TRANSFER

THE STEINBEIS MAGAZINE **03|19**

BUSINESS DEVELOPMENT

Steinbeis

STEINBEIS: A PLATFORM FOR SUCCESS

The platform provided by Steinbeis makes us a reliable partner for company startups and projects. We provide support to people and organizations, not only in science and academia, but also in business. Our aim is to leverage the know-how derived from research, development, consulting, and training projects and to transfer this knowledge into application – with a clear focus on entrepreneurial practice.

Our platform has now resulted in the foundation of more than

2,000 ENTERPRISES.

The result is a network spanning more than **6,000 EXPERTS** in approximately **1,100 BUSINESS ENTERPRISES** – working on more than **10,000 CLIENT PROJECTS** every year.

Our network provides professional support to enterprises and employees in acquiring competence, thus securing success in the face of competition.

And our network continues to expand. To find out more about recently founded Steinbeis enterprises and who to contact, go to

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DEAR READERS,

These are times of transformation, amid major challenges posed by climate change, a shift toward sustainability, digital transformation, globalization, biological transformation, changes in modern travel options ("mobility"), changing logistics, changes in the future of work, even changes in how we organize our work – all backdropped by a need to preserve peace, freedom, and democracy. These are gargantuan challenges, and they place tremendous pressure on society and businesses to change and shape the future themselves. The solution to all this can be summarized in three words: Innovation. Innovation. Innovation!

And it's disruptive and radical innovation we need most – not the usual incremental innovation. To cope with these challenges, make companies future-proof, and allow for continued expansion, we need much more in the way of innovation. Let's remind ourselves: An innovation is only complete when a great idea becomes a reality and adds value.

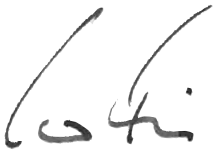
And for this to happen, we need people in society and at companies with personalities to set innovations in motion and implement them – in open-ended, fast-moving situations, taking all circumstances into account, in such a way that we shape the future ourselves – sensibly, responsibly, still ensuring that the maximum possible degree of value is added.

With master programs for junior executives in particular, our Steinbeis-University – where students carry out innovation projects for their partner companies – paired with transfer services from science to the entrepreneurial world reality, the Steinbeis Foundation makes a valuable contribution to shaping a sustainable future of the companies.

"WHO INNOVATES TODAY, HAS A FUTURE. WHO WAITS FOR THE FUTURE TO INNOVATE HAS NOT MUCH TIME LEFT."

I wish you every success in shaping the future, and inspiration in the here and now when reading this edition of TRANSFER magazine.

With kind regards,



PROF. DR. WERNER G. FAIX
werner.faix@stw.de

Prof. Dr. Werner G. Faix is director of the School of International Business and Entrepreneurship (SIBE) at Steinbeis University and deacon of the faculty of Leadership and Management at Steinbeis University.

www.steinbeis.de/su/1249
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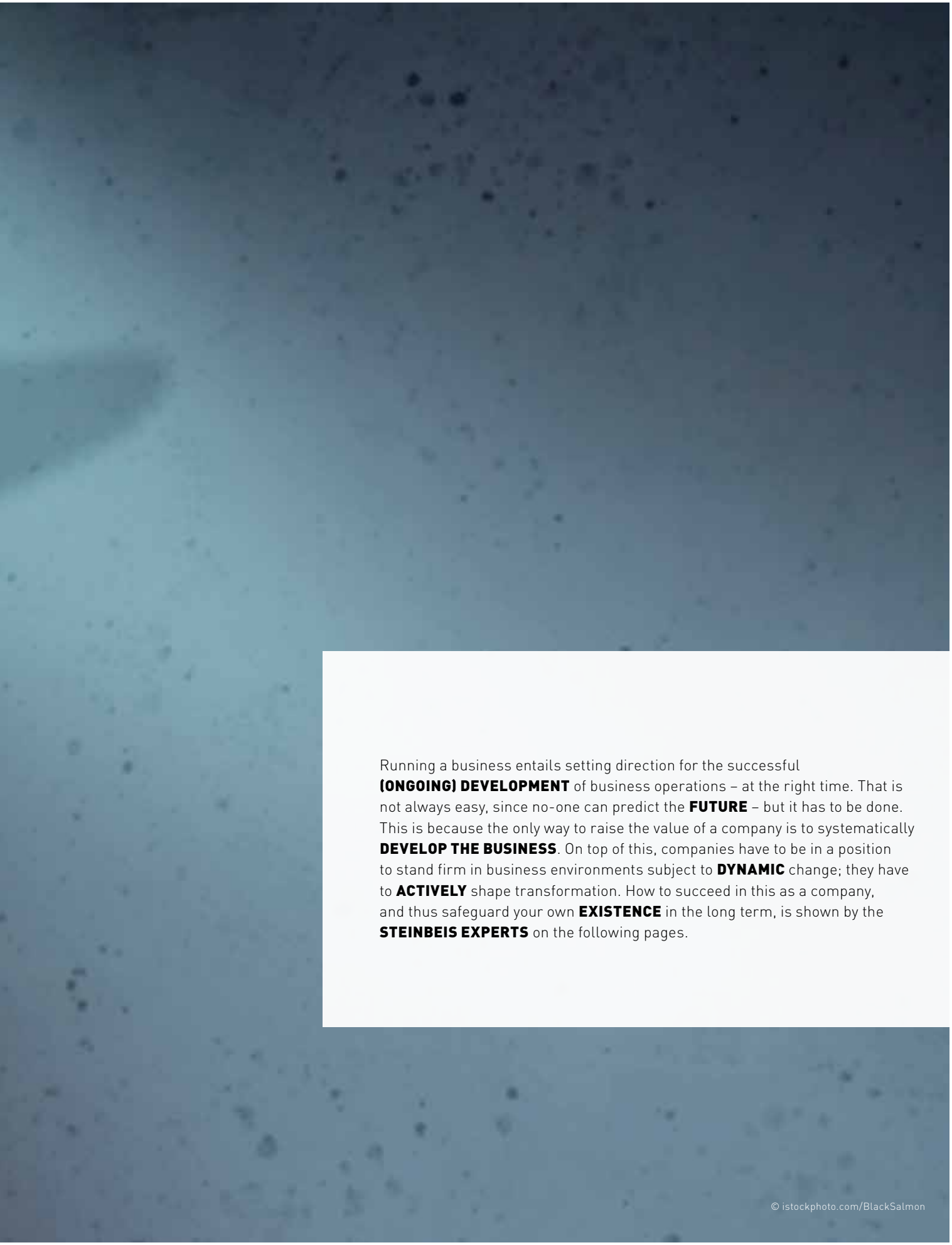
CROSS-SECTION

BUSINESS DEVELOPMENT



Running a business entails setting direction for the successful **(ONGOING) DEVELOPMENT** of business operations – at the right time. That is not always easy, since no-one can predict the **FUTURE** – but it has to be done. This is because the only way to raise the value of a company is to systematically **DEVELOP THE BUSINESS**. On top of this, companies have to be in a position to stand firm in business environments subject to **DYNAMIC** change; they have to **ACTIVELY** shape transformation. How to succeed in this as a company, and thus safeguard your own **EXISTENCE** in the long term, is shown by the **STEINBEIS EXPERTS** on the following pages.

ACADEMIC BUSINESS FOUNDERS BECOME INNOVATION CHAMPIONS

STEINBEIS STUDY IN COLLABORATION WITH THE UNIVERSITY OF KIEL ANALYZES HOW SPIN-OFFS SURVIVE IN THE MARKET

As entrepreneurially oriented offshoots of science, academic spin-offs do not have it easy. They often lack resources and contacts to important partners, or their business models lack definition. What can be done to enhance their chances of survival in the market? This was the question posed and assessed as part of a Steinbeis Network study conducted by Prof. Dr. habil. Achim Walter, director of the Steinbeis Consulting Center COMMIT and Chair of Entrepreneurship and Innovation Management at Kiel University, with Monika Sienknecht, scientific assistant at the professorial chair.

Academic newcomers often meet with skepticism in trade and industry, despite numerous, often impressive examples of smart, entrepreneurially minded thinkers from universities and non-university research institutions giving German technology and business an important hand in keeping pace with the rest of the world. As rookies in their markets, new business enterprises often lack certain resources and can only point to tenuous contacts to important partners for networking – such as customers, suppliers, providers of funding, and staff. And yet it is precisely these people who play such a crucial role in accessing the resources they need to survive. The literature on entrepreneurship points to a phenomenon called Liability of Newness (Stinchcomb, 1965; Hannan & Freeman, 1984).

Even if the starting conditions of knowledge- or technology-based spin-offs are good for doing initial business – perhaps because of public funding, favorable licensing arrangements through the parent organization, tangible or financial assets, lead users, technology centers or startup hubs acting as incubators, or even personal contacts in industry – that is no guarantee that a startup will survive, even after a successful entry to the market. The phenomenon paraphrased in other literature as Liability of Adolescence (cf. Brüderl & Schüssler, 1990) states that the probability of a firm surviving once it has been set up dips at first and only rises again as business gets underway. Any advantages gained by possessing plentiful resources are quickly exhausted if the business model is vague. Other contributing factors include poor work planning, management structures, and working routines, or badly defined target groups for building a reputation in the chosen sector of industry. Such obstacles can cause a "delayed" breakdown with companies that are still "adolescent."

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So what improves the survival chances of a technology- or knowledge-based spin-off? And what can firms do to ensure they gain a foothold in markets given the aforementioned Liability of Newness and Liability of Adolescence? To find an answer to these questions, Achim Walter and Monika Sienknecht turned to the Upper Echelon Theory (cf. Hambrick & Mason, 1984) and work on Innovation Championing (such as Balven et al. 2018; Walter et al. 2011). According to the Upper Echelon theory, managers base decisions regarding the choices they make (such as implementing product innovations, acquisition, capital injections, and launching new production technologies) on their own specific experience, attitudes, and value systems. "We suspect that because of the experience they gain through collaborative research and development projects, academic business founders from universities and other research institutions are in a position to acquire or build on the specific kinds of competences that work in favor of the special behavior displayed by innovation champions," says Walter.

INNOVATION CHAMPIONING

Innovation champions are people who pick up on ideas for new kinds of products at a company and inject them with life. At spin-offs of research institutions and universities, this role is often assumed by entrepreneurially minded (former) scientists who have already played an instrumental role within a parent organization in transferring a technology into practice and translating it into a commercial concept. Through innovation championing, academic business founders also make an important contribution to the strategic development of a spin-off by identifying critical resources for an innovation initiative, being the first to instill trust by engaging in pilot projects, and thus not only mobilizing the required resources at external partners (such as clients, suppliers, or economic development agencies), but also setting priorities when it comes to using these resources. Innovation championing means actively getting involved in and getting enthusiastic about an innovation project from the very beginning and driving implementation despite resistance. Innovation champions are prepared to take certain chances and are even willing to risk their reputation for a good cause. They therefore make a valuable contribution by identifying and entering niche markets, acquiring and building development skills at their company, and planning strategic areas of action (for example, by forging strategic alliances). Another thing innovation champions do is to act as a role model and shape social workplace interactions around them through their conspicuous behavior.

