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The Steinbeis Magazine

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Feature Topic: Digital Transformation & The World of Work 4.0
Steinbeis experts cast a wide net to look at challenges and opportunities

Good Vibrations
Steinbeis experts develop laser coating technology by using vibrations

Transfer Excellence
The winners of the 2017 Steinbeis Foundation Transfer Award – the Löhn Award

Fully in Touch with the Future
The DFTA technology center makes promising advancements in flexo printing processes

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Dear Readers,

Professor Dr. habil. Heiner Lasi is director of the Ferdinand-Steinbeis-Institute (FSTI), which as a member of the Steinbeis Foundation coordinates projects in the field of digital transformation and technology convergence. The focus of tasks at the FSTI lies in transfer-based research in the field of digital solutions and networking. The FSTI is a part of the Steinbeis Network and a research faculty belonging to Steinbeis University Berlin (SHB).

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I can't wait to see what you're expecting to read in this edition of TRANSFER magazine, especially given the feature topic, which has been discussed in a whole host of publications and talks recently: Digital Transformation and the World of Work 4.0. Maybe you feel the same way as I do about the phenomenon of digital transformation, especially in the interdisciplinary context of working environments – that this is a fuzzy area and for many: a somewhat mystical development. One question it has to be allowed to ask is whether this edition's feature topic is actually something tangible. Is it even possible to look at the topic properly in concrete terms? To draw an analogy, isn't this edition about some kind of unknown far-off galaxy, and not some well-known star we can all point to?

Speaking for myself, I'm delighted with the feature topic of this edition of TRANSFER magazine and expect to read some fascinating articles. It's true to say that the term digital transformation is highly multifaceted and covers many topics. Combined with smart work environments – World of Work 4.0 – the radar is even wider. Despite this, I think it's understandable and right for Steinbeis of all organizations to turn the spotlight on the phenomenon of digital transformation and to do this in combination with changes in the world of work. The reason I say this is that Steinbeis is to a certain degree predestined to take an interdisciplinary and holistic look at the multifaceted, multilayered topics encountered in the Steinbeis Network; it has a unique breadth of expertise and can juggle the scientific or academic approach with its transfer-based outlook in order to arrive at constructive and pragmatic approaches.

This is also highlighted in this edition of TRANSFER. We've never had so many top-quality articles revolving around a single feature topic. The scope of applications addressed by the articles – from emergency medical assistance to dialog marketing – give broad, sector-wide insights into the specific approaches that are possible. The authors' contributions look at each issue in detail but also take a top-down look at companies – going micro and macro. The particular tidbits for some will be the short interviews, which deal with technologies and business in general, weighing up the opportunities and threats they entail. This provides a comprehensive picture, a meaningful complement to the outlined implementation scenarios.

If I had to sum up this current issue from a personal perspective, I'd say reading this edition of TRANSFER magazine is an enticement to experiment and make things happen in small steps with the support of the experts at Steinbeis – which hopefully will involve you! So on that note, I hope you gain some helpful ideas for your own projects and plans.

Heiner Lasi

Technology and Management Consulting X.0

Digital transformation and networking are presenting fundamental challenges

Business enterprises, the economy, and society in general are witnessing a prolonged phase of sweeping change driven by digital transformation and penetrating networks, exacerbated by converging structures, systems, and technologies. Not only is this affecting core areas of industry and key sectors within manufacturing, it is also having an impact on the public sector and services. As a result, areas such as technology services, especially technology and management consulting, are also facing new and fundamental challenges. So what are the challenges of Technology and Management Consulting X.0? Dr. Michael Ortiz, project manager of the Steinbeis pilot project Expert Network X.0, examines this question.

The first thing that is happening is that customers in the market are becoming more unpredictable and convergence is taking place. The number of larger companies now setting up their own consulting departments and the number of SMEs providing staff with academic qualifications in order to acquire scientific management and technology know-how is resulting in more firms than ever managing strategic projects themselves and implementing them within the company. Whole areas of traditional consultant expertise are thus being internalized and the knowledge gaps between consultants and the customer are narrowing. Companies are more likely than they used to be to play an active role in strategy and technology initiatives, often buying in the specific support of external experts from a variety of sources. This is inching "preferred supplier" consultants and service providers into the wings, and demand is becoming less predictable. Companies now look for the whole spectrum of specialist knowledge in the field of digital technology and also want highly specialized technology expertise, implementation advice, and – in particular – business model development. As a result, management and technology consulting is also converging in such areas, as disciplines expand and intertwine, especially as a result of new technology.

The other thing that is happening in this changing demand market is that the role models are shifting and the areas in which technology and management consultants work are moving. These experts increasingly need to act as networkers, hub managers, and mediators, as well as pioneers, quick startup initiators, fail-cheap-and-fast idea testers, and experimenters. Networking skills and lab know-how are becoming a key USP.

As companies increasingly turn to premium-value, specific, and validated tools to push forward with their tech and strategy projects, they are continuously fueling demand for scientifically sound methods and digital consulting instruments. Developing and using such tools is becoming more essential as a service and consulting product, making it part of the business model in technology and management consulting.

Other areas are also converging, and this is affecting the overlaps between companies and consulting. More and more technological development is taking place within companies with the support of experts in digital transformation, strategy, and management. There are also noticeable convergences taking place between sales and tech and management consulting. As a result, more and more companies are engaging with networks themselves in an attempt to broaden their own expertise. They want to find platforms that match the requirements of the convergence they are witnessing, especially when it comes to interdisciplinary factors, flexibility, and the modularity implications of "batch sizes of one." Examples of this in the Steinbeis Network include Micro Testbeds and the Expert Network X.0. The challenges these networks present as platforms is that they are particularly heterogeneous in terms of the parties involved, who come from companies, consulting firms, and other areas of science and academia. Such challenges include establishing a basis of trust, making up-front contributions without a clear indication that anything will come back in return (or not immediately), how to introduce completely new operating or business models with others, how to break up areas of a business that were previously protected internally to grant network partners access to these areas and get them involved, how to break down barriers (include mental ones), and how to collaborate with other businesses.

These changes and challenges represent a major parameter shift when it comes to market competition. But they offer advantages to companies working in technology and management consulting with an affinity for collaborative enterprise, especially if they possess the ability to develop networking skills and are effective networkers. Another decisive factor will be the ability to access business platforms, especially if they can be used as labs or experimentation chambers for new business models. Ultimately, important competitive advantage will lie in companies' ability to develop their own consulting instruments (also with others) or gain access to such instruments.

One feature of the Steinbeis Network is that its structure promotes entrepreneurship and decentralized activity in small units, and this holds tremendous potential for the network in a competitive context. It can position itself as a highly specialized technology and management expert X.0. An essential element of this is the way the network is consistently seen (and turned to) as a platform of experimentation and lab testing, to explore new business concepts and models; the way the network is extending its perception of itself and the roles played by individuals in offering modular networking and collaboration competence; and the increasing tendency for consulting instruments to develop and dissipate, not only through head office but also away from the center of the organization.

Steinbeis Swipe! is a regular feature in Transfer Magazine in which an author takes a look at a specific topic and may even take a swipe – left, right, up, or down – along the lines of a critical commentary.

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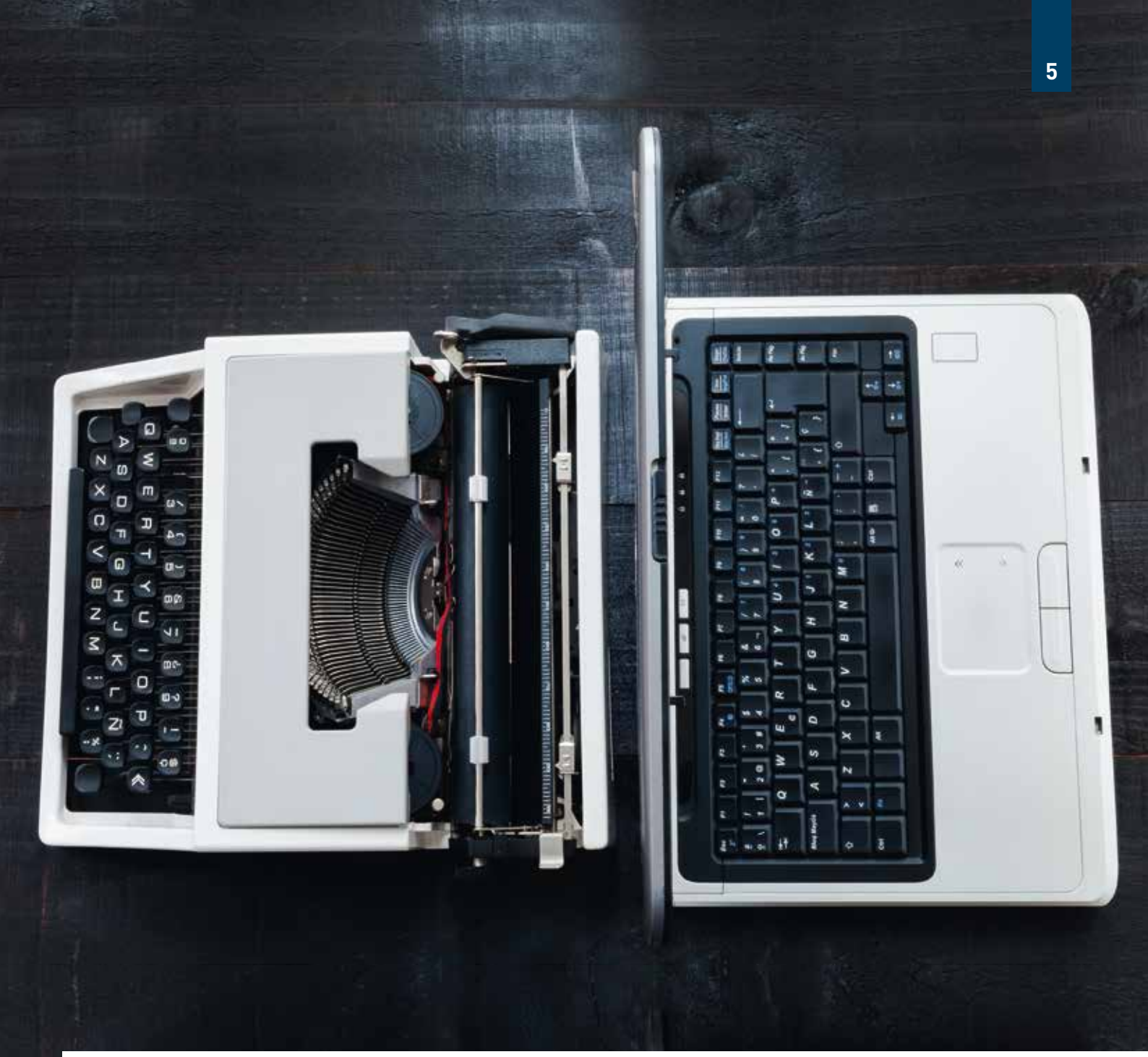


Feature Topic: Digital Transformation & The World of Work 4.0

Insights from Steinbeis experts

Modern life would be unthinkable without digital solutions. They shape how we communicate with our fellow citizens, our everyday habits, business processes, and company structures. They thus also shape the world we work in – our work environment. These developments offer new opportunities, but at the same time, they also harbor dangers – risks that can even instill fear. To stay in charge, it's important to understand what digital transformation entails, digital solutions in different shapes and forms. Steinbeis experts look at the many different ways in which the advancement of digital technology influences a variety of areas in our lives, including our everyday work – from paramedic services to manufacturing, production systems, logistics, HR development, organizational development, leadership, and marketing. Digital transformation affects all areas.

Image: © www.istockphoto.com/andongob

Blockchain – Facts Behind the Hype

Spotting opportunities and exploiting them

In 2009, a person or group of people going by the name Satoshi Nakamoto introduced a digital currency called Bitcoin. Their aim was to cause disruption in the world of banking. Bitcoin is a high-profile example of so-called blockchain. Daniel Burkhardt, scientific assistant at the Ferdinand-Steinbeis-Institute in Stuttgart, explains the diversity of blockchain solutions and the factors that are important for their use.

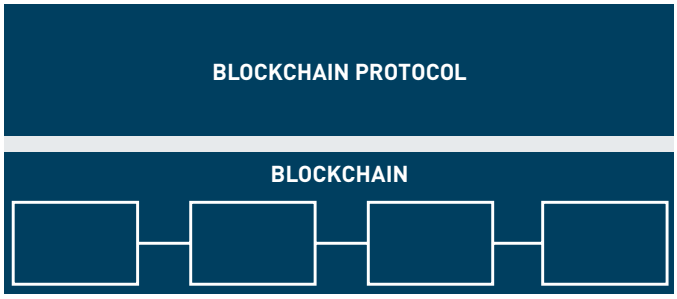
Some companies, banks, and state institutions act as central intermediaries between customers and service providers. As such, they have established a lucrative position of power. Users have accepted this setup without even questioning their trustworthiness and they have increasingly become dependent on these intermediaries. In times when the customer is supposed to be king, this is somewhat paradoxical. A situation has evolved in which structures are based on a data monopoly and people feel their data is being analyzed. In the wake of the banking crisis of 2008, more and more people have been demanding transparency and new solutions. This is offered by blockchain, although this is just one part of the picture.

A blockchain is a digital ledger that keeps updating itself and is duplicated by the participants in a distributed network. A blockchain makes it possible to record currency transactions. Protocols are then based on the blockchain, as with Bitcoin, and these define how participants in the network reach consensus regarding the actual status of a transaction. Transactions are recorded alongside other transactions within the network to form blocks. This happens until a certain block size has been reached, as defined by the protocol. The blocks are kept inside the blockchain with the very latest encryption techniques. It's important to make a distinction between two definitions of the term blockchain. Blockchain can be used to describe an overall area, but it can also refer to a technological approach, which is what we describe here.

The current status of the blockchain ecosystem is comparable to the internet before 1990. For example, the first generation of blockchain is reflected by systems such as Bitcoin, Ripple, or Dash. These make it possible to carry out financial transactions. But these systems have certain disadvantages when it comes to scalability and the speed at which transactions can be carried out. For example, with bitcoins a block with an average number of 2,050 transactions is stored in the blockchain every 5 to 20 minutes. This compares to a credit card company like Visa, which can achieve 2,537 transactions per second, and underscores how much catching up Bitcoin and other protocols have to do. The second blockchain generation includes protocols such as Ethereum. This particular solution makes it possible to offer functions such as autonomous programs (smart contracts) in a blockchain, thus automating entire steps within the process. This, in turn, makes it possible to run distributed platforms and thus cover a broader range of application scenarios. However, these blockchain concepts with extended functionality are still unable to offer solutions to the aforementioned weaknesses (such as the lack of scalability), although development work is already underway in this area.

The nature of blockchain does however make it possible to develop new application scenarios or adapt existing functions. One such field of application relates to the Industrial Internet of Things (IIoT). By merging operational technology (OT) (which works in areas such as sensors or enterprise resource planning) with IT processes, it is possible to come up with some completely new solutions. For example, data gathered by sensors on production lines can be analyzed in the cloud in order to work out what is happening and introduce measures to optimize manufacturing processes. By introducing blockchain, "things" such as autonomous objects, sensors, and actuators (at all stages of the value chain) can tap into certain services, and in essence this can happen without having to make a detour via central processing units for payment.

In Germany, a number of initiatives have started to make use of private or public blockchain. A position paper issued by the Federal Blockchain Association contains a list of companies and institutions actively involved in blockchain in Germany. To prevent the parallel development of heterogeneous blockchain systems and identify the potential of this technology to add value, the required approach needs to be considered from a variety of angles. This is the aim of a research project called "Distributed Ledger – Blockchain and IIoT" being carried out at the Ferdinand-Steinbeis-Institute (FSTI).



Blockchain should not be seen as a technology of the "fourth industrial revolution" – such as additive manufacturing or artificial intelligence. As a virtual intermediary, the system has the potential to foster all of these technological developments itself, as well as carry out currency transactions and forge new links. As a result, the blockchain concept is fueling a technology revolution, also affecting change in social, legal, organizational, governmental, and other individual structures. Increasingly, concepts such as the shared economy, digital government, open ecosystems, data ownership, and digital trust are gaining in importance and becoming implementable.

As a result, it is crucial that a variety of factors relating to blockchain be analyzed, not only in order to add value as blockchain is integrated into other processes, but also to make it possible to introduce or evolve new business models and ecosystems. The following factors have been identified, as well as certain issues that are important when analyzing these factors:

- Technology: What technological aspects are important for blockchain systems, and how are they used and configured?
- Concept and architecture: What subcomponents and layers does blockchain architecture encompass? How does the blockchain ecosystem build on this, and how is it arranged?
- Business model and strategy: What business models are made possible by blockchain solutions, and what impact could this have on business strategies?
- Functions: What functions or services are made available and can be implemented by using blockchain?
- Processes and principles: What processes and principles are needed to implement a blockchain, and in what form?

By analyzing these factors in detail, it is possible to assess whether a blockchain can add value when implementing trustless peer-to-peer messaging or autonomous smart objects within the context of the IIoT, or whether it actually makes sense to use blockchain as component within such systems. The IIoT has certain vulnerabilities when it comes to identity and data protection. So perhaps a blockchain can make certain things better. Furthermore, a marketplace for technology data would be interesting in the future, as would a remote maintenance platform. Blockchain has dedicated features and these can be a crucial component when introducing new systems. Aside from its implications for the economy and social systems, blockchain comes in many forms and varieties, so the challenge now is to analyze this in detail. The experts at the FSTI have recognized this challenge and made the task a top priority.

Image 1: © istockphoto.com/peshkov
Image 2: A blockchain stack: A blockchain is a digital ledger that allows transactions to be recorded. The protocols it adheres to determine the rules for validating transactions.

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Daniel Burkhardt has been a scientific assistant at the Ferdinand-Steinbeis-Institute, a research institution for digital solutions and networking at the Steinbeis Foundation, since June 2017. The focus of his work lies in project implementation and research in the field of distributed ledger (blockchain and the Industrial Internet of Things). His current projects revolve around business model innovation and delivery, IT service architecture, business processes, and emerging technologies.
One question interests him daily: "How can a distributed ledger be used to add value as a component within other technologies or models?"

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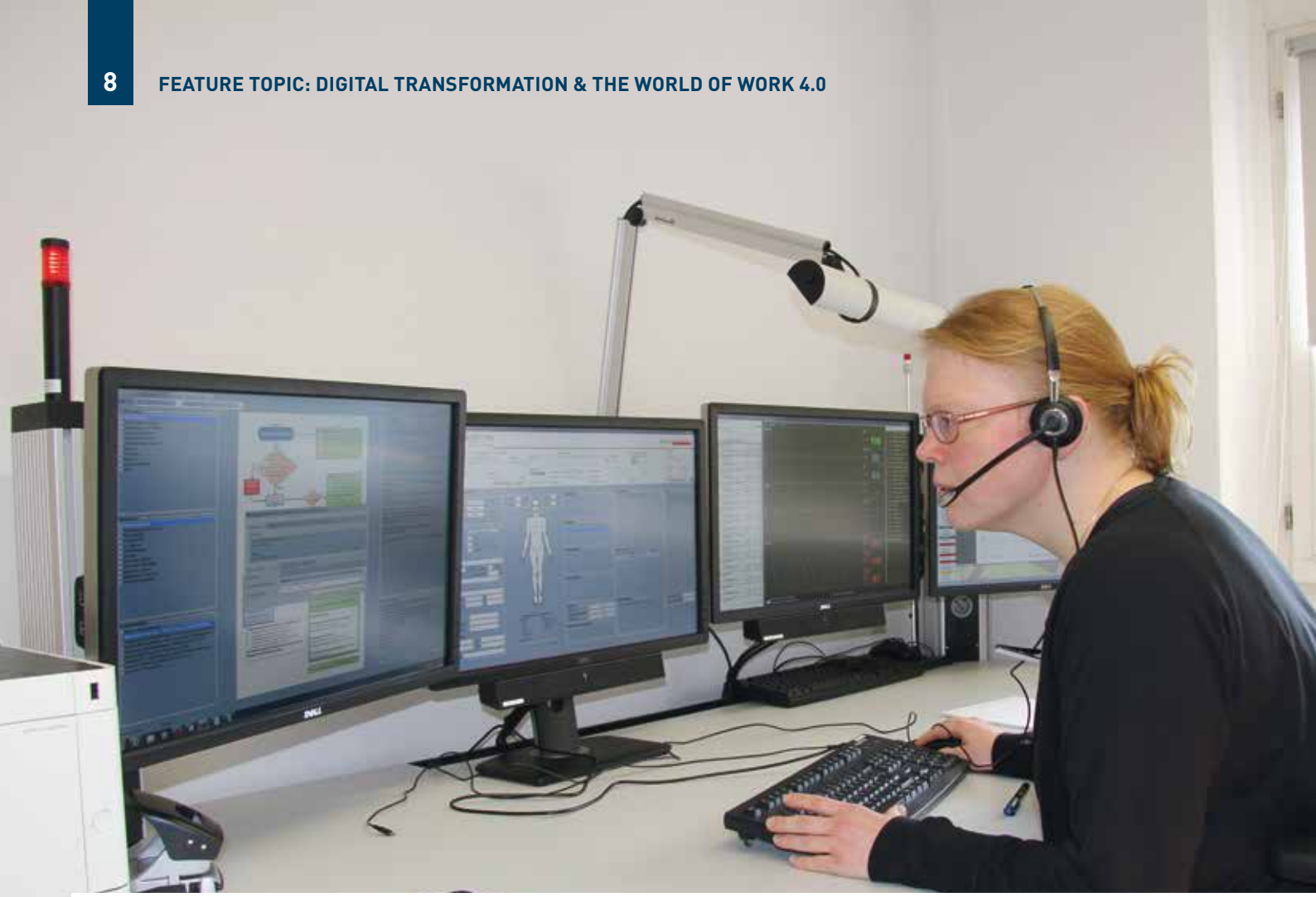

Emergency Medical Services: Help From Telemedicine in Rural Areas

Steinbeis experts help the rural district of Vorpommern-Greifswald with the redesign of emergency medical services

Many outlying areas are discovering that they have access to fewer and fewer paramedics, despite the rising numbers of emergencies. Now digital technology is coming to the rescue. One solution to this problem is emergency telemedicine – physicians providing support through an ops room equipped with telephones, videoconferencing, and real-time sharing of vital statistics. A pilot project called Land|Rettung ("Country|Rescue") is currently underway in around 70 sparsely populated areas of Germany to gauge how best to keep offering high quality emergency services at a reasonable cost.

The €5.5 million project is being backed by an in-house emergency unit run by the district of Vorpommern-Greifswald in collaboration with the Steinbeis Transfer Institute zeb/business.school, the University of Greifswald, University Medicine Greifswald, and an innovation fund offered by medical insurance bodies. zeb/business.school is a Steinbeis Transfer Institute at Steinbeis University Berlin and its role has been to help plan the concept, which it is currently coordinating. It is also offering secondary research to safeguard the sustainability of the project in Vorpommern-Greifswald and ensure it can be transferred to other regions.

One challenge faced by German rescue services is the growing number of calls it receives, despite lower numbers of doctors and paramedics. This is a particular problem in outlying areas. With 43.5% of calls received in Germany, the description of the emergency results in a paramedic traveling to the incident to accompany non-medical staff. There are legal guidelines laid down for all emergency services in the state of Mecklenburg-West Pommerania. These stipulate the required response times for paramedic vehicles, but according to simulations, in 10 of the 36 postal areas these targets are extremely difficult to adhere to.

Many calls are the result of a cardiopulmonary emergency – the number one cause of death in Germany and a condition that requires urgent action. When somebody suffers a heart attack, the brain is starved of oxygen and after three to five minutes damage is essentially irreversible. This is why response times are not the only crucial factor in an emergency. What also matters is the time without medical support – in this case the minutes that elapse between the onset of the emergency and the first steps of medical intervention. Since longer distances need to be covered in rural areas, patients with a cardiac arrest have a lower survival chance compared to patients in built-up areas. Adhering to the emergency service regulations through conventional means would involve running a larger number of emergency call centers across the state, finding people to work at these centers, and of course financing this. But this still would not solve the problem with those crucial minu-

tes of medical intervention. As a result, the concept being worked on by the innovation group is based on four factors:

1. Shorten the period without medical support by bolstering resuscitation skills among the population in all areas and motivating people to give active support. Currently, laypeople try to provide resuscitation after fewer than one third of cardiac arrests in Germany. When the emergency services resuscitate patients, they are twice as likely to succeed if an amateur first-aider has already started providing support before they reach the scene of the emergency. As part of the project, a high-profile PR campaign will be launched alongside major events and selected training courses in order to raise the number of first-aiders helping to resuscitate patients.

2. Quick and professional first aid to be offered as well as life-saving appliances by notifying first-aiders via smartphone. If suitable resuscitation measures are started quickly, it significantly improves the chances of survival after a cardiac arrest. One way to make proper use of the first few minutes is to alarm voluntary first-aiders with medical training via smartphone. Once a call comes into the emergency call center, a system would automatically identify and notify a voluntary helper by tracking GPS coordinates and working out who is closest to the emergency.

3. Faster and more reliable availability of medical experts by introducing telephone paramedics to improve support in areas that are difficult to travel to. As part of the telemedicine network, emergency vehicles with non-medical staff would be kept connected to a paramedic. This makes it possible to provide professional support until a paramedic reaches the emergency. Less life-threatening conditions can be treated independently by a rescue assistant or emergency medical technician under the supervision of a paramedic.

4. Improved emergency coverage by reorganizing collaboration with emergency healthcare offered by the state, the emergency services, and hospital emergency rooms. The paramedic services in Vorpommern-Greifswald previously had no overlaps with the emergency healthcare system offered through state medical practitioners, so this should be better coordinated. There should also be common alarm procedures and a common emergency call center to lighten the burden placed on the emergency services by less urgent emergencies.

The Steinbeis Transfer Institute zeb/business.school is coordinating evaluation activities for the project to help ensure the initiative is a success. Boosting the number of amateur first-aiders providing help with resuscitation efforts should tangibly improve people's willingness to help others and improve skills. The aim is to significantly raise the number of cardiac arrest patients who receive first aid before the emergency services arrive, and thus reduce the amount of time they are not being helped before professional support arrives. It should be possible to assess the availability of paramedics and the quality of support offered over the telephone by monitoring the number of emergencies that can be dealt with by a telephone paramedic and the medical quality of tracer diagnostic measurements. Improving coordination between the emergency services and the emergency healthcare service providers should result in fewer false alarms for the emergency services and a widening in the fixed network of emergency medical practices offered by the state.

Image: A telephone doctor in the „Land|Rettung" emergency ops room. © Peter Brinkrolf

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"Managers have to take much more of a lead than they have in the past"

An interview with Professor Dr. Arnd Gottschalk, director of the Kassel-based Steinbeis Transfer Center Human Resources Management & Organizational Development

What role do HR and organizational development have to play in times of digital transformation? What skills do people need to prepare themselves for the future? TRANSFER spoke to Professor Dr. Arnd Gottschalk about these issues, as well as the tasks that will face managers in the working environments of the future.

Hello Professor Gottschalk, the areas you work in include work organization and organizational development. How will these change as a result of digital transformation and what will this mean for business development?

Digital solutions affect companies differently depending on the area of industry they work in and the products they make. My recommendation is to use a principle I call "first what, then how": It makes more sense to start by asking what changes will come about as a result of digital transformation and then ask how companies will develop in the future, or how they'll have to develop. But what actually is digital transformation? Companies should answer this question with a holistic approach, on several fronts. If they don't, there's a danger that the topic will get shoved into the IT department – and if you ask me, that's the last function it should go! For me, in essence digital solutions are about producing and processing digital information. They're not just about automation, hardware development, or robots. You have to stand back more and take the wider view. The picture we got of this at the beginning was a bit fuzzy, but gradually the demands this area will place on the work environments of the future have become clear to people: Work will become even more broad-based than it has been, more networked, more intense, and more transparent, because data will be available in almost infinite volumes in real time. This is where HR and organizational development is needed!

