. As a result, there is an urgent need to invest in new developments and innovative solutions, since companies keep deferring the need to rethink and put off the transition to a digital workplace. In some cases, they have actually done nothing.

MAKING IT EASIER TO ENTER THE WORLD OF DIGITAL TECHNOLOGY

Set up by the universities of Aalen, Reutlingen, and Esslingen in cooperation with the Steinbeis Foundation, and backed by the Baden-Wuerttemberg Ministry of Economic Affairs, Labour, and Housing, the Baden-Wuerttemberg Industry 4.0 Transfer Platform (TPBW I4.0) is based on the idea that more small and medium-sized companies could be provided with access to knowledge, know-how, and experience regarding project implementation in the field of Industry 4.0 and digitalization – especially when it comes to the practical application of new technologies and processes. In keeping with this idea, the function of the transfer platform is to simplify the challenges firms will

BECAUSE THE TRANSFER HAS A STRONG FOCUS ON BUSINESS PRACTICE, IT BOLSTERS THE REGIONAL ECONOMY, EXTENDS THE OUTLOOK OF REGIONAL COMPANIES TO AS-YET UNIMAGINED SOLUTIONS FOR THE DIGITAL AGE, AND GRANTS SMEs ACCESS TO NEW RESOURCES.

face, no matter how daunting they may seem, and it has already demonstrated through a large number of projects how low the entry point can be for the world of digital technology. It thus reduces the risk of SMEs in Baden-Wuerttemberg falling behind in the worldwide development of digital solutions.

For Economy X.0 to work, SMEs will need to turn to the research and development experience offered at universities, and they will have to be in a position to make a success out of their own projects – more quickly and more reliably. One tremendous advantage offered to companies is that universities have developed implementation concepts and strategies that are not only tried and tested, but also practice-oriented. TPBW I4.0 focuses on core competences with an immediate impact on the future competitiveness of our SMEs, thus supporting the targeted promotion of SMEs in Baden-Wuerttemberg. In particular, it allows companies to get involved, especially those lacking the internal capacity to work on the topic of digital transformation. These firms make use of the resources of the TPBW I4.0 in order to immerse themselves quickly in transformation projects in an uncomplicated manner and turn them into a success. The main focus of the TPBW I4.0 lies in artificial intelligence, the introduction of ultra-smart logistics and assembly processes, the use of cloud solutions, digital twins, data analysis and evaluation, data security, and predictive maintenance.

A WIN-WIN SITUATION FOR EVERYONE INVOLVED

Focusing on these areas delivers significant benefit not only to companies, but also to universities and institutions involved in vocational training. It also serves future generations of engineers and developers, which are urgently needed in the state. The projects being carried out through the TPBW I4.0 clearly highlight how easy it is to enter into fruitful partnerships with other parties and the major benefits that collaboration can deliver not just for companies, but also for universities – over and beyond actual projects. For example, people become more aware of and open to the network philosophy and the sense of innovation shared by their industrial partners, and this leads to further collaboration scenarios, such as involvement in the Industry 4.0 alliance.

The transfer platform is a successful way to help SMEs overcome the challenges of Economy X.0 and adopt a leading position on the world stage in the future. Being able to implement projects through a low entry point is particularly important for allowing a large number of SMEs to benefit from the expertise of universities and Steinbeis. Because the transfer has a strong focus on business practice, it bolsters the regional economy, extends the outlook of regional companies to as-yet unimagined solutions for the digital age, and grants SMEs access to new resources. There is another aspect to the success of the TPBW I4.0, which should not be underestimated: During intense periods of collaboration, industrial partners have the opportunity to discover new business models and raise internal commitment to innovative solutions. As a result, the energy invested in transfer is often just a catalyst for developing important competences within the company. This also gears small and medium-sized enterprises to the challenges they will need to face across a broad variety of topics encountered in Economy X.0.

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"STAFF NEED TO BE BROUGHT ON BOARD"

AN INTERVIEW WITH PROF. DR. DANIEL PALM, DIRECTOR OF THE STEINBEIS TRANSFER CENTER INDUSTRY 4.0 AND DIGITALIZATION AND THE STEINBEIS TRANSFER PLATFORM INDUSTRY 4.0

Digital transformation provides companies with completely new possibilities to add value, but it also spells significant changes in the working environment. This makes it all the more important for firms – and for their success in the long term – that employees are prepared for the change in circumstances. This is something Prof. Dr. Daniel Palm understands from his own experience as director of Industry 4.0 and digitalization, the Steinbeis Transfer Center, and associate director of the Steinbeis Industry 4.0 Transfer Platform. Palm explains to TRANSFER how roadmaps are created for transforming value creation and business models. He also talks about the importance of "seeking pain points." When working on client projects, the Reutlingen University logistics expert also places emphasis on the aspect of sustainable change within companies.

» IT'S IMPORTANT THAT SUCCESSES CAN BE SEEN QUICKLY AND TRIGGER A DOMINO EFFECT IN THE COMPANY.

Hello Professor Palm. For companies, digital transformation is not just an opportunity, it also entails risk. What's the best way to succeed when implementing it?

The first thing digital transformation entails for a lot of people is a huge personal change in their working environment. That's not unlike any other change process. Staff need to be brought on board, involved in the reorganization process, and trained. Otherwise, there's a strong possibility that things will go wrong. We were once brought in by a service provider that had digitalized its paper-based processing systems. The only immediate change was that instead of using paper, they now had a digital filing system. In essence, this is the sort of measure that should accelerate processes and improve things. But the outcome we were presented with was like this: Productivity had gone down, employee satisfaction had shot down the scale, and sickness-related absenteeism had gone up. What had happened? Staff hadn't been given proper training on using the new system, it wasn't user-friendly, and they felt stressed by the never-ending stream of new processes because they no longer had the old piles of paper as a point of reference. The unfamiliar situation and uninterrupted work on computers was causing lots of people to tense up and they got back pains. Managers had no tools or guidelines for dealing with the situation. Yet digital solutions are supposed to help people and should not, as Prof. Andreas Syska once described it – with a hint of provocation – turbocharge the hamster wheel.

One thing you do for customers is create transformation roadmaps for value creation and business models. How does that work?

We take two approaches. One is the top-down approach, where you take a strategic view of the company and link the strategy to the degree of digital penetration at the business. This builds a bridge between business models and overarching measures. To do this, we organize workshops with managers. But it's often more important to use a bottom-up approach, which we also call "seeking pain points." With this, we go through value creation processes with staff and at every stage we ask how we could use digital technology to make processes faster, more simple, more efficient, or better. Based on these potential areas of improvement, we derive measures, which we then evaluate and implement in small projects. It's important that successes can be seen quickly and trigger a domino effect in the company. To make things sustainable, we do need management, but the successes of digitalization have to come from the employees and be for the employees. They'll implement improvements and will be highly motivated if they can avoid doing things twice and prevent uncoordinated overlaps, interruptions caused by different types of media, slack, or the irritation of having to look for things.

The technological advancements brought about by the internet of things has resulted in new kinds of collaboration and with this, the emergence of new business processes. How can business process management help companies shape this development effectively, and how important is sustainability in this?

We also use the classic methods of business process management for digitalization and combine these with an understanding of the capabilities and limitations of Industry 4.0 or internet of things technology. It's important to understand the time and effort involved in

introducing these things, the possibilities, but also the difficulties with certain technologies. Successful and sustainable development within a company also revolves around the classic methods of process management and continual improvement. To do this, we train process managers, who function as experts in certain methods and multipliers within the company.

The demands placed on a company's production networks are changing continuously at the moment – either due to the introduction of new technologies and new products, or due to moves into new markets, or due to changes in the nature of competition. What can companies do to deal with these rapid changes?

The pace of change in the business environment does indeed seem overwhelming at the moment, even if lots of companies have done pretty good business in recent years without adapting. We often hear people saying they're too busy to look into digital business models or digital transformation. The old business models and processes still work, just like they used to. But you keep falling further and further behind. Research organizations and digital innovators have already stopped looking into Industry 4.0. They've moved on to biological transformation and artificial intelligence. But if you don't do your homework with digital transformation, you won't succeed with artificial intelligence. So the gap will keep getting bigger and bigger, and at some point you'll find yourself in a situation that threatens your competitiveness. Then my only piece of advice would be to get started! Start small, but get started! There are a lot of funding options for small and medium-sized companies and they make it easier to get out of the starting blocks. The Industry 4.0 alliance in Baden-Wuerttemberg offers funding for Industry 4.0 scouting options; the state of Baden-Wuerttemberg offers innovation vouchers. Both are excellent instruments for making the first steps. Baden-Wuerttemberg has its Industry 4.0 Transfer Platform that was set up by the universities of Aalen, Reutlingen, and Esslingen in collaboration with the Steinbeis Foundation, funded by the Baden-Wuerttemberg Ministry of Economic Affairs, Labour, and Housing. It's glad to provide advice and help companies with these matters, and it will even work with you on more complex tasks relating to digital transformation.

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DIGITAL TRANSFORMATION MEANS A LOT MORE THAN DIGITALIZATION

SMALL AND MEDIUM-SIZED ENTERPRISES NEED TO DO MORE THAN DIGITALIZE PROCESSES – THEY ALSO NEED TO KEEP OVERHAULING THEIR BUSINESS MODELS

The discussion surrounding digitalization and digital transformation has been a wake-up call for industry. Succeeding with digital transformation is often seen as a do-or-die issue in German industry, since the most recent advances in technology have every potential to disrupt business models – in ways that have probably never been seen before. In the maelstrom of rapid change and the breakdown of existing business models large parts of medium-sized companies have to assert their existence. Prof. Dr.-Ing. Jörg W. Fischer, director of the Steinbeis Transfer Center for Computer Applications in Engineering and professor of production management and virtual factories at Karlsruhe University of Applied Sciences, discusses the steps that SMEs can take to deal with this situation, and the role played by "configure to order."

For a long time – almost unnoticed by the general public and largely unaffected by the discussion surrounding digitalization – small and medium-sized enterprises have been undergoing sweeping changes, shifting away from engineer-to-order (ETO) and moving closer to configure-to-order (CTO). Traditional mechanical engineering and machine construction used to be driven by ETO. This is where a made-to-measure solution is developed for clients to give them a custom-designed machine or equipment that they need. The ETO approach is a good fit with the trend toward individualization, but it also causes a whole series of problems. Because clients have to bear high development costs themselves, the machines or equipment they want to order is often too expensive. On top of that, the approach means that delivery times can often be up to nine or even twelve months. In the fast-moving and dynamic markets of today, this is too long. Most potential customers cannot plan around such long cycles, so they order the machines or equipment they need from companies with shorter delivery times. For businesses working according to ETO principles, it may not take long for this to threaten the existence of the company.

CONFIGURE-TO-ORDER: ADVANTAGES AND CHALLENGES

One way to get around this problem is to switch to CTO. The CTO approach gives customers predefined options so that

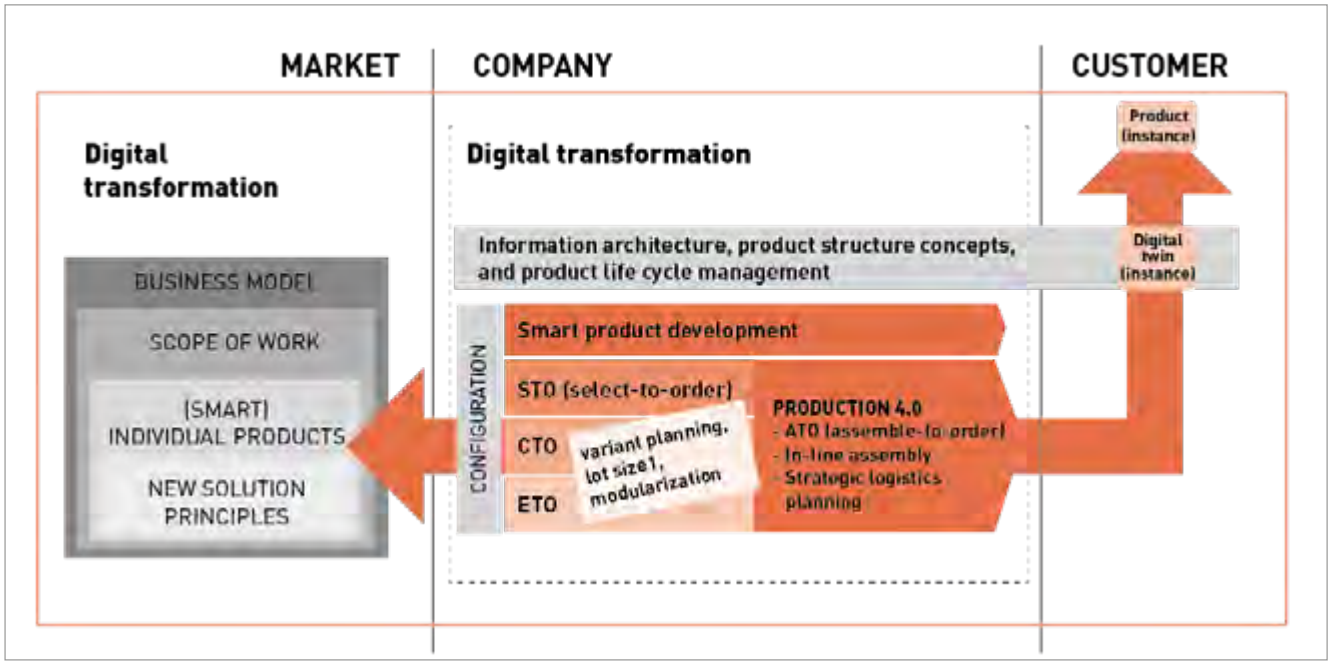
they can configure products according to their requirements. Any possible configurations have been thought about in advance and ideally even developed in advance. Companies that succeed with this transition can cut delivery times from months to several days – with significant cost reductions.