ACADEMIC ENTREPRENEURS IN THE STEINBEIS NETWORK: RESULTS OF THE STUDY

Data was analyzed as part of a broad-reaching study on academic entrepreneurs in the Steinbeis Network. Around 150 Steinbeis Enterprises were assessed and a comparison was made between the innovation championing of their founders and the survival rates of spin-offs. On average, the companies that were surveyed were in their fifth year, had six employees, and were mainly involved in mechanical engineering (51%), biotechnology (44%), and electrical engineering (22%) (multiple-choice answers). Roughly three quarters of the spin-offs were still actively involved in business pursuits after ten years. "The results show that all else being equal, companies whose founders assume the role of a champion are 6% more likely to remain active in the market," concludes Monika Sienknecht. A key factor in the impact of innovation championing is also how well networked a person is. Relationships with the parent organization that the academic founder once carried out (or is still carrying out) research or teaching with, and is still working with directly, also have an impact on the effectiveness of championing. For example, effective championing doubles the likelihood of a firm remaining in the market if founders are also still in close contact with their universities or research organizations.

When it comes to successful regional development and reciprocal gains, universities and other research institutions would do well to stand by and promote their employees when they are implementing science-based innovation concepts. Academic entrepreneurs then find it much easier to build trust and commitment among internal and external innovation partners by acting as innovation champions.

"BUSINESS FOUNDERS ARE SPECIAL KINDS OF PEOPLE"

AN INTERVIEW WITH PROF. DR. HABIL. ACHIM WALTER AND MONIKA SIENKNECHT

In your article, you talk about some of the stumbling blocks encountered by academic spin-offs. What's the likelihood of spin-offs from universities and other research institutions surviving in the long term?

Achim Walter:
It's difficult to draw comparisons between empirical studies in this area. Generally, the ascertained survival rates are surprisingly high compared to conventional business startups. I estimate that at least half of them make it. This also strongly depends on the sector of industry and the financial commitments involved in implementing a technology. But international studies and our own investigations do confirm that there's a high survival rate for academic spin-offs: Over a ten-year period, it hovers at roughly 70%.

Monika Sienknecht:
Also, there is a lot of heterogeneity among business startups. For example, compared to corporate spin-offs, which are founded by business enterprises, academic spin-offs are a little less likely to survive. This is partly to do with the different networks of relationships with the parent organizations, which corporate spin-offs are practically "born into." This makes it all the more important for academic spin-offs to stay in permanent contact with their parent organizations.

So the chances of academic spin-offs surviving in a market are basically not bad?

Walter:
That's right, although you have to take into account the fact that it's fairly common for research-based spin-offs to get help through funding when they start out. Most spin-offs are also set up after plenty of good thought has been put into them – so not out of some kind of hardship, but based on a carefully thought-through, positive assessment of a market. Academic founders have lots of places to turn to for advice or support, and this prepares would-be entrepreneurs well for their self-employment. If it looks like they won't succeed, they're advised not to do it and won't receive backing. This consultation process goes through multiple stages with a focus on understanding your own strengths and weaknesses, and it often results in a clear understanding of one's own position before establishing a startup – so that avoids disappointment at a later stage.

Sienknecht:
You also have to think about the fact that academic spin-offs are often genuine experts in their field – they consciously occupy niche markets based on an exploratory approach. This positioning allows them to ward off excessive competition from established companies.

In your study, you refer to a theory that places tremendous emphasis on the importance of decisions made by so-called key individuals when it comes to the survival of a company, such as business founders and CEOs. To what extent can academic founders influence whether their business will remain strong in the long term?

Walter:
Business founders are special kinds of people. They shape their company through their behavior and their strategic focus, so they leave behind a kind of footprint that can take years to develop. At the beginning, entrepreneurs provide pointers for corporate development which trickle down more and more into working practices, which are then taken on by staff and handed on.

But why do some academic entrepreneurs become innovation champions while others don't?

Walter:
I'd estimate that we find the particular characteristics of an innovation champion in about a third of people that could potentially become one. The most pronounced characteristics of innovation champions are definitely a combination of a drive to achieve something, thinking in terms of feasibility, and a distinct sense of being able to manage themselves. So these aren't the sort of behav-

iors you can expect anyone to display, even if they can be captured formally in a job description or position request.

Are there any insights from research into the things that really make an academic entrepreneur?

Sienknecht:
Insights gained until now indicate that academic business founders are likely to be shaped by people in their social environment – people they are exposed to in the so-called orientation phase. Such orientation phases include preparation stages for their new profession. For example, we already know that the entrepreneurial leaning of PhD and post-PhD students is significantly shaped by key individuals.

What does this tell us about the selection and training of would-be academic entrepreneurs?

Sienknecht:
It's quite common for scientists with a penchant for entrepreneurial thinking to start "talking up" technology transfer even while they're working at a research institution or university. Would-be academic founders can be identified by this kind of behavior and fostered through specific training.

Walter:
If politicians want more academic entrepreneurship at universities and non-university research institutions, we think they should put funds into deliberately acquiring the personal competences that characterize innovation champions.

PROF. DR. HABIL. ACHIM WALTER
achim.walter@stw.de (author)

Director
Steinbeis Consulting Center COMMIT (Kiel)

www.steinbeis.de/su/1082

MONIKA SIENKNECHT
m.sienknecht@bwl.uni-kiel.de (author)

Scientific assistant
Professorial Chair of Entrepreneurship and Innovation Management, Kiel University (Kiel)

www.gruendung.bwl.uni-kiel.de

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LET'S ACTIVELY SHAPE CHANGE TOGETHER!

STEINBEIS EXPERTS FROM PFORZHEIM TURN THE SPOTLIGHT ON CHANGE, PEOPLE, AND SUSTAINABLE TARGET-SETTING

Participants at the Young Founders pitch in Leipzig in 2018 with German Federal President Frank-Walter Steinmeier and his wife, Elke Büdenbender (© Jugend gründet)

Business is going well. The numbers look good. So who needs business development? The answer sounds simple: So the company can adapt and develop according to market requirements. But what's the best way to achieve that? And what can firms do to successfully shape transformation themselves? These where the questions examined by Prof. Dr. Elke Theobald and Prof. Dr. Barbara Burkhardt-Reich, directors of the Steinbeis Enterprises for Business Development at the University of Pforzheim.

The experts at the two Steinbeis Enterprises posed three hypotheses, which were used as a point of orientation for implementing their projects.

- Changes dictate everyday work and success at a business enterprise: If you fail to move forward, you fall behind compared to the competition. Stand still and at some point the company at the rear of the field overtakes you.
- The success of a company depends on every individual worker. People are the key success factors of a company and are thus central to the success of the business during every phase of company development. People also dictate whether entrepreneurial spirit, required for a business to develop, can be unfurled within the company.
- We can shape the future: If you want to shape the future and see a company develop positively, you need long-term, sustainable goals. But individuals have a limited influence on shaping the future. Which is why it's all the more important to understand where, when, and in what way it really is possible to leave one's mark – both on society and in terms of business success.

These concepts form the basis of the work carried out by these two Steinbeis Enterprises and their approach toward sustainable business development in fostering up-and-coming talent (entrepreneurship education), analyzing markets and the competition (management monitor), and developing the world of work and corporate cultures to embrace more diversity within modern companies (women's careers).

Minister of Finance and Economics Dr. Nicole Hoffmeister-Kraut meeting high school students from Albertus Magnus High School in Stuttgart (© Sascha Baumann/all4foto)

ENTREPRENEURSHIP EDUCATION

The intention of the entrepreneurship education projects offered by the Steinbeis experts is to foster an understanding among adolescents for the topics of entrepreneurship, innovation, and business startups. A nationwide project and a state-level project involving high-school students are flagship examples of this. "We're designing and organizing an online idea, business plan, and business simulation contest across the whole of Germany as part of the 'Young Founders' initiative. It's combined with a freely accessible, free education platform. The contest has been backed by the German Federal Ministry of Education and Research since 2003 and is recommended by the assembly of ministers of education of the German states," explains Barbara Burkhardt-Reich. The Young Founders initiative allows young people to discover how they can become active influencers in our society themselves. Over the period of half a school year, they are invited to come up with new and innovative solutions to the challenges of modern times and the world of tomorrow. The first stage is less about actually implementing their ideas and more about expanding horizons. Students are encouraged to conduct research, with no holds barred, and then structure and formulate their results with a specific goal in mind, in keeping with a business plan template. The second stage of the online program consists of a business simulation that allows participants to gain a sense of what it is like to be an entrepreneur. It spans eight phases of commerce, during which the students have to launch their startups in the face of competition and set up a sustainable, successful, and socially responsible company. This is because the only way to create something tangible out of a creative idea or fun innovation is to merge strategic thinking and planning skills. At the end of the journey, numerous prizes are up for grabs, all of which aim to help the young competitors continue developing their ideas. The winning team is invited to a guided tour of Silicon Valley, including exclusive peeks behind the glamorous scenes of the local startup scene. Young Founders promotes teamwork and provides insights into the networks formed by key business stakeholders, sensitizing people to the interdependencies and impacts of entrepreneurial decisions, and motivating them to think in agile terms, research things independently, and work up creative ideas. So in a nutshell, the competition trains students in entrepreneurial soft skills.

Similar objectives, only with a significantly shorter schedule and with a focus on Baden-Wuerttemberg, are being pursued by the Baden-Wuerttemberg Ministry of Economic Affairs, Labor, and Housing, which is sponsoring a project called Start-up BW Young Talents. The initiative comprises two independent modules offered through the public school system and organized by the Steinbeis experts in Pforzheim. The first, Start-up BW@School, invites young entrepreneurs to the classroom to offer students the chance to hear about the world of startups at first hand. Then there is an Innovation Workshop & Pitch initiative to allow high school students to soak up the startup culture at a one-day workshop. The students are guided by the Steinbeis experts through the first phases of a company startup, from identifying ideas using creative techniques to a pitch in front of an external jury against an educational backdrop. The winners of the school pitch then have the opportunity to take part in the Start-up BW Young Talents initiative.

CAREERS PORTAL AND THE SPITZENFRAUEN-BW COMMUNITY FOR WOMEN AT THE TOP

Women are still unrepresented in senior management. Some journalists even talk about a "rollback" in equality. "We're absolutely convinced that diversity can be a success factor for companies, which is why we've taken on the topic of women's careers," says Elke Theobald. Since 2011, the Baden-Wuerttemberg Ministry of Economic Affairs, Labor, and Housing has been channeling funds from the European Social Fund and the state of Baden-Wuerttemberg into a project called Women's Careers in Baden-Wuerttemberg Companies (shortened to Spitzenfrauen-BW).

The job of Elke Theobald and Barbara Burkhardt-Reich and their team is to set the agenda and organize activities for the project. The overarching aim of the project is to boost the share of women in management positions at Baden-Wuerttemberg companies by leveraging the www.spitzenfrauen-bw.de website as a central forum for women seeking to advance their careers, as well as by leveraging support from the Spitzenfrauen-BW network. The website features 120 profiles of women in leading positions, highlighting the diversity of women's careers in Baden-Wuerttemberg. By providing a role model, they encourage other women to aim high in their own careers and develop the skills required to climb the career ladder. The Women at the Top (Spitzenfrauen-BW) community allows members to exchange ideas across different sectors of industry and gain regular insights into exciting companies in Baden-Wuerttemberg. It also offers mentoring to women with strong potential and lines up support, advice, and funding for individual career planning.

MANAGEMENT MONITOR

To meet market requirements, you need to understand the market. Business development thus always involves a comprehensive analysis of the market, trends, and competitors. The Management Monitor is an award-winning marketing intelligence solution developed by Steinbeis experts to make competitive and marketing information available across entire companies and give businesses the collaborative tools they need to engage in corporate development together. It features a competitive radar pulling together domestic, international, internal, and external marketing information, analyzing competitor profiles and campaigns, assessing marketing initiatives, and thus providing a basis for informed decision-making as a key part of corporate development. Combining this information with observations of competitive websites and industry portals can provide a comprehensive overview of market trends and thus avoid being "caught unawares" by the competition.