A couple of years ago people were asking what direction organizational development (OD) is headed in and whether it will actually be needed anymore. It's currently needed more than ever and the fundamental principles of classic OD are still needed, including things like the principle of turning people who are affected by things into people who are involved in those things. The current developments are too complex and too fast for individual business leaders or consultants to make the right decisions or prepare themselves. I believe there's an urgent need in the field of organizational development to see ourselves as learning companions for the future and become established as such within companies. The term I use for this is "future designer," so it's about being an expert who provides methodical and systematic companionship on the journey ahead – for the organization, managers, staff, and teams.

Digital solutions are everywhere now and are fundamentally reshaping the world of work. The central question here is what will it be like working in Business 4.0 – smart companies – and what challenges will these changes bring, not just for employees, but also for employers.

There's a famous saying that "prediction is very difficult, especially if it's about the future." The working environments of Business 4.0 will depend on the type of company – there's no one-size-fits-all answer to this one. It's also clear that some sectors of industry and companies will be affected more by digital transformation than others. So the big challenge will be to ensure that managers and other employees feel similarly empowered – much more empowered – to do something about the changes that are coming, which are getting faster and faster. The two terms I use are learning aptitude and future-readiness. Lots of people have fallen into the trap Seligmann calls "learned helplessness," so they assume their company will take care of things. Wrong! Also, not everyone is in a position to set their own development objectives or to motivate themselves to learn so they can translate their newly acquired skills into practice. So managers have to take the lead in this area, much more than they have in the past. HR development isn't the task of the HR department, it's the managers' job!

The OECD currently points to three skills that will be required in the future: the ability to create new things and think creatively, the ability to deal with conflicting needs and think within the context of complex connections, and the ability to assume responsibility, take on tasks independently, make decisions (and learn to fail), and to do something (and not remain passive). So employees need to be equipped with skills that will

make them future-ready. A tremendous amount of staff training is needed in this area – for managers and other employees. I think methods skills will be needed more by managers in the future. Companies have little awareness of the methods skills they need to prepare for the future in their markets, or this awareness is limited to certain departments. Innovation and future-readiness are not just something you delegate to the strategy department, they're important to everyone and you need an organizational framework that allows for failure and learning.

To shape the new world of digital and virtual work, companies also need to realign their HR strategies. What will that entail specifically for HR managers and other people in management positions?

Well, first of all you need an HR strategy that is also seen as part of the business strategy and is derived from the business strategy, a bit like an innovation strategy or market strategy. Lots of small and medium-sized businesses don't have a specific HR strategy or any strategic direction in their HR (cf. Gottschalk/Vögele: Steinbeis Engineering Study, 2012). I make a distinction in two areas within HR strategies. There's the strategy for the human resources department and there's a human resources strategy for the business enterprise. With digital transformation, what this means specifically is you need to know what the digitalization strategy implies for the HR department. What approach does HR have toward digital technology? The second aspect is about looking at the digital technology strategy for the company. What changes will processes and tasks undergo, and in what way will the network of customers and suppliers change? Digital technology strategies are not some kind of stand-alone strategy. They should always be seen within the context of internal and external business environment. The key questions with a bearing on the HR strategy, especially for companies strongly influenced by digital transformation, are: How quickly can we move things forward? How strong are the forces that move us forward or pull us back? Will we be able to manage digital transformation with our current workforce, and what will we do with the people who can no longer join us on the journey? Flexible, temporary contracts are one way to deal with this issue, but it takes a whole generation of workers to go through the change this way. HR departments should therefore ask how much training is needed for people to adapt – and specialist skills are needed just as much as methods skills – and which new people will be needed. What can we do to develop the skills we need or buy them in? What shifts will there be in current vocations? What new vocations will arise? The problem is, we can't say for sure what will happen in the future – and I use the word "future" deliberately – so management has to be 100% on the ball and involved in planning the strategy. This is where HR has something to gain in the future by ensuring the right models are available for shaping the future and that they're proactively implemented.

Just like any change, digital transformation gets people worried in a company, and it can also meet with resistance. What can or should HR managers and other people in management do about this?

Resistance can be on an emotional, rational, or political level. Emotional resistance usually arises when people are scared of uncertainty. What's going to happen to me? What am I still worth with the qualifications I have? Can I keep pace in a world of digital technology? HR departments and managers need to be prepared for these questions, even if they sometimes don't have an answer to them. Rational resistance typically arises when people misunderstand things or misinterpret numbers, facts, and figures. Why do we actually need digital transformation? What benefit is it to us? So this is about "why?". Then there's political resistance when it's about the balance of power. Who's responsible for digital transformation? Who gets the budgets? Who's trying to use the topic to raise their profile? This is where HR managers can assume the role of a moderator. Resistance is generally seen as something negative or a delaying tactic, but whatever the reason for it, it has to be taken seriously! If you ask me what the antidote is for resistance, I'd say any medicine has to contain the following ingredients: explanation, communication, information, participation, qualifications, and integration.

There's one further point: Employers, managers, and other members of staff have to learn how digital transformation works, and this is where organizational development has a role to play in moving things in the right direction. Employers and managers have to take seriously the demands placed on workers – that they should be "in good shape" – especially when it comes to flexibility, adaptability, and willingness to learn! It's not right to just make demands; people have to lead by example and show what digital transformation means for the individual company and worker. But be careful of people forming factions: I think digital transformation currently has the tendency to split people into factions, and people really put up the barriers. These have to be dealt with by the processes of digital transformation. Organizational development and change management offer a number of effective models and interventions when this happens, such as planning workshops, force field analysis, stakeholder maps, but also design thinking models based on change processes, and we can use these to initiate and steer digital change processes. The principle of participation – i.e., getting people affected by processes involved in those processes, introducing them to changes step by step, accompanying them, and allowing them to shape processes – is something people should take to heart.

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VUCA – More Clarity, Less Uncertainty

It's time to reinvent leadership!

It is the next round of a wrestling match and a revolution in the world of business and society as a whole – a struggle that started years ago. Digital transformation and Industry 4.0 are just the precursors of an imminent metamorphosis, yet nobody seems to be in the slightest bit clear about how important human factors will be. If there's one thing we do know at the moment, however, it's that nothing is certain anymore. There is a fitting term for this situation, an acronym that has the potential to explain many things: VUCA. Wolfgang Natzke, director of the Steinbeis Transfer Institute for Business Management and Innovation, explains what VUCA means and describes the changes affecting management in an era of digital transformation.

VUCA is a useful acronym for summarizing the challenges companies (and people burning to instigate change) face in successfully transforming our world in an era of digital solutions. It stands for volatility, uncertainty, complexity, and ambiguity.

Volatility describes the extent of fluctuation within a short period of time, thus pointing to a situation that is unstable, erratic, and thus difficult to predict. If a company asks itself who and where its customers will be in the future, this kickstarts a period of heightened innovation activity, which has every propensity to accelerate. This requires a culture of innovation, one the people at the company accept and believe in. Uncertainty regarding customers and the competition goes hand in hand with uncertainty regarding market developments. Introducing tactical measures, such as identifying worst-case scenarios to work out what would be the best case, poses a dilemma for firms. The big question is, "How and through whom will the company generate the revenues it requires in the future?" To pave the way for the future, it is essential for HR management to be 100% effective and, at the same time, flexible. The complexity part of VUCA points to the need, more than ever, for a core competence (especially given the highly complex and thus extremely fragile nature of structural factors): mental agility. This is an important skill if managers want to maintain a 360° overview. In the future, "strategists" will be needed who are able and willing to quickly leave their comfort zone, managers who are adaptable and able to deal with and get into completely foreign situations. As for ambiguity, this is about circumstances having different possible explanations. When there are no obvious causal dependencies and tried-and-tested business models are likely to start going wrong, companies are increasingly forced to find individual solutions. Just because people have certain know-how or can point to best practice, this is no guarantee that they will continue to enjoy success. It's a bitter pill to swallow, but the more radical change becomes, the more quickly we realize that our knowledge is finite – as is experience. What were previously considered boundary posts for an industry are becoming more and more fuzzy. And then something unexpected happens – things go full circle and the next VUCA cycle begins.

So which factors need putting under the microscope for a firm to embark on a journey of digital metamorphosis? The experts at Business Management and Innovation, a Steinbeis Transfer Institute at Steinbeis University Berlin, have pulled together a number of ideas they consider useful for business. They are certainly thought-provoking, and to help with this process, they offer a specialist seminar on "Shaping up for the world of VUCA." This provides an entry point for the fascinating world of digital transformation. The experts offer the following helpful ideas:

It is important that a company believes in and reflects a culture of trust. A leading German bank once ran an advertising campaign proclaiming that trust is the starting point for everything. All human relationships are built on a foundation of trust. When people behave with integrity, adhere to arrangements, support one another and mean well, and they

communicate openly and honestly with one another, they sow the seeds of trust. That said, checking things – like simply monitoring a situation – also makes sense.

Errors or misconceptions are not mistakes – something that managers need to think about consciously. This is because ultimately, there is only room for mistakes if people define what's "right." But if complex systems are typically unique in nature, there can be no "right," so there can also be no such thing as a mistake. If anything, there are just misconceptions. This is why trying to point fingers at people is rarely useful. The task for managers and other employees is to take risks – even if this could result in errors – so that they can learn together without apportioning blame.

Swarm intelligence comes before individual intelligence. To have any chance of capturing and understanding complexity, a company needs diversity, the exchange of ideas and changes in perspective in relationships of equals.

Another important factor is that people are willing to take responsibility. If people consistently stop engaging in witch hunts it becomes much easier for everyone at a company to decide if they want to be victims, or the kind of people who take responsibility.

It is also important to adopt the right mindset. Even if making errors can be seen as a setback, talking about how people feel this has affected them and their reactions helps to rebuild confidence.

Systematic networking rather than hierarchies: Beyond the realms of existing formal structures lies a world of openly exchanging views, in all areas of the business at all levels of the hierarchy, and this should be aspired to and actively promoted. Putting the right infrastructures in place (dialogue based on relationships of equals, a culture of feedback, etc.) is a key responsibility of management.

Skills rather than hierarchies: There are huge advantages in allowing key decisions to be made by people in the places where the highest level of competence is held. Currently, many decisions are made by people who are simply responsible for others, or where hierarchical power is held (or both).

Agility rather than rigid planning structures: Best-practice solutions usually fail in complex situations and it's simply futile trying to draft the perfect plan. What does help is if you allow for plenty of flexibility and just experiment by taking the next step. To do this, you need to be able to stand back, trust people's intuition, and allow for visions.

Make improvements rather than seek perfection: The complexity aspect of VUCA entails a high degree of unpredictability, so this is a world shaped by interdependencies that are not always easy to spot. This is why reworking things is absolutely normal, if not essential.

Swap roles as necessary: To be agile as a company, people have to be able to switch roles and revise how they see leadership. Managers should be a kind of moderator who focuses on solutions, people who maintain the focus on the mission, vision, and strategy of the company. They are responsible for ensuring decisions can be made within a given set of circumstances.

Managers need to be aware of the fact that general management strategies previously considered universally valid will have zero effect in the new world of VUCA. Linear approaches to solving problems, linear thinking, linear management and linear career models are definitely not the way forward in a dynamic, ambiguous world – an environment that is not only volatile but also dictated by change. If anything, linear practices are a serious problem. The new core competences are methods and processes that promote innovation, incubation, restructuring, and change management. Models that hail the virtues of managers "taking to the helm of a company" are most certainly doomed to extinction.

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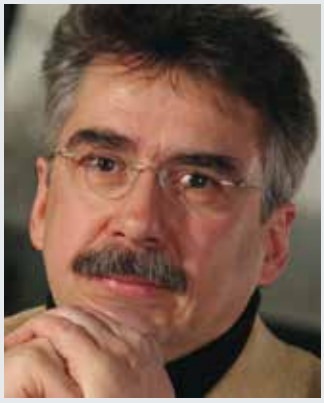

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"What's essential is that people are prepared to accept new developments"

An interview with Professor Dr.-Ing. Tim A. Jansen, director of the Steinbeis Transfer Center for Industrial Digitization at the Baden-Wuerttemberg Cooperative State University in Horb

Why do some companies struggle with digital transformation and fail to exploit the opportunities it offers? What can businesses do to prepare themselves and their employees for change? These and other questions were discussed with Professor Dr.-Ing. Tim A. Jansen.

Hello Professor Jansen, digital solutions offer opportunities to business as well as threats. What should companies do to make good use of the potential they offer?

The developments that shaped previous industrial revolutions always had their critics, although there were also those who welcomed them. Ultimately however, the future was always shaped by new technology. Companies that spot and pick up on trends early became the pioneers in markets. They were the ones who were in a position to cash in on developments and bolster their standing in the market. Things are basically the same today. What's essential is that people are prepared to accept new developments. It's the same with current trends and the Fourth Industrial Revolution, which is heavily influenced by digital technology. The thing that's special about this revolution is that smartphones are developing at breakneck speed and because of this, people have continual access to the internet. Internet use is changing everything, especially with respect to social media. Knowledge, opinions, and other information get distributed extremely quickly. This is already part and parcel of our private lives, but lots of companies are still struggling to keep up with these changes and they are finding it hard to exploit the potential these trends offer to their business. This is an underlying aspect of Industry 4.0. With production, it's machines and products that are communicating with one another through the Internet of Things, acting independently as cyberphysical systems. This is opening the door to completely new business models. But when companies feel insecure, like many do at the moment, this is often the result of cost uncertainty, the lack of time, and information deficits in management. That's why the first step is to ascertain the facts and explain things carefully.

Growing digitalization is forcing companies to question their current product and business processes and do things differently. What do you think are the biggest challenges here?

Things are becoming increasingly short-lived, so companies have to react flexibly to trends and short product life cycles. That's easier if they can plan with the long term in mind and look at things from the perspective of the entire production and service value chain. The priority has to be to achieve complete transparency for in-house processes. But this is precisely what companies are often lacking, so they haven't reached the right starting point for questioning things and making changes. They don't dig down deep enough into their own processes so even if they do succeed in automating important parts of the production process, they're not really in a position to exploit the full potential offered by Industry 4.0 solutions. It's about more than connecting up human beings with a network so they can carry out remote maintenance. It's about more than making production agile so you can make single-product batches. The production scenarios of the future will be

networked beyond the four walls of the company and offer clients and the business itself the kind of value-added that's not been available until now. The problem we keep encountering is that people don't understand things properly and they can't offer the selling arguments or the reliable data they need, so customers aren't prepared to pay for the added value of a product. Companies lack the transparency with respect to possible cost alternatives, so as a result, they try to hand on all of the costs to the customer. Things go full circle, so moving forward is no longer an option.

But even the best processes at a company are worthless without the right people to make things happen. What can companies do to prepare their workforces for these new challenges?

Making a success of something means first of all understanding what's happening, and then doing something. Decision-making and tasks are increasingly being automated and captured in smart networks. The employees of the future will therefore be knowledge workers – people who have to understand whole processes so they know when to intervene and decide something themselves. Task environments will become interdisciplinary. Nobody says that there has to be consensus these days regarding the differences between mechanical engineering, electrical engineering, and mechatronics. IT now acts as an overarching interface. But the people don't exist with an understanding of the overall picture. Nobody knows all areas. So the challenge for workers is to show they have detailed technical expertise but at the same time they have to acquire soft skills to communicate with others beyond the technical interfaces, on an interdisciplinary level. It's particularly important that they can understand others. One term being used in this respect is T-shaped skills – equipping people with knowledge in other areas. Vocational training and degrees do teach people the things they need to know at the moment, but existing workers need to be put through a change management process to make others more aware of what is happening. New processes will be needed, with the right structures, but these should only be introduced if there's the right underlying acceptance from the workforce.

Finally Professor Jansen, your Steinbeis Enterprise offers customers help with embarking on the journey to a digital future. Which of your services do customers ask about most?

Our Steinbeis Transfer Center for Industrial Digitization was set up to provide a networking platform for manufacturing technology. As a Steinbeis Enterprise, we're in a position to offer SMEs discounted initial consultations, so they're free. These help clients explore the steps they would need to undertake to digitalize their manufacturing. We can also offer support on other fronts, such as project support, customized training, or joint research projects funded by third parties. Our portfolio of services revolves around the product life cycle, so we help with developing concepts, test lounges on machining, improvements in logistics, and the introduction of new services.

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Professor Dr.-Ing. Tim A. Jansen is director of the Steinbeis Transfer Center for Industrial Digitization. The Steinbeis Enterprise offers its customers a wealth of information on all kinds of digital solutions, drawing on know-how in production and logistics, continuing professional development and seminars, research projects, test lounges (proof-of-concept environments), manufacturing process optimization, the evaluation of existing/new solutions, and support with product launches.

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Digital Transformation: Ready for the Digital Future?!

Did Germany miss the starting pistol?

Everyone agrees that companies have no option but to become involved in digital transformation. But in practice, making the transition to digital technology isn't as easy as it sounds. Just why, and what can be done about it, was the topic looked at by Stefan Odenbach, project manager at the Steinbeis Transfer Center for Technology – Organization – Human Resources (TOP). To examine the issue, he drew on the experiences of other Steinbeis experts.

Everyone is talking about digital transformation these days. The term refers to a shift away from existing business processes and can be seen as the strategic drive of a company to introduce digital solutions by drawing on new, digital (IT) systems, such as social media, big data, cloud computing, the Internet of Things (IoT), and Industry 4.0 (smart production). According to recent studies (including a BITKOM report and a study issued by GfK from Nuremberg), Germany might be about to sleep through the biggest changes. A shining example of this is the automotive industry and electric cars. The biggest obstacles for many companies and their decision-makers are people "defending existing setups" and a lack of specialist IT expertise.

Digital transformation stopped being a new-fangled buzzword some time ago, but it still sometimes feels like somebody is replaying the famous German advertising campaign, where soccer legend Franz Beckenbauer proclaims, "What?! Is it already Christmas?" This is similar to the reaction of many companies in Germany. And even IT firms, who offer innovative software and solutions to their own customers, still have systems in the back office that they were using 25 years ago.

More than a decade ago, the hot potato topic was globalization. Now it is digital transformation that is sweeping through global value chains and business structures. This is affecting leading companies on the stock exchange just as much as SMEs and society in general. Even major corporations are finding digital transformation a completely new challenge, adapting or even totally rethinking established business models. Digital transformation affects all sectors of industry and influences all market players, from banks to the retail trade, from the pharmaceutical industry to the traditional media. "Only street traders selling French fries are still offline (for now)," says Philipp Depiereux, the founder and CEO of etventure.

So the $64,000 question is: How can a couch potato transform into an exemplary athlete? The first step is to do a fitness check when it comes to digital solutions in order to assess the status quo. There is a practical guideline to help any manager gauge how they shape up digitally:

1. Am I using efficient software like CRM, ERP, DMS/OCM (local or on the cloud)?
2. Am I using data effectively (BI, big data, access to mobile data)?
3. Are my managers in good shape for the digital age (understanding of the digital economy)?
4. Could my company benefit from improved connectivity (in-house/external networks)?
5. Are digital solutions an opportunity to 'go international' (is global B2B/B2C a possibility)?
6. Would it make sense to use social media (which channels offer new customer potential)?

Depending on the results, firms using this model can be placed into three basic digital technology categories: pioneers, followers, or laggards. The pioneers are obviously well prepared and want to ensure things stay that way by regularly working out whether any particular changes are relevant to them. Followers understand the challenges but are sometimes not in a position to do anything. They mainly only work on their weaknesses when the level of risk (threat) outweighs opportunities (competitive advantage). Laggards can't even work out if digital technology is important in their industry. They typically re-examine their business models (much) too late. This summary was pulled together by Professor Karl Schekulin, director of the Steinbeis Transfer Center for Process Development, who has been working in industry for 35 years. He recently said that rather than stemming from a lack of innovation and poor access to lateral thinkers, the problem lies in implementation, largely due to funding, and there is a particular issue with finding the required specialists. His advice to managers: "Just press the Go button!" Schekulin has noticed that despite the technical and structural changes looming on the horizon, (as a variety of independent studies show) recently SMEs have shown little interest in digital transformation, primarily because business is booming. Often, the top priority is meeting delivery obligations; there's enough work to be getting on with and it's important to cash in on the current boom. Many companies have decidedly one-track thinking when it comes to their product range and production technology. When structural change (transformation) takes full effect, Schekulin and other digital economy experts believe things will be pretty dire for lots of SMEs.

Just the right amount of milk in your coffee

In the last edition of TRANSFER magazine we posed a question about when to add milk to a cup of coffee. We received lots of mail so we thought we would reveal the official solution and answer your questions in detail. If you want the coffee to stay hot enough to drink for longer, it's best to add the milk to the coffee right away. According to Newton's law of cooling, the rate of heat loss of a body is proportional to the difference in the temperatures between the body and its surroundings. Take two cups of coffee and leave the first one to cool for 10 minutes and then add the milk. With the other cup, add the milk to the coffee right away and allow the mixture to cool for 10 minutes. The second cup will also cool down, but the temperature drop is steady and it will gradually adjust to room temperature. The first cup, which only contains coffee, will cool down more quickly before the milk is added because it was originally hotter. Accordingly, the cup of coffee that had milk added first will be hotter than the other after ten minutes.

Another aspect is the overall product and production strategy. While many are still struggling with Industry 4.0 and digital manufacturing, for some time now things have been shifting toward Industry 5.0 – collaborative manufacturing with a return to the human touch. This is being fueled by growing demand for highly individual products (batch sizes of 1), which are currently completely over-engineered. Some major challenges lie before us in this area in the future. So it is clear that we still need a whole host of digital lateral thinkers. Also those good-old analog gut feelings are far superior to any artificial intelligence.

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„Even in an era of digital technology, people will still be the cornerstone of success“

An interview with Professor Dr.-Ing. Harald Augustin, director of the Steinbeis Transfer Center for Process Management in Product Development, Production and Logistics

Professor Dr.-Ing. Harald Augustin talked to TRANSFER magazine about future changes in production and logistics as a result of digital transformation and the importance of "free thinking".

Hello Professor Augustin, digital technology is changing manufacturing processes and thus also the world of work. Where do you see the biggest challenges for companies with this new situation?

There are three key challenges that come with digital transformation and at the same time, they're success factors for businesses: finding the right business strategy for digital transformation and communicating this transparently; seeing processes in new ways and thinking freely or disruptively; fostering know-how among staff and developing this knowledge.

Managers need a digital transformation strategy that covers all areas of the business. Without this, there can be no synergy effects between different departments or at the overlapping areas between processes. Also, everyone at a company has to be clear about where the journey is taking them. This is the only way to allay hidden fears and motivate people to do something themselves. So transparency is the be-all and end-all. Digital solutions need to be seen as a driver or enabler of new innovation and improvement. This means firms have to find out which digitalization technologies offer new opportunities for the business, not just in the here and now but also in the future. The key thing is to identify how digitalization can improve existing processes but also which emerging business models and opportunities it can create. "Free thinking" or thinking in terms of disruption are an important element of this. My personal preference is to use the term "free thinking," because that's what you need to achieve disruption – i.e., radical renewal – in the first place. But how many companies actually provide enough leeway for this to happen at the moment? Big companies go on the journey by "buying in" free thinking: They acquire startups. Things are different at small and medium-sized enterprises, who have to go on the journey themselves. This brings us directly to the third and perhaps decisive success factor, which often feels like a restraint or an obstacle to future development: fostering know-how among employees and developing this knowledge. Even in an era of digital technology, people will still be the cornerstone of success. This is because human beings are highly flexible in action and thought. Future possibilities for applying artificial intelligence (AI) are still quite limited, even for the next couple of decades. The changes we need can only be driven and implemented by people. Digital solutions will only be a means to an end, whether it's about optimization or establishing new business models using IT or AI. The question you always meet is whether staff have the right qualifications to exploit the opportunities presented by digital technology and make use of it. So staff need training on a variety of fronts. They need technical expertise – an understanding of how to use the technologies of digital transformation – and they need method skills, which is about knowing how to use digital technology to optimize and redesign processes, structures, and business models – and this expertise needs expanding. I know from my own experience in projects that not enough is being done to invest in these two areas of competence. This is a fatal mistake and it will come back to haunt companies in the medium term, because digital transformation accelerates development at breakneck speed, so skills development has to be continuous. Otherwise, you're actually moving backwards.

Among other things, your Steinbeis Enterprise offers customers the possibility to set up virtual work environments. What sort of problems do your customers ask you about? Are they sufficiently prepared for changes in the world of work?

The problems they face are still the classic ones: factory planning (new plants or changes), production optimization, lean management, implementation issues, warehouse planning, and logistical systems optimization. I don't think there'll be much change in this regard, not on a fun-

damental level, because ultimately digital solutions are a means to an end. For the projects I'm involved in we use the classic methods and tools for planning and optimizing systems, but we also use the instruments offered by digital factories. So we plan processes and layouts in virtual environments, for example using 3D planning systems and visualization processes. If we're designing a factory or warehouse or we're optimizing processes, and it makes sense to use systems revolving around digital manufacturing (such as robot systems), we'll certainly make use of those technologies. Then there are automated and intelligent material flow systems (things like autonomous and swarm-based ground transport equipment or driverless tugger trains) as well as state-of-the-art IT methods such as data mining and warehouse management systems. Whenever we can, we tap into the possibilities offered by digital technology – not just to make planning more efficient and effective, but also so that processes can be automated and made digital. One highlight this year was a project which involved developing a digital transformation strategy for a company as a basis for planning factory optimization projects, like a kind of roadmap. It turned out that the success factors and challenges that were identified for the project were the right ones and that things wouldn't be easy during implementation.

Unfortunately, most companies have had such good order pipelines for such a long time now that capacities have been tight, so they've not had the time and energy to put thought into digital transformation. They've got some ideas and concepts in mind, but if you ask them to be more specific, you never get a clear answer on where the journey will be taking them. This is where things go full circle when it comes to the challenges and key success factors I mentioned – the companies are not working on them, or not directly. There's no proper foundation for tackling this topic strategically or making things happen. So when we're working on a project, we try to provide them with lots of ideas and suggestions, so at least we can plug the knowledge gaps with our own know-how. In lots of cases, we use in-house seminars to dovetail these with skills training for the staff involved in projects. We do this to empower businesses to do their own digital technology planning and implementation in the future – without the support of others.

Logistical processes are also undergoing important changes at the moment as a result of digital transformation. What are the trends at the moment in your area of industry, and what direction do you think future developments will take us in?

The current trends are toward end-to-end IT-based process chains in the supply chain, big data, data mining, smart automation with driverless vehicles in production or the warehouse, human-machine collaboration (for example exoskeletons to provide support with lifting loads), digital planning, and warehouse modeling, etc. There are two key areas of development: On the one hand, there's smart automation involving all kinds of processes carried out routinely by human beings, or processes that are not complicated. Then there's the aspect of managing the unbelievably high volumes of data companies have access to. The first area is more or less about keeping up the rapid momentum of developments until now regarding automation. In the second area regarding data, this isn't necessarily something new, but it was only a couple of years ago that it started to receive more attention – and most companies are still quite weak in this area. Data analysis and the subsequent process of data synthesis – i.e., forging a link between the information and the derivation of actual measures – are an unbelievably important skill that has to be mastered, especially in logistics. There's a huge amount of catching up to do, not just at the universities but also within companies.

Just one last question: Your work revolves around holistic methods and participation – how is this changing in times of digital technology?

In essence, there's nothing different about our approach when it comes to closely involving people in the workshops when we're planning and optimizing things, or trying to pinpoint the best solution together in a way that everyone can live with. Everything revolves around people, including in digital transformation. They're the ones who sponsor innovation and implement it. We've always used technology as an enabler – it's the area I did my PhD in, and the whole concept has been close to my heart ever since. But of course compared to only 20 years ago, we now have a lot more tools at our disposal for planning purposes, plus the systems for implementing things. So I'm actually really happy about this – the view we've always had, which was always part and parcel of how we've approached things, can now be leveraged to the full. Planning is complex and as new aspects of digital technology have come along, it's gotten even more complex, but the new technologies can be used to shorten planning times. Other changes I envisage will be because the new systems make it possible to collaborate in different physical locations by using virtual spaces, and this simplifies international planning and saves a tremendous amount of time. Ultimately however, there will always be a need for personal interaction, because everything revolves around human beings and the intelligence they derive from "free thinking" – even if this is still a bit of a challenge. As George Bernard Shaw told us, the disadvantage of intelligence is that one is constantly forced to learn something new.