The shift from ETO to CTO entails the introduction of completely new process patterns, which also entail changes throughout the company. These process patterns can only be introduced by using the very latest IT systems, and this also makes comprehensive digitalization in product development and order processing necessary. At many small and medium-sized business enterprises, which are typically organized according to classic functional structures, such changes are often impeded by existing departmental boundaries. Companies that recognize this problem frequently consider moving to a process-based organization. This often involves introducing overarching departments, such as a project management office (PMO), process management, or organization-based development. This diminishes the previous dominance of traditional, functional departments. Since this transition from ETO to CTO involves interdepartmental digitalization, if necessary central departments have to be set up. The aim of this is to plan the digitalization process at an overarching level, and sometimes companies introduce a chief process officer (CPO) or chief digital officer (CDO), whose job is to manage the overall digital transformation from the center.

DIGITALIZATION VS. DIGITAL TRANSFORMATION

All of these measures are important and they often lay a foundation for the journey ahead. Despite this, such digitalization measures should not be confused with the required digital transformation, because they will be of little help to a company if the previous business model is disrupted. This is where one sees the difference between digitalization and digital transformation. Digitalization is about the (part-)automation of business processes by introducing modern software solutions, whereas digital transformation is about a change in the company, even extending to new digital business models. In essence, the question is how a company can earn money in the future if its current business models fall apart. For example, what if the conventional approach of selling products directly to customers becomes the selling of services, as has happened in many sectors of industry? Is the German Mittelstand ready for that? And what happens if being able to integrate a supplied product into new scenarios suddenly becomes a key factor driving purchasing decisions?

The process-oriented map for digital transformation



To understand the implications of all this, we can look at a scenario involving cars, looking for a parking space, and a parking garage: No driver wants to waste time looking for a parking space. So it's more than likely that customers will expect vehicles to find somewhere to park themselves. In the future, this will result in an interactive scenario comprising vehicles, providers of parking lots, and a central platform, and everything will communicate with everything else to guide vehicles independently to free parking spaces. Companies that want to offer products for such a scenario will need to predict this situation in order to prepare their products or services now.

Small and medium-sized firms therefore face a number of challenges. On the one hand, changing from ETO to CTO requires digitalization of central processes. On the other, the disruption caused in business models fundamentally changes how firms will need to operate in the market. There is no patent recipe for solving this situation. But in summary, there are a number of points that a company really needs to think about:

- digitalizing internal processes, something that is required anyway
- continually thinking ahead about any possible changes that may come about in business models
- the willingness of shareholders and management to make quick and bold business decisions, including providing access to the necessary financial means
- establishing an organization which is capable of taking action, with flat hierarchies, in order to be in a position to implement decisions quickly and thus create a flexible digital core for the company, networking all required information, across the board.

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» IN THE MAELSTROM OF RAPID CHANGE AND THE BREAKDOWN OF EXISTING BUSINESS MODELS LARGE PARTS OF MEDIUM-SIZED COMPANIES HAVE TO ASSERT THEIR EXISTENCE.

EVERYTHING REVOLVES AROUND PEOPLE

A TEAM OF STEINBEIS EXPERTS FROM WÜRZBURG SUCCESSFULLY FORGES A LINK BETWEEN PEOPLE AND TECHNOLOGY

Despite all the potential offered by digital transformation, ultimately it will be about developing smart things – and in doing so, not losing sight of people. This is a challenge being looked at by two Steinbeis Research Centers involved in a collaborative project in Würzburg. The team at the two centers comprises Sebastian Gläser, Prof. Erich Schöls, and Dr. Markus Thies, whose digital projects focus clearly on the aspect of adding value for people.

Coperion Showcase

Digital technology is a good thing. It brought us the internet, it turned the smartphone into an indispensable companion in our everyday lives and at work, it gave us new payment systems, and it's now lining itself up to turn industry on its head by introducing artificial intelligence and driving the cars of the future around autonomously. It appears to offer huge potential and it looks like it will affect almost all realms of the economy, society, and our culture. Digital solutions accelerate processes, make the invisible visible, and make the global world of news virtually transparent.

Digital technology is a dangerous thing. It dictates our daily lives, it cramps personal time frames, and it bombards us with gargantuan outbursts of data and information. Driven by technological feasibility, markets are being flooded by a continual stream of new apps and products – concepts that most of us still struggle to make sense of or see benefit in, even after using them for a long time. By the time digital transformation has finished, it could cost millions of people their jobs, because they will be replaced by robots and artificial intelligence.

Admittedly, that was a concise version. But as ambivalent as this all feels, this is how the discussion regarding transformation goes among members of the general public. People are just as fascinated by the possibilities of digital solutions as they live in fear of the disruptive power of things digital. We want to be part of modern life and the world of tomorrow, but we still invest time thinking about digital detoxes, because we find ourselves suffering more and more under the disturbing and sometimes nonsensical "digital doctrine." It's almost an empty platitude to suggest that this development will keep advancing in the same way, without change, or that it will have a major influence on all areas of the world we live in. But it will be interesting to see which ideas will be successful or which ideas will go down in the history books as digital blunders.

FORGING A SUCCESSFUL LINK BETWEEN DIGITAL AND ANALOG

If we've learned anything in recent years, it's that technology does not necessarily mean something will be a success. "You have to stand back and look at digital transformation from a broader perspec-

↑ A Zeyko rack configurator

tive, separate it from the technology and place it in the human context. When you do, you see that digital developments have to focus on people and they will only add value in the long term as part of this relationship," says Steinbeis expert Sebastian Gläser with conviction. Gläser manages the Steinbeis Research Center for Design and Systems, and he makes this insight a central aspect of all the studies and inventions he works on. For the past 15 years, a variety of information and media designers have been working at his center with computer scientists – developing digital concepts, prototypes, and solutions for a variety of fields of industry, medicine, and the arts. "The question regarding the meaning of a project and the reactive energy it releases within its sphere of influence are always central to our considerations. We deliberately seek an interdisciplinary exchange of ideas between design and computer science to strike a sensible balance and link the benefits of a potential digital solution with expectations from the analog world," explains Prof. Erich Schöls, a director at the Steinbeis Research Center.

One successful example of this is project Coperion Showcase – an online platform with an interactive product viewer. For this project, the Steinbeis Enterprise developed a sales tool for Coperion to optimize its comprehensive list of product information and allow sales people to interact with one another. A key feature of the solution is a web-based 3D viewer that makes it possible to explore components in detail and add personal comments directly in the 3D model. This system, based on webGL, allows users to display and use 3D content in real time on any kind of browser without needing plugins. It also offers text-to-speech functions to supplement the acoustic presentation of products. The experts also developed an online presentation tool that allows users to write and save individual product presentations, which can also be sent to customers. The system comes with an integrated AR viewer to allow components to be portrayed virtually in space for simulation purposes.

Another exciting project implemented by the Steinbeis Enterprise was for the kitchen company BES zeyko. The project marked the beginning of a new chapter in the history of zeyko in the form of a modern kitchen system, totally in keeping with current times. The Steinbeis experts developed a configurator that makes it a lot easier to position kitchen designs anywhere in a room using augmented reality. This also makes it a lot easier to make decisions. The system includes a module-based, adaptable cooking unit which can be planned, configured, and ordered individually using the app. This is a good match with the online philosophy of younger buyers, for whom such functions are entirely customary.

A strategic development at the beginning of this year resulted in the Steinbeis Research Center expanding by a second unit: The Steinbeis Research Center for Explorative Digitalization Solutions was founded with Dr. Markus Thies. An established AI and blockchain expert, Thies is working on systematically expanding both Steinbeis Enterprises, with the aim of translating visionary concepts and bold ideas into market-ready systems.

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LET'S TALK ABOUT TECHNOLOGY*

STEINBEIS EXPERT PROF. DR.-ING. DR. H.C. NORBERT HÖPTNER APPEALS FOR MORE OPENNESS TO TECHNOLOGICAL DEVELOPMENTS

PCs. Laptops. Smartphones. GPS. We've come to accept the technology behind these devices without even thinking about it. Fly-by-wire. Autonomous cars. Drones. At this point, lots of people start to raise an eyebrow and look a bit skeptical. Operations without surgeons. 3D-printed human organs. Experimental food. If they haven't already, now most people in German society activate the "conventional thinking and methods" button. But why? Because we lack the know-how to understand these new technologies. Because we don't invest time in trying to understand them. This isn't just wrong, it actually poses a threat to the positive development of our society.

I'll get to the point: This is not an appeal for people to see all new technologies – and the products that they give rise to – as good per se. But it is a call for people not to simply form their opinions based on some sort of random "insights" shared in places like the social media.

Emerging technologies are almost always pieced together on a "multidisciplinary" level, so let's call them Technology*. Of course it's surely not possible for everyone to have a specialist knowledge of all disciplines. There's much too much knowledge out there for everyday people to keep track of everything – despite Wikipedia and co. So we need people who can explain Technology* to us and make it accessible. We also need the possible fields of application pointed out to us so we can gain a tangible grasp of how society will be able to use this Technology* to discuss opportunities and threats. Experts need to be involved, so questions can be given concrete answers. And everything needs to take place within a framework of trust, moderated in a "neutral" way, factually, with objectivity.

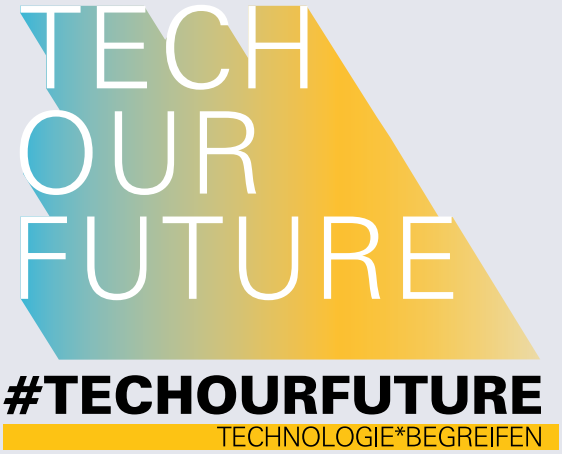
If you're starting to think, "Great, I'd like to be involved in that – but I wouldn't know where," than I have a nice surprise for you. Experts at the Ferdinand-Steinbeis-Institute have found a way to offer such a format within a "forum of trust." And the Baden-Wuerttemberg Ministry of Economic Affairs, Labour, and Housing is providing the required means for our project as part of an initiative called the Macro Testbed – Technologie*Begreifen ("Grasp*Technology").

To get a grasp of what we're doing online, search for #techourfuture or go to www.techourfuture.de (or turn to pages 17 and onwards).

What is the benefit of people looking more closely into technology topics? Well for a start, you feel better. You also feel in a better position to decide something based on knowledge when you don't just see a black box in front of you, but understand what's in it. It helps you deal better with the fear of "losing control" in your life. And this helps deal with the phenomenon of feeling "angry out of helplessness." Jobs in the hi-tech industry are more

appealing when you can discern the benefit you deliver to society through your own work. And last but not least, creating transparency in the fields of technology and engineering is an important part of active democracy.

Which is why I suggest the following: Sit down with relatives, friends, and co-workers – over a coffee, beer, or glass of wine – and talk about Technology* rather than the weather!