The team at the Young Founders 2019 federal finals meeting Andreas Hafner, HR board member at Porsche, and Franziska Metzbaur, project manager at Young Founders (©Jugend gründet)

FURTHER INFORMATION

For more information on the individual projects organized by the Steinbeis business development experts in Pforzheim, go to:

- www.jugend-gruendet.de
- www.startupbw.de/themen/young-talents
- www.spitzenfrauen-bw.de
- www.frauenpower-fuer-gremien.de
- www.management-monitor.de

PROF. DR. ELKE THEOBALD
elke.theobald@stw.de (author)

Director
Steinbeis Transfer Center: Business Development, Pforzheim University and
Steinbeis Innovation Center: Business Development, Pforzheim University (Pforzheim)

www.steinbeis.de/su/587 | www.steinbeis.de/su/1363 | www.szue.de

PROF. DR. BARBARA BURKHARDT-REICH
barbara.burkhardt-reich@stw.de (author)

Director
Steinbeis Transfer Center: Business Development, Pforzheim University and
Steinbeis Innovation Center: Business Development, Pforzheim University (Pforzheim)

www.steinbeis.de/su/587 | www.steinbeis.de/su/1363 | www.szue.de

SUCCESS DEPENDS ON THE STRATEGY

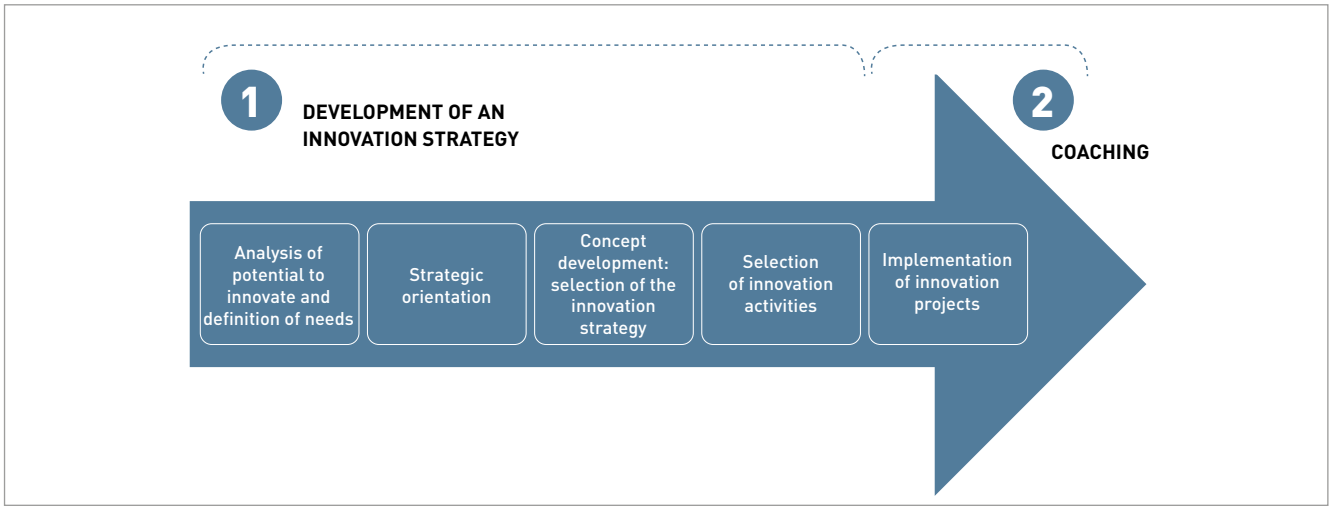
INNOVATION STRATEGIES FOR SMEs

Innovation strategies help firms define structures, set priorities, and plan objectives, concepts, and products. If they also take the requirements of both market and customers into account, they can uncover additional potential to innovate. So strategies dictate which products, services, and business models a company will need to use to generate turnover and earnings in the future. Steinbeis 2i helps companies with this strategic process. Companies gain a clearer understanding of their potential to innovate, they can adopt a more methodical approach to product development, and they gain feedback on organizational development.

Companies that what to remain competitive need to develop innovations now and introduce them successfully to the market. But to do this, they require a structured approach to innovation management. This comprises systematic planning and control mechanisms for innovation processes within the company – from the moment an innovative idea arises to the launch of a product or service. Planning and following an innovation strategy is an essential key to success for an innovation project to bear fruit. And this strategy should be based on an overarching corporate strategy.

INNOVATION STRATEGIES: MORE EMPHASIS ON PRODUCTS OR TECHNOLOGIES?

Depending on its long-term priorities, one option for a company is to place greater emphasis on products or technology in pursuing its innovation strategy. The latter emphasis makes more sense for companies with tech understanding, especially if they are aiming to move forward with a technology – so-called technology push. With a product-centric innovation strategy, the most important criterion is the focus on customer requirements. This strategy makes sense for companies with solid market know-how. A process strategy is derived from both a technology-centric and a product-centric innovation strategy, and



this process strategy captures the materials and information-sharing processes that are required to deliver an offering. Aside from the process strategy, a company may also choose to pursue a timing strategy (as first mover, first follower, or late follower).

To start the strategic process, S2i looks at the individual requirements of a company. For the first step, the experts assess business competences and the potential of the company to innovate, also identifying possible barriers. They then analyze the business environment of the company, looking at trends, the market, and competitors. Companies are provided with recommendations tailored to their business and can then receive coaching on aspects such as protecting intellectual property, going international, open innovation, innovation by target group, or funding innovations.

Steinbeis 2i leads the strategy planning process by running two one-day workshops with the company. The aim at this point is to develop an individual innovation strategy for each type of business corresponding to the know-how held by the company and its corporate goals. This should be as specific as possible, focus on actual implementation, and contain no contradictions. It also should be descriptive and clear. This is because strategic planning and launching innovations enhance the likelihood of succeeding in the market and thus also secure the long-term competitiveness of the company.

INNOVATION IN THE SOLAR ENERGY MARKET

For one such project, S2i provided support to a solar energy specialist called sbp sonne. The company, which has been developing solar power plant technology for over 30 years, has earned a reputation for its parabolic trough collectors, heliostat systems, solar tower power plants, point-focusing dish systems, and concentrating photovoltaics.

To understand the hotly contested solar energy market, the experts at Steinbeis 2i analyzed the business environment and highlighted potential areas of innovation for sbp sonne, which develops technologies used to generate solar power. Based on the strategic competence and goals of the company and after assessing market potential, an action plan was drafted, defining potential projects and any collaboration partners that might need to be considered.

S2i also drafted a partnership profile for sbp sonne and published this on a website called the Enterprise Europe Network. This has already resulted in several potential partners getting in touch from Belgium, Portugal, Slovenia, Turkey, Tunisia, and Taiwan, and sbp sonne is currently looking into these partners.

HARTMUT WELCK
hartmut.welck@stw.de (author)

Senior project manager for bio-economics, nutrition, industrial biotechnology, and innovation management
Steinbeis 2i GmbH (Stuttgart)

www.steinbeis.de/su/2017
www.steinbeis-europa.de

PEOPLE – THE KEY TO SUCCESS

A STEINBEIS EXPERT PAVES THE WAY FOR SYSTEMATIC ONGOING DEVELOPMENT OF A MEDIUM-SIZED BUSINESS

TRUST TRADITION. EXPERIENCE INNOVATION. This is the anniversary slogan adopted by PAJUNK® and nothing could reflect the company philosophy more accurately for the producer of medical technology from Baden-Wuerttemberg. For more than 50 years, the company has stood for innovative medical solutions "made in Germany." A family-owned business now in its second generation, PAJUNK® is a leading international manufacturer of medical technology used in the fields of regional anesthesia, neurology, pain therapy, minimally invasive surgery, and biopsy. It continually reinvents itself as a business by actively involving all members of staff. For this to work, the firm brought the Steinbeis expert Ute Villing on board from the Steinbeis Transfer Institute for Leadership Psychology, HR, and Organizational Development.

The core values of tradition, innovation, and progress have shaped the international, family-owned business ever since it was set up. PAJUNK® works with business partners, medical professionals, and leading physicians to develop innovative solutions and products. The big breakthrough for the company came with the launch of the world's first atraumatic spinal cannula as part of a joint development project with Prof. Dr. Günter Sprotte. The technology made the firm a global market leader.

ACTIVE AND AT HOME IN MANY MARKETS

For the company from the small Baden-Wuerttemberg city of Geisingen, this was no reason to rest on its laurels. The firm has continuing expansion plans, because it believes that building a successful brand with a focus on the future requires thinking and action on a global scale. Accordingly, CEOs Simone Pajunk-Schelling and

A clean room in Building D1 in keeping with EU GMP Class D. © PAJUNK® GmbH

Training at PAJUNK® ©PAJUNK® GmbH

Martin Hauger are pushing ahead with an internationalization process in sales, not only in established markets in Europe, but also worldwide. The "Made in Germany" stamp of approval will remain in place, as will operations in Geisingen, which not only has a manufacturing site but is also home to company headquarters and development. To manage expansions in production, PAJUNK® is looking closely into machine networks, process automation, and integrating robots – valuable help when it comes to producing serial products and dealing with heavy parts. "The requirements of future production are already a challenge today. It has to be adaptable, efficient, and sustainable," explains Pajunk-Schelling.

SHAPING TRANSFORMATION TOGETHER

Continual change and moving forward are important for any firm that wants to stay in tune with future needs, and similarly, they're also important to actively shape change and, in particular, do so with the involvement of employees. The company Continual change and moving forward are important for any firm that wants to stay in tune with future needs, and similarly, they're also important to actively shape change and, in particular, do so with the involvement of employees. The company is now one of the biggest employers in the area and in addition to a workforce of more than 500 people in Geisingen, it also has subsidiaries in Atlanta and Newcastle. As the company expands and hires more and more people, it is also undergoing structural changes and changes in the nature of the workforce. This transformation requires new setups and different ways of thinking, as well as the integration of new employees and managers. "There's a strong team behind every strong product, and this team needs the right skills, an ability to innovate, and the commitment of every individual involved in the process so that everyone can make a personal contribution to the product. This is something we're fully aware of in senior management, which is why we involve our colleagues in the change process," explains Hauger. A central task in doing this is to address a "fear of change" among workers as part of a change management process that will allow staff to play an active role in transformation. To do this, people need to capture the vision together, gain transparency, and communicate openly. Sustainable changes in the corporate culture are only possible by actively involving the workforce.

EXTERNAL SUPPORT WITH SUCCESSFUL TRANSFORMATION

To manage this task, PAJUNK® turned to the support of Ute Villing, director of the Steinbeis Transfer Institute for Leadership Psychology, HR and Organizational Development. Villing is in a position to come to a task with an open mind, without prejudice. She can listen to the concerns and needs of staff and bosses objectively and with empathy. The Steinbeis expert goes through an intensive series of consultation and supervision sessions, drawing on her knowledge of leadership psychology and change management to suggest a number of different ways to systematically move the business forward – all within a timeframe and at a cost that are entirely reasonable for a company undergoing rapid expansion.

As a family-owned medical technology specialist, one essential aspect that has to be dealt with is how it can (or should)

The D10 warehousing and logistics center. © PAJUNK® GmbH

Managing Director
Simone Pajunk-Schelling (right)
standing alongside Martin Hauger.
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manage the fine balancing act fueled by the family atmosphere at the company and its standing as an international business. "The aim of collaboration has to be to manage the multiple tasks together and pinpoint solutions to the central question: What is the best way to allow staff and managers to develop in a way that makes sense, given the growth being witnessed by the company? How can new specialists and managers be made to feel more at home in the world of PAJUNK®? What can be done to support managers with the multiple tasks they are responsible for? Other key factors include how everybody works together, future communication hierarchies, and the desired communication culture. We also want to establish a structured foundation of knowledge at the company with respect to management and psychology so that problems can be tackled and solved in organizational terms, on an interpersonal level, and also for psychological reasons," says Ute Villing, outlining the challenges that lie ahead, which should be solved and implemented step by step alongside the team as part of an iterative process.