Image: © istockphoto.com/Peshkova

Professor Dr.-Ing. Harald Augustin is director of the Steinbeis Transfer Center for Process Management in Product Development, Production and Logistics. The Steinbeis Enterprise, founded in 2002, specializes in the holistic optimization of processes and technologies, as well as IT systems in production and logistics with the aim of adding value for the customer.

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"It's only a problem if you sleep through the transformation"

An interview with Horst Maywald, an expert who worked for Elabo for decades and Steinbeis partner

Horst Maywald talks to TRANSFER magazine about successful ways to achieve digital transformation in business. Maywald has first-hand experience of the process at Elabo GmbH and played a pivotal role in digital transformation before entering retirement earlier this year.

Hello Mr. Maywald, you know from your own personal experience how digital solutions can change a business. What were the changes resulting from digital transformation that you would consider milestones in the development of Elabo as a company?

The most important thing we learned at Elabo was that we would have to begin by looking at processes and structures. This started on a management level and trickled right down to all levels of the business. It wasn't until the section managers had taken this on board and understood the processes in all affected areas, when the level of waste was recognized and all the workers were involved, that we saw the first signs of success. Digital transformation without understanding digital solutions is totally useless – in fact it's harmful.

When people use the term Industry 4.0, they're primarily referring to big companies. What can small and medium-sized enterprises do to not get left behind?

As I mentioned, small and medium-sized enterprises should start with digitalization –period. They should start with the things they can do in parallel to everyday work, the little steps, and they should immediately involve employees, also in celebrating small successes. These days, everyone (especially small and medium-sized enterprises) should assume that new technologies will be invented with the potential to replace the old business, or the old business model. Even if business is going wonderfully at the moment, SMEs have to work more closely with research institutions and consultants to think beyond the horizon. This is what we did for two years at

Image: The learning factory at Elabo GmbH

benefits they generate – are decisive when implementing Industry 4.0, so it's essential that any benefit derived is made measurable and thus manageable. You do this with "overall shopfloor key performance indicators."

Digital transformation and the work environment – a topic that's the source of much trepidation. What's your take on this?

It's only a problem if you sleep through the transformation. There's no doubting the world of work will change. We all have to adjust to it – companies and people, in other words society in general. Lots of jobs won't exist anymore. Machines will do them. But for that, others will be created, even for the not so well educated. At Elabo, we expanded the workforce by 20% in 2017 and we invested in lots of new equipment, as well as training and qualifications. But with unemployment in the area at 3%, we have to do that.

Elabo, and I'm convinced that without collaboration we wouldn't have been as successful as we were. But it involves a lot of work, on top of the everyday job.

Digital transformation involves a lot of challenges for SMEs – more and more customization of products, more networking, shorter product life cycles, the lack of skilled workers, cost pressures. What should SMEs do to deal with this complexity?

The challenge is not digital transformation in itself, it's market requirements, and thus society. What can I do about this? Go digital. As I said, that means taking certain things into account. Change is a dynamic process subject to fluctuation, so it really hits you at the "nucleus" – where processes are planned on the shopfloor. There is a shopfloor execution system at Elabo, a state-of-the-art instrument we developed for assuming leadership in the place where the value is added digitally. Highly efficient processes on the shopfloor – and the

Horst Maywald worked for Elabo GmbH for 23 years, where among others he was responsible for sales and marketing. Before entering retirement in September 2017, he most recently acted as the company's authorized officer (Prokurist) and headed the department responsible for workplace systems. Steinbeis enjoyed a successful partnership with Elabo and Maywald for many years. In 2016, he presented a business case on "process optimization at and with Elabo GmbH" at the Steinbeis Consulting Day alongside the Steinbeis experts Prof. Dr.-Ing. Manfred Wehrheim and Prof. Dr.-Ing. Jörg W. Fischer. Elabo is currently a member of the Expert Network X.0, which pulls together a variety of manufacturers, technology specialists, and management experts from the field of Industry 4.0. The Steinbeis Network provides this expert alliance with the support of a strong partner in technology transfer and management.

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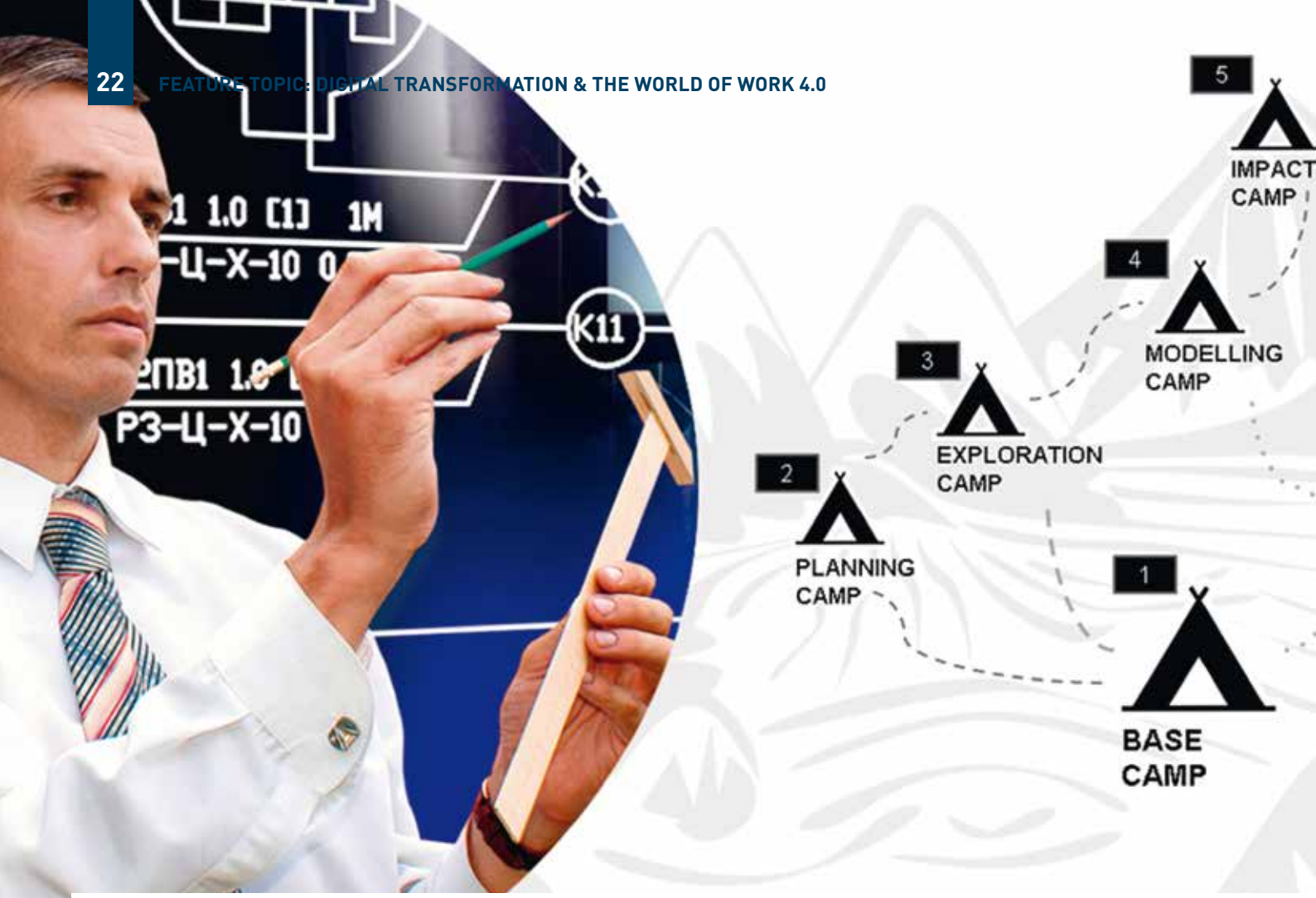


Engineering and Design: Digital and Efficient

The IO maturity level model accompanies firms that engineer their own equipment on the road to digitalization

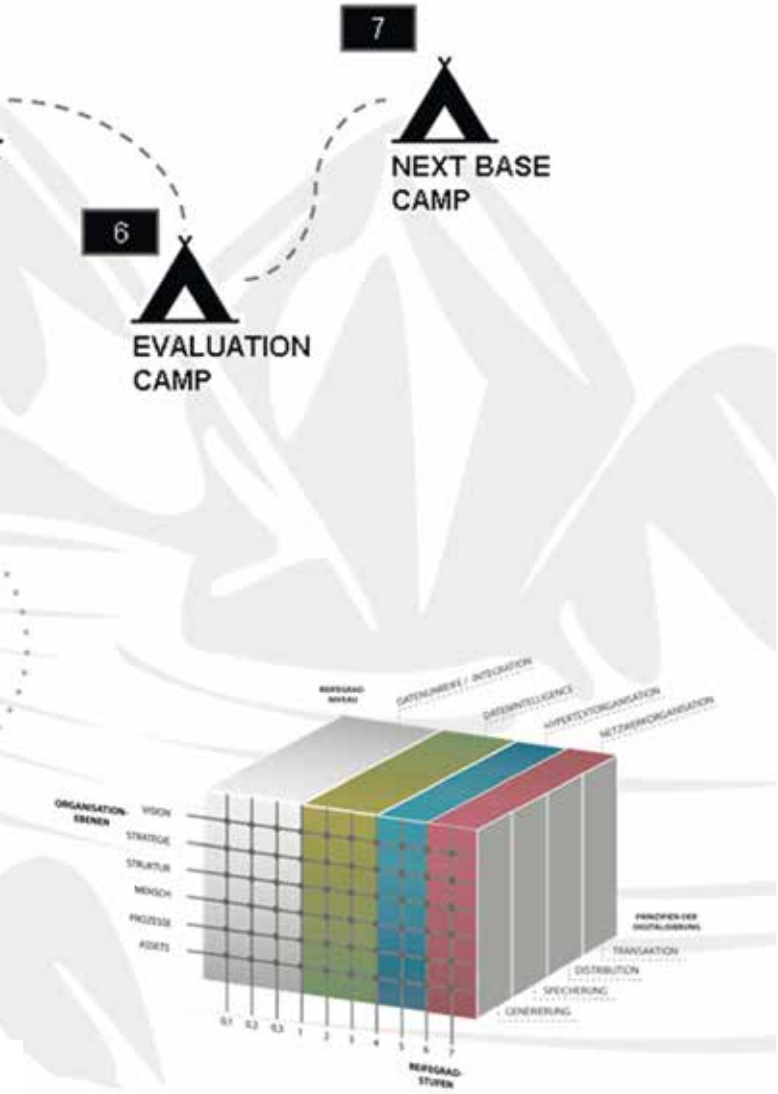
The IO model assesses maturity levels, acting as a strategic tool that allows companies to plan the road to digital transformation. As part of a collaboration between the Steinbeis Transfer Center for Innovation and Organization and Iodata GmbH, the IO maturity model has been adapted to the special requirements of firms that engineer their own solutions for use in in-house product development.

It goes without saying that digital solutions are now indispensable in engineering and design. For years, the biggest area of application for digital technology has been in generating data in development departments. Despite this, the main emphasis of data generation was to help departments quickly complete engineering projects within their own four walls. With the advent of digital technology across entire companies, this is no longer enough. Companies will need to broaden their focus, and this area will have more of an impact on factors such as the efficiency with which core data is gathered, efficiency across different departments when completing a project, the re-use of modules (and how data is used across multiple projects), and any intrinsic requirements that are necessary by default at later stages.

Using the IO maturity model makes it possible to assess the status quo with the main parties generating data in engineering and design. This helps with planning the envisioned objectives of digital transformation. Drawing on the many years of experience with digitalization projects at the Steinbeis Transfer Center for Innovation and Organization helps organizations ensure data is used consistently across different departments, something that is ultimately essential if they want to dovetail digital business models.

Technologies and change processes come with a price tag, requiring extra resources. Despite this, companies cannot afford to ignore them. The IO maturity model helps companies plan their digitalization strategies with future requirements in mind and thus cut costs. It also makes it easier to choose which of the countless technologies or software solutions to use, allowing businesses to focus more on the trends and developments that have an impact on their own business model. The IO maturity model is also useful for providing important pointers when defining desired outcomes or measures that will need to be introduced to implement digital transformation in keeping with goals. Overall, this allows a business to develop its own digital roadmap, capturing goals, key tasks, and responsibilities. One particular benefit of the IO maturity model is that it provides firms with a point of comparison with its competitors. This helps the business understand its strengths and weaknesses. More importantly perhaps, it helps a company establish a USP and thus strengthen its relationships with key stakeholders.

The Steinbeis consultants act like experienced guides in helping companies on their "digital technology expeditions." This involves overseeing firms as they systematically set up a base camp so that potential errors are spotted early, and unknown, hitherto unexploited potential is identified. The firms work with Steinbeis as a partner of equals, receiving



IO maturity level model - status quo of the digital transformation

specific information on their degree of digital maturity, not only in development but also across the company. To do this, there is an online tool that assesses the current situation versus comparable companies. The aim is to pull together activities and initiatives within the business across different disciplines, avoid cost traps, and generate revenues. This paves the way for new business models, which may build on existing models or work disruptively.

The overall idea is to provide straightforward, lean, and inexpensive support with digital transformation – not too much and not too little, at a pace that matches the company's needs – as a partner of equals, placing emphasis on the kinds of decision-making processes used in business.

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Steinbeis Transfer Center for Innovation and Organization

Services

- Advisory services in the field of product development involving CAD, PDM/PLM, ERP/PPS, and even CMS.
- Advice on the introduction of product information systems (PIM) for setting up digital product catalogs
- System-neutral consulting on the selection and introduction of projects as part of launch planning and coordination
- Expert reports, studies, and publications, functional specifications
- Coaching of in-house project managers
- Third-party project management on contract
- Management consulting
- Seminars and training courses

Key areas

- Research and development, engineering design
- Content management
- Quality management
- Change management
- Business partnerships

Oliver Brehm

Alexandre Pereira

Oliver Brehm is director of the Steinbeis Transfer Center for Innovation and Organization. The enterprise provides management consulting services with an emphasis on product development in the fields of CAD, PLM, and ERP, as well as interdisciplinary topics relating to Industry 4.0. This mainly entails system-independent advice on the projects involving the selection and introduction of new methods and software.

Alexandre Pereira works at Iodata GmbH. Since it was set up by ETL specialists in Karlsruhe in 2000, Iodata has developed into an end-to-end provider of business intelligence solutions.

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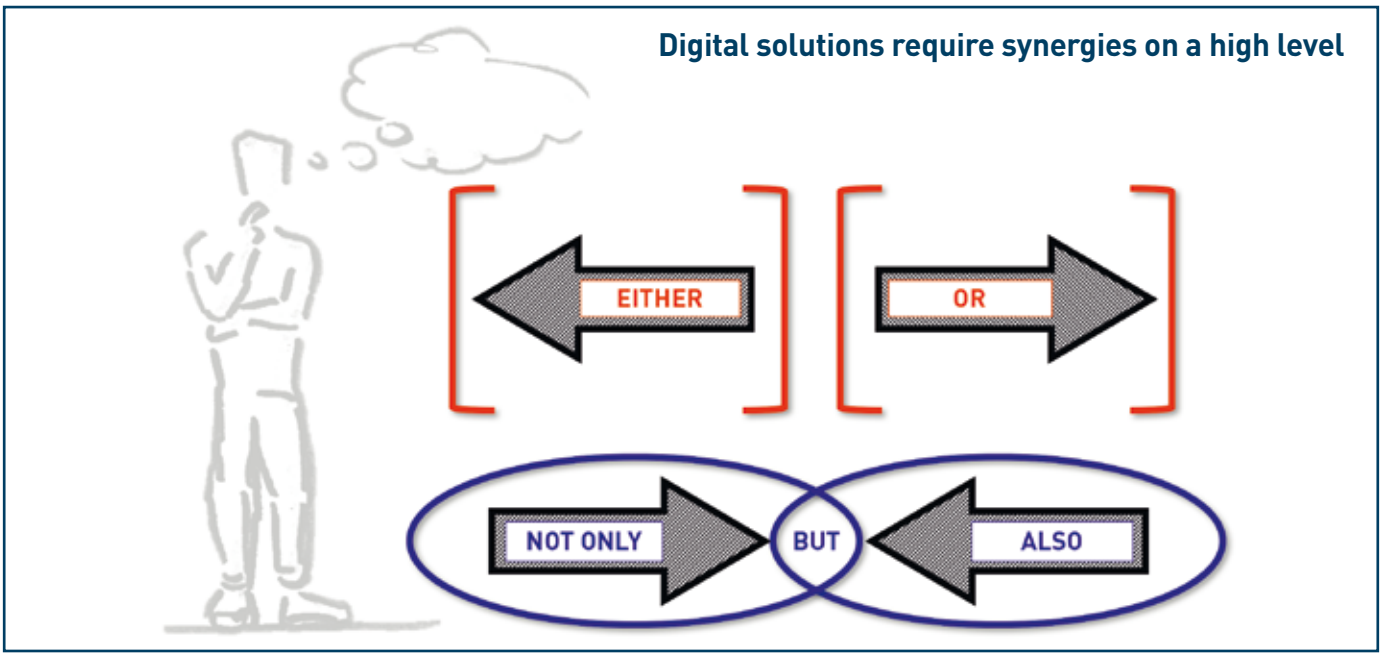

Digital Solutions: A Curse, a Blessing, or Both?

What actually is digital transformation? And how is it affecting different areas of industry and technology?

Nothing is more perennial than change. Very few terms are heard in so many forms as "digital transformation" these days. It's like a driver of our fast-pace modern society. But in non-linear environments, trends lose their ability to dictate the direction of the overall journey. And disruption has a tendency to challenge business models and the nature of products and services. What's the best way to safeguard sustainability in the long term when everything is so ill-defined? Gunther Herr, lecturer at the School of Management and Technology at Steinbeis University Berlin (SHB), is convinced that future-proofing is only possible by engendering an as yet undiscovered culture of innovation, by galvanizing systematic processes within interdisciplinary teams in order to deliberately expand the boundaries of achievement.

Companies face a big challenge. They have to keep reinventing themselves by coming up with more and more innovations, yet establish a decisive core competence in the face of the competition. But there are ways to shape future success and overcome individual challenges – by thinking in terms of contradictions. Picturing the future – and drawing on radical ideals – makes it possible to challenge existing business models, posing questions and making predictions that will stand the test of time. And by turning to "shrouded" patterns of development, inspiration can be found for ways of thinking that focus firmly on the future.

There are so many examples of digital transformation doing the rounds at the moment, including a variety of instances of companies apparently enjoying breathtaking success – almost in an instant. And no publication worth its salt can get by without using buzzwords like pain points, customer value, MVP, or non-linear. Apparently, every C-level manager should have several months' experience in Silicon Valley to point to. One often gets the impression that industrial processes and organizational structures are some kind of anachronism. Modern times are about agility and scrums. Academic books never tire of appealing for a culture of failure. Hardly a speech is given without some call to fill the "innovation funnel" with more ideas. Yet nobody seems to be questioning the success rates people usually quote – less than ten percent. One thing we do know, however, is that the rate of change is accelerating in ways we have never witnessed before.

So what would happen if people actually started adhering to all the demands they are hearing? How many manufacturing companies can really afford to make two huge bad investments in quick succession? What sort of brand can cushion that kind of blow? And what kind of shareholder would try to tweak output or tune their investment risk to startup levels? Can anyone who is invested honestly afford to implement a radical change in direction in the short term? Aside from taking all the required flexibility in decision-making into account, established companies also have to think about path dependency: their own past, with all the other things happening around them. These could be conditions that make things easier, but they might also be a hindrance. But they're out there. So the worst thing you can do is ignore them. As a result, it might just be useful to come at challenges from a different angle, just one more time, because there's no doubting that those challenges are there, and our entire societal system faces them.

What lies beneath the culture in Silicon Valley? Why, of all places, is it actually where it is? Why isn't it in Florida? What makes that specific area so special? And why was it that the Industrial Revolution took place in Europe? There's probably no obvious answer, or at least not without delving into history. The foundation of rapid development in central Europe actually dates back to the period after the Thirty Years' War (1616-1648). It was during this time that Arabian scriptures archived in Spain were being translated. These originated from the Moorish Occupation (711-1492 AD). These translations fueled rapid advancements in scientific understanding throughout Europe. This contrasted to the claims to power and even wisdom originating from the

Roman Catholic Church, subsequently imposed through the Roman Inquisition (1542-1798). Thanks to Isaac Newton (who told us to create models to predict the future), Galileo (who said change should be measurable to develop things), Descartes (who believed that explaining things involves unraveling complex issues), and Aristotle (four possibilities of logic), Europe established a basis for scientific pursuit. A culture of science developed during this time, closely based on the reproducibility of measurements, quantification, and the possibility to analyze things. These concepts still shape our thinking today. We want clarity and irrefutable evidence, ideally with causal justification. The world of scientific experimentation, the essential European establishments of education, but also industrial processes all go back to principles shaped in the 16th century. Then came social values influenced by the French Revolution (1798-1799), which in turn resulted in comprehensive social security systems.

So what about the west coast of the United States? How come it seems to be breaking with these fundamental principles? Ok, we know Columbus discovered America in 1492. That would give us one reason why a different culture has developed in the centuries since this date. But that's not enough in itself. After all, from the very beginning there has been close communication between the newly discovered continent and Europe. Did something big happen – something that could shed more light on the differences? Well, on April 18, 1906, at 5:12 in the morning, the whole of the San Francisco area was rocked by an earthquake. The quake and the fires it started resulted in damage that in monetary terms would be about the equivalent of $11 billion today. The whole area was like a blank piece of paper. If anybody was insured, they were generally only covered for fire; earthquake damage wasn't part of the insurance policy. So new standards started to evolve, quite spontaneously, in a way that had never happened before. Most people affected by the quake suddenly found themselves with nothing, aside from the knowledge that the only way to make things better would be to do something themselves. Without any kind of safety net to speak of, doing anything was better than doing nothing. So the only consequence of failure would be that things were "no better" than before. And things could certainly not get worse. As early as 1915, the "kick up the backside" this gave to the whole area led to the Panama Pacific Exhibition, signaling and celebrating the emergence from the ashes of the entire cosmopolitan area of San Francisco.

So what we have with the social revolution of this day and age stems from a contrast – between two fundamentally different starting positions. On one side of the Big Pond is a European culture underpinned by a comprehensive social security system and based on fundamental scientific principles. The goal is predictability. On the other side is a society that once had nothing after falling victim to a natural disaster. For them, doing anything has to be better than ceding to circumstance. Failure has no consequences. Things can't get worse. Both starting points have resulted in the release of a significant amount of energy in recent decades. In each social environment, the result has been considerable success. If, however, the classic Aristotelian either/or discussion takes place in Europe and people wonder whether the principles of Silicon Valley are more "right" than the experiences we have gathered in Europe, we're wasting our breath. That's not the right question. But if we look at it from a different angle, we could learn some interesting things: Software and data-centric business models, as well as recent startups, typically have a manageable volume of long-term capital commitments. This makes them flexible (or agile). When you incur little financial risk, it's easier to "try things out." Decisions get made more quickly – and they can be reversed. In times of rapid and intense change, that holds certain appeal. But unfortunately, that's not much use when it comes to the fundamentals of manufacturing companies. Production systems and operating infrastructure tie up capital. Once an investment has been made, it automatically means you're committed to something. Another factor fueling path dependency is human resources, especially if they are subject to binding contracts. Changing tack in the short term requires a significant amount of energy, not just due to capital requirements but also because of the need to share ideas and train people.

The modern concept of the Internet of Things (IoT) may already offer an answer to this problem. Digital business models thrive on the symbiosis of both worlds. Sure, it's important to make good use of the flexibility and speed offered by digital technology. There's no point living in denial. Despite this, the IoT needs things. And these things need producing. So we have to exploit the potential synergies of both worlds. And to do this, we need "mutual acceptance." This is about exploiting degrees of freedom, exploring realms that will allow us to overcome previous obstacles. It's about defining the obstacles between the two worlds so accurately, so succinctly, that they become workable. This work requires experts and people from certain disciplines to be brought around the same table in ways that have not happened before.

The main focus of the Strategic Innovation course offered to the executive MBAs at the School of Management and Technology lies in different aspects of innovation culture and innovation science. These are pulled together into an ecosystem that provides systematic support to "Innovation within the Value Creation Chain" in order to create new business models. What is crucial in this process is that people on the course understand the importance of mindset and a culture of discussion, breaking the concept shaped by our education system that there are "desired solutions for given problems." In times of digital transformation, this is about making our thinking principles and decision-making models compatible with a business environment that is undergoing non-linear change. The ability to "think abstract" plays a decisive role in this respect.

Image: © WOIS Institute 2017

Gunther Herr is a lecturer at the School of Management and Technology at Steinbeis University Berlin (SHB). The focus of his work lies in comprehensive business innovation strategies. The SMT offers a number of degrees in its portfolio, all based on the principles of project skills. Its programs span a variety of training and continuing professional development options, each building on one another so they can be taken in succession. The broad spectrum of degree and seminar programs ranges from certification courses to state-approved bachelor and master programs and even doctoral programs.

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"Accept, Understand, and Shape"

An interview with Professor Dr. Dr. Helmut Schneider, director of the Steinbeis Transfer Institute for Digital Transformation and holder of the SVI foundation chair for marketing and dialog marketing at Steinbeis School of Management and Innovation

What changes need to take place in people's minds for companies to succeed with digital transformation, and does gazing at the moon help? These were just some of the issues touched on in an interview for TRANSFER magazine with Dr. Dr. Helmut Schneider, professor at Steinbeis University Berlin (SHB).

Hello Professor Schneider, everyone is talking about digital transformation at the moment, but getting it to work is still a major challenge for companies. What changes do you feel need to take place in people's minds for companies to master the process of digital transformation?

I'd summarize it with a combination of three things – accept, understand, and shape. Digital transformation is going to happen whether we like it or not. That's why I say accept it. Second, people need help in interpreting what is happening. When people are talking about digital transformation in public, everyone agrees that it has a huge impact, but not enough is understood about what that change will bring about in detail. It's quite logical for people to be scared of things they don't know. And thirdly, once you have a foundation of understanding you can identify different ways to shape how we deal with the different changes that will happen.

"Stand on the moon at look at it from that angle!" – this is the sort of thing all of your students get to hear at some point. You say that to challenge them to think about things from a different perspective. Do people have time for things like that in an era of digital transformation?

How you allocate time when it's in short supply is about how you set priorities. Just saying "I haven't got time for that" is simply a reflection of the priorities you set. True, in a world of digital technology the clock does tick more quickly than in the analog world. I once wrote something on the blackboard at a start-up, a different angle on an old saying: "better never than late!" But even in digital times the angle you take on things changes people's understanding. And sometimes it's just important to check the key interdependencies and not just start making decisions. To do that, you have to "look at things from the moon."

What impact is digital transformation having on the world of marketing, and what can a business do to benefit from these changes?

This is a broad issue. Even the marketing world is undergoing fundamental and sweeping change as a result of digital technology. The way it looks to me, on the one hand some of the things that create value are coming under pressure from digital transformation. The value added, for

example through lower transaction costs, is much lower in "new digital territory" than in the "old analog territory." Also, digital technology is making it more difficult to exploit the opportunities presented by accessing information first. So the first thing companies will have to do is work out how digital-proof their existing business models are. But on the other hand, digital solutions open the door to a variety of different options for coming up with radically new business models. In the new digital territory, it's possible to add value in ways that were not feasible in the old analog territory. So recognizing and seizing opportunities is the second key challenge.

A company is only as good as the people who work there, but they're also affected by digital transformation because digital solutions are omnipresent. What impact is this having on the world of work, and what opportunities or threats does this present?