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Prof. Dr.-Ing. Dr. h.c. Norbert Höptner studied Signal Engineering at Darmstadt University of Technology. In 1982, he gained a PhD in digital signal processing systems at Karlsruhe Institute of Technology. He was first appointed as a professor at the former University of Applied Sciences in Karlsruhe in 1989. During his time there, he founded the Steinbeis Transfer Center for Signal Processing Systems and aside from focusing on teaching and research, he also became increasingly involved in technology transfer. In 1992, Höptner moved to Pforzheim University of Applied Sciences, where he was the founding rector of the department of electrical engineering. From 1995 until 1999, he was prorector and director of the Institute of Applied Research (IAF) at the university. He then spent four years as chancellor of the University of Design, Engineering, and Economics in Pforzheim.

In 2002, Höptner became the Commissioner for Europe for the Minister of Economic Affairs in the state of Baden-Wuerttemberg and he was also director of the Steinbeis-Europa-Zentrum based in Stuttgart and Karlsruhe. Since July 2018, he has been working at the Ferdinand-Steinbeis-Institute, part of the Steinbeis Foundation, with a focus on "making technologies tangible."

TO THE POINT

STEINBEIS EXPERTS DEVELOP A PROCESS FOR SELECTIVELY ADDING COATINGS USING EXTREMELY FINE POWDER PARTICLES

Mechanical engineering is currently shaped by two major trends: achieving productivity enhancements and improving the energy efficiency and ecological efficiency of products. For manufacturers, these trends require machines and plant with a long service life. But at the same time, there is no getting around the fact that running machinery results in wear and tear, placing a great deal of stress on component integrity. When metal parts become worn, they either have to be replaced or, as is often the case, a more economical method is needed for reworking and reconditioning components. It is common to re-process metal components by using thermal spraying or welding methods. This involves reconstructing worn parts and then machining and finishing them. As things currently stand, there are number of serious drawbacks with the processes used to do this. Intelligent Functional Materials, Welding and Joining Techniques, Implementation (the Steinbeis Innovation Center) has now developed a process technology that does away with some of the main headaches faced with such processes.

↑ The new coating system: The plasma powder spray gun, including hardware and a powder-conveying unit for coating component surfaces with extremely fine powder structures

One of the biggest problems with the processes used at the moment to add metallic layers is that they subject the parts that need to be reconditioned to extremely high thermal stress. This can result in cracks forming and structural changes, or in components losing their original shape. When this happens, parts have to be subjected to complex thermal reprocessing or post-treated mechanically. Aside from the negative impact this has on materials, certain difficulties arise when using extremely fine coating particles, such as powder agglomera-

TECHNICAL PARAMETERS OF THE PROCESS

- Achievable coating thickness: 0.01-1.0 mm, depending on the defined process parameters
- Maximum conveyed volume of powder: 1.0-25 g/min depending on added mixture, gas flow, and the cross section of the injection nozzle (internal diameter)
- Layer porosity depends on the material used: < 2
- Electric burner rating of the plasma spray gun: up to 150 A

tion, which hampers the distribution of coating powders during the coating process. It is important that powder particles are kept in a loose state and if materials do agglomerate, they have to be broken down to allow the powder to be transported into the right position when applied by gas.

This was the challenge faced in a research project at the Dresden-based Steinbeis Innovation Center for Intelligent Functional Materials, Welding and Joining Techniques, Implementation. The aim of the project was to develop a reliable process for using minute powder structures (particle size ⩽ 30µm) to selectively add coatings to metal component surfaces and thus produce parts strong enough to withstand stress. These parts should also be true to the required component geometry. The project team conducting the experiments decided that plasma spraying would be the most appropriate process for adding the extremely fine powder structures. This technique is suitable for a variety of component sizes and materials, from metals to high-melting-point ceramics.

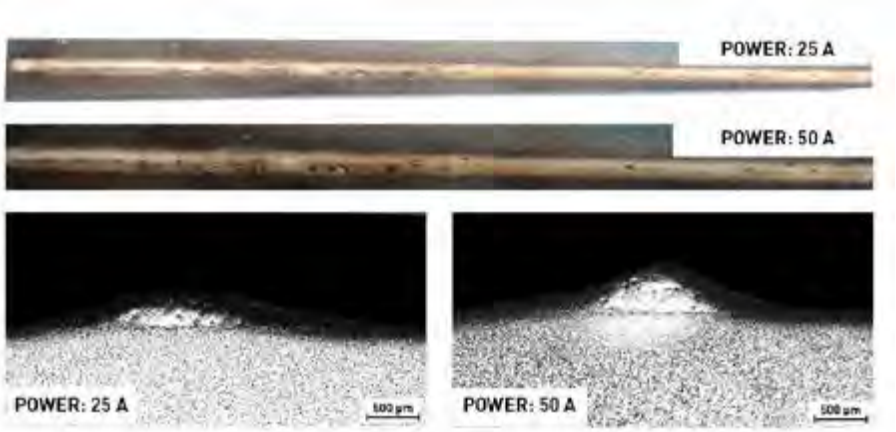
THE PROCESS IN PHYSICAL TERMS

The physical principles underlying the process used for the project involve melting a powder-based spray mixture until it forms a thermal plasma, which is then catapulted onto the prepared material surface. An external powder conveyor uses a carrier gas to transport the small powder particles into a plasma beam in and around a gas nozzle. This plasma beam, which is created by a high-current electric arc, is driven between an electrode and the nozzle by a processing gas, most of which is ionized; it emerges from the injection nozzle at a high speed due to thermal expansion of the gas (argon). These processing principles make it possible to achieve the required technical parameters and functions of the coating system prototype. This will be important when adding thin metallic layers, which will need to be strong enough to cope with material stresses.

THE TECHNICAL EQUIPMENT

Naturally, the research project didn't just look at the underlying concept for the innovative process. Working in collaboration with their industrial partner WM Spezialgeräteentwicklung GmbH, which makes specialist mechanical devices, the Steinbeis experts also developed the technology for adding extremely fine layers of powder structures to component surfaces. Building on the identified material, technical, and structural principles of the proposed solution, an innovative plasma spray gun was developed (electrical burner rating up to 150 A) complete with a powder-conveying device and a control and guidance system for coating microstructures, not only when adding surfaces to new parts but also for repairing worn surfaces. The project team checked the coating process and the prototype in detail by conducting a variety of simulations and experiments. Aside from gaining a fundamental understanding of the process, the work carried out by the team also makes it possible to plan the technology and design aspects of an entire error-free coating system and determine the thermal loads that are placed on components. As a result of the new process technology, the team succeeded in pro-

THE AIM OF THE PROJECT WAS TO DEVELOP A RELIABLE PROCESS FOR USING MINUTE POWDER STRUCTURES TO SELECTIVELY ADD COATINGS TO METAL COMPONENT SURFACES.



Microlayers produced by the new coating system; plasma powder spraying with varying process parameters

ducing suitable thin coatings for dealing with wear and corrosion. These coatings are entirely fit for purpose, not only because they can be used to produce new functional surfaces on components, but also because they help repair worn surfaces on parts.

PLASMA SPRAYING IN PRODUCTION

Explaining the different stages of the plasma spraying process, Associate Professor Dr.-Ing. habil. Khaled Alaluss, co-director of the Steinbeis Innovation Center, says: "The sprayed particles reform on the substrate and cool down within milliseconds. The resulting particle morphology is mainly dictated by the diameter, temperature, and speed – as well as the rate of cooling." The viscosity of the melt, the surface tension, and the heat transfer coefficient between the particles and the substrate have an influence on the flow of particles when they hit the surface. The morphology of the resulting splat thus has a crucial impact on layer properties, adhesion, and porosity. Layer adhesion is important for characterization of the layer properties. It is strongly influenced by the chemical, physical, and metallurgical interplay between the spray particles and the substrate. It is these factors that help define and optimize the technical parameters of the process and establish the required conditions for producing error-free plasma spray layers. The result when the parameters are just right: coatings offering the required adhesion, hardness, and precision, as well as extremely low coating porosity. The new powder-conveying device delivered good coating rates and good bulk density without powder agglomeration.

The coatings produced for the research project were uniform in terms of layer geometry and also looked good in purely visual terms. The thickness at different points along the grain of the layers was also uniform and free from errors. The plasma-sprayed microlayers are thus suitable for achieving reproducible properties of a suitable quality. Overall, the project was a success for the team from start to finish, and the coating system can now progress from the prototype stage to practical application.

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DIGITAL TRANSFORMATION WITHOUT "THE" IT: A REVIEW OF THE 2019 STEINBEIS ENGINEERING DAY

STEINBEIS EVENT SHOWCASES SUCCESSFUL EXAMPLES FROM RESTAURANTS AND CATERING, THE MANUAL TRADES, WHOLESALING, AND MANUFACTURING

Digital transformation is often a bit of an obstacle for traditional companies. Making the transition often fails because of existing IT infrastructures or a lack of specialist know-how. There are so many technological innovations out there, even big companies struggle to understand the overall picture. As a result, it's all the more important to be able to experiment with new technology in networks that transcend different sectors of industry. On May 8, 2019, Steinbeis invited visitors to the fifth Steinbeis Engineering Day at the Sparkasse Academy in Stuttgart. The theme: digital transformation without "the" IT!

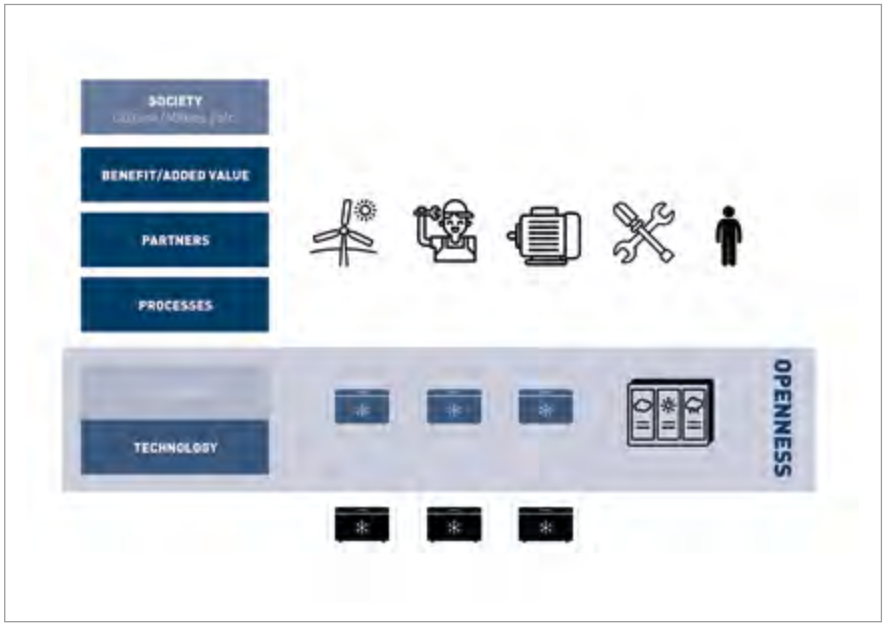
Drawing on the example of a familiar household object – a chest freezer – Prof. Dr. Heiner Lasi, director of the Ferdinand-Steinbeis-Institute (FSTI), provided an insightful explanation of the potential already offered by digital solutions – simply by making good use of existing infrastructures. Freezers have temperature controls. This already makes them automated devices, and depicting such objects virtually on a platform in the real world unleashes new potential. For example, new processes emerge involving both new and old business partners. This generates completely new benefits for consumers and with these, new potential to add value for a whole host of business enterprises. So what could that look like in practice? The energy company providing power to the chest freezer could, for example, track the device virtually and ascertain whether its electricity consumption is too high, or whether there is something wrong with its energy consumption. It could then contact the owner via email or smartphone app and suggest a nearby maintenance company or even offer to send a contractor around itself. For end customers, this would minimize potential losses resulting from food spoiling in the freezer, and the energy provider could offer add-on services on behalf of the freezer manufacturer. A maintenance company could also be lined up with quick jobs. Such business scenarios are already feasible today – even without all of the involved partners having to restructure IT systems, which can be very expensive. But for such value creation scenarios to work, the companies would have to be open to sharing information.

Two discussion sessions were organized to gain insights into further value creation scenarios based on partnership. In the first session moderated by Dr. Marlene Gottwald, researcher at the FSTI, Jochen Ausprung (WMF Group), Michael Steiger (Fürstenberg's Irish Pubs), and Tim Wetzel (Schwanen Hotel and Restaurant in Metzingen) examined a concept called "Coffee to Go? No, Coffee from the Cloud!" The catering Micro Testbed was injected with life with the support of the other companies at the event. The idea – developed as part of a project initiated by the FSTI and backed by the Baden-Wu-

erttemberg Ministry of Economic Affairs, Labor, and Housing – shows how a digital guest room can be created by connecting a cash register with a beer tap, coffee machine, and a restaurant menu. By using open platforms, it becomes possible for virtual copies of the real objects to communicate with one another. This results in new business models, such as new pricing options. The Micro Testbed showed that digital transformation also plays a role in optimizing processes in sectors of industry that are seemingly disconnected – and to work, advanced IT infrastructures are not needed. Whether the focus lay in measuring how much beer is lost at the tap, assessing the air quality in the bar, or managing the menu or coffee machine digitally, the participants in the discussion agreed that it will be necessary to carry out "digital adjustments" to match customer requirements, especially given the fierce competition in the hotel and catering sector. Ideally, these adaptations would be tackled together, with the right partners on board.