UTE VILLING
ute.villing@stw.de (author)

Director
Steinbeis Transfer Institute
Leadership Psychology, HR and
Organizational Development
(Gosheim)

www.steinbeis.de/su/2255

Plastic spraying of cannulas in clean room D10 © PAJUNK® GmbH

Goods being stored in the fully automated small parts warehouse in D10 © PAJUNK® GmbH

SUSTAINABILITY: AN ACE UP YOUR SLEEVE

STEINBEIS EXPERTS HELP WRITE THE LONG-TERM SUCCESS STORY OF A MEDIUM-SIZED COMPANY IN THE CONSTRUCTION INDUSTRY

The key construction industry has undergone significant structural change in Germany and many companies have gone out of existence. The Flammer group of companies in the small Baden-Wuerttemberg city of Mössingen is still going strong, however. Its large footprint and versatility were an instrumental factor in the survival of the company, which not only offers housing and civil engineering services, but also builds pipelines, and provides horticultural solutions and landscaping. Flammer first started working with the Ravensburg-based Steinbeis Transfer Center for Technology – Organization – Human Resources (TOP) in 2004 and has received advice and support from the center with a variety of business decisions.

"We're delighted with how the company is doing now," says CEO Jochen Flammer, who believes that working with Edmund Haupenthal, Elmar Marmann, and the other experts at Steinbeis was an important factor in the success enjoyed by the business. As well as strategic discussions, for the last 15 years the two parties have held regular monthly meetings mainly focusing on understanding services that could not be delivered, monthly budgets versus actuals, and cash flow forecasts. There have also been regular meetings with banks and funding partners. "I really appreciate having the sparring partner sessions with the team from TOP. They provide us with thorough assessments and make me feel more certain about the decisions I have to make as a businessman," says Jochen Flammer.

The company mainly takes on medium-sized contracts. "Avoiding big contracts makes us less dependent on customers, reduces risk, and makes the company less vulnerable to crisis if the construction industry starts to cave in – which is exactly what it does, at regular intervals," explains Edmund Haupenthal, a director at the Steinbeis Transfer Center. In 2004, the company developed a management information system (MIS) with the Steinbeis experts to track monthly order requirements, and monthly project controls are also managed tightly. The company uses software provided by the construction IT company BRZ from Nuremberg. Not only does it create project offer, it also does the financial accounting. The BRZ system works as an add-on to the finance accounting and company accounts system,

WE STAND FOR TOP PERFORMANCE AND ALWAYS STRIVE TO FIND A GOOD SOLUTION FOR OUR CUSTOMERS

Jochen Flammer, managing director of the Flammer group of companies
© Flammer Bauunternehmung GmbH

so it also allows Excel access to data, making it possible to set up extremely adaptable industrial evaluations in the MIS. Over the years, the Steinbeis consultants have become experts on the BRZ accounting software so they have also become extremely familiar with the add-ons used by the program. Not only can the Steinbeis experts set up evaluations of individual subsidiaries, they can also provide consolidated MIS information to map the overall company.

A MODERN COMPANY WITH A LONG TRADITION

The founder of the company was Adolf Flammer, the grandfather of Jochen Flammer. A bricklayer by trade, he set up the company in 1925 to become self-employed. In 1951, his son Richard entered into the business as a partner and in 1993 he handed over operations to his three children.

In 2005, Jochen Flammer became the sole shareholder of the company and the CEO. The experts at the TOP Steinbeis Transfer Center were closely involved in this development through involvement in strategic decision-making, which also entailed a partial restructuring. Two years later, the business switched to a different location and moved into a new building in the industrial and trading zone in Maybachstrasse in Mössingen. "We helped them draft the business plan they needed for this, complete with an investment and funding plan, plus meetings with the bank, and we played a central role in implementation," says Elmar Marmann, also a director at the Steinbeis Transfer Center. The company also received help from the Steinbeis expert in acquiring a new division specialized in pipeline construction, within its own limited company with a separate managing director.

"I'm a builder in body and soul. We stand for top performance and always strive to find a good solution for our customers," says Jochen Flammer. He also underscores the strong regional ties of his company. His "modern family business with 80 employees" always makes sure it thinks about "growing its own" workers. That's extremely important to Flammer. He believes that a company can't keep going in the market without training programs and good people. For Flammer, one of the mainstays of success for the company has been the long-standing partnership with Haupenthal and Marmann, who he describes as established experts in the construction industry. As the sole shareholder in the company, the regular coaching sessions with the experts from Steinbeis provide help in gaining clarity. It is not always an easy journey getting to where you're headed, but despite all his trials and tribulations as a company director, the coaching sessions help Flammer focus on what needs doing.

↑ Company headquarters in Mössingen
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ELMAR MARMANN
elmar.marmann@stw.de (author)

Director
Steinbeis Transfer Center Technology – Organization – Human Resources (TOP) (Ravensburg)

www.steinbeis.de/su/151

PROF. EDMUND HAUPENTHAL
edmund.haupenthal@stw.de (author)

Director
Steinbeis Transfer Center Technology – Organization – Human Resources (TOP) (Ravensburg)

www.steinbeis.de/su/151

"OVERARCHING VALUES ARE THE BIG TOPIC OF THE FUTURE"

AN INTERVIEW WITH WINFRIED KÜPPERS, DIRECTOR OF THE STEINBEIS CONSULTING CENTER FOR SALES ANALYTICS

Professional and efficient marketing makes an important contribution to the success of a business, just as much as well-organized and well-planned selling and the customer acquisition this leads to. But often, these are the very areas of business that are neglected. August Musch, managing director of Steinbeis Beratungszentren GmbH, joined Winfried Küppers, Steinbeis expert and director of the Steinbeis Consulting Center for Sales Analytics, to discuss the impact this can have on companies and why such factors play such an important role when it comes to corporate development.

Winfried Küppers (left) talking to August Musch

Hello Mr. Küppers. Effective marketing and professional sales are essential ingredients for a company to be successful, but they're often neglected when it comes to corporate development, especially at technology-centric companies. Why do you think that is?

You might have seen those TV series where experts are called in to help restaurant managers. If you analyze these programs, it doesn't take long to work out what the main problem is: The restaurant owners are new to the area. It's often the same problem in marketing and sales: Development engineers are new to selling. So this leads to a whole series of issues – the same problems over and again at tech companies.

That mainly includes a complete lack of understanding of marketing and sales. Lots of engineers are so busy thinking about implementing the technical requirements of their customers that they basically forget to put thought into where or how they're going to sell their products. Very few people realize that business growth has to be managed and generated. This overconfidence is often a problem because some engineers assume good products will sell and become well known by themselves. But that's not how things work anymore. People often highlight product features but they don't mention the customer benefit. And then they often misunderstand customer requirements and buying behavior. How do potential customers judge products? Where do they find out what they need to know about products? Who actually is my target group? If I can't answer these questions, I can't offer the customer a made-to-measure solution. The next thing I have to mention is how ineffectively resources are used. Some firms already splash out on expensive resources, such as sales staff or marketing campaigns. But their campaigns often just fizzle out because they're badly designed or organized, or they don't offer the target group any real added value. For example, one thing we often witness is inefficient and poor sales teams that just react without any real method or numbers to go by, instead of working proactively. And last but not least, companies often lack the right know-how regarding available digital options. Lots of firms don't even realize what options new digital sales and marketing channels now offer them. And even if they do use them, it's far from optimal. Companies are often taken aback when they discover the channels potential customers are already actively using these days – unfortunately with the competition. This is where we can make optimizations and provide support making the right choices.

Your Steinbeis Consulting Center helps companies analyze and realign sales concepts and marketing planning. Where does your focus lie in this?

Something that generates a lot of awareness for us is our approach to not just creating concepts, but also acquiring customers. We work alongside field sales and we've set up our own call centers that can make calls for clients and arrange appointments. This also allows us to prove that our concept works.

When it comes to concept development, naturally we also cover the full bandwidth of services, in both marketing and sales. This ranges from improving your understanding of the market, to who the actual customer contacts are, where the customer journey takes them, fundamental positioning and strategy, and detailed action plans.

This covers the entire customer journey and includes communication campaigns and search engine optimization. One thing that's special about our approach is that we look at the entire sales and marketing process on a holistic level, because that's the only way to generate more turnover. But we also have an expert in each specific area with many years of experience in industry. Lots of consulting firms have an expert who can also answer all kinds of questions – what we call generalists. But how many of them have actually experienced these things in industry, in detail? So I always make sure we send experts to the customer for each project. It means we have to invest a bit more time and effort internally, but it results in much better outcomes. Using experts from industry, who also have years of experience in business coaching, also helps our customers to give teams and employees the right skills.

What sort of problems do your customers approach you with?

Our customers mainly approach us with six questions. The first is: How can I generate good growth? The answer to this is different for every client. Some customers mean the classic thing with this – more turnover and profit. Others want more customers, so they become less dependent on big clients. The second question we hear a lot comes from automotive suppliers trying to become less dependent on car companies. They work with us to look for new target groups and fields of business. They also tend to ask us about the best way to use communication channels. We're living in a time when people have lots of different communication options in their private lives, so they also expect that of their suppliers. If you don't put out the right messages through different communication channels you'll be ignored by potential customers. And if you invest lots of money in the wrong channels, you'll lose money without gaining customers. We help identify the right measures for

LOTS OF ENGINEERS ARE SO BUSY THINKING ABOUT IMPLEMENTING THE TECHNICAL REQUIREMENTS OF THEIR CUSTOMERS THAT THEY BASICALLY FORGET TO PUT THOUGHT INTO WHERE OR HOW THEY'RE GOING TO SELL THEIR PRODUCTS.

each company. One issue that's often forgotten but can significantly raise turnover, especially for big companies, is the mental strength of the workforce: Sales people with strong personal resilience generally produce 20% higher sales. So we're often asked to bring in our special team that coaches sports squads, to help set up the best team of sales people and managers. This does staff a lot of good, and it's good for the company. But lots of firms are also coming under pressure from clients – for example, more and more firms are being asked to integrate their processes into customer ERP systems. Making processes as automated as possible for customers can also be quite challenging for the company acting as a supplier. This is where our specialists can provide support. We also get a lot of calls from company owners and investors who want to find out how the company really is doing in the market and what options there are for the future.

People know that digital transformation is a new challenge for the business, but what does that actually mean in concrete terms for marketing and the sales department? And what does a company have to do to deal with this trend successfully?

This development is a major opportunity for sales organizations. Lots of companies have slept through developments and that's allowing small and medium-sized companies to catch up quickly. Companies that have already involved sales in digital transformation make a good impression on clients, they find it easier to recruit specialists, and they're much more agile. But the challenge lies in introducing the right measures and getting sales on board. Exploiting the new opportunities offered by digital technology allows you to manage customers individually. And that leads you into new markets.

By definition, the job of marketing departments is to carry corporate communications forward into the world of digital solutions. This takes high levels of digital technology in the marketing department, so people can make the best use of all marketing channels. But to do that, you need a clear strategy so that information has the desired effect, as defined in advance.

Which trends do you think will determine the future of marketing and sales? And what can or should companies do to prepare for this now?