This is also a broad issue. My understanding of digital transformation is that it's about translating things into machine language; to make this more tangible I've come up with eight laws of digital consequence. Two of those laws – the explosion in speed and the emancipation of space and time – probably have a major impact on the world of work. The analog parts of a process, which I think include human decision-making, come under tremendous time pressures in a digital world. Emancipating space and time is leading to new ways to distribute work and organize tasks. Ultimately, certain types of human work will be replaced by algorithms. The people who are affected by this may see it as a threat, but substitution comes with tremendous leaps in productivity so for society as a whole that's an opportunity. I think one result will be that these developments will place more emphasis on the current debate in society regarding new performance and distribution paradigms – and I'm thinking about an unconditional basic income. This is something I would welcome wholeheartedly.

Image: © istockphoto.com/Olivier Le Moal

Professor Dr. Dr. Helmut Schneider is director of the Steinbeis Transfer Institute for Digital Transformation. The Steinbeis Enterprise offers its customers research services, solution-centric consulting, application-based research, and training and education services in the field of digital transformation.

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Welcome to the Steinbeis Network

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

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

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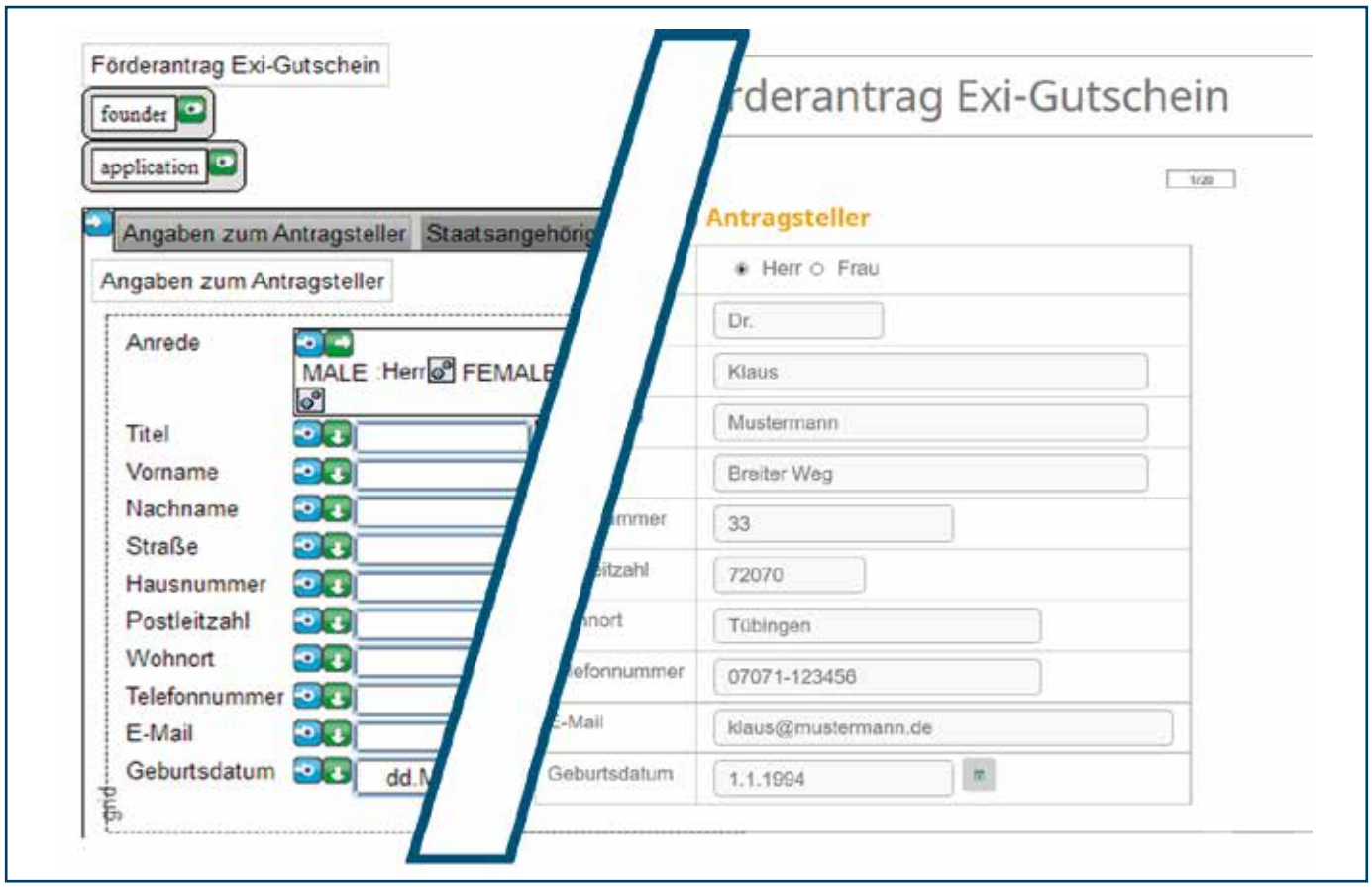

Immediate Designer: Flexible, Efficient, Inexpensive

Digital transformation for SMEs – an insight into industry practice

Digital solutions offer a wide array of opportunities to small and medium-sized companies, but unfortunately it is precisely these kinds of firms that fail to exploit the full potential of such modern technology. One of the reasons for this is that they lack the right kind of software to digitalize the value chains within their businesses. The Steinbeis Consulting Center Agile Development of Information Systems has developed a system called Immediate Designer to offer SMEs a financially viable solution to this problem.

In March 2016, the industry association Bitkom issued a report called the Digital Office Index. Its synopsis of the current state of affairs was upbeat: "Four out of ten businesses across all sectors of industry (40%) have developed their own strategy for digitalizing their business processes." The fact that this number is no higher is mainly because of "the scale of required investment" (80%) and the "lack of qualified staff" (78%). The survey mainly revolved around standard tasks, however, such as accounting and document management. Also, only companies with 20 or more employees were questioned. So in actuality, the survey left out the lion's share of businesses in Germany.

It is small companies in particular (with fewer than 20 employees) that have so much to gain from digital transformation. Often at such companies, all employees and the business itself are actively involved in value creation, even if they also have administrative tasks and organizational issues to deal with. When companies are experiencing growth, this frequently places an extra burden on staff and can result in bottlenecks. Typically, such companies have no access to the right software solutions. Their processes and internal procedures are less formalized, even if they are tightly interlaced with the specific value-adding activities of the business. This makes procedures all the more difficult to capture digitally with standard software. Alternatively, doing so will involve major outlays on consulting, adaptations, and training. In most cases, the conventional approach of specially matching customized software to the company makes little sense from a financial standpoint.

The Steinbeis expert Dr. Holger Gast has been working at his Steinbeis Consulting Center, Agile Development of Information Systems, to develop customized software for existing and established processes. Thanks to a special development tool called Immediate Designer, he is in a position to offer attractive cost scenarios. Immediate Designer works along similar lines to tool kits, offering standard components found in a variety of applications so they can be combined flexibly as required. This makes it possible to quickly create templates and databases for specific tasks with special graphical elements. Immediate Designer uses these engineered graphical components to produce finished software, and this can be used as web applications on most end devices. As a result, the overall development effort for creating individual software to optimize a particular process can be accelerated by a factor of between 5 and 10. One key requirement in this field of work is flexibility. On the hand, the

field of application that the center is involved in is broad: Projects worked on by the Steinbeis Enterprise range from classic administrative tasks encountered in business to project management and the application of robot simulations. Furthermore, it must be possible to edit new software without major outlays, especially if a firm intends to shift its business focus, or its internal processes need to be adapted to new requirements or customer needs. Deciding to construct software based on building blocks offers flexibility on both of these fronts.

Gast places emphasis on methodically formalizing existing business processes and making these uniform. If a project involves the specific know-how of particular employees or individual decisions, the new software can structure information and optimize team communication. As repeated processes arise over time and experience is gathered with the tool, automating calculations offers plenty of potential to make improvements.

As a result, it's important that a solution addresses long-term planning and sustainability. Should users require new functions – whether it's two months or two years after introduction – any extensions to functionality must be just as flexible and efficient to introduce as they were when programming the original software. It is especially here that the advantages of the tool kit approach are clear, especially compared to using standard software. It can be extremely expensive changing or expanding standard solutions, whereas building blocks are based on the principles of "combination and collaboration," so new functions can be inserted into existing software structures.

The Steinbeis expert finds it important to share tasks during development for every project. His role as a software architect is to suggest technically feasible solutions and draw on his experience gathered on previous projects. Ultimately, however, the users make all key decisions regarding appearance and functionality. This is because only they can really understand how such factors will impact their actual work. During this coordination phase, it is important to listen carefully at the beginning and think creatively – the optimum solution will only be possible if people are willing to switch between technical factors and user issues. This also unveils new insights into working processes. Immediate Designer makes it possible to rapidly introduce new functions and evaluate them by drawing on practical examples, and this quickly takes everyone to their destination – without major detours.

One big challenge with such projects lies in existing data relating to current business transactions. Mostly this is held in Excel files or Access databases and for the software introduction to run without hitch, it will need to be migrated automatically. The way such data is formatted is typically good for the human eye, but it is not a good fit with professional databases. With Excel lists, logically separate information is often entered into one line to provide users with a quick overview. For example, lists of data on current client projects will also show core customer data and details on the current status or cost calculations. This is unlike databases, which will store such information in different tables that are linked to other data. "Normalizing" data is crucial for developments further down the line and this will be essential if the new software is to remain sustainable. To transfer human-readable data into machine-optimized formats, Gast has developed his own special tool, which supports the complex process of normalization. The software developer uses sample data to mark sections within lines that can be linked to database tables. The Steinbeis expert's tool then reads data and saves it with corresponding links, in keeping with the mark-ups in the database. His tool also makes it possible to re-read edited files, assuming the records can be identified according to clear criteria such as customer or order numbers. In such cases, the tool simply enters the changed values into the corresponding fields in the database. This approach has made it possible to provide project functions such as mailing lists. Users simply download email addresses and names into an Excel file, send out emails using their usual software and then enter responses or error messages into the spreadsheet. These additional entries can subsequently be transferred back directly into the database.

Digital transformation at SMEs thus makes it important to deal with some extremely specific challenges. The existing standard software usually addresses value-adding processes that are specific to the individual business, but it's precisely such processes that need the right supporting software in order not to threaten business growth. But at the same time, any transition to new systems must happen step by step, shifting away from previously formalized business processes to new ones that involve a series of individual decisions. To keep the business running smoothly, any information that was previously entered manually has to be transferred into a central database. Ultimately, projects only succeed if the software development process itself is flexible and can adapt to changing requirements within the company. It is this blend of challenges (and the opportunities these present) that drives Gast as he works with customers on finding the right solution. His aim is for each solution to be implemented expediently in the short term and at the same time deliver viable solutions in the long term.

Image: Immediate Designer is also being used successfully in the Steinbeis Network, for example at the Steinbeis Consulting Center Business Start-up: "The software is now a central instrument for reliably processing a large volume of data relating to the EXI Startup Bonus," says Ralf Lauterwasser, director of the Steinbeis Enterprise.

PD Dr. Holger Gast is director of the Steinbeis Consulting Center for Agile Development of Information Systems, which offers its customers the agile, model-based development of information systems, the development of data-centric Web applications, and the prototyping of information and administration systems.

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Ready with the Grab Bag?

Suddenly the boss was gone. Digital solutions help safeguard businesses.

One diagnosis is enough to change an entire lifetime, at home but also at work. The Steinbeis expert Elke Kirchner explains what bosses can do in such situations and outlines possible solutions presented by digital technology, also drawing on her own experience.

"What you have here is a tumor and I have to assume it's malignant." – "Okay, so what next?" This was how a conversation went between me and a senior doctor at a hospital, as we looked at a scribbled drawing on July 25, 2017. It was the beginning of a new phase in my life. Being torn away – without preparation – from your professional setting and the place where you make all the decisions, suddenly finding yourself dependent on foreign influences, is something the self-employed and business leaders try to sweep under the carpet. I was no exception. As somebody who did regular sport and considered herself fighting-fit, the idea of having a tumor seemed highly improbable.

I'm a management consultant, so I'm used to the frequency with which decision-makers and individuals who are key to a company suddenly disappear or stay away for a long time. The consequences for businesspeople and people dependent on leaders are dramatic, especially if there's no Plan B. Just two weeks without a boss in the business is enough to put some companies in deep water and threaten their existence. Every year, some 4,050 companies across Germany – with over 60,000 employees – have to declare insolvency after unexpectedly losing a company director. We know from experience that people find it extremely difficult dealing with the consequences of a bereavement, accident, or serious illness. Sometimes the difficulties are of an existential nature. For example, if the sole managing director of a limited company is suddenly gone, without provisions the firm is immediately unable to do anything. The managing director is the only person who is allowed to represent the company. If the managing director is the sole shareholder, there is not even a general meeting of shareholders to appoint a replacement, and this can have fatal consequences for the com-

Must-include items in a grab bag/emergency folder:

- A contact list detailing the most important people at the company. This ensures employees and family members get in touch with the people with the right knowledge so they can keep the business going or lay foundations for decision-making.
- Guidelines on who should provide cover, and details of agreements regarding what should be done if the boss is gone and how. Interim arrangements are easier to adhere to if the worst-case scenario has been planned carefully and everyone knows exactly what needs to be done.
- Powers of attorney/authorizations given to safeguard the continuation of business processes. Commercial power of attorney, general power of attorney, procuration arrangements, or individual powers given to third parties to keep the business going if the boss is not there.
- Legal documents. Prophylactic powers of attorney, patient decrees, wills, and notary contracts ensure that actions are implemented as the boss intended and important steps are undertaken. Specific rules and provisions help avoid misunderstandings and can prevent legal disputes.
- Access codes; keys. Things are encrypted for a reason, but without PINs or keys it can be almost impossible to access important systems, data, or bank accounts. To ensure the smooth processes of a company are not interrupted, a person of trust should be able to gain access in an emergency. To keep the passwords themselves safe, free tools like keepass are recommended.
- Internal company information. Documentation regarding licenses, participation in customer bids, incomplete processes, and similar, will help representatives gain a quick overview and gain transparency.
- Overviews of existing contracts. Lease or rental agreements, company insurance, employment contracts. In extreme situations people will need to check if contracts can stay in place or should be terminated. To ensure decisions can be made regarding each individual contract, it is essential that lists are exhaustive.
- With limited companies in Germany (GmbH), a procurist (person with power of attorney) will be needed. If a company owner is sick, has had an accident, is deceased, or is otherwise unable to lead the company, and they have not given someone power of attorney, a GmbH is deemed legally incapacitated. There is a risk that bank accounts will be frozen and sometimes the existence of the company is under threat within a matter of days.

pany. In Germany, the process of appointing an emergency director through the courts can take up to a year. This results in a large number of companies shutting down operations every year.

If I turn the clock back 25 years to when I first became self-employed, all the things I can now do in my current situation would have been unthinkable at the time. Technological advancements such as cloud services, being permanently available, the ability to exchange information beyond borders through networks, apps – there are so many things in place now, ways to work out suitable solutions and deal with a crisis. Thanks to free video communication systems like Skype or Zoom, you can take part in meetings from anywhere, exchange information, or make agreements.

The best way to do the responsible thing, safeguard a company, and secure jobs is to prepare an emergency grab bag – a kind of rescue file with clearly laid out overviews, power of attorney authorizations, key information, and checklists. Digital developments are also providing plenty of ways to put everything in place so a company can keep going if a senior manager suddenly disappears – at a reasonable cost. For example, document templates can be downloaded from the website of the German Justice Department to prepare a strategic emergency plan and make sure everything goes as it should do. There is also a Central Register of Wills for people to make individual arrangements in case of death and administer documents electronically. The Federal Chamber of Notaries offers a central register providing a register of private and official lasting powers of attorney, care, and patient decrees.

It is not difficult to pack a grab bag. Start by talking to an experienced advisor about the things that should go into the grab bag, such as: the most important people who should make certain decisions (at home, work, or both); letters of authority; documents; overviews, etc. Some things can be delegated to experts, but it's also important to assess risks and think about long-term planning and any documentation required for interim arrangements. It makes sense to store all documents digitally, for example by ensuring somebody you can trust can access records. Information can also be stored in a deposit box held by a bank or in a (digital) safe. It is also strongly recommended that everything is checked and if necessary updated once a year, especially given that change is the only constant in life.

Image: ©istockphoto.com/Bestgreenscreen

Elke Kirchner is director of the Steinbeis Consulting Center for Healthy Organizations. The services provided by the Steinbeis Enterprise include seminars and workshops, advisory services on networked skills management, risk assessment relating to psychological stress in keeping with German occupational safety and health law, advice on the orientation of occupational health programs, support with OHM programs, absenteeism analysis, absenteeism management, and the development and introduction of structured occupational integration management.

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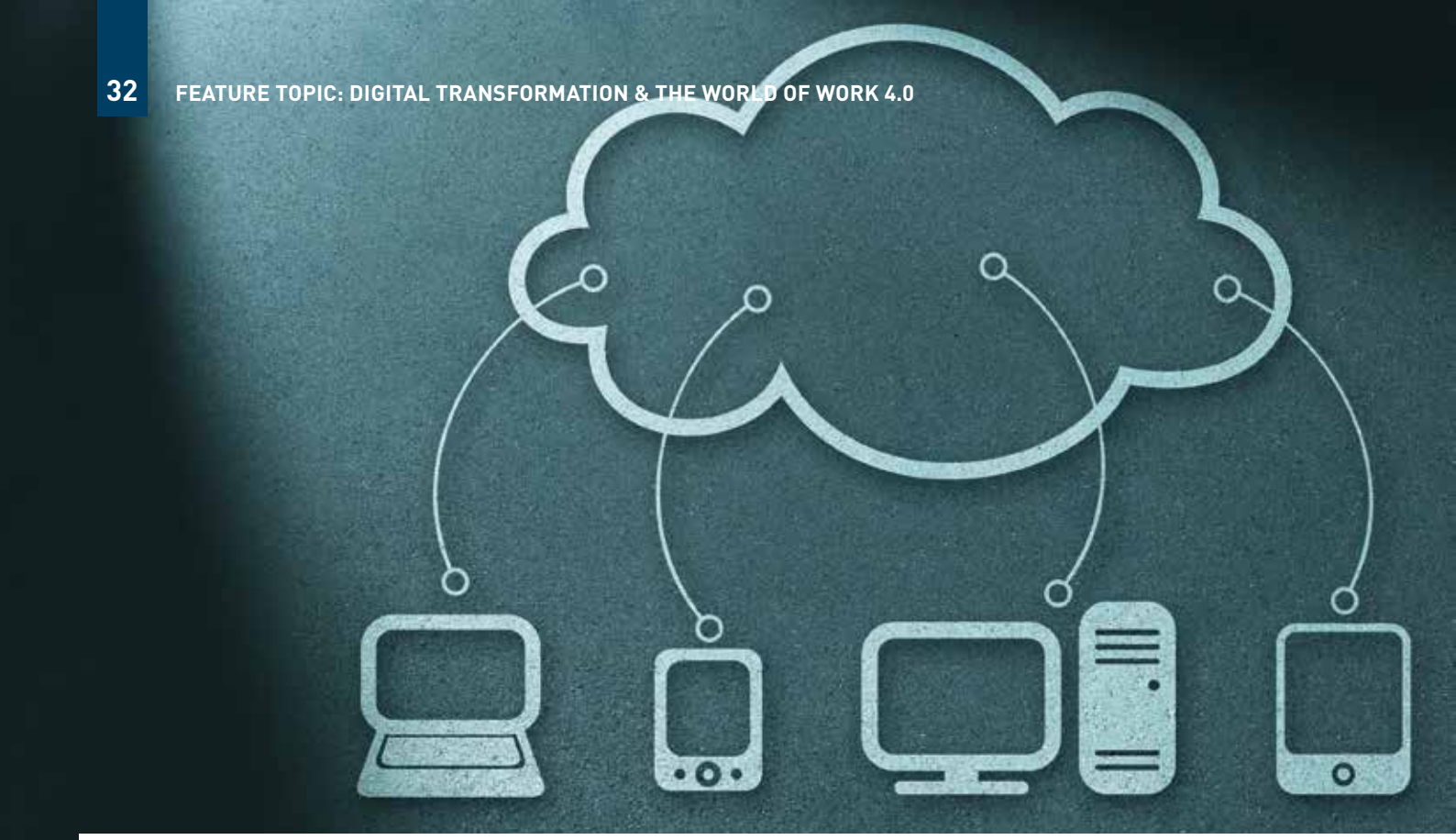

"SMEs face particular challenges with digital transformation"

An interview with Professor Dr.-Ing. Ben Marx and Professor Dr. Christian Cseh, directors of the Steinbeis Transfer Center Processes in Motion

If a company wants to go digital, it has no choice: It will have to implement IT projects. This also applies to SMEs, but when they start grabbing IT projects by the horns, they soon discover that the playing field for their particular type of company may be governed by a completely different rulebook than for large companies. This starts with the search for business partners and even applies to the actual implementation of their digitalization solution. Professor Dr. Ben Marx and Professor Dr. Christian Cseh spoke to TRANSFER magazine about the unique conditions affecting SMEs and what can be done about them.

Looking first at the initial situation small and medium-sized businesses find themselves in when implementing IT projects, in what ways is their starting point different from the situation faced by large companies?

Ben Marx: The situation is mainly dictated by the fact that IT projects are expensive and need to break even relatively quickly. Technology in this area develops at breakneck speed and it doesn't take long for existing solutions to grow old. The high initial outlays and operating costs of digital transformation projects are usually easier for bigger companies to cushion because they can simply spread costs more easily. It's a different kettle of fish introducing a new condition monitoring process for 20 machines or doing that for 2,000 machines.

Christian Cseh: Certain approaches taken toward IT projects are simply not suited to small and medium-sized companies. Sometimes a pilot study for a project – involving three consultants for two weeks – can incur costs that would be more than a small business envisages for the entire project. Then there's the aspect that lots of trends in industry, especially in manufacturing, are directly or indirectly linked to IT, whether it's Industry 4.0, driverless cars, or big data. The market competition for resources has made things even worse, and this is particularly noticeable for SMEs.

That sounds pretty desperate. So what can small and medium-sized companies do about this?

Marx: True, it does sound bad. SMEs do face particular challenges with digital transformation but no, it's not that desperate, and even big companies struggle with IT projects. SMEs can play to their flexibility and be much more discerning with an IT project. One mistake would definitely be to embark on a project based on the same premises as a big company – only to find that everything is going to be much too expensive, and then do nothing. SMEs can usually zoom in more on things with a project, so they don't have to bring 30 people to meetings and that saves money. They also find it a lot easier dealing with iterative processes, which is one of those big things in the world of IT – you start with a particularly useful partial solution and then make optimizations step by step. SMEs also have to consider whether they really want everything from a single source. You'll often hear people refer to monolithic systems, which is basically used to mean a solution that does everything I want it to do. Supposedly, the benefit of such a solution is that it'll save me lots of hassle, for example for integration work or support. These advantages are indeed there, but on the other side of the coin there are also a whole slew of disadvantages. If a solution meets the majority of requirements at a company, it'll be difficult to replace it and that can

make a business highly dependent on the solution provider. For a small or medium-sized business, something like that can have huge implications because as a client, the individual company will probably not be all that important to the provider – unlike a big company.

Cseh: Another disadvantage is that such systems are less flexible and agile. If you're using a self-contained solution from a single provider and you need a new functionality, you're dependent on that provider for help and have to hope that they actually offer the functionality you need. Even if the provider can offer you the functionality, the price will be take-it-or-leave-it, because you're not in a position to consider any alternatives. So it's not surprising that such all-in-one solutions are now going out of fashion. Big companies have been focusing more on modular solutions for some time now.

So now that you mention module-based solutions, what do they offer?

Cseh: Module-based solutions are basically a reflection of the division of tasks within a company – these get reflected in the IT system. Everyone does what they're good at and all the other things are done by the others. So when you look at the IT, everything's organized into partial solutions. They do a really good job in the specific area they're used in, but they don't try to do things in the areas they're not specialized in. Back in the 90s, the programmers of software for SMEs often still used to write their own programs for data management. These have practically disappeared now. Everybody just turns to a database management system because they know that they can get what they need much more quickly and reliably than the software of someone who specialises in applications for logging empolyee times.

Marx: Most module-based solutions have some sort of ERP system inside them to take care of the basic functions, and quite often they're even put there for statutory reasons. So that can include things like invoicing systems, accounting, management accounting, or HR. But the really special functions such as fleet management or the kind of data gathering you need for condition monitoring are looked after by other system components. These lift the required data out of the ERP system, process it, and return the relevant results to the system. Of course to do this, you need the right interfaces.

Don't those interfaces add another aspect of dependence?

Cseh: Not if you use the right standards and they're open and based on the right communication protocols. There are now a whole host of open, standardized ways to exchange data with a variety of different systems. In the classic world of IT, these are mostly http-based protocols like SOAP and REST interfaces. There's also OPC-UA, especially in Industry 4.0 because of the overlapping nature of IT and machines. So if you buy software, you need to make sure it supports the right standards. If it does, you lay the right foundations for running existing or future functions through the cloud. If you buy a flatscreen TV these days, you wouldn't buy one with connections that only work for one supplier, or get one without HDMI. With software, customer behavior with everything-from-one-source solutions is often exactly the other way around.

What are the advantages of cloud solutions for SMEs?

Marx: In principle, deciding whether or not to buy a cloud solution is a make-or-buy decision. Even if I don't write my own software, with a conventional in-house solution I have to take care of the introduction, start-up, and operation myself. SMEs often have oversized solutions because it's difficult to get the scale of the IT solution to match the size of the company. Just look at what can happen with the human resources you need. A company might be running software that has to work without a hitch for every working day throughout the year – so basically it needs to set aside two people. If the software is used by 15,000 people, as can be the case with a big company, it's much easier to absorb the personnel costs than if you're sitting on the same personnel expenses for 200 users, as will be the case with a medium-sized company. With cloud computing, SMEs in particular will be able to access IT solutions according to their actual needs. Ideally, this will work in such a way that the SME only incurs costs if it also has to invoice something, in other words when it actually derives benefit. So cloud computing can remove some major obstacles when introducing digital solutions at an SME; a company can embark on projects that wouldn't have been possible otherwise. It's the classic business enabler.

Image: © istockphoto.com/ iLexx

Professor Dr.-Ing. Ben Marx und Professor Dr. Christian Cseh are directors of the Steinbeis Transfer Center Processes in Motion. The Steinbeis Enterprise has been offering solutions and services in the field of mobile processes since 2011. Its work thus revolves around business process optimization with the support of mobile end devices such as smartphones and tablets. There is particular potential to make improvements in the field of after-sales service and as a result, Processes in Motion has a focus on this area. Many after-sales processes are now supported by a cloud-based application called 4tfs.

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Customer 4.0 – A Foundation for Safeguarding Companies in the Long Term

How to implement customer relationship management

According to a number of PIDAS studies, 70% of all companies in Germany lose 50% of their customers every five years. The reasons for this are insufficient mechanisms to manage customers, and sheer indifference. Martin Ritter, director of the Steinbeis Consulting Center for Safeguarding Companies, explains what companies can do about this by using digital technology and the role played by customer relationship management (CRM).

In times when the differences between companies are often dictated by a destructive battle to win on price, placing more emphasis on the quality of personal service is a decisive factor in achieving differentiation. Sounds simple, but the challenge comes in actually doing this. According to statistics, every customer of a company will have approximately five contact points with employees and on average, each encounter will last around 15 seconds. This can redefine how people view a company on countless occasions every year. Every point of contact is a new experience, a 15-second piece of the puzzle that can be pieced backed together afterwards and made into a big experiential image. Ultimately, it's these countless moments of truth that decide if a company will have a safe journey into the future. As each moment unfolds, the aim should be to prove to the customer that choosing this company was the best thing they could have done.