The delegates then moved on from catering and restaurants to think about manufacturing. In the second discussion session "Digitalizing together – efficiently and inexpensively without 'that IT'.", this time moderated by Heiner Lasi, the focus was on the Micro Testbed for industrial services, Matthias Herzog (Liebherr Hydraulic Excavators), Markus Hucko (Leadec Group), Martin Rathgeb (SHW Machine Tools), Dirk Slama (Bosch Innovations), and Michael Köhnlein (Steinbeis Digital Business Consortium) presented the results of the Micro Testbed, which is funded directly by the companies involved in the initiative. Their presentation showcased a new kind of business model that resulted from the partnership, plus the benefits derived by all of the parties involved in the project. The example looked at was the process used to manufacture revolving platforms for wheeled excavators. A pay-per-part model was developed based on an open platform. Producers would only pay for properly produced parts, so they would no longer buy and own production facilities. This model offers a number of advantages. Because producers would no longer have to pay for entire machines – they only pay for faultless production parts – and money is freed up to fund other investments. The machine maker would still be selling its machines, but in effect it would only sell them to a new "owner of the means of production." It would be a bit like an insurance company reducing the risk of production downtimes and thus avoiding having to issue payouts on insurance policies. Data needed to ascertain when a part has been properly produced could be transmitted via sensors to a platform, which would coordinate payments. If the new owner has any spare production capacity on its machine, it can use the platform to sell capacity to other producers. Although the project needed input from people in IT, to ensure the concept could be implemented quickly in digital terms it wasn't necessary to gain agreement regarding IT structures and data exchange.

The Steinbeis Engineering Day also provided insights into a number of other digital transformation projects at the FSTI. One of these projects involves implementing building information modeling (BIM) in the manual trades. This will make it possible for skilled craftsmen to optimize the coordination of individual stages of work on construction sites. Sensor systems can be used to monitor temperatures, condensation, and vibrations on the construction site, and the data this generates can be shown to other



The different layers of digital transformation and the industrial players who benefit from a digital chest freezer

MICRO TESTBED: RESTAURANTS AND CATERING

- Participants: DEHOGA, DIRMEIER Schanktechnik GmbH & Co. KG, Fürstenberg's Irish Pub, Schwanen Hotel & Restaurant Wetzel GmbH u. Co. KG, TourOnline AG Business Development, SI-SUITES – Appartment House SI Betriebs GmbH, WMF Group GmbH
- Backed by the Baden-Wuerttemberg Ministry of Economic Affairs, Labor, and Housing

MICRO TESTBED: INDUSTRIAL SERVICES

- Participants: Bosch (SI and Connected Industries), Balluff GmbH, Büro Kohler, Leadec Gruppe, Liebherr-Hydraulikbagger GmbH, SHW Werkzeugmaschinen GmbH, Schmid Maschinenbau GmbH & Co. KG

MICRO TESTBED: BUILDING INFORMATION MODELING

- Participants: Breinlinger Ingenieure Hoch- und Tiefbau GmbH, Bürkle & Schöck KG, FACT GmbH, FiliTime – Digitale Plantafel GmbH, Karl Sikler & Sohn GmbH & Co. KG, Maler Giese GmbH, Schaaf GmbH, TMM AG, Winfried Wiedersich (independent architect), Baden-Wuerttemberg Crafts Congress
- Backed by the Baden-Wuerttemberg Ministry of Economic Affairs, Labor, and Housing

MICRO TESTBED: WHOLESALING

- Participants: Armin Hamma Umwelttechnik, Efficiency Systems, Heller Maschinen GmbH, Hermann Bantleon GmbH, Lorch-Mechanik GmbH, New Fluid GmbH/VPKM GmbH, RAW Handel and Beratungs GmbH
- Backed by the Baden-Wuerttemberg Ministry of Economic Affairs, Labor, and Housing

MICRO TESTBED: ADDITIVE MANUFACTURING

- Participants: 3D-LABS GmbH, August Reuchlen GmbH, Boxer Motor & klassische Automobile GmbH, KUOLT Fertigungstechnik, The Pagoden Center
- Backed by the Baden-Wuerttemberg Ministry of Economic Affairs, Labor, and Housing

parties via a platform. This makes it easier to plan the work schedules of individual craftsmen.

For the wholesaling Micro Testbed, a digital process was developed for monitoring cooling lubricants. This also involves using sensors to continuously monitor the state of cooling lubricant emulsions online through a specially programmed dashboard. All of the project partners would have access to the same system so they can share recommendations with the operator. Support can be provided for the entire life cycle of cooling lubricants, from the moment they are sold to maintenance and environmentally friendly disposal. This makes it possible to drastically reduce machine idle times, reduce the frequency of damaged tool replacements, and thus also cut costs.

Both the Micro Testbed for additive manufacturing and the professorial chair for general business administration and information systems at Stuttgart University presented the possibilities offered by additive manufacturing. The experts participating in the Micro Testbed ran a live demonstration of production using a 3D printing device to show possible business models in the restoration industry for producing replacement car parts. Afterward, a student from the University of Stuttgart showed the potential that technology offers to after-sales workshops and the skills needed to work with this technology. Additive manufacturing is about producing a virtual representation and a "printed" physical product, so it is a fitting symbolic representation of the interplay between digital goods and physical items.

A further technical solution was presented by Dr. Holger Gast, director of the Steinbeis Consulting Center for Agile Development of Information Systems. His software writes further software itself, making it possible for companies and entire collaborative networks to quickly implement digital solutions. This enables different parties to optimize processes across several companies, linking up different stakeholders to facilitate shared, digital value creation scenarios.

FURTHER INFORMATION

Many of the testbeds presented at the Steinbeis Engineering Day were sponsored by the Baden-Wuerttemberg Ministry of Economic Affairs, Labor, and Housing. These were: additive manufacturing; building information modeling; restaurants, catering, and hotels; and wholesaling. The industrial services Micro Testbed was financed by the company itself. All Micro Testbeds were moderated by the Steinbeis Digital Consortium with scientific support from the FSTI.

A presentation by students working at the FSTI showed that there is sufficient understanding of the very latest technologies for digital solutions to be implemented today. The students presented three different sides to blockchain technology. The first blockchain example showed how technology available in the healthcare industry can enable patients to maintain complete control of their data thanks to "digital transparency."

Another project looked at how blockchain technology can provide a monetary incentive to improve the use of capacity in local transportation networks and thus cut harmful emissions caused by cars in urban areas. The third project looked at using blockchain technology in the diamond industry. Blockchain could help companies make the supply chain more transparent and thus pave the way for fair trade.

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For further information on the Micro Testbed, go to www.steinbeis-fsti.de/de/micro-testbeds.

THERE ARE SO MANY TECHNOLOGICAL INNOVATIONS OUT THERE, EVEN BIG COMPANIES STRUGGLE TO UNDERSTAND THE OVERALL PICTURE.

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(Left - right) Boris Behringer, Ulrich Gutting, Katrin Schütz, Prof. Dr. Heiner Lasi with the Toolbox.
Photo: © Uli Regenscheit

MAKING A SUCCESS OUT OF DIGITAL TRANSFORMATION IN WHOLESALING

TOOLBOX DEVELOPED BY THE FERDINAND-STEINBEIS-INSTITUTE PREPARES WHOLESALERS FOR THE FUTURE

Digital transformation – it's like a modern mantra. But before using digital technology, a company has to put good thought into future possibilities to add value – or value creation scenarios. To visualize existing capabilities and plan how to deal with future value creation scenarios, help has arrived in the form of a Toolbox that could be particularly useful for small and medium-sized wholesaling specialists. The solution was developed as part of a study initiated by the wholesaling association grosshandel-bw and funded by the Baden-Wuerttemberg Ministry of Economic Affairs, Labor, and Housing. The research was conducted by experts at the Ferdinand-Steinbeis-Institute (FSTI). The new Toolbox was put through its paces at an event called The Future of Wholesaling, which took place in Stuttgart at the end of May.

The Toolbox offers 60 wholesaling-specific "functional capabilities" for adding value. These capabilities were worked out during the research project by conducting partly standardized guided interviews with 13 wholesalers. These companies differ not only in terms of the size of their workforce and sales revenues, but also sectors of industry. They ranged from producers of mechanical fittings and metal parts to pharmaceutical companies and book manufacturers. The Toolbox goes through nine steps, graphing the current situation a com-

THE WHOLESALING MICRO

Testbed Backed by the Baden-Wuerttemberg Ministry of Economic Affairs, Labor, and Housing, the focus of this testbed lies in the wholesaling of cooling lubricants. Running regular checks on cooling lubricants, cleaning them, and (if necessary) completely replacing them, can help clients (manufacturing companies) reduce machine idle times and thus save money. This was the starting point for the Micro Testbed. The participants agreed that they would offer a shared, platform-based, single-source solution that should encompass the delivery of a suitable emulsion, regular checks (using different measurement techniques provided by the individual Micro Testbed participants), clearly presented data (on measurements, using a dashboard), and environmentally friendly disposal of the cooling lubricant.

pany finds itself in and highlighting potential new value creation scenarios. These scenarios are based partly on capabilities already possessed by the company, partly on new capabilities. By pooling the capabilities of different businesses, the Toolbox can help firms find different partners for forming value creation networks.

ADDING VALUE FOR USERS AND BUSINESS PARTNERS

For Prof. Dr. Heiner Lasi and Patrick Weber, experts at the Ferdinand-Steinbeis-Institute (which belongs to the Steinbeis Foundation), the event at the Mercedes-Benz Arena in Stuttgart was an ideal opportunity to present the practical uses of the Toolbox: "It's about considering which value-added can be created in the future, for users and partners. Technologies like online platforms are just enablers, so you don't need to look for the right technology until you get

USING THE TOOLBOX

To analyze companies' value creation scenarios, the Toolbox guides them through nine steps:

1. Definition of the value creation scenario; status quo
2. Assessment of existing capabilities; status quo
3. Formulation of value creation scenarios; future options
4. Classification of existing capabilities for value creation scenarios; future options
5. Selection of further capabilities for value creation scenarios; future options
6. Checking whether capabilities will be needed after shifting emphasis
7. Defining business partners
8. Matching partners with capabilities
9. Optional reduction of no-longer-needed capabilities

To find out more about the Toolbox, go to the FSTI website: https://steinbeis-fsti.de/de/toolbox.

to the second step," says Lasi, summarizing the key message for the audience.

To bring the practical uses of the Toolbox to life for the audience, Peter Meißner, managing director of the fittings manufacturer Koch, presented the first live example of the day: the transformation of a value creation scenario. Meißner conducted a conversation with Alexander Neff (FSTI) and Heiner Lasi to explain the current situation faced by his company, also outlining how the existing value creation scenario can be extended by adding certain capabilities and creating a new, customer-centric value creation scenario.

A second practical example was provided by Dr. Daniel Werth, managing director of Beyerbach, who gave a number of insights into the transformation of his company. Beyerbach's journey took it from being a specialist restaurant and catering wholesaler to becoming a provider of solutions for supermarket concepts. A key aspect for both Werth and Meißner was that after the transformation process, the emphasis of existing capabilities had shifted: They have now been complemented or substituted by digital solutions.

A panel discussion moderated by Boris Behringer (chief executive of grosshandel-bw), Rainer Janz (departmental manager of product and quality management at Hermann Bantleon), and Peter Wittmann (project manager at the Steinbeis Digital Business Consortium/SDBC) looked at the third example of the day and discussed value creation networks. Their example: the wholesaling Micro Testbed (also sponsored by the same ministry), this time focusing on cooling lubricants made by Bantleon. A new sensor has been introduced to production for measuring cooling lubricant attributes. This system automatically uploads data to a "smart shop floor" browser application programmed by an IT company. The idea is to continually monitor the condition of emulsions, independent of specific location. Involving a further business partner in the value creation network resulted in a device being fitted on machinery to clean emulsions. Although the cooling lubricant does not need to be replaced as often as it used to be – meaning lower sales for Bantleon – the company can leverage the benefits of its network with the Micro Testbed participants by offering new services. Digital technology thus adds a certain degree of stability to the firm's processes in terms of adding value.