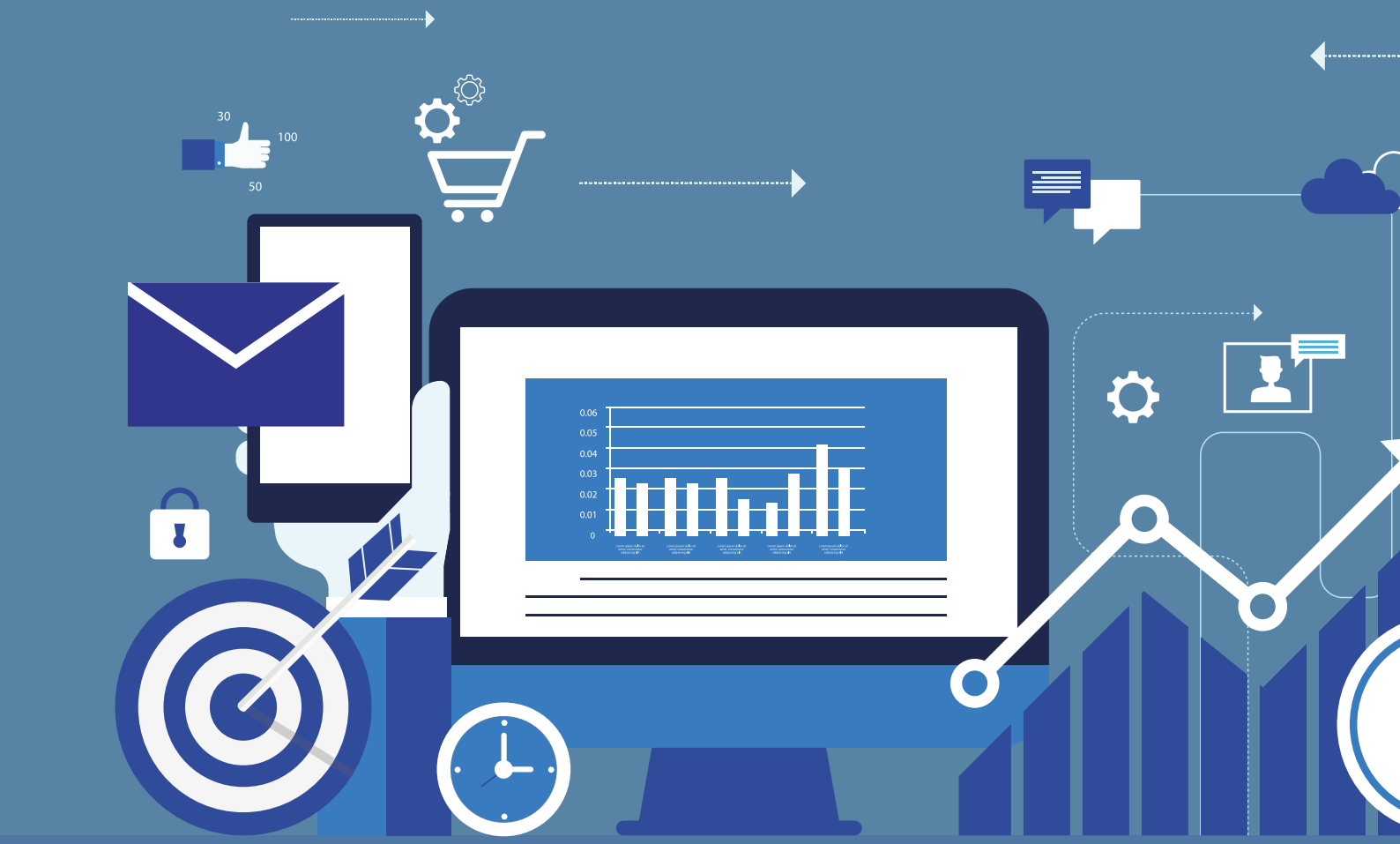
The main trend at the moment is about making the sales organization more agile. The tendency these days is for more and more purchasing departments to be led by senior management. The implication of this for us is that we're not being allowed to plan the sales process as much as we used to be; we have to set up everything according to the buying process. To do that, you need more agile sales processes. Lots of companies are struggling to make headway in marketing through classic "outbound" marketing based on advertising or trade shows. The challenge is to understand the client better – specific contacts and the customer journey – and to give them interesting content and tools on certain topics in the form of "inbound" marketing, so they can be helped with the evaluation process, on the way to successful selling.

We're also already preparing our clients for the new trend of "overarching value argumentation." Overarching values are the big topic of the future – not just in terms of communication with end customers but also with B2B clients! At the moment it's a lot about sustainability but in the future that will expand to other topics. The firms that succeed in conveying clear selling arguments through the right channels will gain significant competitive advantage.

WINFRIED KÜPPERS
winfried.kueppers@stw.de (author)

Director
Steinbeis Consulting Center
Sales Analytics (Hilzingen)

www.steinbeis.de/su/2159
www.steinbeis-vertriebsanalytik.de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MERGERS AND ACQUISITIONS IN A DIGITAL WORLD

THE DIGITAL M&A PLAYBOOK FOCUSES ON DIGITAL MARKETS AND REQUIREMENTS

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Technological innovation, digital solutions, and increasingly demanding customers continually challenge companies to overhaul and update products and rethink their internal processes. As changes in the business environment become more and more radical, at times completely disrupting existing business models, sometimes drastic action is required. Agile startups develop groundbreaking technologies, for example based on artificial intelligence or blockchain technology, and not only do these offer commercial potential, they can also have a strong societal impact. Such startups increasingly become the target of mergers and acquisitions (M&As) and challenge firms to reorientate. The talk here is of so-called Digital M&As. To help firms achieve such a turnaround in practical terms, Steinbeis Consulting Mergers & Acquisitions GmbH has developed a tool called the Digital M&A Playbook.

SMEs with small workforces are particularly likely to drag their heels when it comes to investments in digital solutions. They run the risk of allowing their businesses to fall behind in terms of future competitiveness and lose track of the increasingly digital world of international business around them. According to surveys carried out by industry association Bitkom, 56% of such firms say they want to adapt their portfolio or business model to keep pace with digitalization, but only 34% of those businesses have an interdepartmental digital technology strategy.

DIGITAL M&AS: THE CONCEPT

The Digital M&A tool offers firms an opportunity to lay down and implement a digital transformation strategy. The global transaction value of digital M&A deals amounted to $658 billion in 2017, equivalent to one quarter of the overall

THE DIGITAL M&A TOOL OFFERS FIRMS AN OPPORTUNITY TO DEFINE AND IMPLEMENT THEIR DIGITAL TRANSFORMATION STRATEGY.

M&A market, making digital deals crucially important to business. One issue that has to be addressed, however, is the actual company value of digital enterprises, which are sometimes valued at up to 40 times their business turnover. Increasingly, attention is turning to synergies and access to certain technology. Cultural difference should also be expected, and this is where certain holes begin to appear in the conventional logic applied to M&As. To overcome this, a digital mindset is required.

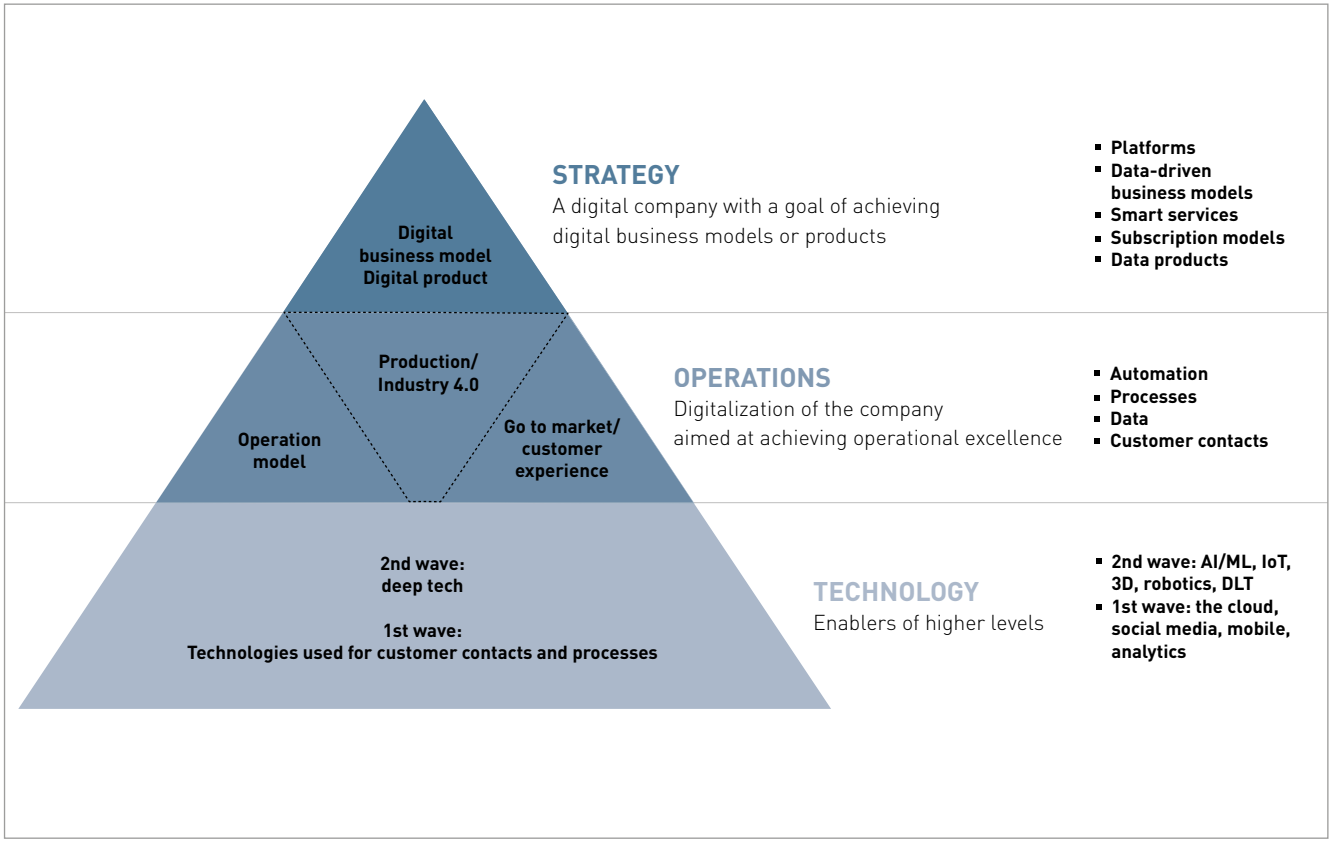
DIGITAL M&AS: APPLICATION

Understanding the underlying concept behind a digital M&A is a relatively easy task – unlike practical application, which can be challenging. As a result, Steinbeis Consulting Mergers & Acquisitions has developed a Digital M&A Playbook that can be used to foster a digital mindset and realize a digital M&A strategy based on the following five drivers:

1. Aim for ambitions goals
2. Take risks, accept risk
3. Systematically expand digital capabilities
4. Assess the strategic importance of possible targets
5. Plan and design transformation processes

Disruptive technology will also make new business models possible in the future, or make them more efficient. So companies with a good understanding of technology and trends will be particularly likely to benefit if they can identify efficient and scalable application options for such technologies at different stages of their company value chain. Regarding the digital strategy itself, planning timeframes need to become shorter and shorter and management approaches will have to be increasingly iterative and agile, ideally based on the digital transformation pyramid. The existing understanding of M&A processes is only of limited use with digital targets. Transaction stages do still adhere to

The Digital Transformation Pyramid



traditional processes, but there are marked differences within individual stages of transactions.