The current debate about unknowns regarding the impact of Industry 4.0 on companies often overlooks something: Clear statements are needed from business leaders and managers about the firms of the future being the product of the people who work for them. People are so fired up about digital transformation that this realization is being overshadowed. Our companies will no longer enjoy the protection of traditional competitive advantage as they undertake the journey into a digital economy. Once upon a time, they could bank on their engineering services and that famous Vorsprung durch Technik. Businesses are finding it more and more difficult to keep pace with the competition by simply pointing to product advantages. They now need new markets – ones that are not cluttered by the competition. This is a laudable aspiration and if firms play their cards right, they can enjoy some major successes. And one way to get there is to undergo a change and become a customer-centric service provider.

Image: © iStockphoto.com/ninitta

A significant number of companies still see themselves as the sum of all products, technological capabilities, their impressive head office buildings, and slick administrative processes. But ask their customers and they won't even mention the machines, high-tech solutions, advanced IT-based internal processes, or where and how they invest their money. Instead, customers point to their experiences with people at the company. Logically speaking therefore, succeeding as a business and remaining successful takes more than an accumulation of material assets. To an increasing extent, success is about quality enhancements in direct communications between customers and people working at a company.

Some time ago, Germany reached an historic crossroad and entered the service economy. This is even affecting companies that would previously not have considered themselves service providers. If everything is available to everyone one day and can be produced by anybody, and hard-earned know-how drifts off into the cloud, the starting point for securing the future of a business in the long term will no longer be products or technology, but customers. If companies want to stay in the running in the long term, they need to regain their bearings and set their sights on the customer. Everyone involved in a market must be clear about the fact that company value will almost exclusively revolve around having delighted customers – clients who all want to be treated like individuals and will not choose to enter into a business partnership with you if you don't do precisely that. External and internal customer relationship management is a key, future-centric component of quality management and the long-term sustainability of a company.

The ultimate challenge will be external customer contact and how people deal with each other internally. Let's imagine for a moment that everybody within a company does take this challenge to heart and behaves accordingly. The company would have a huge competitive advantage. This is why it's important to learn how to welcome customers and their issues, desires, and complaints – rather than try to fight them. Companies need to develop an ability to foster constructive customer dialog rather than stifle it. Rather than feel demotivated, employees need to be empowered to enter into dialog with customers. The focus should be external, on the rapid changes happening in the market; not internal, on administrative scheming. If a company can seize this opportunity to enter into close client relationships and give staff ways to react individually to the needs and problems of customers, it can derive so much from those moments of truth, multiply the number of delighted customers, and thus safeguard the long-term competitive advantage of the business.

In doing so, it's important that staff are allowed to shake off the shackles of administration. It's also important to ensure that indifference becomes a foreign concept at the company. Employees should become managers themselves – helpers who serve their customers and the market. This engenders a culture that breeds mutual trust and togetherness, a place people want to stay in a personal environment that safeguards the future of the company in the long term. Even in times of Industry 4.0, everyone bears responsibility for customers, including the bosses, because customers are the only people who pay money into the company.

Martin Ritter is director of the Steinbeis Consulting Center for Safeguarding Companies. The Steinbeis Enterprise offers its customers stocktaking services with the aim of safeguarding companies' long-term existence, foresight consulting, targeted support and implementation in all areas related to safeguarding companies, one-on-one coaching sessions for business leaders, managers, and staff, as well as the Steinbeis Enterprise Competence Check.**X**

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Cyber-Physical Systems – A Driver of Digital Transformation in European Business

Steinbeis experts and Hahn-Schickard help SMEs gain access to digital technology

Cyber-physical systems (CPS) play an important strategic role in systematically digitalizing European companies. The first successful projects carried out by the European Commission, individual member states, and companies can already be gauged and evaluated. S2i and Steinbeis-Europa-Zentrum picked up on these trends several years ago and have been involved in a number of CPS projects ever since. The Steinbeis experts help companies, universities, and research institutions to consolidate their work in this area, and this includes European collaboration.

The European Commission considers CPS an important part of Industry 4.0 and is providing the field with financial and tangible support through programs such as the Smart Anything Everywhere (SAE) initiative, the Digitizing European Industry initiative, and other activities organized under Research Framework Program Horizon 2020. As a key area of future technology, CPS is revolutionizing the global networking of embedded systems by offering ways to monitor and control the physical processes of sensors and actuators through the internet. The new production systems and business models this is leading to are helping to safeguard the competitiveness of European companies, also helping to underscore the innovative power of Europe.

Many SMEs feel they need to take urgent action when it comes to CPS, although there have been positive developments in a number of member states of the EU. The main obstacle they encounter is actually introducing CPS and the unpredictable nature of acquisition costs. Although it is already apparent that digitalization will bring about sweeping changes in processes and innovation at manufacturing companies in the coming decades, SMEs across Germany tend to be reticent about investing in new production systems and manufacturing equipment. This unwillingness to make investments stems from the lack of uniform standards, insufficient digital infrastructures, and the growing threat posed by cyber attacks. For companies to successfully defend their position in the market, the experts agree that managers responsible for decision-making need to act quickly and plot the right course for a digital future.

For a number of years, Steinbeis 2i GmbH and Steinbeis-Europa-Zentrum has been providing SMEs with support on the road to CPS implementation. As part of two current Horizon 2020 projects backed by the EU, Platforms4CPS and Smart4Europe, Steinbeis 2i is helping the European Commission and businesses in their research activities and helping them gain access to digital technology.

As the global market leader in time- and safety-critical systems, it is particularly important that Europe be in a position to design, develop, and deliver highly complex and networked digital solutions. The Platforms4CPS initiative was launched in November 2016 with the aim of providing companies with support, particularly in the fields of transportation, production, energy, and healthcare. The Platforms4CPS group is developing a vision, strategy and technology toolkit to promote ecosystems required for future CPS applications. The aim is to introduce strategic measures for future CPS by providing roadmaps, sharing results, and setting up a community. Platforms4CPS is a two-year coordination and assistance initiative backed by the European Commission and coordinated by Thales SA alongside seven partners from four European countries. Steinbeis 2i is acting as a project partner on the initiative, providing expertise on roadmapping, transnational technology transfer, the application of project results, and market studies.

In recent years, products and services have increasingly focused on innovation and digital solutions. High-profile examples include consumer goods such as smartphones, driverless cars, and Industry 4.0 solutions (smart production). As a result, the key question posed as the Smart4Eu-

rope project kicked off in September 2017 was: What can be done to optimize how this potential is exploited? It should be easier for SMEs to get into digital transformation technology. The Smart4Europe initiative is being spearheaded by the Hahn Schickard Institute in Villingen-Schwenningen. Work at the institute revolves around areas such as smart systems integration (SSI) and CPS. The experts working on the SAE project consider SSI and CPS to be crucial basic technologies for digital transformation. Steinbeis 2i is the second partner from the state of Baden-Wuerttemberg and it is involved in all key activities. It is also managing tasks relating to expansion of the innovation ecosystem and establishing this as a more permanent feature in the long term. Steinbeis 2i brings valuable experience to the project in the areas of innovation management, technology transfer, and trans-European networking. For example, it works with partners in over 50 countries as part of the Enterprise Europe Network.

The Smart4Europe project will result in the setting up of a web-based innovation portal that will also act as a service center. To underpin this, Smart4Europe is fostering the exchange of ideas between industry players at the European Commission, the Smart Anything Everywhere initiative, and SMEs. This is taking place at international collaboration workshops, resulting in a kind of technology radar for identifying technologies that would be beneficial to the SAE. The growing number of projects and companies under the Smart Anything Everywhere umbrella will span different areas of technology and roles with the innovation cycle. Smart4Europe will ensure all key players are involved and will help the network to grow organically. The coordination and support provided through the Smart4Europe initiative lasts two years, and the seven project partners are focusing on SMEs, the European Commission, and the Smart Anything Everywhere initiative.

Both the Smart4Europe initiative and the Platforms4CPS project build on experience gathered in several projects conducted in recent years by Steinbeis-Europa-Zentrum and Steinbeis 2i. Some projects also ran in parallel.

CPSELabs (Feb 2015 – Feb 2018) aims to accelerate implementation of CPS and mainly offers SME financial and technical support with the development and application of CPS. To this end, the project partners regularly issue requests for quotations on innovative CPS experiments. These primarily focus on facilitating innovative CPS value chain in the European market, the demonstration of innovative CPS engineering technology, and the design of innovative new CPS solutions.

Road2CPS (Feb 2015 – Jan 2017) was coordinated by SEZ and looked at roadmapping, the analysis of CPS project findings, and how these affect or build on the CPS ecosystem. The aim is to overcome obstacles encountered with the implementation of CPS solutions, to identify possible difficulties, and to access new fields of business for CPS products and services. This has involved drawing on roadmaps and case studies from a variety of sectors of industry, and one area of emphasis lay in smart networks, smart cities, fully automated factories, and networked travel solutions. To ensure the projects consider the wider picture, societal and socio-economic developments were also looked at.

TAMS4CPS (Feb 2015 – Jan 2017) resulted in the development of a strategic research and collaboration agenda between the EU and the United States for modeling and simulating CPS. Experts on both sides of the Atlantic joined forces at a series of workshops to build on synergies and explore promising areas of collaboration. These provided a foundation for drafting a strategic agenda. The SEZ developed a roadmapping method and was responsible for sharing the project results.

Image: The kick-off meeting with the project partners from Smart4Europe in September. The meeting was coordinated by the Hahn Schickard Institute in Villingen-Schwenningen.

Dr. Meike Reimann

Steve Bageritz

Sarah Mortimer

Dr. Meike Reimann, Steve Bageritz and Sarah Mortimer all work at Steinbeis 2i GmbH. Steinbeis 2i works in the field of innovation and internationalization and is a partner in the Enterprise Europe Network of the European Commission, which currently involves 600 partner organizations in over 50 countries. The aim of the network is to provide support to companies on all issues relating to business in Europe, innovation, research, and technology transfer. It also helps firms exploit the findings of European research. Steinbeis 2i is a partner in the Baden-Wuerttemberg consortium and works in collaboration with the manual trades association Handwerk International, bw-i, the Ministry for Economic Affairs, and six chambers of industry and commerce.

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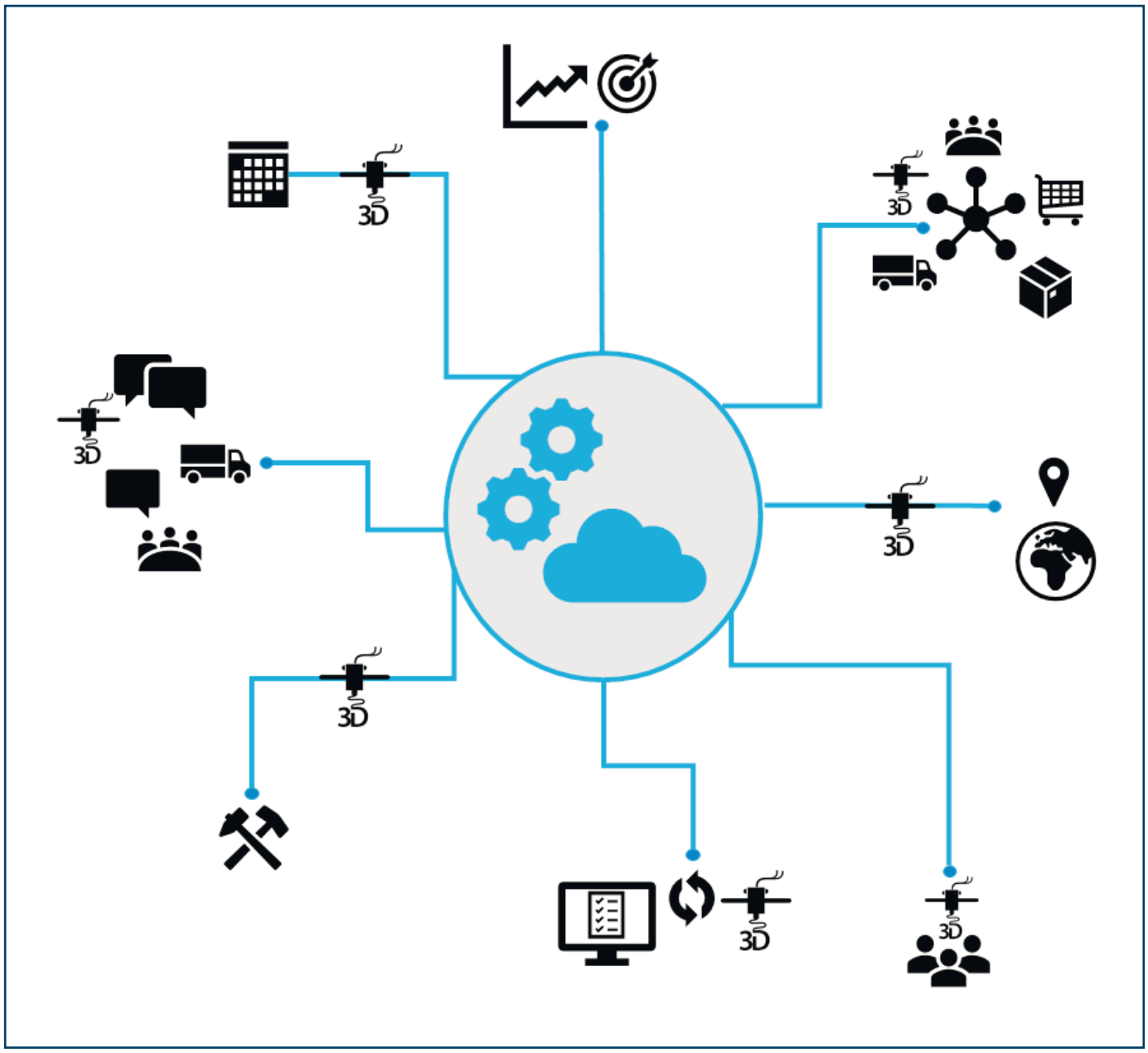

Digital Transformation – Industry 4.0 – Additive Manufacturing

Efficient and flexible just-in-time production

These days the term Industry 4.0 is used excessively in all sectors of industry, from the automotive market to plant production and medicine. It is also thrown into conversation about additive manufactoring technology, or so-called 3D printing. But what exactly is Industry 4.0? What does the 4.0 stand for and what is it a reference to? Does it have anything to do with additive manufacturing? Philipp Renner, who works at Apium Additive Technologies GmbH in Karlsruhe, is willing to provide a definition.

The term Industry 4.0 uses the number to indicate that it's the Fourth Industrial Revolution, and it describes solutions whereby conventional production technology is connected to smart systems and digital networks. The aim of connecting systems to one another is to pull together the entire process of product creation by linking individual stages of the value chain – mainly by using computer systems and modern communication technology to form direct links.

Industry 4.0 is about smart machines that make it possible for all elements of production – people, machines, materials, and the end product itself – to communicate with one another by using cyber-physical systems. By connecting things, a kind of decentralized entity is created, a value creation network capable of gathering data, processing it, storing it in a central location (in the so-called cloud), and then making the best possible use of this data at all stages of production. Digitizing facts and the way they are stored in the cloud allows people involved in this pro-

cess to access the information from anywhere, thus also making it easy and quick for people to exchange data between different companies, locations, and clients.

This helps significantly enhance efficiency and flexibility. Machines can react quickly to changes in product preferences, and as a result it becomes possible for companies to provide end customers with personalized products in real time. This is beneficial for both parties because it raises customer satisfaction and maximizes revenues for the company.

The advantages offered by becoming more flexible, personalizing products, and making individual adaptations to production requirements are also gained with 3D printing. One of the most valuable benefits of this format of digital technology is that it dovetails seamlessly with the processes of Industry 4.0. Ordering information can be captured during production, flowing into product design during the next stage before the optimal size and dimensions of the object being produced are checked, which are put to use by defining which machine to allocate a product to. Then comes quality management. Finished orders are then re-checked and logs are forwarded to technical specialists and managers. Not only does this mean the decision-makers in production can be kept informed, even customers receive notification of the status, quality, and production processes of their end products. This extends to the now normal options given to customers to track orders or check their delivery status, moving information upstream into production so clients can see how far into the production process their product is.

A further advantage of dovetailing digital technology with additive manufactoring technology is that things can be made in real time. With the right planning software, production materials can be sorted and prioritized, making it possible to offer just-in-time and just-in-sequence production and thus make significant savings in terms of warehousing and logistics. By simplifying data exchange with companies and other sites involved in the value chain, it becomes easier to react to changes and adjust production accordingly. With additive manufacturing, it is also possible to arrange 3D printers to offer ultimate flexibility so a printer that has just finished making a pair of spectacle frames can immediately get on with making a housing for a smartphone. This high degree of flexibility allows manufacturers to make dynamic adjustments to schedules and under such circumstances, it should not be a major production challenge introducing new product variants.

Also, companies can continuously gather data and this allows people in the sales field to go back through data in real time and find important information, such as the value of a contract, or review data from previous production runs. This can be compared to the products or service requirements of clients and allows salespeople to submit individual offers. Integrating customer and historical data into the production setup of Industry 4.0 is a key aspect of 3D printing and the innovative advantages it offers over conventional production technology.

Another advantage with digitalizing production for 3D printing is that it gives production planners a heads-up if they are about to run out of or run low on parts. The continual circle of communication between machines makes it possible to track usage rates or material wear, and if necessary review orders being submitted to the 3D printers. In areas such as injection molding, this presents a useful option for making better use of high-performance polymers. An injection molding machine can be set up to exchange production cycle data with a 3D printer and organize print runs according to a defined cycle. Then if a slump in orders is anticipated, quality standards can still be maintained and costs can be contained.

The combination between digital solutions and additive manufactoring offered by Industry 4.0 represents the next important milestone in our industrial economy, and it promises to revolutionize manufacturing. Additive manufacturing has an important role to play by offering flexibility and the facility to freely adapt shapes – to name just two of the hundreds of advantages offered. As such, it's a shining example of the way our production technologies are becoming more usage- and customer-centric; technology is improving by becoming more autonomous, resulting in long-term efficiency and quality gains.

Image: © Steinbeis Consulting Center IMAPS

Tony Tran-Mai

Philipp Renner

Tony Tran-Mai is director of the Steinbeis Consulting Center IMAPS Institute for Material Applications & 3D Printing Solutions. The services of the Steinbeis Enterprise range from application consulting on additive manufacturing processes to the selection of suitable 3D printing systems and materials for individual component developments, the planning of launch strategies in existing business companies, seminars, training sessions, and workshops on additive manufactoring.

Philipp Renner works at Apium Additive Technologies GmbH. Apium provides its customers with products and solutions for processing high-performance polymers using a 3D printing technique called fused filament fabrication.

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Business Models in Internet-Based Value Creation Networks – A Capability Approch

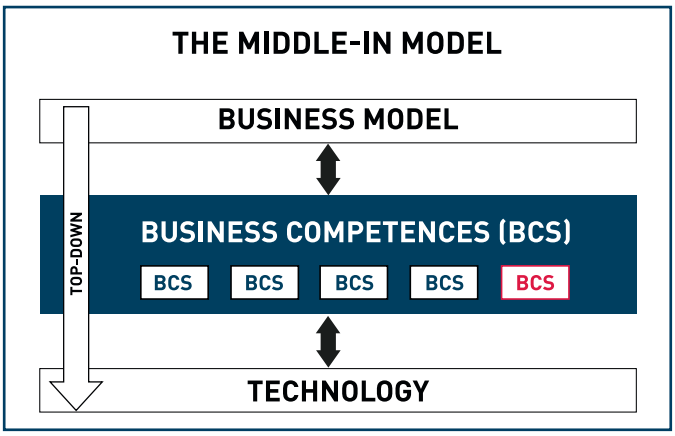
The Ferdinand-Steinbeis-Institute (FSTI) is developing an alternative model for creating digital business models

What are the key success factors when designing digital business models, and what can be done to support SMEs in this area? These are the issues being looked at by the Ferdinand-Steinbeis-Institute (FSTI) as part of the " Kompetenzzentrums Mittelstand 4.0 – Stuttgart". For this the FSTI started a series of interviews and workshops with small and medium-sized companies. The resulting insights will be used by the FSTI to develop a so-called capability-based model.

The interviews and workshops that have been carried out until now show that digitization leads to an increase of customer demands and as a result, products and services become increasingly complex. The connection between these two factors can be seen by looking at the example of car dealerships. Until now, dealers have generated revenues by selling and servicing cars. In the course of the electric car, customers are becoming increasingly demanding. No longer do they just want to buy an electric car, they look for an comprehensive solution. This solution encompasses an overall package underscoring the reliability and quality of the vehicle itself, the supporting infrastructure, installation, key information, and services. In most cases, an individual car dealer is simply not in a position to deliver such a complex package of services. To do so, it would have to pull together the capabilities of various companies. This example shows why it is becoming increasingly difficult for small and medium-sized companies to offer their customers a complex performance promise. What they need is a variety of different parties from different domains, so they can pull on the same levers as part of a Internet-based value creation network (also called an ecosystem). By doing so, the different partners join forces and deliver added value for the customer together. A key feature of internet-based value creation networks is that individual elements of a service are broken down into fragments. Each fragment is taken care of by a different partner within the value creation network. Coming back to the example with electric vehicles, this would entail the car dealer managing the service fragment relating to the car sale and service, an energy provider would add its process know-how to the value creation network, and an electrician would input with installation capabilities. It is only when all of the different competences are pulled together that the customer promise of "providing electromobility to the user can be fulfilled.

The question this raises is: How can companies creat their business models within internet-based value creation networks in such a way that they can participate in value creation in the fuhter? To answer this question, the Ferdinand-Steinbeis-Institute started by looking at conventional approaches used to develop innovative business models, including the Business Model Canvas and the St. Gallen Business Model Navigator. These are method-based approaches used to plan and update business models. These approaches usually design business models based on the company strategy (top-down approach). But when they are applied to the example of the car dealership, they are often reaching their limits. For example it is difficult to take a strategy as the basis for developing a business model for a value creation network in a way that exploits the full potential of digitalization. Also, in practice it is often a complex process trying to determine who the customer of a value creation network actually is and develop a common value proposition for this customer.

Based on these insights, the FSTI has been looking into different ways to design digital business models. By drawing on established business model innovation principles, a capability-based approach has been developed. This method is called the Middle-In Approach. The first step involves identifying existing business capabilities held by a company (shown



in the blue box). This procedure is not fundamentally new. For example, in strategic management and enterprise architecture (EA), organizations are often categorized according to their capabilities. Despite this, the capability-based approach have not been used much in business practice. One of the reasons for this is that it is a difficult and long-winded process to identify the existing capabilities in order to use these as a basis for adapting business models. Until now, once a company has identified its business capabilities, it has had to ask itself if there are other capabilities it can develop based on these (see model, red box) in order to play a successful role in value creation in the future. The business capabilities within a company also provide a foundation for defining the requirements that need to be met to implement a certain technology.

To use this capability-based approach properly, there needs to be a clear understanding of different terminology, which until now has not been the case in business literature. As a result, the Ferdinand-Steinbeis-Institute has taken established models revolving around resource-based views, core competences, and dynamic capabilities, adding insights from the existing literature on business capabilities to derive the following definitions: Business capabilities are an interdisciplinary package of deliverables, individual to a company, aimed at adding the best possible value. Business competences thus describe what a company does in abstract terms. Based on this definition, the FSTI has developed a structure for designing digital business models based on business capabilities. The first step is to identify the existing business competences of a company. The second is to map the market environment of the company and the competitive situation including the influence of digitalization. This provides a basis for deciding which business capabilities the company can use to position itself in internet-based networks. This approach also helps to highlight the additional business capabilities a company needs to acquire and any business capabilities that will have to come from business partners and subcontractors in the network. Based on this, the digital business model provides a quantified package of business capabilities offered by individual companies. This capabilities-based model for planning digital business models will undergo further development as part of work being carried out at the Competence Center, Mittelstand 4.0 – Stuttgart. The plan is to offer training courses and projects in the coming year.

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The Competence Center, Mittelstand 4.0 – Stuttgart is sponsored by the Federal Ministry for Economic Affairs and Energy. The competence center looks at the approaches used to share existing technologies, implementation solutions, and experiences of the general public with the digital transformation of work and value creation processes. Its focus lies in small and medium-sized enterprises as well as the craft. The experts working on the project at the FSTI and bwcon are focusing on interdisciplinary topics of business model und service development.

Image left: © University Stuttgart IFF Fraunhofer IPA, photo: Rainer Bez
Image right: The Middle-In Model

Patrick Weber is a Research Assistant at the Ferdinand-Steinbeis-Institute and is responsible for research in the field of industrial internet/Industry 4.0. Research at the FSTI revolves around the increasing merging of physical objects and embedded IT, taking into account changes in Internet connectivity and the consequent impact on industrial ecosystems, value creation and societal structures.

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The 2017 Steinbeis Day: The Value Added by the Network

The emphasis at this year's event lay in networks and consortium projects

As the Network continues to expand, communication and successful networking become the key challenges. Both issues were the focal topics discussed at this year's Steinbeis Day. More than 200 Steinbeis directors, project managers, and other employees from the Steinbeis Network came to the Steinbeis House in Hohenheim (Stuttgart).

A series of workshops was organized to provide Steinbeisers with insights into the various specialist topics currently being looked at in Steinbeis Network projects. The breadth of topics covered by Steinbeis enterprises was also reflected by the issues discussed at the workshops, from agile innovation techniques (discussed by experts from bwcon) to the factors influencing efficient risk management (discussed by Prof. Dr.-Ing. Aleksandar Jovanovic, Steinbeis Advanced Risk Technologies, and Dr. Andrej Heinke of Bosch). Heinz Pöhler talked about a specialist group within the Steinbeis Network that looks at future energy supplies. The Steinbeis Consulting Center he manages, 4IES, is just one of four partners at the Steinbeis Competence Center for Sustainable Energy (KNE).

Uwe Haug (Steinbeis Headquarters) and Harel Boren (Steinbeis Israel) revealed the level of international collaboration possible within the Steinbeis Network. One perfect example of cross-border technology transfer between different companies comes from a startup in Tel Aviv: tinyinspektor. A workshop organized by a team of consultants from Steinbeis Headquarters demonstrated how consultants and companies in Germany can attract financial support for innovative concepts and business startups. The workshop received a tremendous reception, underscoring the strength of interest from all sides in this area. This was also highlighted by a team of presenters from Steinbeis 2i, which ran a workshop revolving around the administrative and financial aspects of managing Horizon 2020 projects. Steinbeis 2i also functions as one of the first ports of call for such projects in the Steinbeis Network and during the workshop it provided an overview of training on contractual arrangements, budgeting, and communicating with the European Commission.

A team of scientists at the Ferdinand-Steinbeis-Institute (FSTI) presented an update on current research into digital solutions and networking. Another important topic was the series of micro testbed projects currently under way in the Network. SMEs from a variety of sectors have formed a partnership with the Steinbeis Digital Business Consortium to work together on a neutrally moderated "Forum of Trust." The idea is to

translate value creation scenarios into real business settings. Further scientific input was provided by a team from the Steinbeis Enterprise Competence Check (ECC) which offered an introduction to a tool called ECC Research. The software makes it possible to carry out simple, yet methodically and contextually sound assessments and evaluations based on ECC principles.

Dr. Petra Püchner (Steinbeis 2i) and Beate Wittkopp (the TransferWorks BW Steinbeis Transfer Center) provided insights into innovation processes. Following the successful launch of their Steinbeis initiative, An Alternative View of Innovation – Women in Technology Transfer, further parties interested in the future network attended a workshop at the Steinbeis Day to identify overlaps and explore different skills.

All projects and networks within the Steinbeis Network are open to newcomers, whether they were only recently launched at the Steinbeis Day or have been running for longer.

For more information on the day, go to the website: www.steinbeis-tag.de.

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STEINBEIS-ABEND


Steinbeis.
Transfer Visions
into Business!