The Toolbox and the Micro Testbed model both support businesses in planning and designing new value creation scenarios for the future. The next step will now be to use digital technology as a key to successfully implementing the new value creation scenarios.

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THE WHOLESALING STUDY

Between June 2018 and May 2019, the FSTI conducted a study on digital technology in the wholesaling industry in the state of Baden-Wuerttemberg on behalf of the Ministry of Economic Affairs, Labour, and Housing and the wholesaling association grosshandel-bw. Whereas manufacturing is already making good use of digital solutions to pick and pack goods for its online customers, and websites such as Amazon are offering customers a variety of new services, the wholesaling industry is falling further and further behind in its traditional role as a trading intermediary. For the study, the FSTI interviewed 13 wholesalers in Baden-Wuerttemberg, spanning a variety of sectors of industry. It soon became clear that it would not be possible to conduct a survey across all sectors and that the research would need to be kept more abstract due to the huge differences in the types of products being traded (and this would also have had an impact on the research methodology). As a result, the interviews focused on ascertaining the business capabilities of the individual firms and how these mark them out as wholesaling companies. The next step was to evaluate the findings of the interviews, which had involved numerous experts. The aim was to ascertain which of the capabilities already possessed by the individual wholesalers would make it possible to add value as part of a cross-industry value creation network (such as a Micro Testbed). This would also make it possible to define the potential roles that could be played by the individual wholesalers in a digital value network, and although these roles would be based on existing capabilities, they would not necessarily be dictated by the kind of goods currently sold by the companies.

SOCIAL AND TECHNOLOGICAL INNOVATION CAN WORK TOGETHER SUCCESSFULLY HAND IN HAND

COOPERATION RATHER THAN CONFRONTATION

STEINBEIS EXPERTS LOOK INTO DIFFERENT WAYS TO DOVETAIL TECHNOLOGICAL AND SOCIAL INNOVATIONS

Innovations are thought up by people on behalf of people. Despite emphasis on technological progress, it is increasingly important to keep social factors in mind, especially in times of digital transformation. This is because digital transformation entails three key factors – automation, networking, and decentralization – and not only are these changing business and our working lives today, they will continue to do so for years to come. Of course nobody can predict for sure what exactly will change or how, especially given the fact that technological change leads to further, major challenges on a societal level – such as demographic change, globalization, climate change, and finite resources. But one thing we do know: We will have to use innovations to cope with all these challenges. Steinbeis-Europa-Zentrum and the Steinbeis Transfer Center for Social and Technological Innovation are showing that technological and social innovations are not "either/or," but can work together successfully hand in hand.

It's precisely because innovations are thought up by people and for other people that one needs to keep major societal changes and challenges in mind. There are important issues to consider such as usefulness to society. To do this, one needs an understanding of innovation, not only in terms of its technological, non-technological, and social role, but also with regard to how innovations serve the needs of society. Even if something does – at first – succeed commercially, that does not necessarily mean it makes sense for the economy as a whole, or that it is actually welcome in societal terms.

SOCIAL INNOVATION: ADDED VALUE FOR SOCIETY

Social innovation can be seen as targeted reconfigurations of social practices, which are not only better at solving problems or needs than if they were based on established practices (Howaldt et al. 2008: 65), but are "therefore worth copying and institutionalizing" (Zapf 1989: 177). This makes it possible for social innovation to make a significant contribution to societal advancement. Social innovations also influence whether a technological invention will become a wide-scale innovation, in which directions it spreads out, through which channels, and any impact this will have. After all, an innovation should come with two ingredients: invention and diffusion. It is about a new idea, a new product, a new process, a new service, and how these are transferred from one person to another. Ultimately it's also about how it will become established in the market


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and spread out. Social innovations are, on the one hand, about new ways of meeting societal challenges – ideas that are accepted and adopted by affected people, groups, and organizations. Technological innovations can therefore also be social innovations. On the other hand, they also help many technological developments to become more widespread.

STUDY CONFIRMS THE IMPORTANCE OF SOCIAL INNOVATION

Social innovations address different social needs, for example in areas such as health care or with respect to structural change in rural areas. Working in collaboration with the Centre for Social Investment (CSI) at the University of Heidelberg, Steinbeis-Europa-Zentrum conducted a study on behalf of the Baden-Wuerttemberg Ministry of Economic Affairs, Labour, and Housing to explore the economic and technological importance of specific types of social innovations. The project coordinators selected 19 out of 100 possible social innovations for investigation. "This allowed us to use specific examples to show that focusing on social needs and achieving commercial success are by no means counterproductive, but instead can mutually underpin one another," highlights Dr. Victoria Blessing, who coordinated the study as the project manager at Steinbeis-Europa-Zentrum. The study identified social innovations developed by existing firms as well as social innovations that would go on to become the starting point for setting up businesses – some of which were extremely successful.

One example is AfB, which was set up on the basis of a social innovation: "Processing IT hardware and deleting data with employees with disabilities." In the meantime, it has grown into a medium-sized business enterprise. One key factor dictating the success of this company is its robust business model. IT hardware has a limited life cycle, so AfB picks up used hardware directly from companies before deleting data in the hardware and reprocessing the equipment. It then sells this equipment to end users through its own outlets, and in some cases it sells equipment directly back to companies. AfB places emphasis on linking commercial thinking with social entrepreneurship. This is because it needs to be commercially successful to achieve its social goals, which entail creating jobs for people with disabilities.

Another example is DB Regio, an existing company that developed the Medibus – a kind of mobile medical practice using converted city buses. The buses contain an examination room and a registration area, as well as telehealth solutions provided by CISCO. The Medibus can drive out to rural areas and provide patients with medical care which they would otherwise only be able to receive by traveling long distances. There is strong interest in the Medibus and it has already entered successful operation. Examples of organizations that have used the bus include the Charité hospital in Berlin and the Association of Statutory Health Insurance Physicians in Hesse.

The entire study – New Technology and Social Innovation – has now been published by Steinbeis-Edition and includes outlines of further social innovations and the research findings.

TECHNICAL AND SOCIAL INNOVATION SPANNING MULTIPLE GENERATIONS: THE LIFEPHASEHOUSE

Another Steinbeis Transfer Center (STC) that has been looking into the overlaps between technological and social innovations is the center of Social and Technological Innovation at the University of Tübingen. This STC operates a "LifePhaseHouse" at the University of Tübingen to demonstrate how these principles work in practice. The facility is funded by partners in industry and politics, science, and the general public. The house provides a location for research, demonstrations, and knowledge-sharing, allowing users to work shoulder to shoulder with developers, producers, and service providers on solutions that do as much as possible to promote a long and healthy life of self-determination, all within a person's own four walls – during all stages of life.

The teams also try out – and bring to life – new services, technological support systems, and solutions capable of providing everyday help. "If people are interested, they can come and gain an impression of the multitude of possible uses these offer. And if anyone wants to, they can also get actively involved in shaping innovations," explains Prof. Dr. Daniel Buhr, co-director of the Steinbeis Transfer Center for Social and Technological Innovation. They can do this by offering direct feedback or working on one of the many research projects. The building is also used by the manual trades, architects, care workers, physicians, producers, insurance companies, local authorities, associations, and educational establishments for training courses and different events.

Innovations jump out of the woodwork in the LifePhaseHouse thanks to large-scale international research projects, small workshops involving local craftsmen, or development projects conducted by medium-sized enterprises in the fields of medical technology, pharmaceuticals or the electronics industry. The center also offers seminars on Design Thinking through social enterprises, runs co-creation workshops with small focus groups, and even organizes entire evaluation projects with several hundred participants. Its activities range from barrier-free design to the development of new business models, digital platforms, service innovations for the so-called silver economy, and even acceptance studies on avatars in health care or the use of artificial intelligence for enhanced diagnostics.

INNOVATIONS OFFERING POTENTIAL

Social innovations offer considerable potential for social, technological, and commercial development. They are not just theoretical concepts; they can be applied as concrete approaches to innovation and business development – and deliver significant benefit to all of us. To exploit this potential, innovations have to be looked at and developed from a broad perspective, and end users need to be involved in this process. If commercial, technological, and social determinants can be seen not as antagonists but as protagonists, new alliances can be formed beyond the confines of specific topics and innovations – and such alliances can deliver major benefit.

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PREPARING FOR LEADERSHIP: FROM MONASTERY TO BECOMING A MINDFUL LEADER

DR. ANDREAS DÜRR, ALUMNUS OF STEINBEIS UNIVERSITY, DISCUSSES PREPARATION FOR WORKING IN A LEADERSHIP POSITION

"You have to strike the right balance between 'being there as a buddy' and 'banging a fist on the table sometimes'," says Dr. Andreas Dürr, alumnus of Steinbeis University and Head of Connected Vehicle Solutions at Daimler Mobility AG. Dürr was invited to share his thoughts on what makes a good leader with an audience of more than 60 people at the School of International Business and Entrepreneurship (SIBE) in Stuttgart.

One of the main things Andreas Dürr highlighted was the preparations one can make for a position as a leader, outlining the five key components he considers essential. The first is personal character: You should consider who you would like to be as a manager. Furthermore, Dürr outlines the four key roles that should be played by (future) leaders. They should be communicators, facilitators, providers of meaning, and coaches.

"Leadership starts with yourself," says Dürr, with a sense of conviction. He himself spent some time in a monastery, where he meditated about his own inner attitudes. Additionally, he attended seminars on the topic of leadership, which still influence his leadership style today. It is inspired by the three Benedictine values: discipline, gratitude, and humility. These values allow a leader to provide co-workers with a positive environment to work in. According to the SIBE-alumnus, this is one of the most important factors of everyday work, because "even the most awesome job won't make you happy in a bad environment".

Andreas Dürr gained a degree at the School of International Business and Entrepreneurship (SIBE) of Steinbeis University in 2012 before completing a PhD in business model innovation at Clausthal University of Technology. He now prefers to talk about "leadership" rather than "management." Managers organize, delegate, and often have the last say, whereas leaders pose questions in keeping with the concept that "knowledge speaks, wisdom listens." Dürr believes that even if a leader is a communicator, their job is not actually to say much themselves. Instead, the emphasis should lie in actively listening, asking questions, and ensuring communication is open and productive. He has no doubt that good communication is first and foremost about providing clear structure and seeking to find solutions. "The aspect of 'how you talk' is extremely important," he says, describing communication with colleagues by making a reference to the philosophy of football team manager Jürgen Klopp: When dealing with people, ask yourself "How would I like to be treated?"

To lay a foundation for open communication, a connection needs to be established between people. Dürr says that this starts with an "acceptance point," which often comes about through a shared interest in a topic. He says that a leader's role as a facilitator is to create a framework for their own team to produce good work. It is about bringing out the best in every individual employee. So this also involves forging links between people through relationships, or bringing people together: "Because when the team feels comfortable, team spirit develops" says Dürr.

This is why it is also important for a leader to act as a coach for employees. "Why should people follow you? There are several possible reasons: Because they have to, they like you, you help them perform, you support them, or because they can identify with what you represent," says Dürr. For him, the two last points are extremely important. This is

LEADERSHIP ISN'T ABOUT A POSITION; IT'S ABOUT THE INFLUENCE YOU HAVE ON OTHERS

because a positive environment still needs to offer an opportunity to develop. Leaders should make this possible for their co-workers and provide them with support. Also, every leader should have a clear vision and mission so they can clarify for their team team what they are working toward. Dr. Dürr sees leadership as a service, because in some respects it is like providing support to other people. "Leadership isn't about a position; it's about the influence you have on others," says the SIBE-alumnus.

One of the biggest topics in the panel discussion that followed was addressing conflict when you are a manager. When asked to what extent a manager should be expected to deal with difficult employees, Dürr's advice was to enter every meeting without prejudice. "You should not take your own interpretations into a meeting" he says. Instead, dealings should be based on the principle of impartiality. That is the only way to take in all aspects without judgment and form a picture of the situation.

A common challenge for younger leaders is dealing with established employees. Dürr's recommendation in such situations is the same as dealing with co-workers: appreciate people and recognize the experience they have to offer. To avoid jumping in at the deep end, he encourages young and ambitious managers to take the size of the team into account when they first take responsibility for a team as a manager. One advantage of leading a smaller team is that you can talk to people personally. When discussing things with people, it becomes possible to bring them on board and point to all the things that can be achieved together. This creates commitment to achieving goals, and if problems do arise, employees can be given support.