One example of this is a hidden champion – a global market leader in equipping ambulances and paramedic helicopters. The company has already developed a digital technology strategy that will focus not only on systematically linking medical equipment (such as defibrillators) to the internet in order to use predictive analytics, but also on connecting ambulances and helicopters to hospitals in order to quickly share vital statistics. The firm was only partly able to acquire the necessary skills internally, so its first step was to bring on board an innovative company specialized in data analysis as a collaboration partner – and ultimately acquire it.

The traditional B2B market was in stagnation, so the next step of its digital technology strategy envisaged focusing on the quickly expanding B2C sector, such as the evaluation of patient data gathered by smart watches and other wearables. The aim here was to identify interesting startups offering innovative ideas, network evaluations, and opinions in the social media. In terms of perceived synergies, somewhat untraditional synergies were considered particularly important when it came to the assessment of the value of the company. The Steinbeis experts quantified these by conducting an objective evaluation of things offered by the buyer and skills brought on board by the acquisition target.

The due diligence process was mainly based on an assessment of future expectations, partly because a retrospective analysis was not possible due to a lack of data. The key people at the company were of tremendous importance, however, especially given the early timing of the acquisition. As any potential offered by the company was closely tied to these individuals, an attempt was made to understand their capabilities and motivations. For the buyer, it was important to communicate with the digital target in such a way that would pave the way for a quick business transaction in order to make the best possible use of technological momentum. As the deal moved forward, the buyer had to carefully consider the degree of autonomy expected by the target managers and tie in management so that know-how could be transferred as efficiently as possible. Earn-out options were also put in place to link a proportion of the buying price to successful outcomes. These would be paid in subsequent years.

Once the transaction was completed, one priority of the post-merger integration process, which would be critical to success, was that key people at the target company would stay with the company. Other important factors that had to be considered during the post-merger integration phase were assurances that these people would be granted sufficient autonomy, the firm would be more open to failure, and there would be a greater willingness to take risks. Temporary staff arrangements and job rotation arrangements also helped with the success of the transaction and digital realignment.

The focus of the Digital M&A Playbook lies in two areas – potential and the future, not in proven performance and the past. This focus transcends many aspects of the Digital M&A model and, for example, it lends a completely different meaning to company evaluations and due diligence. Assessment parameters such as risk and success have to be re-calibrated and the significance of cash flows has to be re-examined. Depending on the nature of the integration process, soft factors such as company culture become more important; these subsequently become clear when examining how people see themselves, how willing certain people are to take risks, and how much autonomy people require. The Digital M&A Playbook developed by Steinbeis Consulting Mergers & Acquisitions provides small and medium-sized firms with useful support, not only in gaining experience in dealing with digital targets, but also in standardizing processes.

PROF. DR. PHILIPP HABERSTOCK
philipp.haberstock@stw.de (author)

Partner
Steinbeis Consulting Mergers & Acquisitions GmbH (Hamburg)

www.steinbeis.de/su/2152
www.steinbeis-finance.de

MARTIN G. SCHMITT
martin.schmitt@stw.de (author)

Managing Partner
Steinbeis Consulting Mergers & Acquisitions GmbH (Mannheim)

www.steinbeis.de/su/2152
www.steinbeis-finance.de

"GOOD MARKETING HAS ALWAYS BEEN ABOUT WHETHER AND HOW THE COMPANY GENERATES VALUE FOR THE CUSTOMER"

AN INTERVIEW WITH PROF. DR. KONRAD ZERR, DIRECTOR OF THE STEINBEIS CONSULTING CENTER MARKETING – INTELLIGENCE – CONSULTING

In what ways does marketing intelligence add value? And how are digital solutions changing the way people work in marketing? These are the topics TRANSFER magazine discussed with Prof. Dr. Konrad Zerr, director of Marketing – Intelligence – Consulting, the Steinbeis Consulting Center. Zerr is a marketing expert and a specialist in the field of information and data security. In October 2019, his Steinbeis Enterprise was honored with the Outstanding Security Performance Award.

Hello Professor Zerr. You founded your Steinbeis Consulting Center in 2006. How have the services you provide changed since that time? And what technical, technological, but also social developments have had an impact on your work?

If I may start with a bit of irony: Naturally, we were already totally up to date with our offering in 2006. So there have been absolutely no fundamental changes since then. Okay, let me be honest. From the outset, our offering has focused strongly on the topics of information and data security, so we've had to "keep our finger on the button." If anything, this topic has become even more important in recent years. This is because there have been sweeping changes on both a technological and societal level. Digital solutions, big data, Industry 4.0, artificial intelligence – none of these things would be conceivable without data security. But this isn't just about technological solutions – security starts in people's minds.

We offer solutions that allow you to understand whether people are aware of security issues – we capture "security awareness" – and based on this, we develop marketing and training measures to raise security awareness.

How important is marketing for the successful development of a business?

Digital solutions have fundamentally changed the role played by marketing in recent years, and it will have to continue to adapt. Some companies are witnessing a new sense of rivalry between the chief information (chief digital) officer and the chief marketing officer. Who's actually "wearing the pants" in an era of digital transformation, especially when it comes to the customer-to-company interface? Marketing mustn't allow itself to be pushed into the second row, especially given the interests of the company. Its ability to generate "customer empathy," tune into the worlds people live in, understand their desires and needs, and make that knowledge part of the internal processes of the company will remain crucial in the future. Also, in a world shaped by insecurity, companies will only be able to develop properly going forward if they also instill confidence in the outside world, if they deliver on their promises, and if they deliver benefits for customers. That's the responsibility of marketing! But to do what's necessary in a world of digital technology, you need new skills and competences, new processes, tools, and methods. Just rethinking the 4Ps handed down from previous generations – product, price, place, promotion – won't be enough anymore.

One of your specialties is marketing intelligence. What actually is that and how does it benefit companies?

In simple terms, marketing intelligence concentrates on establishing areas of expertise within companies and systems that make it easier to understand the processes of the market, and – based on this – make "smarter" marketing decisions. That includes issues relating to how the marketing department is organized, so it touches on topics like agility and enhancing the ability of marketing to learn. But it also involves issues relating to digital technology and the technological infrastructures used in marketing – for example, in what ways artificial

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intelligence or data science processes can help marketing to improve or even automate decision-making processes. And ultimately, marketing intelligence also deals with issues relating to the skills people require within the company. For marketing to succeed as a function, it needs a minimum level of technical and analytical skills.

To put it in a nutshell again, just expressed a different way: How we understand market processes depends on how we gather, evaluate, and interpret internal and external information. The specific role played here by marketing intelligence is that it helps companies put the large volumes of data – which have expanded astronomically in an era of digital transformation – to meaningful use in order to practice smarter marketing.

Digital solutions bring new challenges and change the way people work in marketing. What are the biggest challenges, but also what opportunities are there for companies?

I've already mentioned some of the challenges faced by marketing. The role played by marketing keeps changing, so it has to reinvent itself. The internal relationship with the chief information or digital officer has to be re-balanced. Interdisciplinary and agile thinking will be crucial. Companies will need to re-establish digital competences and suitable IT infrastructures. Also, thinking about how marketing actually sees itself, it needs to remember what the original idea was behind marketing – good marketing has always been about whether and how a company generates "value for the customer." This is the only way to ensure a company actually does offer benefits. This concept of offering "value for the customer" is the core strength of marketing.

I personally see this as one of the central challenges of marketing, but at the same time one of the biggest opportunities is for marketing to offer context and place the value it offers to customers in the right context. Digital technology offers previously unimagined possibilities to use sensor technology, tracking methods, etc. to capture and understand the context of the situations within which customers use products and interact with the company. Products that deliver value can then be managed, specifically, according to a particular situation in real time. This trend is called "value in context."

What this underscores is that the key opportunities offered by digital solutions are not (or not just) about raising efficiency at the company, but also about using digital technology properly and creating new offerings that revolve around the customer and add value for him or her.

PROF. DR. KONRAD ZERR
konrad.zerr@stw.de (author)

Director
Steinbeis Consulting Center
Marketing Intelligence – Consulting
(Achern)

www.steinbeis.de/su/1011

PUT YOUR COMPANY THROUGH A DIGITALIZATION STRESS TEST!

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IS YOUR BUSINESS MODEL DIGITALIZATION-PROOF?

STEINBEIS EXPERTS DEVELOP A TEST FOR ASSESSING DIGITALIZATION THREATS POSED TO BUSINESS MODELS

Digital solutions are bringing about sweeping and fundamental change in our society. They are also impacting the value chain processes of companies. On the one hand, this results in completely new value creation scenarios, but on the other it also threatens business models in the old analog world – models that previously worked fine as they were. The Steinbeis Transfer Institute for Digital Transformation has developed a simple test that allows firms to check if their business models are susceptible to digitalization threats. The stress test is based on a concept relating to eight laws of digital technology, each revolving around universally accepted principles of digital transformation.

A business model is an abstract description of the value added by a business enterprise. It has three core components: the value proposition (in which ways are customers provided with benefits?), the value chain architecture (how is value creation organized internally and externally?), and the profit equation (how does the business generate revenues?). Although all three components of a business model are probably affected by digitalization, it is mainly the value proposition that receives the most attention. This is because how you organize value chain activities or generate returns is irrelevant if a company fails to deliver customer benefits better than the competition.

THE DIGITALIZATION STRESS TEST

There are three main threats posed by digitalization to the benefits delivered by a company:

1. Benefits are based on the opportunistic exploitation of "information advantages"
2. The client problem previously solved by the company in analog times no longer exists in the digital space
3. The client problem still exists, but it can't be solved using digital solutions

Companies have a number of "information advantages" over clients. They know the production process of their products and thus also have a better understanding of the resources this requires. As a result, they tend to be in a much better position to judge not just profit margins, but also a variety of quality criteria. As information becomes more "symmetrized" in the new digital space, it becomes increasingly difficult – if not impossible – to exploit such information advantages, because it might only take

seconds for potential customers to research the experiences of previous customers, or even people previously or currently at the company. As a result, benefits based on the opportunistic leveraging of information advantages are massively threatened by digitalization.

The second reason why benefits become eroded is that the problem previously solved by the company along analog lines may completely disappear. The conditions of the digital space can thus result in the customer pain no longer existing.

THE LAWS OF DIGITAL TECHNOLOGY

Five of the laws of digital technology appear to be relevant within this context. In new digital territory, due to information symmetrization (law #1) the demand for companies capable of bridging information asymmetries will decline sharply. Examples of benefits that revolve around the reduction of information asymmetry are restaurant guides, tourist handbooks, TV listings, or consumer test magazines. Interface centralization (law #2) will erode demand for intermediaries who span different interfaces.

A typical example of such a function is a taxi control room, which ultimately does nothing more than provide an interface for customers (often via telephone) and an interface for taxi drivers (often via radio) so that customers and taxi drivers can be linked to one another. The emancipation of space and time (law #3) will erode demand for spanning physical space. Processes in the old analog world that were linked through the same space require at least one of the parties to be mobile, especially if two parties are in different locations anyway. Students and teachers have to go to schools, patients go to medical practices, employees go to work. If digital transformation can result in these processes becoming possible without sharing the same location, mobility requirements are reduced. Benefits stemming from lower transaction costs come under pressure in the new digital space, because transaction costs tend to be significantly lower in such a business biotope compared to the analog territory (law #4). For example, the benefits offered by retail chains, which deliver lower transaction costs by pooling wares in physical terms, are threatened by digitalization. Finally, law #5 relating to "new galaxies of insights" will make some forms of information gathering obsolete. For example, in the new digital space, companies are much less dependent on market research, since they can observe the behavior of their customers in detail themselves.