The 2017 Steinbeis Night: Time for the Network to Meet Up

Relaxed conversation and networking become important part of the relaunched evening event

Following the annual Steinbeis Day in the Steinbeis House, which focuses on the implementation of specialist knowledge, the evening event in the Liederhalle arts and convention center in Stuttgart took a more general approach to topics. Around 500 guests were invited to the Steinbeis Network evening to soak in the relaxed atmosphere, enjoy culinary delights with other Steinbeisers, and engage in informal conversation. The new evening arrangements went down even better than expected. The casual atmosphere was clearly enjoyed equally by guests of all ages.

Among the highlights of the evening were the bestowal of the Steinbeis Foundation Transfer Award – the Löhn Award (see following articles) and a graffiti artist with a difference: Professor Dr. Jürgen Scheible, a lecturer on the advertising and market communication degree at Stuttgart Media University, temporarily added completely new colors to the Beethoven Room at the Liederhalle center. He did this by using a "digital spray can" on his smartphone.

To match the conversation and cuisine, there was also musical accompaniment. The Silvio Dalla Brida quintet did its usual job of enticing dancers of all ages onto the dance floor. The aim is to repeat the format next year. The next invitation from the Steinbeis Network to the Steinbeis Day in Stuttgart is on Friday, September 28, 2018.

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Practice-Based Transfer, Implementation Excellence: The 2017 Steinbeis Foundation Transfer Award

Two projects involving automation and production optimization earn the Löhn Award

Manual Production? Complex Automation!

Chemnitz-based Steinbeis researchers and Prym Consumer Europe GmbH receive the 2017 Transfer Award of the Steinbeis Foundation – Löhn Award

There is growing demand for solutions with a "hand made" label and although this trend continues unabated, it is by no means a short-term phenomenon; if anything this is a long-term trend. This resulted in Prym Consumer Europe from Stolberg joining forces with the Steinbeis Research Center from Chemnitz, Automation in lightweight construction processes (ALP). Their joint development project has now earned them the Löhn Award.

The aim of the two project partners was to develop a complex automation system for manufacturing circular knitting needles. After examining fundamental material issues, the team developed new components, designed new parts, and successfully established a new production technique that makes it possible to completely automate a process that had previously been entirely manual.

The extensive experience of the experts at the ALP research center in Chemnitz played a pivotal role in the development, especially when it came to automating the plastic processing of flexible materials. The process of transferring the findings of fundamental research carried out at the Institute of Lightweight Structures (TU Chemnitz), which worked on the project alongside the ALP Steinbeis Research Center, was also described as exemplary. The end product itself is also highly innovative. It has already allowed Prym to win the Red Dot Design Award for the redesigned external properties of their circular knitting needles, the ergonomic handling of the knitting process, and the introduction of premium-quality steel wire to replace the previously used plastic wire.

It was only possible to implement the project thanks to close collaboration between the specialists working in industrial tool design, manufacturing processes, and product development. Winning the Transfer Award for the project is a testament to the outstanding achievements of Prym and the ALP research center in working alongside Chemnitz University of Technology to transfer research findings into serial production processes.

Image: From left to right: Oliver Fischer (Prym), Manfred Mattulat (Steinbeis), Raphaela Homann (Prym), Prof. Dr. Dr. h. c. mult. Johann Löhn (Steinbeis), Prof. Dr.-Ing. Wolfgang Nendel (Steinbeis), Prof. Dr. Michael Auer (Steinbeis), Mirko Spieler (Steinbeis), Jürgen Burkert (Prym)

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Steinbeis has been recognizing the outstanding contributions made by Steinbeis projects to knowledge and technology transfer since 2004. It does this at the Steinbeis Evening by bestowing the Steinbeis Foundation Transfer Award – the Löhn Award. This year it was the turn of project teams from Stolberg, Chemnitz, Bruchsal, and Pforzheim to celebrate wins.

The important factors that the jury look out for when selecting winners of the award are quality, speed, commercial viability, and optimum collaboration between different partners. The prize money for the award is up to€ 60,000 plus a sculpture that is awarded to project partners featuring two intertwining halves symbolizing successful transfer processes.

Using Energy to Optimize Wiegand Wires

Steinbeis experts at Pforzheim University and SEW-Eurodrive GmbH & Co. KG win the 2017 Transfer Award of the Steinbeis Foundation – Löhn Award

For many years, the Bruchsal-based company SEW Eurodrive has been looking closely at Wiegand sensors, which are non-contact revolution counters that are self-sufficient in terms of energy requirements. One unique feature of Wiegand sensors is that they go beyond emitting signals and can actually be used as an energy source. They work by using energy-rich impulses, which are independent of the actual number of revolutions but are enough to run ultra-low power electronics. For example with electric motors, this makes it possible to measure axle revolutions without any external power input. At the heart of the sensor lies a Wiegand wire, which was originally patented by John Wiegand in 1978. Made of thin metal consisting of a ferromagnetic alloy, when a Wiegand wire is subjected to special cold forming processes it can adapt properties, allowing it to spontaneously change its magnetic axial orientation. Working with the Steinbeis Transfer Center for Material Development and Testing (WEP), the team at SEW-Eurodrive successfully developed quality analysis methods that allowed the firm to significantly improve energy yields, simultaneously optimizing the manufacturing process delivering results that are entirely reliable. The two project partners were given the Löhn Award in recognition of this achievement.

Using a specially developed preparation technique, the Steinbeis experts worked together on the project to map the different magnetic zones of wires and for the first time their results have been published in the world of research. Further experimentation was carried out with carefully prepared material samples to systematically analyze microstructures deep down inside Wiegand wires in order to yield insights into the complete range of properties (mechanical, thermal, magnetic).

It was important to gauge the overall picture, but this was only possible by combining a large number of material testing techniques, all of which were offered by the Steinbeis experts at the material testing labs at Pforzheim University. The project partners have been working continuously on the initiative for some time and their increasingly close alliance has now been honored by the Steinbeis Foundation Transfer Award. As a result of the successful project, Wiegand wires can now be produced in unprecedented quality, offering every potential to revolutionize the multi-turn angular position sensor market in the near future.

Image: From left to right: Prof. Dr.-Ing. Norbert Jost (Steinbeis), Manfred Mattulat (Steinbeis), Katarzyna Plaskonka-Weisenburger (Steinbeis), Prof. Dr. Dr. h. c. mult. Johann Löhn (Steinbeis), Ursula Christian (Steinbeis), Prof. Dr. Michael Auer (Steinbeis), Dennis Rädle (SEW), Dr. Olaf Simon (SEW)

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Good vibrations

Steinbeis experts develop laser coating technique by using vibrations

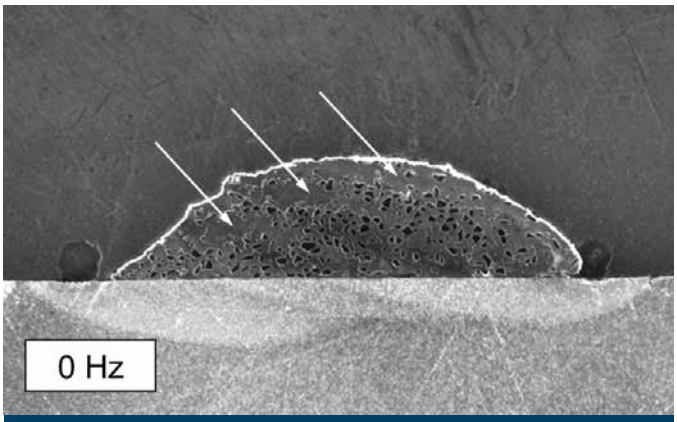
It's important for components subject to severe wear and tear to be given hard surfaces. This is something metallic materials usually don't have, so to strengthen surfaces, weld overlaying is used to add an extra layer and provide more protection. Typically a material like tungsten carbide is used for this overlaying process. It is embedded as isolated hard particles into a tough nickel/boron/silicon matrix material. The high density of tungsten carbide comes hand in hand with a high mass and this makes weld overlaying more difficult. Gravity causes hard material particles to sink within the molten matrix and this has a negative impact on the wear protection offered by the coating. Strong protection is only possible if the hard tungsten carbide particles stay near the surface. The experts at the Steinbeis Innovation Center for Intelligent Functional Materials, Welding and Joining Techniques, Implementation have now found a solution to this problem.

As part of a collaborative project with a partner from industry, Lunovu Integrated Laser Solutions from Herzogenrath, the Steinbeis team has been testing the use of vibrations in laser weld overlaying processes. The aim of the joint development project was to see if mechanical vibrations can adapt the flow dynamics of molten coating layers and stop tungsten carbide particles sinking away from the surface. Ultimately, it should be possible to add a protective coating with evenly spread tungsten carbide.

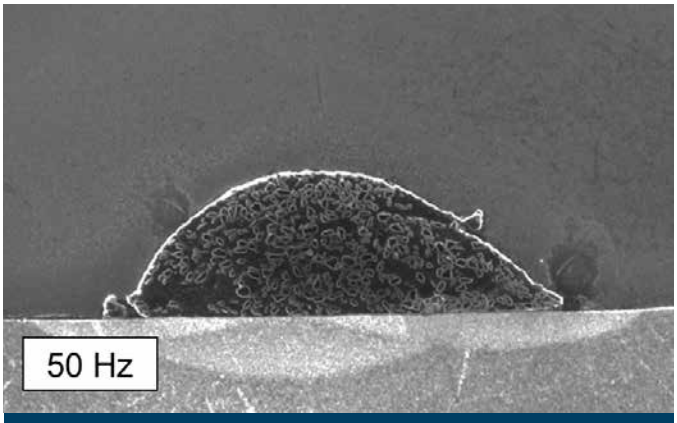
With laser weld overlaying, the material that is going to be added to the surface starts as a mixed powder (60% nickel/boron/silicon, 40% tungsten carbide). The powder is fed onto workpieces using argon, which shields it from the air and allows the powder to melt under a laser beam. The project partners integrated a vibration monitoring device into the process to make it possible to control the frequency of linear oscillations along the base material and melting area.

Tests showed that vibrations have a clear influence on flow dynamics during weld overlaying. The experts discovered that the distribution of the tungsten carbide was particularly uniform at low frequencies with high oscillations and as a result, this prevented sinking.

The two following images show a comparison between three overlapping welding layers. In the first image, no vibrations were applied and as a result there was marked sinking of the tungsten carbide within each of the three weld passes. In the second image the distribution is homogeneous. The welding process was subjected to vibrations with a frequency of 50 hertz

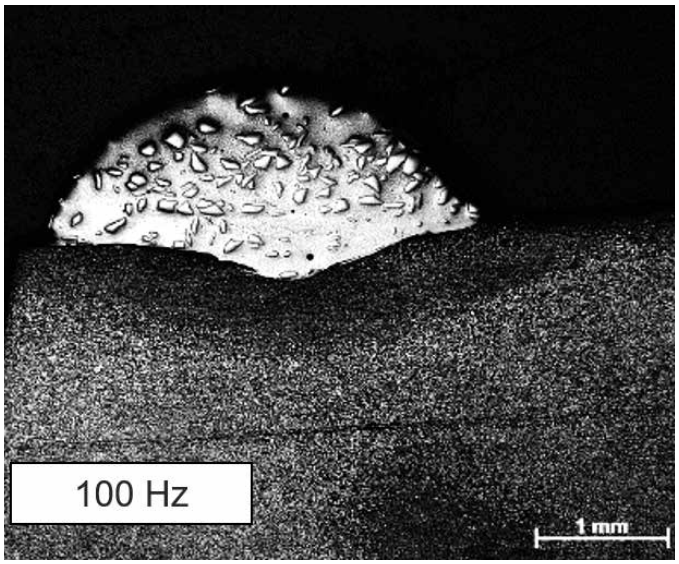


Carbide sinking through each welding layer



Uniform carbide distribution without sinking

The microscopic image below shows an example of a coating layer with a welding process frequency of 100 hertz:



Measuring the hardness of layer surfaces made it possible to improve protection and confirmed that the new welds were working. This meant the project team had achieved their development goal and it is now possible to improve the wear properties of welded overlay materials containing tungsten carbide. A number of options for successfully transferring the vibration process to large, complex components have already been worked out and tested.

Image left: A vibration testing device with an integrated laser power jet
Embedded images in text: Layers welded with 100 hertz vibrations; three overlapping layers welded without vibration; three overlapping layers welded with 50 hertz vibrations

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A GEMASOLAR plant (property of Torresol Energy) in which Cleaning Technology of ECILIMP is used. ©SENER

MinWaterCSP: Reducing the Water Consumption in Concentrated Solar Power plants

Steinbeis 2i acts as partner in EU project

In Concentrated Solar Power (CSP) plants, collectors are bundling the sunlight on an absorber in order to generate electricity. CSP plants are often installed in arid areas where solar irradiation is high and water resources are scarce. CSP plants making use of traditional wet-cooling systems consume a large amount of water because of both cooling system evaporation losses and mirror cleaning processes. Steinbeis 2i GmbH is acting as a partner in the EU project "MinWaterCSP" which is funded by the EU Horizon 2020 program. The aim is to reduce the overall water consumption of a CSP plant while maintaining or even improving thermal efficiency and reducing capital costs.

Eighteen months into the project, the results are already promising. The project consortium has developed a hybrid dry/wet cooling technology to reduce the amount of water lost through evaporation in the CSP plant by 75 to 95% compared to a solely wet cooling system. The project partners have also built a prototype for an axial flow fan which has already been installed on a full-scale test facility in South Africa and is undergoing continuous testing. The team has successfully created prototypes for cleaning different types of solar panels for use with parabolic trough collectors and linear Fresnel reflectors. These should cut water consumption by 25%. A new demo site is currently under construction in South Africa for the hybrid cooling system and the CSP cooling fan. Software has been adapted for use with CSP plants so that the project team can also simulate water consumption, water quality, cleaning processes, and the energy required for cleaning. The idea behind reducing water consumption is to make CSP technology more competitive and more appealing to local communities, especially where the previous focus was on fossil fuels.

As a project partner, Steinbeis 2i is helping the project coordinator, Kelvion Holding, with the administrative and financial aspects of project management, also providing input on communicating, sharing and exploiting project results. The project also involves another 11 organizations in Belgium, Germany, Italy, Morocco, Spain and South Africa.

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Smart Energy Storage for energy self-sufficiency on the Island of Borkum

The NETfficient EU project develops smart energy management and efficient energy storage solutions

NETfficient is an EU project launched in 2015 with the aim of bringing together project partners from seven European countries to work on the development and implementation of storage technologies and the smart distribution of renewable energy. The project is being implemented on Borkum, a German island in the North Sea. By introducing smart energy storage technologies to the existing electricity grid on the island, the idea is to raise the share of renewable energy used on Borkum and bring the island one step closer to its goal of self-sufficiency. Storage technologies range from old electric car batteries to ultracapacitors and hydrogen storage, in combination with efficient energy management systems. –Steinbeis-Europa-Zentrum (SEZ) is one of 13 partners of the project.

The project also involves an analysis of the life expectancy of systems and maintenance requirements, as well as a life cycle assessment. An energy management platform will make it possible to cover the entire energy value chain, from power generation to the end user. Technologies are implemented in five application scenarios. Appropriate business models are also being developed to help lower existing market barriers for small-scale distributed energy storage systems and to ensure project results can be translated into successful market introduction. Steinbeis-Europa-Zentrum is supporting exploitation and roll-out of project results. It is also supporting the project consortium with PR and administrative and financial tasks relating to the project.

Installations are already underway on the island of Borkum and making good progress. By early 2018, all storage systems will be connected and ready for action. Tourists on the island have already been able to visit the project showroom since April 2017. Hosted by the local utility of Borkum, it is being used by the project partners to showcase their contributions to innovative, smart, and sustainable energy storage and storage operation. The exhibition includes demonstration models of energy storage technologies such as hydrogen and battery systems and energy management applications. Some of the exhibits have internet access and touchscreens to allow visitors on site to try out functionalities such as predicting energy requirements. The project also hosts a website with a virtual showroom providing insights into different testing scenarios and 3D simulations of the technologies being used in the project.

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Certified Interpreting Excellence for Medical Technology

TZM GmbH receives innovation award from the district of Göppingen

The challenge when networking medical devices is to ensure the various systems are compatible with one another and they all "speak the same language." TZM, a member of the Steinbeis Network, offers a product called the Universal Medical Gateway (UMG), which has become a key link in the field of medical technology for connecting different devices. The UMG makes it possible for a variety of medical institutions to connect equipment as required and quickly link it across networks. It acts like an interpreter in the world of technology, allowing systems to communicate with each other despite different "mother tongues." TZM was partly set up in 2014 because of the introduction of the UMG, and it has now been honored in the startup/succession category of the innovation award bestowed by the rural district of Göppingen.

Medical device manufacturers used to have to integrate new system connections directly into their medical products. Because of this adaptation requirement, manufacturers faced the costly process of re-certifying their medical systems. The financial burden they faced was enough to put off some manufacturers, and many a connection project failed as a result. The solution provided by TZM provides an answer to this problem. The Göppingen-based company is considered a hidden champion and it can point to a number of detailed and complex medical device development certifications. Leading European and American producers now turn to the experts at TZM for support. Last year the team implemented more than 150 connection systems.

"The UMG is an ultra-smart device capable of communicating with a broad variety of medical systems. There's no widely accepted communication standard in medical technology, so the UMG has to demonstrate that it's as versatile as possible. It's a highly challenging starting point but despite this, we've managed to develop a lean and agile system that's also inexpensive," explains TZM managing director Edgar Grundstein. TZM has invested approximately half a million euros in developing the gateway over the last two years, and since delivering the first system last year the product has become established in the market.

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The Resilience Megatrend: Preparing Personal Skills for the Future

Steinbeis Transfer Institute Offers Training to Become Resilience Trainers

Increasing workloads and accelerating processes are leading to more and more people suffering occupational burnout and feeling stressed. The world has become more volatile, insecure, complex, and ambiguous. People (as well as organizations) react to this by feeling stressed. But what can people do if their instincts only give them the three F options: fight, flight, or freeze? People need to be equipped with the right skills to react to stress and a crisis. They have to learn from personal setbacks. They need what's now called resilience. There are more and more courses on the continuing professional development market offering resilience training, and demand among companies is also rising. The competence institute unisono, a Steinbeis Transfer Institute at Steinbeis University Berlin, has responded to this demand and now offers a certification course to become a Resilience Trainer (SHB).

People deemed more resilient are more adaptable to challenging situations, they adjust more quickly to change, and they're more likely to take control. Resilient workers know how to control their emotions and they come through a crisis feeling healthier and even stronger. When resilience is used to describe people or organizations, it refers to the development, application, and ability to access certain skills – the things people need to deal more effectively and more quickly with setbacks, accidents, stress factors, and fate. They may also come out stronger in physical terms.

Everybody has a certain degree of resilience – some more, some less. The question is, do they have the right level of resilience to deal with the challenges they face at work or at home. Not only does it make sense to bolster your personal resilience, it helps if you are aware of the things that stress you and the techniques you use to recharge your batteries.

Resilience trainers come equipped with the right skills to plan, offer, market, and run resilience courses matched to the individual client. One tool for coaches to train people at companies is called Resilienz-Lotsen® ("resilience pilots"). This can help resilience become a fixed part of the organization. The training covers two modules, each lasting four days. In the first module, participants get to know resilience basics and acquire a fundamental understanding of resilience itself, stress, and occupational burnout. This is underscored by insights from specialists on the topic of resilience – through training, consultation, and coaching. The other days of the course look at the special nature of adult training in terms of teaching and learning methods, plus the fundamental factors that are important for resilience training to be a success. The aim is to show people how to run their own resilience courses and allow participants to become familiar with training techniques. The Resilienz-Lotsen® training concept has received official recognition for its levels of innovation and quality; the German Association for Coaching and Training (dvct) certified the course as a "Qualified Product 2017" – one of the most important endorsements in the German training industry.

Over 50 resilience trainers have already received training. When asked what convinced her that the course was right for her, Dr. Angela Daalmann (LSB Lower Saxony) said: "Becoming a resilience trainer has taken me into an area that's more important than it's ever been, and it's a good complement and enrichment for the field I work in. I particularly like the emphasis the training placed on actual business practice." The Steinbeis experts are also noticing how much interest there is in resilience topics by the breadth of topics covered by the transfer projects worked on for the Steinbeis University Berlin certificate. Resilience is pointing the way forward as a concept and megatrend in the fields of communication, leadership, professional sport, consulting, and schools – to name just a few. People on the course take examples from their own work and link this directly to the content of their resilience training modules.

The course is mainly being taken by consultants, business coaches, and trainers, although there are also managers, students, and HR development experts. Marcus Schmidt, the owner of a firm called Fokuswechsel and a self-employed business coach, was inspired by the training: "Becoming a resilience trainer has added another product to my portfolio and it won't be difficult for me to integrate this material into my coaching. There's more and more demand for resilience, especially in business, so this training allows me to lay a sustainable foundation for further innovative courses!"

Image: © depositphotos/pertusinas

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Talk – Before It's Too Late

Steinbeis mediation experts work on EU project for resolving inheritance disputes out of court

An increasing number of EU citizens move to different countries and as a result there has been a rise in the number of cross-border inheritance cases. This could be a German pensioner who has decided to spend his final years in Spain, or a French woman who owns real estate in Austria and would like to bequeath her assets to relatives after her death. When EU inheritance laws were reformed in 2012, it had major implications. There are uniform rules stipulating that sovereign law now takes precedence in the country in which the testator was most recently considered resident. This has fundamental implications for Germans. Laws in people's country of origin no longer apply. Instead, it's the law in the country where somebody spends most of their time now that counts. Since the inheritance laws in Europe differed considerably from one country to another – including the "compulsory portion" rule – these changes could result in legal uncertainty and arguments. As part of an a EU-sponsored project, the Steinbeis Consulting Center for Mediation of Business and the Academy for Mediation, Social Aspects and Law, a Steinbeis Transfer Institute, are looking into ways to prevent cross-border disputes in civil cases and inheritance situations. The project should also result in the setting up of an international network of experts.

The main emphasis of the two-year research project (Fostering mediation in cross-border civil and succession matters, or FOMENTO) is to understand the theoretical and empirical aspects regarding the implementation of two EU laws: directive 2008/52/EG governing certain aspects of mediation in civil and commercial matters (the Mediation Directive), and regulation EU/650/2012, generally referred to as the EU Succession Regulation.

The aim is to ensure that out-of-court settlements can be reached in the event of a dispute – so-called alternative dispute resolution. Ideally, some mediation will already have taken place before somebody passes away, so that possible heirs and testators can discuss matters beforehand and avoid disputes in the first place. Even with an inheritance involving heirs in different countries, an online mediation process can make a decisive contribution toward gaining understanding between the different parties. To promote mediation throughout Europe, the EU issued the Mediation Directive in 2008.

The Steinbeis Consulting Center for Mediation of Business and the Academy for Mediation, Social Aspects and Law, a Steinbeis Transfer Institute at Steinbeis University Berlin, are part of a project consortium involving a variety of other partners from Italy (Resolution, Prodos Consulting) and Poland (Mediatorzy.pl). In the coming months, the teams will be investigating the specific impact of the aforementioned guidelines on Germany, France, Italy, Poland, Sweden, and Austria. Expert interviews will be carried out as well as online surveys to assess the main difficulties encountered with international inheritance disputes. Based on the information this generates, the teams should present best practice proposals for dealing with such disputes.

Training sessions are planned in 2018 to take place in Germany, Italy, and Poland to explain to EU citizens how the inheritance rules work and suggest different ways to resolve conflicts outside of court. It is also planned to set up a multinational network for inheritance mediation. The project will finish in 2019 with a closing conference in Leipzig.

FOMENTO
FOSTERING MEDIATION IN CROSS-BORDER CIVIL AND SUCCESSION MATTERS

European Commission

Image: © fotolia.de/Kwarner

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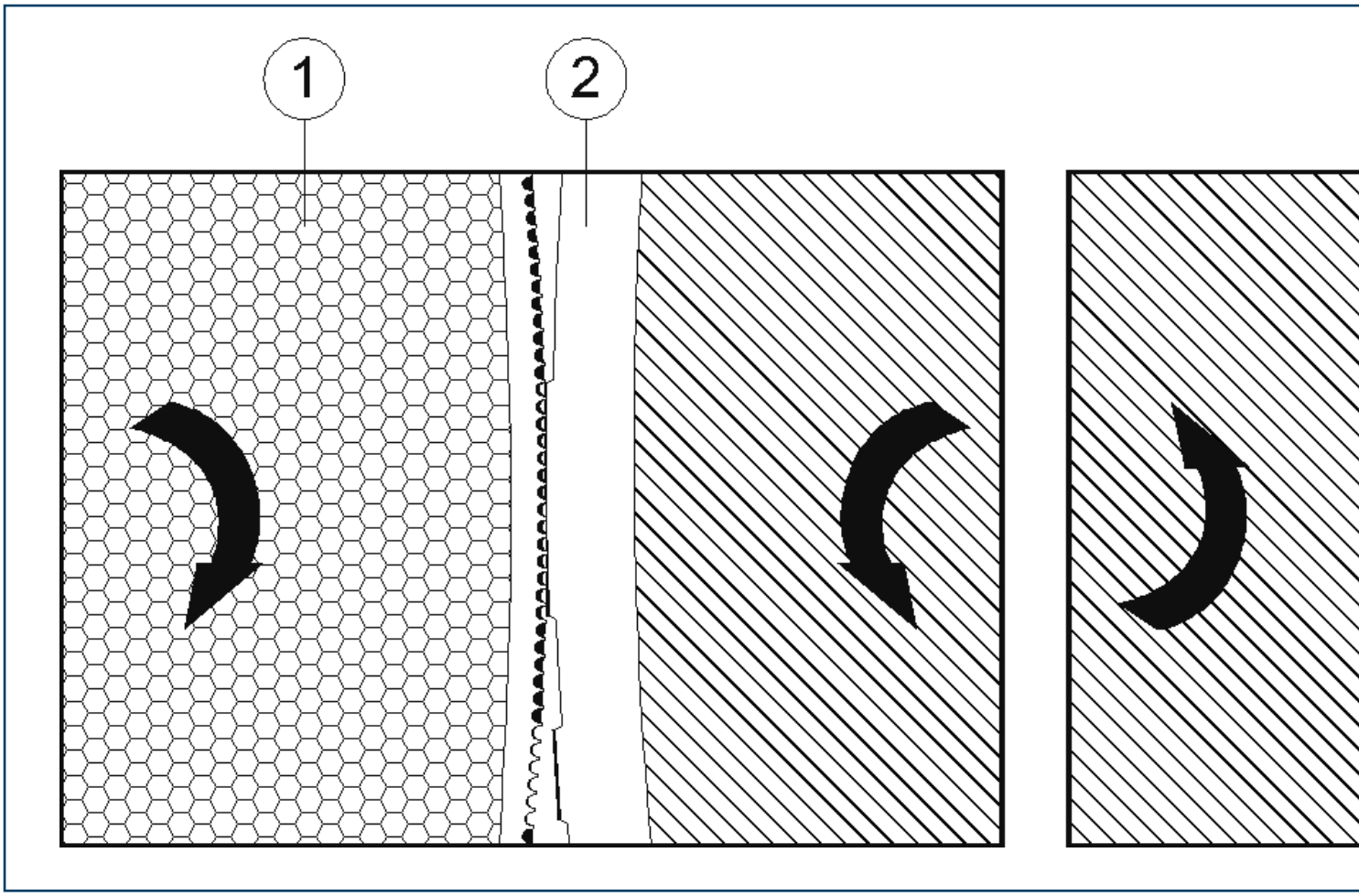


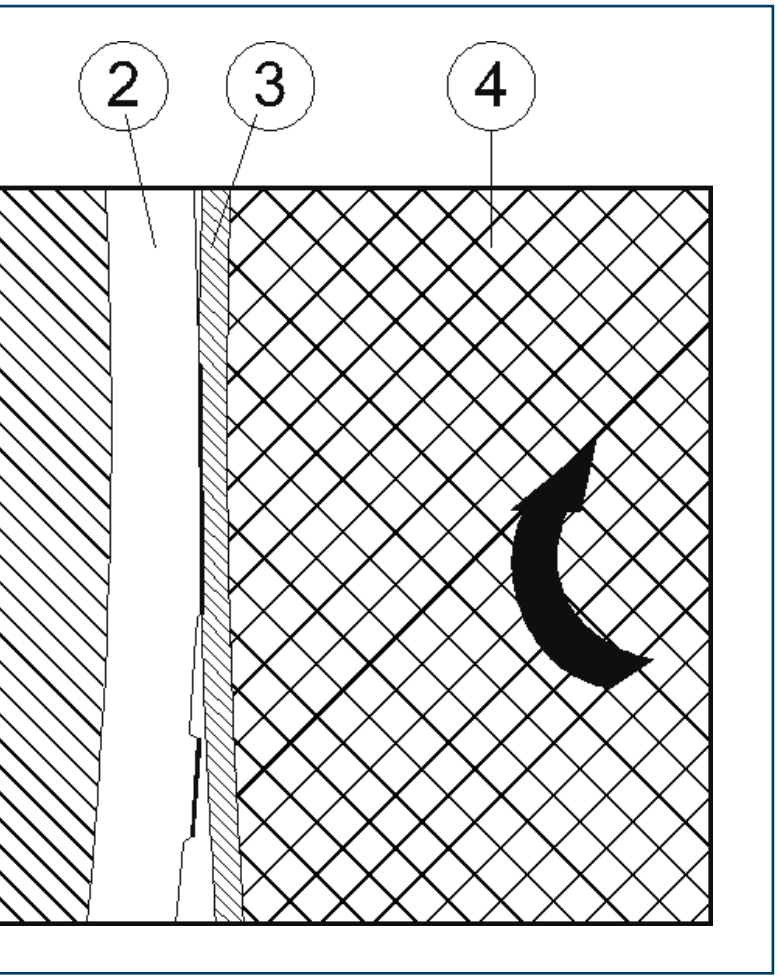
Fully in Touch With the Future

The DFTA Flexographic Printing Technology Center makes promising advancements in flexo printing processes

Flexography (also known simply as flexo) is a high-pressure printing process involving flexible relief plates. Only the protruding areas of the plate come into contact with screen rollers and the material being printed on. Depending on the nature of the print and the amount of pressure required, printing plates sometimes adopt irregular shapes, similar to the way a roughly treaded or damaged car tire can become squashed slightly during travel. Uncoiling can result in vibrations in the printing machine, and in extreme situations the material being printed on is left with horizontal stripes. Researchers at the DFTA Technology Center, a Steinbeis Transfer Center based at Stuttgart Media University, have now registered a "Full Contact" flexo printing process for patent. The new technique simplifies the use of printing machines and drastically reduces the degree of contortion resulting from printing plate production. The technique has every potential to make flexo printing even more competitive.