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HOW TO SUCCEED WITH DIGITAL TRANSFORMATION AS AN SME

FIRST INDUSTRY CONVENTION HELD BY THE BADEN-WUERTTEMBERG INDUSTRY 4.0 TRANSFER PLATFORM

The Baden-Wuerttemberg Industry 4.0 Transfer Platform (TPBW I4.0) was founded in collaboration with Steinbeis with the aim of supporting SMEs in Baden-Wuerttemberg with digitalization of their value chain processes. On March 28, more than 200 visitors came to the Stuttgart House of Commerce (Haus der Wirtschaft) to enjoy a powerful and varied program of live events staged by the TPBW I4.0. The sixteen exhibitors and nine public speakers left the audience in no doubt that the practice-related transfer platform will be playing a pivotal role in helping SMEs make a success out of Industry 4.0 and digital transformation projects.

During the event, Dr. Nicole Hoffmeister-Kraut, the Baden-Wuerttemberg Minister of Economic Affairs, underscored the valuable role she believes the TPBW I4.0 plays. She is convinced that the transfer platform will help continue the success story of industry in the region. In her keynote speech, she highlighted the important role played by small and medium-sized business in Baden-Wuerttemberg, the importance of digital transformation – particularly for SMEs – and the role played by the transfer platform: "The Baden-Wuerttemberg Industry 4.0 Transfer Platform creates transparency, shares examples, provides advice, and offers the support of a research and development partner. In doing so, it bolsters our small and medium-sized enterprises on their journey to Industry 4.0. It provides innovative and 'hands-on' solutions for digitalizing industrial value creation."

STRONG PARTNERS – SUCCESSFUL PROJECTS

The industry convention highlighted the scope of services and implementation expertise offered by the universities participating in the platform. This was made particularly evident by the vivid demonstrations and talks given by the project partners. Visitors were given the opportunity to see for themselves how digital transformation projects are successfully implemented by SMEs. They could also find out more about virtual reality, digital twins, artificial intelligence, and predictive maintenance, as well as talk to exhibitors about topics such as the IIoT, edge computing, and self-calibrating localization in logistics and assembly. As such, the event successfully showcased the breadth of expertise on offer to SMEs thanks to the strong commitment not only of the universities of Aalen, Reutlingen, and Esslingen, but also of Steinbeis. The collaboration agreements already entered into with project partners in industry and education reflect not only the impact of the new platform but also the scale of demand. In his closing speech, the transfer platform's initiator, Prof. Rainer Würslin (Steinbeis Transfer Center for Microelectronics; Esslingen University of Applied Sciences), outlined the process of entering into a collaboration agreement, bringing the day to a close with a simple message: It's always worth entering into dialog with the transfer platform.

THE BADEN-WUERTTEMBERG INDUSTRY 4.0 TRANSFER PLATFORM (TPBW I4.0)

Backed by the Ministry of Economic Affairs, the TPBW I4.0 was set up in 2016 by the universities of Aalen, Reutlingen, and Esslingen in collaboration with the Steinbeis Foundation. Its role is to transfer knowledge and know-how from research and development into companies and thus make it possible for firms to experiment with new techniques and technologies. The innovative solutions, products, processes, and new business models this creates lay a foundation for safeguarding the future of small and medium-sized businesses in Baden-Wuerttemberg. SMEs will need to turn to the experience offered by universities in terms of research and development, and they will have to be in a position to make a success out of their own projects – more quickly and more reliably.

↑ Dr. Nicole Hoffmeister-Kraut (left) visiting the TPBW I4.0 industrial convention
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Prof. Dr. Dr. h.c. Werner G. Faix receiving his certificate and congratulations from Prof. Dr. Brigitte Tag (right), Vice-President of the European Academy of Sciences and Arts. In the background: Prof. Dr. Dr. h.c. mult. Felix Unger, President of the European Academy of Sciences and Arts.

HIGH DISTINCTION FOR CONTRIBUTIONS TO SCIENCE AND EDUCATION

PROF. DR. DR. H.C. WERNER G. FAIX HAS BEEN ACCEPTED AS A MEMBER OF THE EUROPEAN ACADEMY OF SCIENCES AND ARTS

The European Academy of Sciences and Arts welcomed 80 leading scientists as new members at an official ceremony at the University of Salzburg on March 2, 2019. Gaining membership of this transnational network of scientists, artists, and spiritual leaders is considered a high honor. This year, the honor was also bestowed upon Prof. Dr. Dr. h.c. Werner G. Faix, deacon of the faculty of Leadership & Management at Steinbeis University, where he is also professor of business and personnel management, and director of the School of International Business and Entrepreneurship (SIBE).

As an academic forum, the European Academy of Sciences and Arts takes an interdisciplinary approach to tackling a variety of key topics and issues, transcending different fields to develop potential solutions to these issues. It currently has around 2,000 members from all corners of the globe, including 32 Nobel Prize winners, politicians, spiritual leaders, and former pope Benedict XVI. It is not possible to apply to become a member of the academy. New members are nominated by a selection committee based on achievements in research, education, and society, and are selected by the academy's senate. Becoming a member is therefore considered an honor and an acknowledgement of scientific and educational achievement.

"Naturally this is a tremendous honor and recognition not just for me personally but also for the scientific work and the education and degree programs of the School of International Business and Entrepreneurship as a whole," says Werner G. Faix, clearly delighted with the award. SIBE is a business school of leadership and management belonging to Steinbeis University and has already received a number of awards for its international degree programs.

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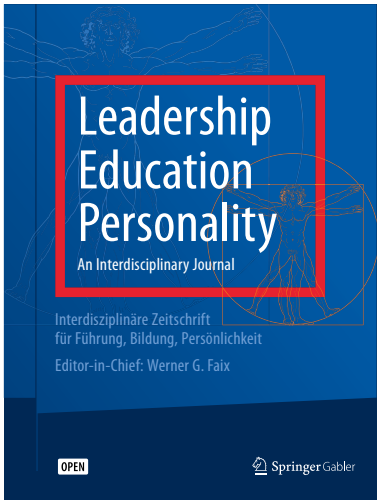
LEADERSHIP IN A DIGITAL WORLD

SYMPOSIUM DEBATES WAYS TO ACTIVELY SHAPE THE FUTURE



Digital transformation and the changes it brings about are influencing companies all around the world, as well as other areas of life. Gearing business and society in general to future developments will require wide-sweeping transformation processes. To deal with the challenges we face, it will not be enough to have good managers – it will become increasingly important to have good leaders. The School of International Business and Entrepreneurship (SIBE, part of Steinbeis University), associated with the Springer journal, Leadership, Education, Personality: An Interdisciplinary Journal, organizes its first symposium on Leadership in a Digital World. The event, which will take place in the Haus der Wirtschaft (House of Commerce) in Stuttgart on November 22, 2019, aims to examine the exact influence of digital transformation on requirements – not only of future leaders, but also in terms of how we will structure our work.

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Digital transformation is shifting business away from purely "managing" people toward actively shaping the future by introducing innovations and transformation processes in open-ended, complex situations, often dictated by dynamic framework conditions. Despite the tremendous importance of this issue, research on the connections between digital transformation, leadership, and work design is slow getting out of the starting blocks. In addition to examining key issues of research, it is also important to think about leadership in a digital world, including in business. The symposium will thus look explicitly at links between the two areas, in keeping with principles of sharing know-how. There will also be different types of events to do justice to the needs of different interest groups.

For example, the latest research findings will be presented, based on submissions made by international scientists before the event in response to a call for proposals. Research will be subject to double-blind peer reviews. To consider the current situation from a business angle, representatives of companies will give keynote speeches on the challenges they currently face. The idea of the program is to offer speeches, posters, and a workshop to make it easier for delegates to become actively involved in discussion. The event is being organized in collaboration with Eurac Research from Bolzano (Italy).

KEYNOTE SPEAKERS

Prof. Dr. Christoph Igel
Scientific director of the Educational Technology Lab at the German Research Center for Artificial Intelligence (DFKI)

Dr. Andrej Heinke
Vice President, Future Research and Technology Strategy Robert Bosch GmbH

Dr. Ingmar Hoerr
Co-founder and Chairman of the Supervisory Board, CureVac AG

WORKSHOP

Dr. Sylke Piéch
Senior Research Manager of the Education Technology Lab at the German Research Center for Artificial Intelligence (DFKI)

For further information and online registration go to www.steinbeis-sibe.de/lepj-symposium.

MORE THAN UTOPIAN: THE ZERO CARBON FOOTPRINT CITY

STEINBEIS EXPERTS IMPLEMENT FUTURE-PROOF ENERGY CONCEPT IN ESSLINGEN

In urban environments, climate protection and the transition to alternative energy sources require new energy supply concepts. But what role can urban authorities and specific districts play in tangible terms? This was the issue looked at by the Stuttgart-based Steinbeis Innovation Center for Energy, Building and Solar Engineering (EGS) on behalf of the Federal Ministry for Economic Affairs and Energy and the Federal Ministry of Education and Research. Working in alliance with eleven other project partners, the EGS experts are developing a future-ready urban district concept for the energy transition. This is all part of an interdisciplinary research project in the "Neue Weststadt" ("New West Town") district of Esslingen. The key technology for the project is called Power-to-Gas (P2G), which allows surplus "green" electricity to be converted into "green" hydrogen for use in fuel cell vehicles and industry as well as feed in the natural gas grid.

A mock-up of Block D at
New Weststadt Esslingen
© Architekten Graf + Graf, Montabaur

An overview of the entire district of New Weststadt Esslingen © Lehendrei | Architektur Stadtplanung, Stuttgart

In an old railroad freight yard in Esslingen, a showcase urban district is springing up on an area of land measuring 100,000 square meters. The new district comprises around 500 apartments, office and commercial sites, and a new building owned by Esslingen University of Applied Sciences. One important cornerstone of achieving municipal environmental protection goals will be to ensure the district is climate-neutral. "The future inhabitants of "New West Town" are not the only ones who will benefit from the development of a zero carbon footprint urban district; all people living in Esslingen stand to benefit," explains Dr. Jürgen Zieger, the City Lord Mayor.

THE ENERGY SUPPLY CONCEPT: INNOVATIVE AND CLIMATE-NEUTRAL

A core component of the technologically innovative urban area is an energy supply concept developed by the Steinbeis Innovation Center EGS, which envisions a merging of different "sectors": buildings (electricity, thermal energy, cooling), modern travel options ("mobility"), and industry. To achieve this, a digital information network – or smart grid – will be set up, comprising a network of electricity, natural gas, thermal energy, and ICT solutions, several distributed technical units within individual buildings, and in the middle of the district: an energy center.

At the heart of this energy center, there will be an electrolyzer (approx. output 1,000 kW_{el}) that will transform surplus renewable electricity (local and transregional) into "green" hydrogen (power to gas, or P2G).

The "green hydrogen" this will generate (250 to 400 kg of H_2 per day) will be used for an H_2 filling station and an H_2 drumming station for transportation and manufacturing purposes. It might also be feed into the existing natural gas network and make an important contribution to reducing the carbon footprint of the gas grid. If, at some point in the future, the urban district needs electricity from renewables (for example at night), the hydrogen can be converted back into electricity (gas to power, or G2P) through fuel cells or by a cogeneration plant. One impact of electrolyzers is that they can stabilize the network and as such, they are considered an important aspect of transforming the German national energy system into a virtually renewable energy supply – a key factor in achieving climate protection targets by 2050.

In addition to the goal of supplying more renewable energy through local photovoltaic electricity (around 1,600 kWp through PV panels on the building roofs), any waste heat generated by the electrolysis process will be feed into the local heating network. That way, it can also be used to satisfy heating demand from buildings, which will also improve overall efficiency. Bottom line, this will raise the efficiency of electrolyzers from around 55% (for hydrogen production) to approximately 90%.

By integrating battery storage units (overall capacity: roughly 1,500 kWh), surplus electricity generated by the photovoltaic units can be stored temporarily, thus raising the share of self-generated electricity used within the district. Another aim is to use the

batteries to cover the charging requirements of electric cars at any time. They will also help connect vehicle charging and booking systems to allow them to function as a network. The plan is to link up individual technical components and the supply systems and thus set up a smart grid. There will also be a central energy management system to regulate and control energy flows.

The team has even developed its own simulation tool for networked urban areas, making it possible to assess the efficiency of interactions between innovative forms of technologies, especially the electrically controlled cogeneration unit power station and the electrolyzer.