ANALOG VS. DIGITAL

The third threat posed to business models in the old analog world results from customer pains – that were previously solved along analog lines – now being solved by digital solutions.

There are numerous examples of this, such as entertainment products, education, and financial solutions. The competitive standings of analog and digital stakeholders are fundamentally different because firms in the new digital space operate according to the conditions of digital rules. Four of these can have a major impact on competitive standing: the marginalization of incremental costs, speed explosion, new galaxies of insights, and the emancipation of space and time.

Stakeholders in the new digital space have practically zero incremental costs. The bigger the key market – i.e. the greater the sales potential – the more stakeholders in the old analog world of business are at a disadvantage in cost terms. Compared to companies operating along digital lines, stakeholders in the new digital space also always have speed advantages. The more important time factors are to competition, the greater the competitive advantage enjoyed by digital companies. In the new digital space, previously unknown connections get discovered (new galaxies of insights) and obviously, this also applies to customer behavior. The more important it is to understand customer behavior (gain customer insights) in order to deliver benefits – for example due to a strong customer need to solve individual problems, as is the case with the healthcare market or dating services – the greater the competitive advantage of the digital players. After all, digital players operate according to the conditions of an "emancipation of space and time." The more restraints there are from a customer standpoint when it comes to space (location of the customer) or time (such as opening hours), the more digital players are at an advantage.

PROF. DR. DR. HELMUT SCHNEIDER
helmut.schneider@stw.de (author)

Director
Steinbeis Transfer Institute
Digital Transformation (Berlin)

www.steinbeis.de/su/1949

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SUCCESSFULLY MANAGING CORPORATE SUCCESSION AT SMES

STEINBEIS EXPERTS HELP WITH THE PLANNING OF A SUCCESSFUL SUCCESSION PROCESS

Businesses are an important source of earnings and wealth, especially if you're the owner of an SME. If you built up a successful business, you want to ensure it stays in safe hands when you decide to move on. But if there is no obvious candidate in your family to take over the business, you will have to motivate somebody from outside to succeed you. Finding the right person is not as easy as it sounds, and often professional support is required. This is where the experts at the Steinbeis Transfer Center for Rehabilitation and Financing come in with their specialist knowledge. The center recently helped Dill, a medium-sized tooling and mold-making firm from Karlsbad, with its business succession process.

Looking forward to a successful business transition: Sibylle and Harald Dill (left) pictured with Timucin and Tuba Okullu (right)

Founded by Harald Dill in 1991, the firm makes simple and complex, advanced tools and molds for the plastic injection molding industry and the production of pressed parts, pressure die-casting parts, and powder injection molding parts. Dill asked the Steinbeis Transfer Center for Rehabilitation and Financing to support him in finding a successor. To help him, he also turned to a European Social Fund (ESF) program that offers business coaching to SMEs, and his company was awarded a €6,000 subsidy for the project.

KEY SUCCESS FACTOR NUMBER 1: EARLY PREPARATION

At small, owner-managed companies there are often large overlaps between the everyday business and the personal affairs of the owner. For example, these can affect real estate rented out to the company or decisions regarding the salary of the owner, etc. It can often take a long time to separate out such factors when it comes to selling the company, and it can be a while before the business is prepared for a planned sale in financial terms. With such companies, it makes sense to start making preparations for a sale three to five years before the planned takeover. One advantage with this is that the owner is well prepared if a potential buyer comes along and expresses an interest in the business. It also removes time pressures if a company does not suddenly have to be sold in the next six months.

Dill was 59 when he embarked on his project with Steinbeis, and his goal was to sell the business within three years and hand it over to a suitably qualified successor. This meant there would be sufficient time to find somebody interested in the company. In addition, Dill's strategy had always been to delegate as many tasks as possible to people working for his company. This makes things a lot easier for the next person in line when they enter the door as a successor.

KEY SUCCESS FACTOR NUMBER 2: THE CONCEPT, THE STRATEGY, PROCESSES

As a first step, it is important to capture the goals of the company succession process with the seller. Is the sale of the firm about making the maximum amount of money, or are there any other factors that might be relevant? For example, the owner might want the name of the company to stay the same, the business to stay in the same location, job guarantees for workers, as much time as possible before the selling agreement is signed, no changes in rental arrangements (especially if buildings are owned by the previous owner or their family), a consulting contract, continued employment at the business for a defined period after it is sold, or various other wishes. Only when all of the goals have been captured can the process of planning the strategy for the company succession begin. This involves drafting a business plan spanning several years, conducting an assessment on the company, identifying potential buyers, clarifying legal and taxation issues, and writing a company exposé. The next task is to approach potential buyers, use any intermediaries that offer networking services, or both. When approaching a potential buyer for the first time, it is recommended asking an external consultant to contact the buyer anonymously. The name of the company should only be divulged after signing a confidentiality agreement, after which the potential buyer may also be shown the company exposé. Next, the potential buyer is usually taken through a due diligence process. This involves vetting the potential buyer from head to toe. It is then time to start contract negotiations, sign the business acquisition agreement, and complete the sale. If the buyer is an ongoing business, the next stage is to embark on the so-called post-merger integration process. The aim at this point is to dovetail the purchased business with the existing operations of the company (or group of companies) owned by the buyer, so that the buyer can derive maximum possible benefit from acquiring the business. One important aspect is that any workers that are taken on are made to feel welcome at the company. At this point, they are often the most crucial asset of the business.

THE EUROPEAN SOCIAL FUND (ESF) PROGRAM OFFERS BUSINESS COACHING TO SMES, AND THIS CAN RESULT IN A COMPANY RECEIVING A SUBSIDY OF UP TO €6,000.

KEY SUCCESS FACTOR NUMBER 3: EXTERNAL SUPPORT

For a business owner, the succession process has a fundamental impact on their role as an entrepreneur. Most owners only ever sell a business once in their lives, so many of the challenges they face when handing the business over to a buyer can be quite daunting. Often, they are also strongly attached to the company on an emotional level, especially if they set up and grew the business themselves. It can therefore be useful to the business to draw on the opinions of a neutral and objective adviser, who can play an important role in successful company succession processes. Consultants also offer specialist knowledge and experience in ensuring the process runs as smoothly as possible. One area for which this is perhaps most important is when it comes to estimating a realistic value for the company. Ultimately, the value of a company revolves around the potential revenue the buyer of the firm can generate through future business. Different buyers are often willing to pay a different price for an ongoing business. For example, a strategic buyer who considers a firm the optimal complement to their existing business will typically pay a higher price than an entrepreneur hoping to acquire the company to become self-employed.

THE RESULT: SUCCESSFUL SUCCESSION

Once all his goals were clarified, Dill, his company accountant, and Thomas Täge from the Steinbeis Transfer Center for Rehabilitation and Financing sat down together to work out the value of the business being sold. They then drafted a company exposé for potential buyers. The Steinbeis expert then approached prospective buyers anonymously by going through his "list of contacts" and placed an anonymous ad in a public market place featuring businesses for sale. This attracted the attention of Timucin Okullu. At the time, Okullu was working as a development and sales engineer for a major automotive supplier. Following an intensive period of negotiation, including a due diligence process, Dill and Okullu came to an agreement and subsequently signed a company purchase contract with the support of a specialized attorney's office. In parallel to this, Okullu had to secure funding from his bank manager, who also visited the company in person to gain a first-hand impression of the business. The company exposé also proved extremely useful in this respect, since it contained all the necessary information for making decisions regarding credit arrangements, quickly paving the way for approvals. After the ink had dried on the contracts, Dill accompanied Okullu on visits to key clients of the company to ensure the handover went as smoothly as possible. The workforce was informed about planned succession arrangements as early as possible to ensure they also had an opportunity to get to know the new owner in advance. Harald Dill still works for the business as a consultant, and this also allows Timucin Okullu to draw on his personal experience. The overall succession process only lasted nine months. It should be noted, however, that it is becoming increasingly difficult for SMEs to find suitable buyers, especially in more technical areas, and as a result successful company takeovers can take several years.

THOMAS TÄGE
thomas.taege@stw.de (author)

Project Manager
Steinbeis Transfer Center
Rehabilitation and Financing
Ötigheim)

www.steinbeis.de/su/578

FOUR COMPANIES – ONE BRAND

STEINBEIS EXPERTS DEVELOP A NEW, COMMON BRAND IDENTITY AFTER A COMPANY MERGER

The brand of a company plays an important role in how it is perceived by everyone around it. Companies that succeed in creating a unique and memorable brand can establish a strong positioning in the market. This lays a solid foundation for successful corporate development going forward. But what is the best way to establish a common brand identity after a merger involving four companies? How can product offerings and services be made understandable and clear to customers? How should sales and perception be promoted when a company is rationalizing its product range? The answers to these questions, and how it's done successfully, were discovered by four companies from Bremen after working with experts at the Institute for Integrated Design (i/i/d Steinbeis Transfer Center).

Four companies – HASECO ZÖGER (Bremen/Hamburg), STETTNER (Erkrath), NordCap (Bremen), and NordCook (Hamburg) – have decided to merge and accordingly, they want to realign their business strategies. The firms' core field of business was originally refrigeration solutions for restaurants, catering, and store fitting. Together, the four companies can offer a new portfolio of products and a variety of services for fitting technical equipment in restaurants, catering, and store interiors.

The product range is also being reorganized and divided into three fields of business: refrigeration, cooking, and dishwashing. Products and services are no longer communicated and promoted on a company or business level. Instead, they are combined with suitable products matched to specific customer groups.

A crucial ingredient of this hybrid marketing model is a clear and recognizable brand strategy. The NordCap brand, which is no longer just a product name but also the name of the new company after the merger, should convey comprehensive expertise in industrial chilling, cooking, and dishwashing technology, as well as matching products and end-to-end solutions aimed at a variety of sectors of industry (bakeries, confectionery stores, butchers, small and medium-sized restaurants, industrial kitchen operators, and much more), not to mention different types of applications (warehousing, preparation, production, presentation, bars and drinks, and cleaning).