The ultimate indication that somebody has mastered a specialist discipline is that they observe and analyze a process and come up with a new solution. The DFTA sees this as one of its most important tasks. As a result, a team of researchers has been looking closely at deformations in printing plates during printing. A string of tests showed that the only way to eradicate residual stripes after printing was to avoid "process resonance" by adjusting printing speeds.

The question was, could another technique be found to address disharmonious printing? The DFTA experts started by looking at the fundamentals of high-pressure printing processes. Differences between printing surfaces and non-printing surfaces already emerge when printing ink is applied. By only allowing the upper surfaces of anilox rollers to touch the raised relief areas on a plate (which takes on ink), only these parts of the plate can transfer ink to the substrate. This is of course nothing new to the experienced printing expert. But the researchers decided to think one step further. The experts conducted a series of experiments to raise the entire non-printing surface on the printing plate – the relief base – and position it so high that there is virtually "full contact" in the printing gap between the printing plate and the substrate. Another way to think about this is that the relief depth is reduced to such an extent that the entire base area of the relief along the printing line comes into contact with the printed surface. This full contact between the plate cylinder and the printing medium allows the feed to roll off extremely harmo-



niously, because protrusions on the plates are hardly detectable (less than a hair's breadth) so they no longer get in the way.

Vibrations and the horizontal stripes these leave on the print should thus be a thing of the past. At the same time, a whole range of other advantages are gained. The main kind of printing plate used in the European flexo printing market is made from photopolymer materials. The manufacturing times or costs for these materials are largely dictated by the depth of monomer materials used to create relief, and these have to be washed out or removed using thermal techniques. In the DFTA experiments, only one tenth of a millimeter of relief depth made a huge difference in shortening the time needed for the main exposure of plates, washing, developing heat, and drying. This time saving is passed on to the printing houses, which also save solvents and energy, and thus free up resources.

One knock-on benefit of flatter relief formations on photopolymer printing plates is invaluable: improvements in the accuracy of multicolor prints. The experiments being carried out at the DFTA Technology Center are still underway, but the experts have the impression that the lower relief on flatter printing plates will not allow the usual expansion differences to occur on prints (caused by outline effects). It would also appear that the photopolymer layer is still relatively thick (with a plate of 1.14mm thickness, even after subtracting the thickness of the carrier layer, the photopolymer thickness is still 0.85mm) and this helps to minimize supposedly unavoidable distortions in parts of the printing plates used for multicolor printing. Overall, this improves accuracy.

The DFTA experts found it was also easier to carry out certain parts of the printing process itself. If there are vibrations and stripes resulting from the printing process, these can be kept within a tight window and managed more easily. Lateral adjustments can be reduced for each print and this makes each pass easier to control when feeding prints through the rolls, because less time is invested in trying to make changes – something that was also previously impossible to guess beforehand for each printing effect. This benefit is probably due to the fact that all printing plates come into uniform contact with the cylinder. The printing quality is on a par with conventional printing techniques, although the researchers have also been looking into new experimental screen methods. These should help achieve even more significant improvements in quality, and this will still be in line with standard image resolutions with digital photopolymer plates of 2540dpi.

"We believe the function of our alternative flexo printing process is linked closely to how precisely the extremely low relief depth can be adhered to across all areas of the printing plate. This is because this is the only way to keep the relative pressure uniform when there's full contact between the printing plate and the material," surmises Prof. Dr. Martin Dreher, director of the Steinbeis Transfer Center. When producing photopolymer plates, it is not possible to simply control the timing and thus achieve low relief depths, especially if the depths are nominally determined by light exposure behind the plate. The new procedure cannot cope with thickness variances in the relief base of ±40µm or more, which can be normal for back exposure but are not so much of a problem with conventional processes. As a result, the project team has developed a reliable alternative which makes it possible to adhere to tolerances of only around ±10µm.

The biggest challenge now is how to design the transverse gap needed when using printing plates. The design options examined in the experiments to date did not satisfy the experts, but they do still have a number of options up their sleeves. The task now is to design the gap in such a way that it covers the entire area during full contact. This is because if the process does leave a gap, this could cause vibration again in the system. On the other hand, however, the edges must not protrude too far upwards or else unwanted oblique lines will be printed.

If seamless round printing plates can be used, the researchers will have achieved their goal and will have found a way to use the process without restriction. This will mean there is nothing stopping the experts registering their technology for patents. The next challenge will be to conduct testing to discover which areas of the flexo printing market the new technique is particularly well suited to.

Image: The improved process being developed for the invention ("Planoflex")
Legend:
1: Anilox roller
2: The soft, elastic printing plate surface
3: The medium being printed
4: The back pressure cylinder

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Maintaining the Focus on Maximum Quality at a Minimal Cost

Steinbeis Junior Employee Project aimed at developing competitive multicamera systems

Optical measurement systems used in industry are subject to a variety of requirements. As the image resolutions of industrial cameras improve, the size of chips is increasing, and this in turn is raising people's expectations in terms of the quality of optical output. Another effect is that enhanced optical quality has an immediate impact on technical requirements and this has an influence on prices. As part of a PhD project at Ulm University in Ilmenau, Guido Straube decided to try to develop a system using several low-cost cameras as an alternative to established camera systems. The obvious way to do this and develop his ideas was to work with the experts at the quality assurance and image processing specialist SQB, which is based at the university campus.

Straube set the bar high. The multicamera system he wanted to develop for his project should offer image quality on a par with a single-chip camera system, but it should be cheaper to make and offer significant commercial benefits over established single-unit systems.

To ensure the image resolutions of his new system would be competitive compared to large single-chip cameras, the budding engineer opted to integrate any number of cameras into his system (multicamera solution). The pictures from different cameras would then have to be merged and processed as a single image. What is important with such an approach is how the edges of images from individual cameras overlap – they have to be pieced together. The resolutions of the individual cameras have to be added up, but it still has to be possible to use software to process image overlaps.

Because the individual cameras had to be inexpensive, certain corners had to be cut when it comes to image quality. This is inevitable because cameras in the low cost segment often have fixed-lens systems. To nonetheless match the high resolutions offered by individual cameras, Straube decided to enhance camera output using image processing.

The first step when setting up a camera array is to select the right cameras themselves. The priority at this point is the image resolution offered by individual cameras and the interfaces needed for data transfer and the power supply. "One important factor is that there's no fixed way to pre-process images inside the camera itself. When you process the data, it's good to have access to the raw data provided by the sensors," explains Straube. He decided to use two megapixel board-level cameras for his project and these were given a 3D-printed plastic housing. After selecting the required cameras, the next step was to design a layout for controlling the unit and capturing images. "It's important to find a way to connect several cameras to a computer at the same time so you can adjust settings such as image intensity (gain) and integration times, not just for individual cameras but also for all connected cameras working in unison," highlights Prof. Dr.-Ing. Gerhard Linß, who as the managing director of SQB also supervised the PhD project. It was also important to the SQB to provide the young scientist with backing, also for financial reasons. The money for funding the research was provided by a European social fund through the Thüringen Aufbaubank, and the overall project was co-funded by SQB.

Not only was it important to work out the right settings for the cameras, one key requirement was that all of the shots taken by the cameras could be synchronized. To piece together individual images and not lose any information, distortions had to be resolved for each image supplied by the cameras. "When you get distorted pictures, the scale of images changes as the distance increases from the optical axis. We make a distinction between pincushion and barrel distortion," explains Straube, to put it more graphically. Once the image data has been pieced together, Straube has his image. Ideally there will then be no difference between this image and those supplied by a high-resolution camera. Depending on the application and the corresponding resolution requirements, Straube would like to find a way to extend the camera array and reduce the number of required cameras. Processing and evaluating the large volume of image data involved is a challenge for any software. It takes technology to the boundary of big data.

One thing Straube's sights are firmly fixed on now is the practical application of his research project. His aim is to develop an adaptable system that can be matched to actual usage scenarios and ensure that it is competitive, not just in terms of technological capabilities but also in terms of initial investment. This should make it possible to use his system to take high-definition images of extremely large objects. Possible applications identified by the researchers at the university in Ilmenau include checking car body parts for scratches and quality controls on major components at the end of a production line. The system could also conceivably be extended to include 3D images, and this would expand application options for the solution. To all intents and purposes, the experts seem to be already planning where to take the project next.

Steinbeis Qualitätssicherung und Bildverarbeitung GmbH (SQB)

The focus of the experts at SQB lies in contractual research and development, production, and advisory services in the field of quality management. This involves the development and production of innovative measurement and monitoring systems (typically used in contactless precision measurement and visual inspection), the development of application software, and the provision of independent and universal software components.

The area around the Technical University in Ilmenau is ideal for promoting the transfer of research findings into industry. Not only does the SQB have access to a reliable source of staff and know-how through the university, the campus makes it possible to share the latest insights into recent trends and developments with clients, especially with a bearing on industrial image processing and quality assurance.

SQB expertise has resulted in a variety of successful client projects in the past, plus a string of awards. These include the Steinbeis Foundation Transfer Award – the Löhn Award, which the Steinbeis experts from Ilmenau have now won three times for outstanding contributions to knowledge and technology transfer.

Image left: A two megapixel sensor and lens
Image right: A camera in its 3D-printed housing

Guido Straube, Prof. Dr.-Ing. habil. Gerhard Linß
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The Journey to New Key Enabling Technologies

The SEZ is working as a partner on two EU projects: NUCLEI and KETGATE

Novel kinds of key technologies in the fields of ICT, production, photonics, modern materials, microtechnology, and nanotechnology are important drivers of innovation. Exploiting these new technologies on a multinational level will help safeguard the long-term competitiveness of manufacturing in Europe. Central to this will be knowledge exchange between European research institutions, universities, and trade and industry. Two Interreg CENTRAL EUROPE projects, NUCLEI and KETGATE, which the Steinbeis-Europa-Zentrum (SEZ) is also working on, will help improve access to key technologies, especially for small and medium-sized enterprises as part of open innovation processes.

The term "open innovation" is attributed to Henry Chesbrough, a professor at Berkeley University in California. He coined the term to describe the strategic "opening up" of innovation processes within organizations and making use of processes in the outside world. A distinction is made between three core constituents of open innovation processes: outside-in processes, whereby external knowledge is integrated through external parties; inside-out, where internal knowledge is taken to the outside world to be used there; and a coupled process, which combines outside-in and inside-out through alliances with complementary partners. Applying such processes improves the ability of an organization to innovate, making it possible to introduce market-ready products more quickly and secure competitive advantage.

Key enabling technologies (or KET) are drivers of innovation and fuel ideas of different ways to achieve smart and sustainable economic growth. But there are major differences within Europe in terms of companies' ability to access KET. There are particular problems in central Europe, where there are not enough of the right services or infrastructures – factors that are important to SMEs when accessing new market-ready technologies. The aim of the Steinbeis-Europa-Zentrum in supporting the NUCLEI and KETGATE projects is to help SMEs gain better access to such technology services and thus initiate open innovation processes.

The focus of the NUCLEI project lies in manufacturing. The NUCLEI project focuses on the advanced manufacturing branch. Partner come from different regions in Italy, Austria, Germany, Poland, Slovakia, and the Czech Republic, and comprise research institutions, advanced manufacturing clusters as well as technology transfer centres. Their common goal is to exchange knowledge and forge networks between the different regional contact points in order to pool know-how and line up and implement open innovation projects, especially among small and medium-sized businesses. By means of a collaboration plattform with a number of at least 100 companies from the regions of Emilia-Romagna, Veneto, Upper Austria, Bavaria, Lower Silesia, East Slovakia, and Prague. NUCLEI partners promote transantional innovation services. The initiative will end in December 2018. However, in spring 2018, a series of free seminars in the area of digitisation and Industry 4.0 will be offered to companies, research institutions, and other prospective partners in the field of digital solutions and Industry 4.0. The Steinbeis-Europa-Zentrum is providing support with the planning of internationalization projects and required processes, including training on open innovation.

With KETGATE, an Interreg project for central Europe, the Steinbeis-Europa-Zentrum is acting as a project coordinator. Here too, the idea is to make it easier for SMEs in central Europe to access key technologies,

only in this case the emphasis lies in modern materials, photonics, micro- and nanotechnology for transportation, the food and beverages industry, and healthcare technology. The project kicked off in July 2017 with the support of five economic development and three research institutions from Germany, Italy, Croatia, Poland, Austria, Slovenia, the Czech Republic, and Hungary. These regions are being used as a kind of testing ground. The experts want to gauge the effectiveness of a network of innovation support centers and technology service providers. These should be in a position to help SMEs access suitable applied research institutions even beyond the borders of their own countries.

The support centers are being set up in each of the partner locations to provide SMEs with advice in their native languages on the application options for key enabling technologies. By developing service provision models together, the companies selected to take part in the pilot projects should be enabled to use KET in specific applications, also by working with research and development institutions in other countries. Overall, the aim is to bring 90 central European SMEs on board by August 2020. Also, 15 transnational pilot alliances should be put in place involving different innovation service providers. KETGATE is building on experience gathered by the Steinbeis-Europa-Zentrum while working on the KET Inventory in 2015. This involved pulling together a list of possible suppliers (research and development institutions) on behalf of the European Commission. To ensure SMEs gain access to prototypes, process developments, and test installations across all KET, they will be allowed to use a European database of KET technology centers pulled together by the SEZ.

The Interreg program:
European Territorial Cooperation

The aim of the European Territorial Cooperation (ETC) is to provide a framework for development and cohesion between different European regions as part of transnational, trans-European partnerships. The ETC initiative falls under the Interreg program and promotes

- collaboration in border areas (focus of Interreg A)
- transnational cooperation across different regions (Interreg B)
- interregional collaboration across Europe (Interreg EUROPE).

For Interreg A and B, a variety of collaboration options are open to communities, cities, regional business development organizations, research institutions, and business enterprises in Baden-Wuerttemberg for the Funding Period V (2014-2020):

- For the Interreg V A program, Baden-Wuerttemberg is involved in cross-border projects along the Upper Rhine and in the Alpine Rhine/Lake Constance/High Rhine region.
- For the Interreg V B program, Baden-Wuerttemberg is involved in four transnational alliances: Alpine Rhine, Central Europe, Northwest Europe, and the Danube Region.

The funding provided through Interreg V B is designed to support development in the program regions and is subject to specific conditions and certain requirements in the area of collaboration. For example, setting up transnational alliance projects should help with the sharing of knowledge and experience between regions participating in the project. As a result, these should be better equipped to work together on the implementation of innovative, showcase solutions to specific challenges.

The Steinbeis-Europa-Zentrum is providing advice on the funding options of transnational collaboration, also helping organizations pull together their project ideas, set up transnational partnership networks, and submit project proposals.

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http://www.interreg-central.eu/Content.Node/NUCLEI.html
http://www.interreg-central.eu/Content.Node/KETGATE.html
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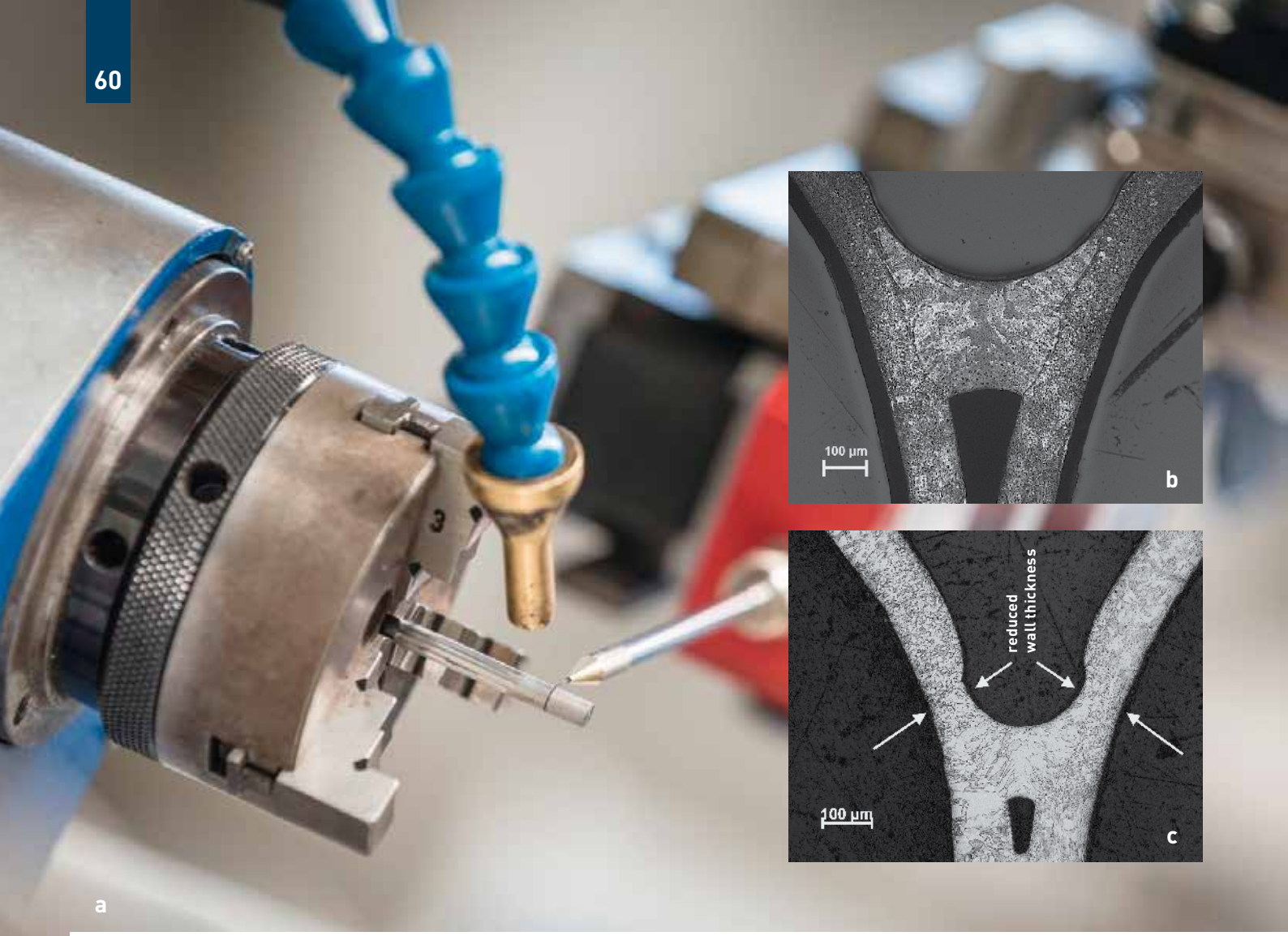

Welded Seams – Small Is Beautiful

Steinbeis experts enhance developments in laser beam microjoining used in medical technology

Demand for laser welding in the manufacture of medical components continues to rise. These are components in sometimes highly complex shapes and sizes, sometimes also with seam contours and these can be subject to extremely tight tolerance requirements. Undertaking a task on something like ultrathin capillary tubes (which sometimes have walls less than 200µm thick and have to be welded onto increasingly complex components) soon becomes impossible using traditional laser welding techniques, especially without additional filler metals. The section thicknesses suffer and the capillary tubes become significantly thinner. It is simply not possible to guarantee that tubes will be joined together as required. This was the starting point for a collaborative project initiated as part of the Central Innovation Program for SMEs (ZIM). The project is called "Laser Beam Microjoining of Cannula Tubes for Medical Products using filler metals." Both of the project partners from Chemnitz – the welding production company STF GmbH and the Joining Technology Steinbeis Innovation Center – are working on new ways to insert wire-shaped materials into a pulsed laser process in order to deliver reproducible welds.

As medical instruments become smaller and smaller, it is becoming more and more challenging to produce the right welds and join materials in new ways. There are also commercial considerations. Not only is important to build on existing joining technology, which can be adapted to meet these new challenges; new methods and techniques also have to be developed. Finally, the project partner needs to keep costs under control.

The experts working on the development project decided to use a wire feeder made by a laser application specialist called L&A. This can be automated and it has an open interface allowing the user to integrate the technology into existing laser systems and processes. The wire feeder makes it possible to feed wires with a diameter of up to 300µm into a component, without affecting the process, so it could be ideal for many other joining applications in the future. The system also includes an adaptable fixation device consisting of two hydraulic clamping arms and an ultra-precise positioning device on three axes. This makes it possible to adjust the inserted wire as required and reproduce configurations to match certain shapes and seam contours. The seam welds are made along thin-walled cannula tubes using stainless steel (type 1.4301) with diameters of between 1.5 and 4.05 millimeters and wall thicknesses of 140 - 200µm.

To work out the different combinations of parameters that will be relevant to this laser beam welding technique, the project team decided to use a special material that is known to be suited to medical technology: QuaLAs QL Med 4430. The experts at the Steinbeis Innovation Center and STF conducted a series of experiments to test how to match the laser beam welding parameters (focus diameter, pulse energy, welding

speed) to processes when the filler material is added. They also determined suitable parameter ranges for inserting the filler material (wire diameter, wire insertion rate, length of protruding wire ends, the angle of attack of the wire, etc.). Further work carried out for the project included a comparison of the properties of welds without the filler material.

After comparing their results with the diameters on the original parts, which had been joined without inserted fillers, it was found that the diameters with additional fillers had a wider join between the cannulas. Accordingly, using wire-shaped fillers made it possible to raise the maximum tensile load of seams by up to 30 percent (maximum possible load without additional filler 1400N; with additional filler 2000N). The experts therefore concluded that welding the parts without additional fillers did indeed result in extremely thin walls on the tubes as a result of the welding process. If there were faults with welded seams using additional fillers, these were generally along the pipe walls because the diameters were too low for the weld. The dimensions of the different elements along the welded joint – where it may not be possible to fill the welding area right up to the point where the two tubes with additional fillers meet – have no negative impact on component strength.

When curved cannulas needed to be welded, a small gap developed during the bending process due to different tolerances. This gap ran between the tubes in the area around the bend and this could be safely connected by using molten filler material. The seam properties were no different to straight welds.

The parameter list provided by the Steinbeis Innovation Center for Joining Technology covers connecting welds with additional fillers for a variety of semi-finished capillary tubes. The list has allowed STF to optimize its existing welding process and extend its systems to cover a wider spectrum of variants. This has of course also allowed the firm to expand its portfolio of medical components. Because the welding process is now also more automated, production has become more efficient and this will help safeguard the competitiveness of the Steinbeis partner into the future.

The Steinbeis Innovation Center for Joining Technology

Services

- Development of joining strategies and connection technologies
- Joining- and process-compatible design of assembly modules
- Characterization of joint features – assessment of join quality
- Process analysis and optimization of joints by measuring significant process indicators

Key areas

- Development of beam technologies for joining different combinations of materials
- Planning of joining concepts for medical technology and precision technology applications
- Validation and expansion of process monitoring and analysis methods
- Validation of diffusion-based joining techniques and integration of manufacturing process chains

This project was delivered as part of the Central Innovation Program for SMEs and was sponsored by the association of industrial research alliances, AiF.

Image left: Experiment design showing (a) a transverse cannula diameter of 4.05mm (section thickness 150µm), (b) welded with supplementary material, and (c) without the supplementary material
Image right: A demonstration unit for a complex component: connecting weld of different cannula diameters and section thicknesses

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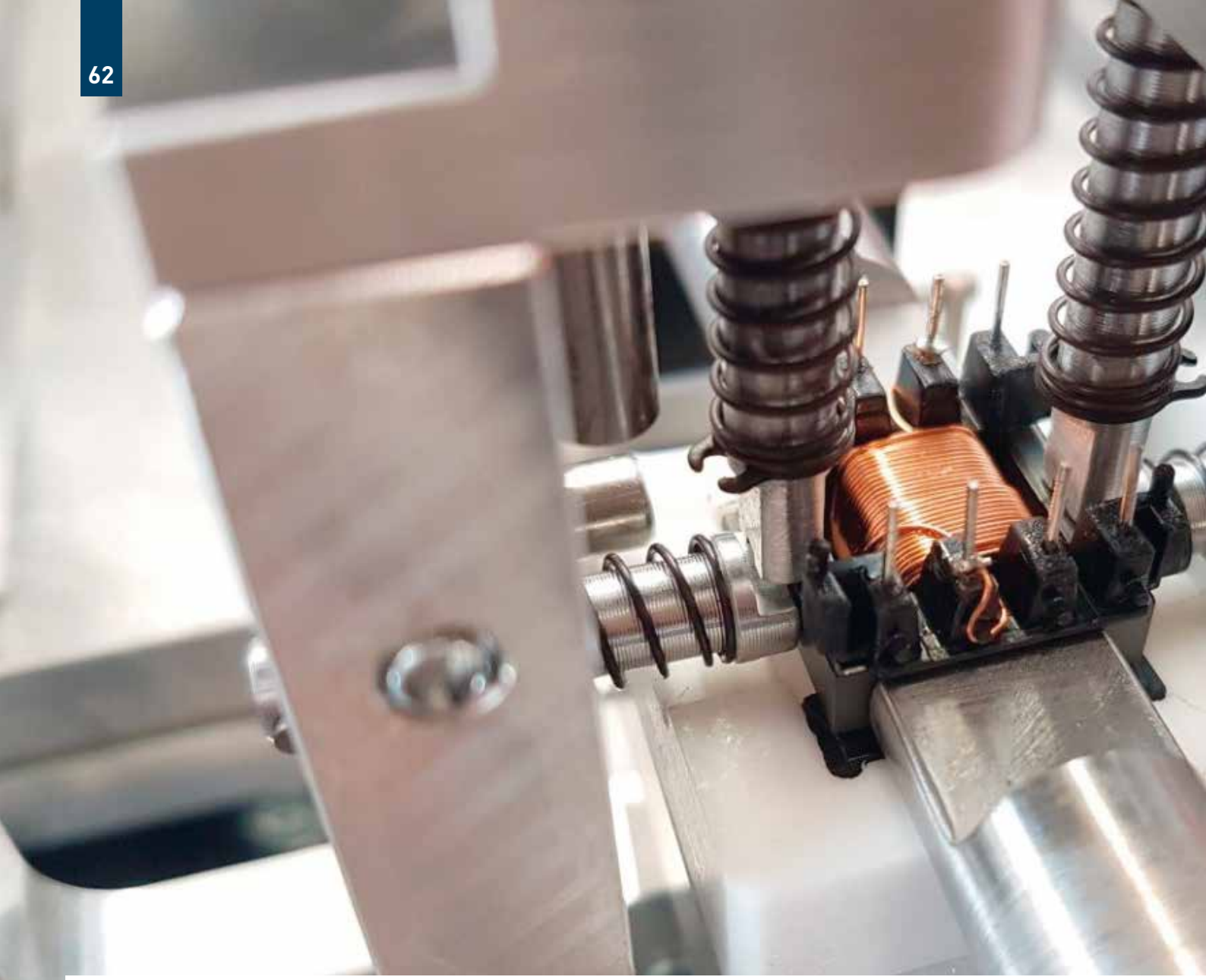

Accurate Assembly

Steinbeis experts develop multiple assembly system for electric coils

Arnold Elektronik GmbH, which specializes in inductive components and is based in Lichtenau in Saxony, enjoys a long history. Founded nearly a century ago, it has continually moved forward as a business, but the high-precision parts it produces still require intensive manual processes. Until now, the coil cores it manufactures have been assembled by hand. Obviously this has drawbacks, especially with small coils, so Arnold decided it was time to do things differently. The firm has been working with the Chemnitz-based Steinbeis Innovation Center for Drive and Handling Technology in Mechanical Engineering. Together, they have developed an assembly system that makes it possible to automate key processes.