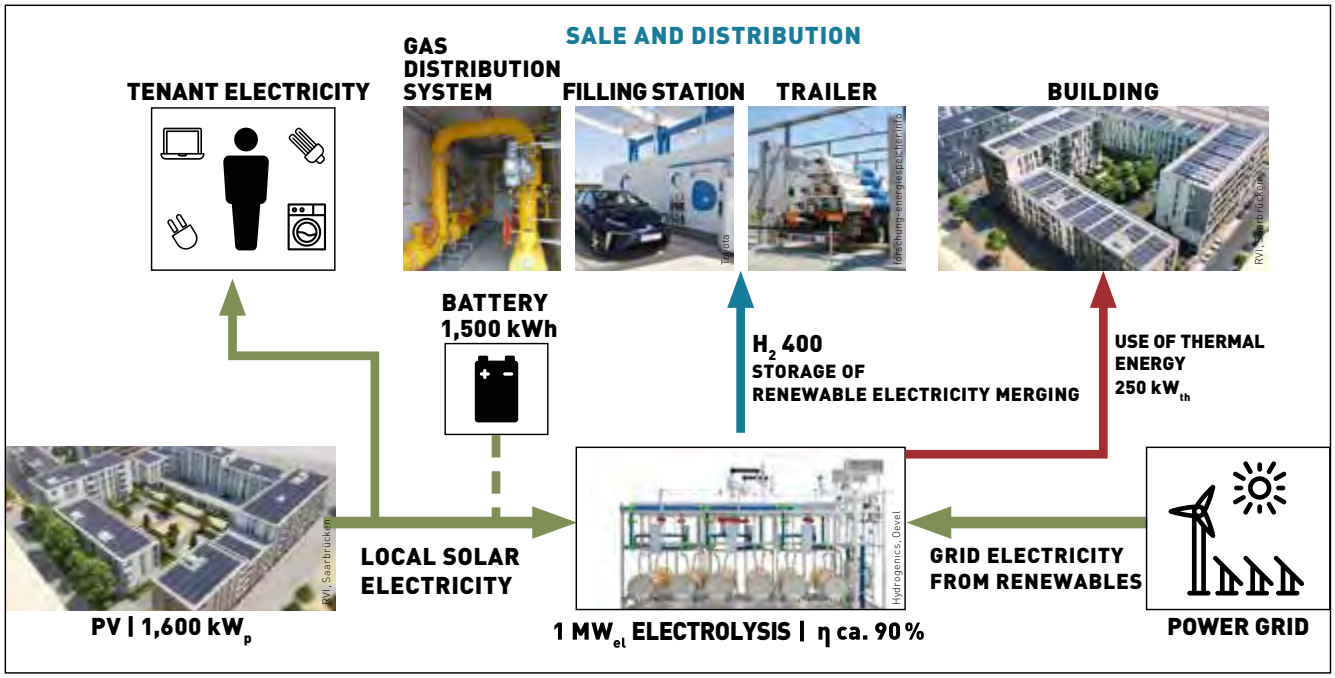
The project team has also already identified a number of measures to involve users in the urban area. One example is a special app that allows tenants to quickly access information on energy patterns or electricity prices.

AT A GLANCE: THE "NEUE WESTSTADT" DISTRICT IN ESSLINGEN

The Federal Government's aim is for buildings to achieve a zero carbon footprint by 2050. To drive this transition to alternative energy sources through "research, development, and demonstration," in 2016 the Ministry of Economic Affairs and Energy and the Ministry of Education and Research issued an inter-departmental funding declaration on "Solar Construction/The Energy-Efficient City" alongside financing worth €150 million. Out of about 60 applicants, the "Neue Weststadt" Esslingen project was chosen as one of six beacon projects in Germany.

In total, around €23 million of the costs for the Esslingen project are eligible for funding. The financing given by the Federal Government provides the interdisciplinary team with funds of around €13 million to make a success out of the project and provide support. The project kicked off in November 2017. The Steinbeis Innovation Center for Energy, Building and Solar Engineering (EGS) is coordinating the project and has now been working on the site for five years to help implement the concept alongside eleven partners.

Its project, which goes by the name ES-West P2G, is an important element of the overall project in achieving climate protection goals in Germany and is certain to inspire a large number of copycat projects.



Scheme of hydrogen use from the energy centre © SIZ-EGS, Stuttgart

THE CHALLENGES OF PLANNING AND MARKETING

One particular challenge currently faced by the project team is planning the energy center, which is required under municipal construction guidelines to guarantee high living standards and make buildings pleasant to spend time in. The center will also have to be located underground. Hydrogen production is scheduled to start in late 2020. The system will be subject to a comprehensive series of safety checks and approval processes due to its urban location. This is also to ensure that the technology operates safely and complies with legal requirements. "It will be particularly important to quell prejudice regarding hydrogen. Acceptance from the different user groups and satisfaction among the citizens of Esslingen will be important for the success and transferability of the project," highlights Prof. Dr.-Ing. Manfred Norbert Fisch, director of the EGS Steinbeis Innovation Center and co-founder of Green Hydrogen Esslingen (GHE). Founded in March 2019, GHE's other shareholders are Polarstern from Munich and the municipal utility of Esslingen. The role of GHE is to finance and operate the energy center with an electrolyzer, battery, cogeneration unit and hydrogen store as well as the PV-plants at the building roofs. The company will also sell and distribute "green" hydrogen, electricity from the photovoltaic units on buildings and the cogeneration power station, and waste heat from the electrolyzer and H2 power station (converted back into electricity).

To do this, the experts will first of all have to create a market for selling "green" hydrogen. A parallel aim of the pilot project is to encourage others to set up hydrogen and fuel cell systems in Germany, and talks are already underway with potential end customers such as municipal transportation companies, manufacturers, and car fleet operators.

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INDIVIDUAL TABLETS: DOSAGES AS REQUIRED

STEINBEIS EXPERTS PROVIDE SUPPORT WITH THE DEVELOPMENT OF NEEDS-BASED MEDICATION

Good health is the most valuable personal possession there is. When it's threatened, tablets might help. But the problem with pills is that they contain fixed proportions of ingredients, whether you need a strong dose or there is actually a risk of negative side effects from an overdose. kg-pharma wants to solve this problem with a new tablet press that will produce tablets in different sizes and batches containing a mixture of active substances and filling materials. The idea is to optimize the dosage of pharmaceutical agents in each tablet. The firm is making use of a go-inno innovation voucher from the Federal Ministry for Economic Affairs and Energy (BMWi) and is receiving the support of experts at the Steinbeis Research Center for Simulation.

Tablets play an essential role in health care. Not only are they needed when people are sick, they are also used prophylactically, for example as a nutritional supplement. All currently available medicines are based on statistically defined standards, which dictate the quantity of active ingredients they may contain. The tablet press developed by kg-pharma makes it possible to produce personalized medication matched to each patient, in order to treat every individual case based on needs.

SMALL TEST – BIG IMPACT

Many years of experience in concept development, engineering design, and the commercialization of small tablet presses made it possible for kg-pharma to take all technological, pharmacological, and product-related factors into account while working on its development. Despite this, every new development needs to consider certain influences to make sure the concept takes heed of market requirements. Support from the go-inno initiative allowed kg-pharma to call on help from the Steinbeis Research Center for Simulation, which was asked to use a computer simulation to produce a 3D-printed mock-up of the product concept. This could be present-

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THE DEVELOPED TABLET PRESS MAKES IT POSSIBLE TO PRODUCE PERSONALIZED MEDICATION MATCHED TO EACH INDIVIDUAL, IN ORDER TO TREAT EACH CASE BASED ON NEEDS.

ed to potential customers to investigate the marketability of the planned device. Based on a survey of potential users, the experts assessed whether the current concept is going in the right direction and if any other factors need to be taken into account from a user perspective. It was only a small test but it had a big impact, since professional users such as drugstore owners have different expectations of such a system compared to private end users.

MOVING FROM ANALYSIS TO THE DECISION

The support provided by the experienced consultants at the Steinbeis Research Center made it possible to make a quick functional sample through simulation, and this sample was also used for the survey. The results of the survey provided a reliable foundation for decision-making so that the innovative concept could be taken to the next stage. Analyzing the potential of the concept showed that kg-pharma should concentrate first on professional users. An important factor among this group is adaptability of use such that a wide range of variables can be taken into account for the end products (tablets). With (specialized) end users, there is a strong focus on preconfigured tablets and it should be possible to use the device without specialist knowledge. The two concepts entail different requirements when it comes to the underlying principle and the design this necessitates. By concentrating first on application scenarios and simultaneously thinking about any required overlaps with other application scenarios, it will be possible for professional users to gather more experience working with the device, and this can be tapped into by untrained end users to help with simplified application options. The next step for the project will be to draft a launch concept and plan each individual stage of development.

EMBARKING ON EFFECTIVE AND EFFICIENT INNOVATIONS AT SMEs

SPECIALISTS AT BWCON HELP MEDIUM-SIZED ENTERPRISE WITH THE "INNOVATION LEARNING JOURNEY"

Small and medium-sized enterprises are often confronted by seemingly insurmountable hurdles when they embark on or try to establish innovation processes, especially if their operations are already up and running. To provide them with a safe environment, there is a new concept called the Innovation Learning Journey. The format behind this concept focuses on the challenges encountered when trying to involve all employees "at the right time" – with their ideas, skills, and experience. As part of a European INTERREG project called DesAlps, the bwcon Innovation Academy has been working with a hidden champion of industry, KRAMER from Umkirch outside Freiburg, and embarked on the Steinbeis Network's first successful test in this area.

"Join us on a journey of innovation!" This was the invitation extended by the bwcon Innovation Academy earlier this year to SMEs from Baden-Wuerttemberg. Firms were invited to apply for the Innovation Learning Journey. The criteria that affected acceptance to the program included participants' underlying motivations and the degree to which they would be open to trying out new methods or work principles. Factors such as communication and trust played a central role in interviews. This is because the chosen method of collaboration was also an experiment for the academy. The company that was selected from all the applicants was KRAMER, which has 90 years of experience in coming up with innovations in different sectors of industry: insulation technology, cold room construction, and shopfitting. With more than 250 employees in all areas of Europe, KRAMER is one the leading companies in its sector.

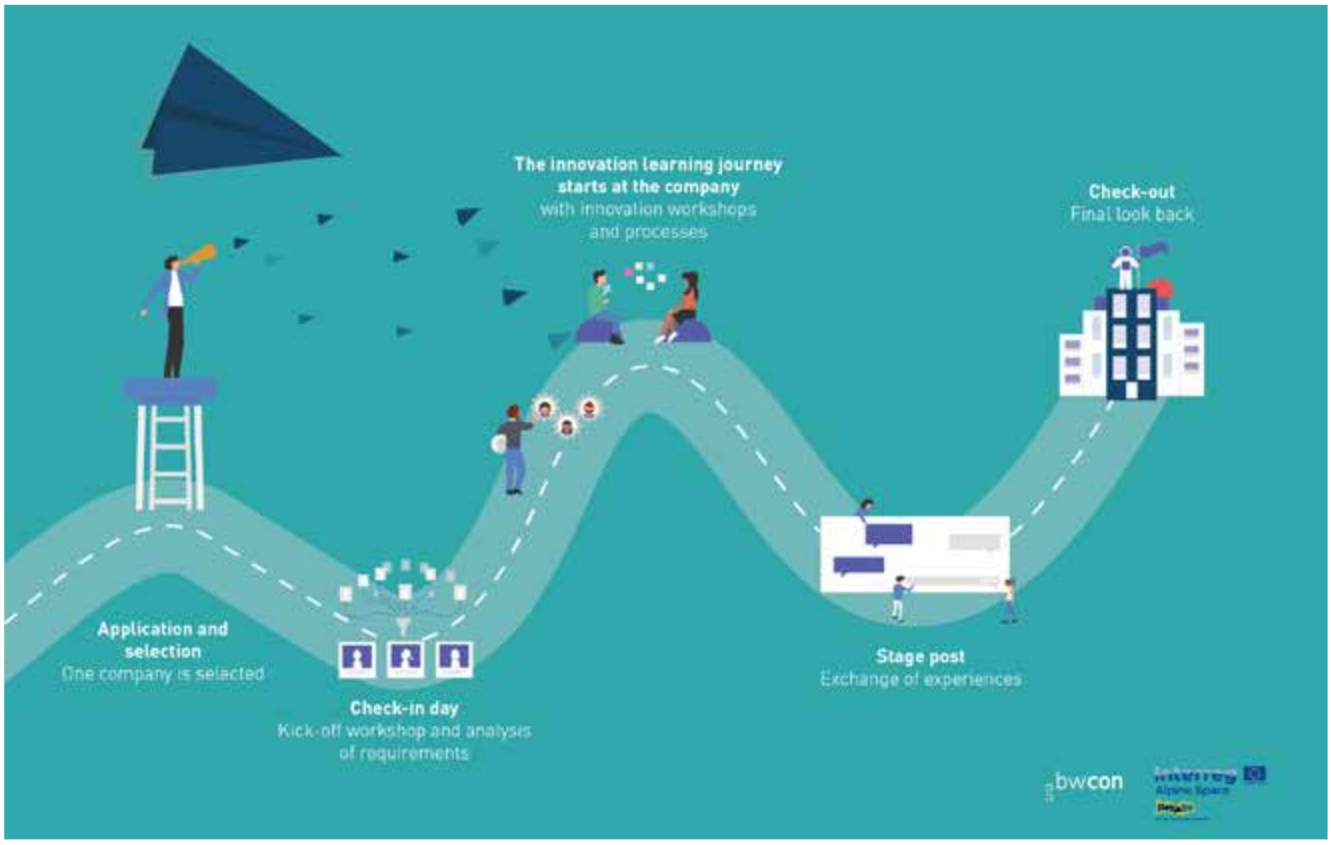
CHECK-IN

To start the journey, a core project team consisting of experts from the Academy and KRAMER met up and agreed the ground rules and goals for their six-month collaboration. Taking the current situation as their starting point, the team drafted a list of challenges and areas of action. This highlighted the fact that the company had no clear internal procedures for dealing with innovations. It also lacked the required "visibility" when it came to disruptive ideas that had already been implemented. A central concern of the project was to make better use of staff potential in keeping with the principles of continuous improvement – across the entire organization, bundling competences with a specific goal in mind.