Coils mounted onto other systems consist of a wound coil body and two ferrite halves. These are inserted into the coil body and glued together. Once the two halves adhere, they should leave a gap simply filled with air. The angle of alignment of the core halves dictates coil induction. Offsetting angles by just 100th of a millimeter has an influence on whether induction tolerances can be adhered to and whether a coil works. The ultimate mechanical strength of a coil is achieved by bonding covered copper wires in an oven at 150°C. The adhesive surfaces have to be robust and stable at different temperatures.

One thing that is particularly difficult when handling small coils is that it is almost impossible for the operator to avoid touching wetted gluing surfaces. Aligning the core halves takes ultimate concentration and dexterity, since there are only a couple of seconds to apply the glue while inserting the activator. Immediately after joining the parts, an induction device is needed to measure the coil between specification pins. If a coil does not meet measurement requirements, operators may try to force the core halves together by squeezing them in their fingers or rubbing parts together. Alternatively, they may pull the two halves apart again and use another part instead. This means that the joining areas have to cleaned and re-wetted. If the join on a coil is already too tight, it can only be rejected or destroyed, although a coiled core can sometimes be retrieved and used again.

It's compulsory for operators to wear gloves when assembling parts, but it is almost impossible to avoid skin contact, since the two connecting pins are extremely sharp and even if somebody is wearing protective

gloves, one touch is enough to penetrate the surface. As for miniaturized coils, they are practically impossible to handle with gloves on. Handling parts can cause severe injury to fingertips, and skin damage caused by adhesives is a major contributor to sick leave. The process places high demands on the workforce, also because it is strenuous on the eyes. The quality of coils and the number of rejects depends largely on each individual's ability to work quickly and accurately.

All of these limiting factors were motivation enough for the project partners to optimize the assembly process. The assembly system developed by the Steinbeis experts in Chemnitz and Arnold Elektronik now makes it possible to mount a variety of coil cores, starting at a core width of 12 to 25 millimeters. All the system requires is an interchangeable workpiece grip matched to the type of coil.

The operator starts the process by inserting up to ten coils, including ferrite cores, into the assembly unit. There are electromagnets mounted on moving magnet carriers, and these are used to remove coil core halves from the coils and swivel them into a wetting position for adhesive to be applied. Once the glue is applied, the core halves are reinserted into the respective coils for joining. The alignment module ensures that the coil cores, which are difficult to position and have to be precise, are carefully aligned to one another. This is an essential part of reproducing accurate adhesive joins.

The new assembly units are already being used as a substitute for the intricate manual process, which required a huge amount of concentration, dexterity, and speed. The produced parts are reproducible and there are fewer rejects resulting from misaligned cores, primarily because the quality of joins no longer depends on individual operators. Operators working on the components at Arnold will no longer have to wear the special protective gloves, as there will be no more direct skin contact with the adhesive. The new assembly system also saves a significant amount of time; up to ten coil cores can be joined and aligned at the same time. Previously each coil had to be mounted manually one at a time. The multiple assembly system has provided Arnold Elektronik with a state-of-the-art, adaptable workstation that will make a big difference in raising productivity and improving product quality.

The Steinbeis Innovation Center for Drive and Handling Technology in Mechanical Engineering

Services

- Research and development of innovative products, technologies, and production processes
- Development of prototypes
- Transfer of prototypes into serial production
- Consultation on funding options

Image: The alignment module joining core halves

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Getting to the Heart of Digital Maturity

Steinbeis and Pforzheim University analyze the digital maturity of SMEs

The role of manufacturing firms is shifting fundamentally. Until now, everything has revolved around the development, production, and selling of high-quality tangible goods. In the future, customers are going to demand end-to-end solutions to a specific problem – from pure products or products with service add-ons through to pure services . Products will still help satisfy customer needs, but for customers the product will no longer be the main priority. Thus so-called product-service systems (PSS) will have to be set up for companies to safeguard their competitiveness in the future. The Federal Ministry for Economic Affairs and Energy (BMWi) is conducting a research project called Use-PSS as part of an alliance initiative focusing on the promotion of "digital SMEs." The priority will be to develop product-service systems for industry. This will involve establishing an innovative design framework and a methods tool kit for SMEs to create and test their own PSS concepts. To do this, it will be necessary to ensure companies are in a position to analyze the current situation regarding their existing products and services, customer requirements, and their digital business strategy. The experts at Pforzheim University have been working on the project with bwcon, which is spearheading the alliance, conducting evaluations on the digital maturity of SMEs in Baden-Wuerttemberg.

Franziska Blatz, a student at Pforzheim University, has researched the topic for her bachelor degree, also examining the factors that influence the maturity of business enterprises. She has drafted a questionnaire covering six dimensions:

- Strategy and leadership
- Company culture and organization
- IT infrastructure
- Data maturity
- Processes and operations
- Products (post-delivery to the customer)

"We asked a set of further questions in order to shed light on key aspects relating to digital technology for each dimension," explains Blatz. Under the supervision of Prof. Dr. Rebecca Bulander, a questionnaire was designed consisting of 58 questions, each to be answered on a Likert scale (five points) from "Strongly disagree" (0) to "Strongly agree" (4).

To check the questionnaire in a business environment, it was distributed through the bwcon network. In total, 55 companies from Baden-Wuerttemberg participated in the first round of the survey and completed the questionnaire. Explaining the process for the survey, bwcon project ma-

nager Rudolf Mietzner says, "The study examined the digital maturity for each company for all six dimensions which were used to suggest recommended actions."

The project team analyzed the responses and discovered three typical patterns in the answers given by the companies. Type I companies (49%) achieved high scores in certain items of the questionnaire with respect to digitalization . Despite this, they have not overalladdressed issues of one dimension, or even several dimensions regarding digital maturity. Blatz and Mietzner would recommend that these companies consider all aspects of digital transformation for each dimension, working systematically and over the long term.

Type II companies (22%) scored highly on some dimensions (for several connected questions) and are thus advanced in terms of digital transformation. However they scored significantly lower in other dimensions. For example, a company could be at an advanced digital stage within the dimensions of strategy, company culture, and IT infrastructure. Despite this, the business may still need to achieve the same high levels of digital maturity for other dimensions such as processes or products. These companies have already laid a digital foundation for a high digital maturity score . They have the right strategy in place, employees and senior management believe in the potential and importance of digital transformation, and the IT infrastructure is of a relatively high standard. The priority now has to be to use this foundation as a basis for taking digital maturity to the same high levels on the other dimensions.

Companies that answered the survey and were categorized as Type III (18%) are generally at a high level of digital maturity. They scored highly for a variety of questions across a large number of dimensions. There were exceptions for certain aspects which deviated from the high values. The Type III companies now just need to work on these single aspects and keep up in terms of their degree of digital transformation.

The Use-PSS project is funded by the Federal Ministry for Economic Affairs and Energy (BMWi) in order to help SMEs keep up with digital transformation and in doing so, consider usability aspects. Pforzheim University, bwcon and 2 Digital Business, the Steinbeis Innovation Center, and three small/medium-sized companies are working on the project together to develop a best practice model for SMEs to set up their own digital product-service systems.

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Mittelstand-Digital

Image: © iStockphoto.de/AlexRaths

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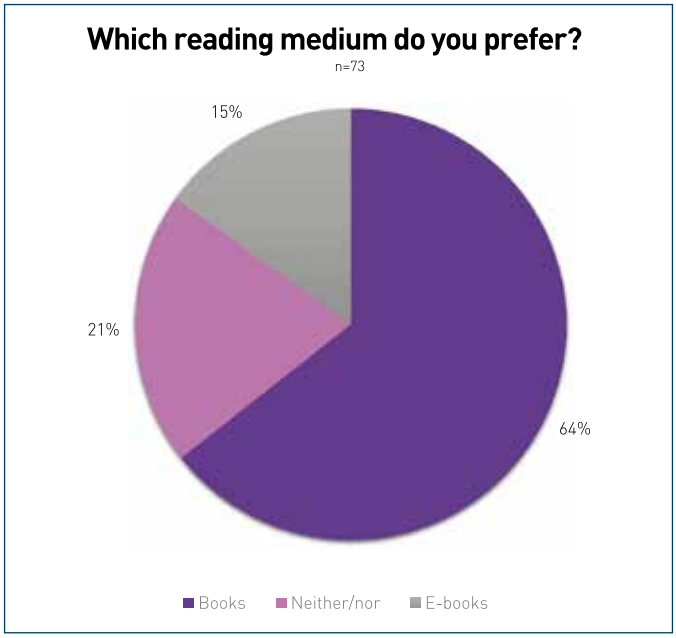
Book or E-Book – Anyone Fancy a Digital Solution?

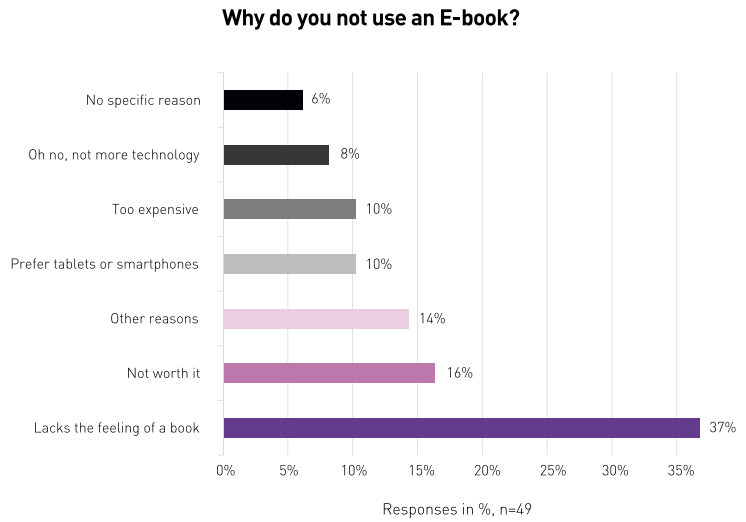
Steinbeis-Edition reader survey takes a closer look at the latest trend

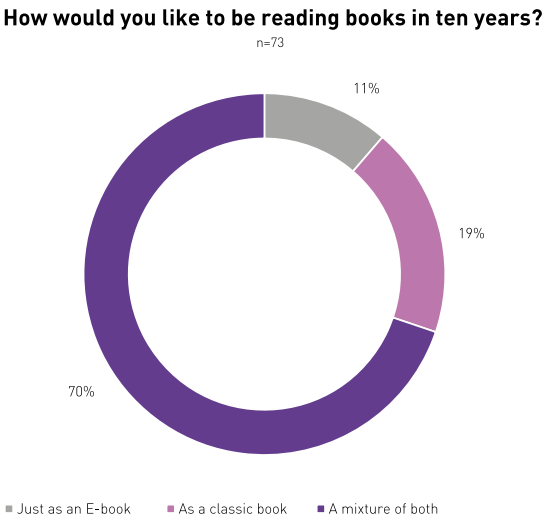
Technical advancement resulting from digital solutions is turning the publishing market on its head and confronting industry with some fundamental questions regarding the future focus of product portfolios. E-books are nothing new anymore, but now, more than ever, publishers still have to ask themselves if they want to go along with the trend. Reading digital content on e-readers has been with us for some time, but is this a good basis for future business for a specialist publishing house? Steinbeis-Edition (STE), the publishing arm of the Steinbeis Foundation, has been supplying readers with material on a broad spectrum of topics for over a decade now. It prints a variety of individual titles and series. The specialist printer has been carrying out a survey in recent months to take a close look at the e-book trend.

It's not easy in the publishing world to work out if it would be worth investing in digital solutions – or not as easy as it may be in other sectors of industry. Are specialist books and non-fiction as comfortable and efficient to read in digital formats, especially compared to tried-and-tested printed and bound publications? Do customers even want to read books on e-readers or tablets, especially specialist content? If digital formats are a viable option, under which circumstances? To find out more, the STE conducted a survey on the media options preferred by readers. Are e-books about to push printed books into the sidelines, or is the centuries-old invention of Gutenberg still a strong contender?

Books hold a special value for many people compared to other everyday objects that can be replaced by digital solutions or modern technology. According to the STE survey, over 60% of respondents prefer classic books to e-books. Why exactly is that? It appears to have something to do with people's emotional connection to books. Over one third of the people who prefer to read a printed book don't want it to stop "feeling like a book." By this they mean the pages they flick through and the smell of printed paper when they open a book.

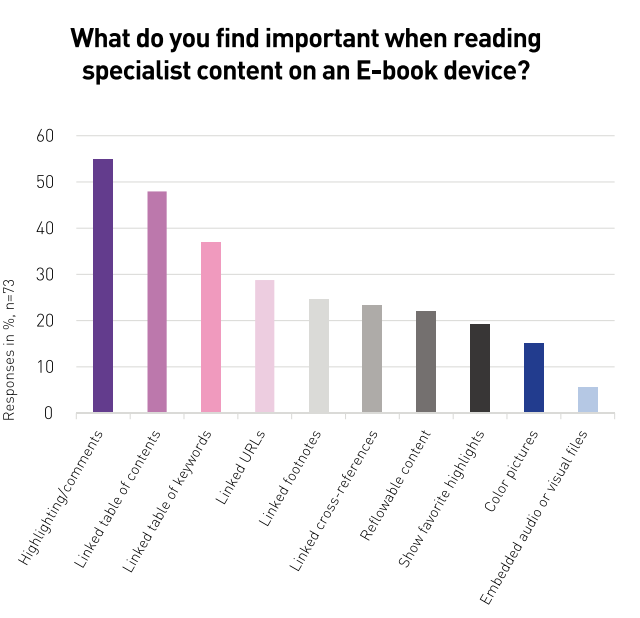






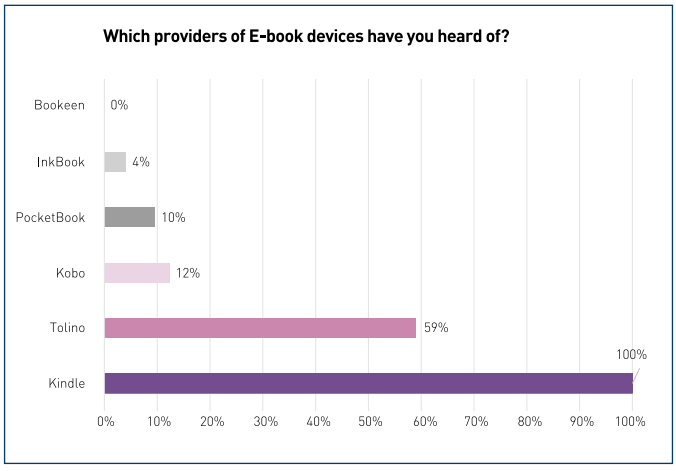
"Classic books shouldn't be lost forever," was the sort of feedback the average respondent gave. So digital transformation is not about to sweep through the publishing market? Well that's not totally the case. Although the majority of respondents still feel attached to the printed alternative and would not want to do without it in the years to come, over 40 percent knew the future belongs to e-books.

So the question is, under which circumstances would an STE specialist book be read on an e-book device? The user requirements are multifaceted, but they mainly relate to practical aspects such as editing and additional functions. Users want editing options for highlighting, commenting, or linking passages, URLs and content tables, sorting functions, printing choices, and ways to share content. How this would work in technical terms is not something people could say. Even if everyone seems to have heard of the Amazon Kindle, half of the respondents said they knew none of the common e-book file formats at the moment. Many have never heard of Mobi, ePub, or AZW.



According to the survey, reading specialist books on e-readers may not be the most important trend at the moment, but 41 percent of respondents could still imagine using them in the future, especially if the reading experience is right and they could improve reading efficiency because of certain editing functions.

This provides the STE with a good basis for publishing e-books in the future by reacting more specifically to the expectations and requirements of certain customers. This will also pave the way for more successful digital solutions.



All images: Steinbeis-Edition

All of the survey results can be browsed by going to www.steinbeis.de/su/1371 and clicking the dropdown Steinbeis Media tab.

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IndInnovation – Innovation Management for Indian SMEs

Steinbeis experts and CEFE promote the interests of innovation initiatives for SMEs in India

India is a fascinating country on a number of levels, due to its amazing culture, the strongly growing economy, and the entrepreneurial spirit of its people. But at the same time, the subcontinent also has to deal with a number of social upheavals. The country is considered highly competitive and in some sectors of industry, it is innovative. For many SMEs, innovation, research, and development are simply not on the radar as relevant topics. As part of a program called Promoting Innovation in SMEs launched in 2016 by the German Society for International Cooperation (GIZ) Steinbeis experts from Germany and India, as well as CEFE International (Cologne) provided successful support to SMEs in India.

The IndInnovation project worked on two levels. First, the project team developed a training program for SMEs with plenty of case studies, and courses were run for a number of SMEs. Second, the experts developed a training program along similar lines for so-called intermediaries – chambers of commerce, technology parks, incubators, transfer offices, business support organizations, and other network multipliers.

The training program was based on a fairly innovative approach for India broken down into three phases. During Phase 1, both programs offered a 5-day training module based on case studies for SMEs and intermediaries to discover more about the topics of innovation, technology, product development, and process development. There were differences in the emphasis of content with made-to-measure instruction both for the SMEs and the intermediaries.

Based on the content of Phase 1, during Phase 2 the course participants were offered intensive mentoring – a novel concept in the Indian market. This allowed Steinbeis and CEFE to provide further support to individual innovation projects within the SMEs and intermediaries. During Phase 3, participants on the program were asked to present the current status of their innovation projects at a "finishing school."

The SMEs on the program were particularly open in presenting their innovation concepts to the other participants, sometimes even revealing prototypes developed during Phase 2. The Indian project partners had not anticipated this at the beginning of the project and were positively surprised by the outcome. In reality, the company owners were extremely honest and open and this is an important prerequisite for promoting technology transfer even more intensively in the future.

To ensure that the program developed and run by Steinbeis and CEFE could be organized on a local level from the outset, the project partners also asked four leading Indian business schools to become involved. These were allowed to take the training manuals and the three-phase process, and the plan is for them now to offer and run the program in the Indian market and thus safeguard the long-term survival of the project. Another important aspect of the project was to provide Indian business school lecturers with instruction on the special method of adult education called experiential learning. The fact that the program has met the expectations of the SMEs and provided an initial stepping stone into innovation processes is underscored by the large number of queries from industry received by the experts at Steinbeis India. People are asking for support with their own innovation processes. Also, a partnership agreement has now been signed with a further Indian management institute. Again, the aim will be to promote technology transfer through this university into local industry.

Image: © iStockphoto.de/Radiokukka

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Turning the Spotlight on the Feasibility of Autonomous Production Processes

Steinbeis convention in Karlsruhe examines the challenges of digital transformation in SME production processes

Autonomous production and digital factories – key issues revolving around Industry 4.0 that caused pearls of sweat to run down people's foreheads in the early years ... at the prospect of empty production halls with not a soul in sight. With so many companies finding their order books full in recent years, there has also been an increasing tendency among SMEs to be cautiously reluctant about digital transformation. Another reason for Steinbeis experts to tackle the topic at the next Industry 4.0 at SMEs conference. The event will take place for the third time on March 1, 2018 in the Steinbeis House on the campus of Karlsruhe University of Applied Sciences.

Shedding light on issues from an SME angle should make it easier for such companies to make a sensible start with digital transformation in production. The 2018 convention will mainly look at the topic of digital solutions in production, posing questions such as:

- What business models do SMEs need to be part of the digital technology vision?
- What can SMEs do to automate processes that are causing problems in the factory?
- What's the best way to manage the leap from Industry 2.0 to 4.0 and keep people on board?

Business leaders at the event will discuss model-based forecasting methods for managing data complexity, maturity models adapted to the needs of SMEs for ascertaining how far they have come with digital solutions, and people's experiences with digital transformation. The glass lab at the university in Karlsruhe allows people at the convention to practically look over the shoulder of cyber-physical production systems in operation.

To register for the event, go to https://industrie40inkmu.de. The results of the convention will be issued in a proceedings document.

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Award for Innovation and Quality

Call for entries to the 2018 Baden-Wuerttemberg Competence Award for Innovation and Quality

For industry in Baden-Wuerttemberg to develop competitive skills of a global standard, two factors are important: a particular ability to innovate among business enterprises and high quality expectations. The Baden-Wuerttemberg Competence Award honors outstanding contributions and achievements and encourages companies to innovate more and exploit their full potential to deliver quality. The prize, which will be awarded for the eleventh time in 2018, stems from an initiative started by P. E. Schall GmbH & Co. KG and the TQU GROUP, an enterprise from the Steinbeis Network.

The competence prize is awarded annually at Control, the international quality assurance trade show in Stuttgart. The prize is awarded under the patronage of Steinbeis. The next award ceremony will take place on April 24, 2018 and companies and organizations based in Baden-Wuerttemberg are invited to apply for the award by February 10, 2018. Eligibility for the prize is subject to strict requirements, and a strong entrepreneurial drive and innovative spirit alone will not be sufficient. Ever since it was introduced in 2008, the aim has been more about rewarding companies that bridge the gap between innovation and quality, integrating this into their everyday business, and demonstrably leveraging their efforts with a positive outcome.

KOMPETENZPREIS
BADEN-WÜRTTEMBERG

For further information on the competence prize go to www.kompetenzpreis-bw.de.

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Planning and Monitoring Systems in the Context of Company Management at Small and Medium-Sized Enterprises

Tim Fritzenschaft

2017 | paperback, b&w | 391 pages, German
ISBN 978-3-95663-148-1

About the author

Tim Fritzenschaft studied Business Administration and Company Management (M.A.) at Heilbronn University as well as International Business Management (M.Sc.) at the University of West London. He earned a PhD at Steinbeis University Berlin in 2017.

Buying Incentives of Business Enterprises Aimed at Attracting and Retaining Committed Managers in Generation Y

Christoph A. Geisler

2017 | paperback, b&w | 261 pages, German
ISBN 978-3-95663-149-8

About the author

Christoph A. Geisler studied Computer Science, Business Administration, and General Management (MBA), and between 2011 and 2015 he was the program director at the Steinbeis Transfer Institute Organization and Management. Since 2009 he has been board chairman at an international group of companies working in the field of digital solutions in business, research, and society. His scientific interests lie in the interdisciplinary field between computer science, the arts, and business. He earned a PhD at Steinbeis University Berlin in 2017.

Steinbeis Entrepreneur Forum

Networking forum for SMEs | 2017 proceedings
Steinbeis Foundation (ed.)

2017 | paperback, b&w | 37 pages, German
ISBN 978-3-95663-151-1

About the event

The fifth Steinbeis Entrepreneur Forum looked at topics revolving around the development of digital business processes. The event was based on two parallel talks in which presenters examined a topic from different perspectives: one Steinbeis expert examined the fundamentals of an issue from a theoretical standpoint, immediately followed by a Steinbeis expert who looked at the same topic from a business perspective.
The proceedings documentation contains a summary of the talks given at the event, which looked at the topic of the development of digital business processes from different angles.

FINETHIKON Volume 4 – Finance and Organizational Ethics Yearbook

Frank Zschaler, Jens Kleine, Sabine Meck, Christoph Weber-Berg, Bernd Dennemarck (eds.)

2017 | paperback, color | 121 pages, German
ISBN 978-3-95663-144-3

About the series

The Finethikon yearbooks contain a series of English and German papers documenting the proceedings of different financial ethics conventions. The publications also include other valuable statements that the editors consider important with respect to financial and business ethics. The series also looks at ethical discussions taking place in other areas. The Finethikon series is published in collaboration with the Steinbeis Transfer Institute for Personality Research and Ethics.

Situative Application of Sales Forecasting Techniques

Alexander Ritzel

2017 | paperback, b&w | 367 pages, German
ISBN 978-3-95663-155-9

About the author

Alexander Ritzel studied Business Administration and Company Management (M.A.) at Heilbronn University as well as International Business Management (M.Sc.) at the University of West London. He was then appointed as a scientific assistant at the professorial chair for consumer and B2B marketing under Prof. Dr. Rainer Schnauffer at Heilbronn University. He earned a PhD at Steinbeis University Berlin in 2017.

The Future and Relaunch of University Lecturing

Bernd Jörs

2017 | paperback, b&w | 173 pages, German
ISBN 978-3-95663-145-0

About the author

Prof. Dr. rer. nat. Bernd Jörs studied Industrial Management and gained a PhD in 1982 at Goethe University Frankfurt. Since 1987, Jörs has worked at a variety of universities and since 2000 he has been a professor for Information Economy and Online Marketing Engineering at Darmstadt University of Applied Sciences. In 2016, Jörs was named Professor of the Year in the category of arts, social, and cultural science, with an emphasis on Information Economics and Online Marketing Engineering. Jörs has been heading up the Steinbeis Transfer Center for Online Marketing Engineering & Business Analytics since 2017.

Suggestion Through Language – A Bold Opportunity

Daniel Schmid

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About the author

Daniel Schmid has been the full-time chair of the management board at Raiffeisenbank Bern since 2003 and is also a commercial judge in the Bern Canton High Court. Schmid has a master of advanced studies in Management Accounting from the Zurich University of applied sciences HWZ and is a graduate of the Swiss Banking School. He also attended the University of Freiburg, where he received training as a mediator, also gaining a master of arts in Mediation and Conflict Management at European University Viadriana. Schmid has been project manager at the Steinbeis Transfer Center for Human Resources Management and Corporate Communications since 2017.

Aligning the resilience-related research efforts in the EU-DRS projects

Aleksandar Jovanovic, Emanuele Bellini (eds.)

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ISBN 978-3-95663-143-6

About the event

The joint DRS-7 and 14 Projects workshop was organized to coincide with a meeting of the community of users on September 12, 2017. The main topic of the workshop was simple: new methods for assessing resilience and management methods; the development of new guidelines and tools as part of a variety of live EU projects. This summary of the workshop was written with the support of the European Virtual Institute for Integrated Risk Management (EU-VRi), a Steinbeis Enterprise.

Systemic Thinking – The Solutions of Today Are the Problems of Tomorrow.

Gernot Barth, Bernhard Böhm (eds.)

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About the editors

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

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