AN EXPEDITION: THE INNOVATION LEARNING JOURNEY

In the weeks that followed, the experts at the Academy fleshed out pain points with the project team at KRAMER and identified which ones resulted in losing potential customers. They also defined an ideal process for innovations. This now clearly assigns roles to everyone involved in the innovation process and maps areas of responsibility and tasks. The firm's overall process now follows "end-to-end logic," providing a complete internal project framework from the initial idea to long-term implementation.

» **JOIN US ON A JOURNEY OF INNOVATION!**



The bwcon Innovation Academy Innovation Learning Journey

STAGE POSTS AND CHECK-OUT

The journey of KRAMER was a collaborative process from beginning to end, with clearly assigned roles. After reviewing certain points, team members could share their experiences and, if necessary, leverage them to change direction. At the end, there was also discussion surrounding the personal and collective insights of stakeholders:

- **No journeys pass off without incident.** The Innovation Learning Journey also encountered bottlenecks and bumps along the way, forcing the project team to make adjustments. In a world dictated by change, it would be utopian to expect transformation processes to pass off without friction. This is where understanding and flexibility are needed.
- **People are only human.** There were no surprises on this front and the project team also met with some unforgiving headwinds. It takes a lot of empathy to pick up on sentiments during live processes, perceive resistance, look further into the causes, and seek dialog. Also, communicating more openly instils more trust among staff involved in the process.
- **"One must travel to learn"** – as Marc Twain once said. It's quite common to see "plannability" and safety being sent to the back of the line and people going off in a completely new direction. When this happens, it's important to have a companion on the journey – someone who looks at things from a different angle and helps with decisions. It's also helpful if they come in from outside, especially with in-house change processes.

For the time being, the journey has reached its destination – although the team at KRAMER still has wanderlust. The next step will be to test the process by working on a specific example at KRAMER.

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INCONNECT: INNOVATION REQUIRES COLLABORATION!

STEINBEIS COOPERATION INDEX ANALYZES THE POTENTIAL OFFERED BY PARTNERSHIPS

The fountain of innovation flows from exchange with others. Important foundations of this are networking and collaboration. That's because value creation in and through networks is becoming increasingly important. Collaboration – and the transfer processes it leads to between different stakeholders – is also a key prerequisite of value creation. There are few areas of business to which these prerequisites do not apply, yet fulfilling them is no guarantee of success. To position themselves and prepare for collaboration, it is therefore essential for companies and economic regions as a whole to stand back and assess in detail their own ability to enter into partnerships and engage in innovation. In addition, it helps to draw systematic comparisons between the collaborative strengths of different regions or companies and make assessments with the aim of identifying success factors and recommending actions based on them. Steinbeis 2i and STASA (Steinbeis Angewandte Systemanalyse GmbH) have now developed an important analytical tool that can help with such assessments: the InConnect Partnership Index.

To turn networks into successful partnerships – collaboration with the ability to boost innovative capabilities – you have to answer three key questions: how, with whom, and when? Of course it's important to develop strategies, but at the same time organizations need to be open to the unforeseen and surprises. One key term that has emerged in this context in recent years is "open innovation," which means turning your back on established, in-house innovation processes and shifting deliberately toward opening up to and working with external partners. But it's the exact nature of each partnership that dictates whether it will have a positive impact on innovations. For example, it's important that partnerships work on both a regional and inter-regional level (Broekel et al, 2010). In addition, the more stakeholders involved in R&D partnerships, the more likely collaboration is to result in new products (Becker & Dietz, 2004).

HOW DOES INCONNECT WORK?

The InConnect Partnership Index developed by Steinbeis 2i and STASA is the first of its kind to focus specifically on the collaboration factors that dictate innovation. The project team based its work on scientific insights into partnerships and innovation, using these to define relevant indicators. It then used its own specially developed calculation methods to pull these indicators together into meaningful indicators to be used for the InConnect index.

InConnect makes it possible to work out different aspects of collaboration on different levels, the factors that help to promote innovation. It then predicts different stakeholders' prospects of developing added value through various collaborative activities. Based on this, it becomes possible to highlight the potential that companies, scientific bodies, and economic regions have to improve their partnerships, and this has a positive impact on the development

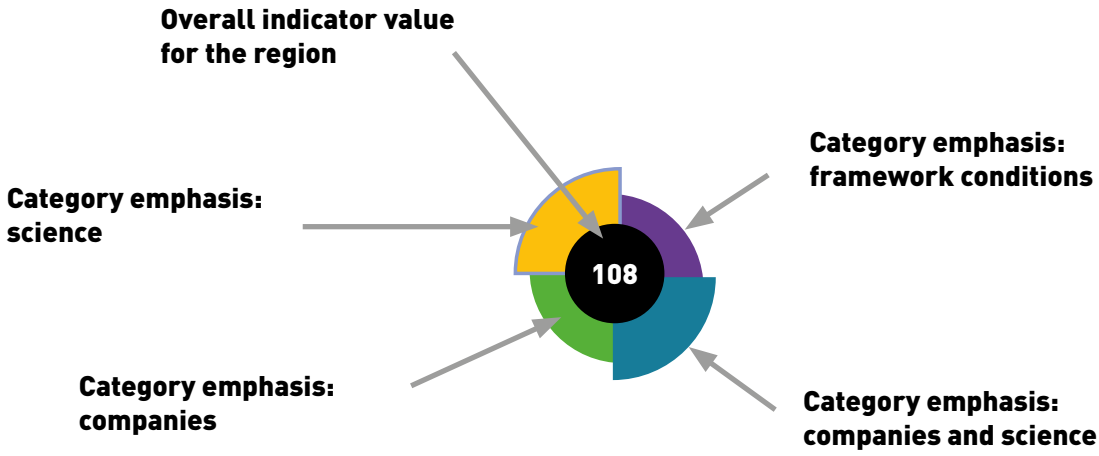
↑ The InConnect index being presented at the Max Syrbe Symposium in the Literaturhaus in Stuttgart

of innovations. The tool also makes it possible to carry out benchmark evaluations.

InConnect spans four categories, allowing users to assess collaboration and innovation factors in detail. These four categories not only provide a framework, but also reflect specific types of partnerships. Three types of partnerships are considered: partnerships between companies and science (or academia), intercompany partnerships, and partnerships between different scientific institutions. For each individual category, several subordinate indicators are calculated and displayed.

Partnership networks within research projects form an important part of the InConnect Index. These make it possible to highlight developments with the potential to emerge from collaborative research in the future. Collaboration on research projects carried out by different types of institutions helps to make partnership networks more visible, and this can foster new innovations.

Linking regional indicators to the primary data of the individual stakeholders within partnership networks makes it possible to conduct specific assessments of collaboration factors on a regional level. Using special software to display



The overall indicators used by InConnect

indicators on clear, interactive charts provides detailed insights into the collaboration factors that affect various stakeholders. This also makes it possible to conduct further evaluations and look at outcomes in geographical terms as well as other, more abstract terms.

The strengths of the index lie in its ability to assess partnerships and innovations systematically and in detail. It does this by drawing on different sources and perspectives. It also allows comparisons to be made between countries. To help users further, the index presents them with interactive graphs.

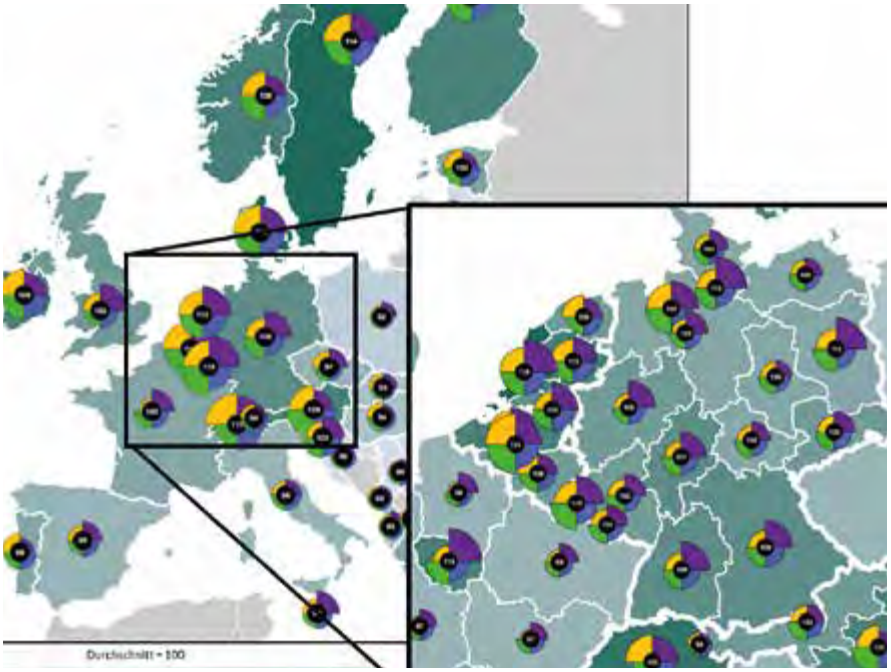
HOW CAN YOU BENEFIT FROM INCONNECT?

Using the partnership index can boost innovation by pinpointing and promoting relevant partnerships, which then lead to tangible examples of innovation. It also makes it easier for different stakeholders to weigh up the benefit and cost of partnerships. A further advantage lies in the emphasis the index lays on future factors. This is because partnerships, especially in research, always revolve around the possibilities of the future. Months or sometimes years later, they fuel innovations. Providing visual representations of the index also makes it possible to work on a variety of factors relating to collaboration and innovation, and these allow intuitive and clear conclusions to be drawn from the information.

InConnect is thus of interest to any organization aiming to derive more value from partnerships. Benchmark evaluations in the private and scientific sectors can be combined with the index and used to conduct a detailed comparison of your own organization with other institutions and companies. The index also makes it easier to find interested partners already active in a collaboration arrangement, not only improving how innovations are developed but also accelerating processes and helping with the development of new products and areas of activity. Organizations in the public sector will be particularly interested in the regional comparisons offered by the InConnect Index. Its unique ability to link socio-economic indicators to partnership networks allows the index to support strategic planning and the promotion of partnerships and innovation.

INTRODUCING INCONNECT AT THE MAX SYRBE SYMPOSIUM

The index was first unveiled at the Max Syrbe Symposium organized by the Steinbeis Foundation on June 25. The tool was presented by Dr. Jonathan Loef-



The InConnect Index is an interactive tool providing visual representations and evaluations

fler (S2i) and Dr. Philipp Liedl (STASA) in front of 80 guests at the Literaturhaus in Stuttgart. A keynote speech made by Prof. Dr. Johannes Glückler (University of Heidelberg) provided a memorable example of the value offered by partnership networks. To build a bridge between theory and practice, Dr. Marlene Gottwald (Ferdinand-Steinbeis-Institute) moderated an open discussion to allow some of the first pilot customers to describe their experiences with the index, the possibilities it opened up to them, and the challenges of successful partnerships.

INTERESTED IN HEARING MORE ABOUT INCONNECT?

To download a detailed brochure (in German) on the partnership index, go to **www.steinbeis.de/inconnect**. The authors would also be happy to answer your questions.

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PREVIEW

EDITION 03|2019
Feature topic: Business Development
Planned publication date: late december 2019

There are many ways to approach business development. Some think in the long term with a strategic outlook, others in shorter cycles, focusing on technological developments and changes to activities in the value chain – but in all cases the goal is to raise the value of the company. Business development is an ongoing task because as rapid changes take place around the company, it repeatedly faces new challenges. In the next edition of TRANSFER, the feature topic will look at how companies can successfully manage these challenges and safeguard their existence in the long term.

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

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