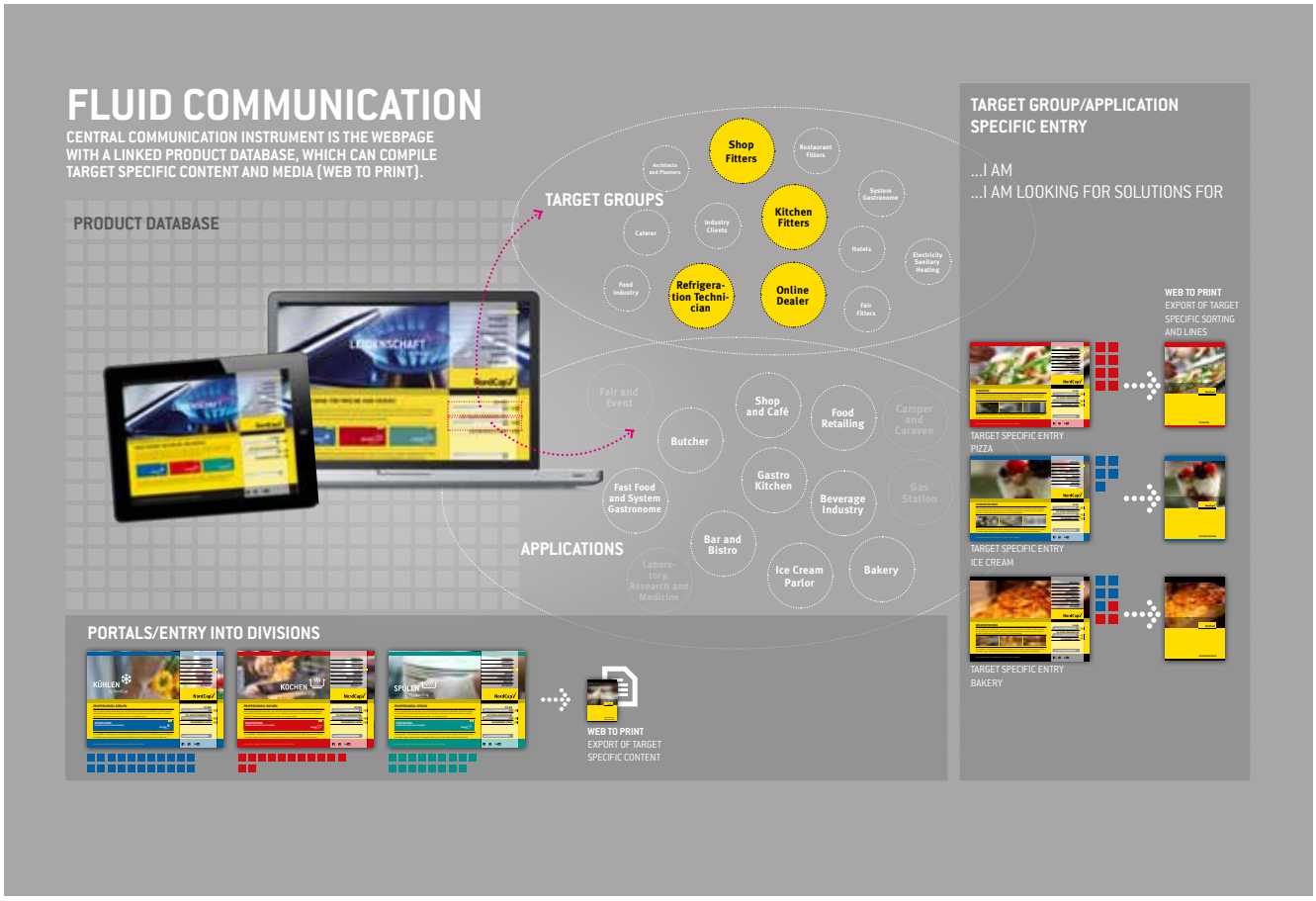
NORDCAP: AN AGILE AND POWERFUL BRAND

This was the brief the four companies took to the i/i/d (Institute for Integrated Design, the Steinbeis Transfer Center in Bremen), which specializes in communication planning and designing marketing interactions, systems, structures, and processes, as well as specific design innovations for B2B and consumer goods, brands, enterprises, products, and spaces. The four firms found what they were looking for. The brand strategy, branding hierarchy, and visual imagery developed by the Steinbeis experts address all areas of media and communication, from printed materials to digital media, and spatial presentation formats such as exhibitions and trade shows.

The redesign allows the NordCap brand to present itself in a new light as an adaptable entity. The core brand values ("genes" of the brand) lay a credible and reliable foundation that conveys the proactive approach of the business in a new and memorable way.

Thanks to the support of the Steinbeis experts, NordCap now owns a powerful brand and product promise, an effective media plan for future corporate campaigns, a clear strategic positioning, an assortment of products matched to market requirements, a strong brand, and a clear branding hierarchy. The Steinbeis experts are continuing to support the NordCap group of companies with advice, not only in order to help the business with strategic issues, such as corporate positioning, but also when it comes to the actual design of specific media (such as materials used for trade shows). Everything revolves around doing what's right for the brand and the customer.

THE BRAND OF A COMPANY IS CENTRAL TO HOW IT IS PERCEIVED BY EVERYONE AROUND IT.



PROF. DETLEF RAHE
detlef.rahe@stw.de (author)

Steinbeis Transfer Center i/i/d
Institute for Integrated Design
(Bremen)

www.steinbeis.de/su/0417
www.iidbremen.de/

"THE TRANSFER PHILOSOPHY REALLY NEEDS TO BE STRENGTHENED AND NURTURED"

AN INTERVIEW WITH PROF. DR. MED. MARC O. SCHURR, DIRECTOR OF THE STEINBEIS TRANSFER INSTITUTE FOR HEALTHCARE INDUSTRIES, BOARD DIRECTOR AT OVESCO ENDOSCOPY, AND MANAGING DIRECTOR OF NOVINEON CRO AND TUEBINGEN SCIENTIFIC MEDICAL

Prof. Dr. Marc O. Schurr at the inauguration ceremony of the Ovesco campus on Oct 30, 2019

Introducing a man who knows what it's like setting up a successful business and how to transfer know-how and technology between science and industry. Prof. Dr. med. Marc O. Schurr helped TRANSFER magazine look back on his 25 years of experience with Steinbeis and his journey as a researcher and business leader – ascertaining that chance can also play a role in success. He also shed light on the importance of experimentation to the long-term success of a company, offering a number of useful tips for academic entrepreneurs.

Hello Professor Schurr. You've been a "Steinbeiser" for almost 25 years now and have also set up a number of successful companies during this time. How did your experience with Steinbeis help with this?

I'm sure that the early years of my career – in combination with my ongoing involvement in academic research at the University of Tübingen and working as the director of a Steinbeis Enterprise – formed an essential part of my subsequent career path, also as an entrepreneur.

On a fundamental level, Steinbeis offered me "room to experience" how market-related research findings can be applied to projects in industry, and that gave me an opportunity to gather experience which still benefits me to this

day. In those days, in the late 1990s, merging the activities of science and industry was somewhat out of the ordinary at universities and I think that setting up transfer centers at the universities in Baden-Wuerttemberg has allowed Steinbeis to open a door that has made an effective contribution in allowing university research to gain its bearings in terms of applying know-how – especially among stakeholders interested in this area.

For me, my experience with Steinbeis turned entrepreneurial and market-focused action into something that can be experienced, it made commercial business undertaking something that can be learned, and it provided me with a springboard for deciding to become professionally involved in the area of overlap between business and science, and not to pursue a career in the clinical field – you have to remember that I trained as a doctor. I've never regretted it, even though I'm still interested in clinical medicine. But of course I'm much more closely involved in the interfaces from a commercial standpoint. Despite that, I've never seen my ongoing work as a researcher as a contradiction. That's something I also

FOR FURTHER INFORMATION ON INNOVATION CHAMPIONING, TURN TO THE ARTICLE ON PAGE 8.

see within the context of Steinbeis. Some might say it's a conflict, but it's something I resolved early on – you can be successful according to the ground rules of both worlds.

You're what they call an academic entrepreneur. So if you're an academic entrepreneur, you're also what Walter and Sienknecht call an innovation champion. How important were classic planning and systematic chance to your success?

I'm not sure I know, or not with any certainty. Chance always plays an important role in life. For me, I'm also sure it played a role in my second semester as a medical student – it was the early 1990s and I joined a working group set up by my long-term boss, Prof. Dr. Gerhard Buess. He was a pioneer in minimal invasive surgery. One thing I learned from him is that a fundamental innovation in interventional medicine automatically necessitates innovation in an associated area of medical technology. That was incredibly fascinating at the time and we stayed up night after night in our working group trying to find ways to translate ideas into prototypes in the laboratory and the workshop. The next day, we'd conduct experiments on them and just keep going till it led to a result – i.e. a clinical application that would bring benefit to patients. In essence, that's what I still do today – in a broader sense – with all the people now at our companies.

Then Steinbeis came along and a couple of years later I was called up by Steinbeis University, and then at the same time I set up our companies to produce and sell the medical products we had developed worldwide.

I think lots of the things we encounter on the journey in life are down to chance, but the opportunities we seize and how we exploit them depends on our predispositions and enthusiasm. Looking back now, my career path feels entirely plausible even if it was never planned that way or something I "decided."

What role does technology transfer play in business development when sharing know-how between science and companies, and why is experimentation so valuable when it comes to the success of a company?

I believe it plays an essential role. For a start, of course it's a tool for extricating good ideas from universities with minimum red tape and giving them a chance to work in practice. Steinbeis continues to do a lot in this respect, as do others, but this transfer philosophy really needs to be strengthened and nurtured. The realization rate – by which I mean the number of ideas from research findings that get implemented as commercial ideas in the market – is still too low in the German scientific community, not just at universities but also in other areas of research beyond universities. In my opinion, the international competitiveness of Germany would still benefit from a more active culture of commercialization in science and research. Using research findings should be a quality benchmark and be highlighted more as one of the parameters of success for publicly funded projects and institutions.

Experimentation, combined with innovation, commercialization, and entrepreneurship – the second part of your question: The reason that's so important is that most people at research institutions have absolutely no experience in this area. The Steinbeis model is extremely fit for purpose as a practical tool.

Engaging in this kind of experimentation and putting commercialization issues to the test allows you to find out if an entrepreneurial career path – through a Steinbeis Transfer Center or elsewhere – would be an appealing career option or whether you'd actually enjoy it. Without access to this kind of vocational space to experiment with things, some people would probably not pluck up the courage – I probably wouldn't have either.

What would you say to academic entrepreneurs hoping to succeed in the long term – after the injection of adrenalin of a startup?

I think it's important to keep educating yourself. All of those technological skills, motivation, staying power – they're just some of the prerequisites of potential success, even if they're probably the most important ones. But you also have to think about some of the key thrusts of business administration, which I think are primarily marketing and accounting, and later you'll be dealing with law and HR issues. Even if you have someone with business know-how on board, if you're an entrepreneur, inevitably you'll still at least need a solid understanding of the principles of business. There are also a variety of adult education options and it doesn't necessarily have to be a full-blown MBA. But you can't completely ignore this aspect if you want to be responsible for running things yourself.

The second thing is that you mustn't leave it too late on the innovation journey to examine the market in detail, customers, their needs, commercial possibilities – and thus also issues such as pricing and margins. People often leave it too late to think about this. But at some point, every enterprise has to be in a position to turn in a profit and to do that, in my experience success will depend on your understanding of pricing structures and the sales volumes in your market.

PROF. DR. MED. MARC O. SCHURR
marc.schurr@stw.de (author)

Director
Steinbeis Transfer Institute
Healthcare Industries
(Berlin/Tübingen)

www.steinbeis.de/su/628

"DIGITAL SOLUTIONS ONLY MAKE SENSE IF THEY BENEFIT THE CUSTOMER OR COMPANIES"

AN INTERVIEW WITH PROF. DR. PETER PHILIPPI-BECK, PROF. DR. ANDREAS PUFALL, AND PROF. DR.-ING. HEINER SMETS, EXPERTS IN THE STEINBEIS COMPETENCE TEAM AT TECHNOLOGIEUMSETZUNG – UNTERNEHMENSOPTIMIERUNG K|T|U

Three Steinbeis Enterprises – one concept: providing companies with end-to-end solutions. This approach is particularly important to companies in times of all-encompassing digital transformation, as technologies and sectors of industry converge. But what does it entail in practice? To find out, TRANSFER spoke with Prof. Dr. Peter Philippi-Beck, Prof. Dr. Andreas Pufall, and Prof. Dr.-Ing. Heiner Smets, who pooled their expertise in 2016 to help companies spot technological trends and introduce new business models, products for the future, and manufacturing processes.

Hello Professor Philippi-Beck. In 2016, you joined forces with Professor Pufall and Professor Smets and founded the Steinbeis Competence Team for Technologieumsetzung – Unternehmensoptimierung K|T|U. What was your idea behind this?

Our idea at the time was to offer interdisciplinary services, so not just work up business or technological solutions for customers, but also comprehensive solutions. That's still our approach today, and it's an important one. We started out with a focus on production topics, but we've increasingly noticed that we need to include other competences in the knowledge network; the changes happening in industry are spreading out into other areas and shifting dynamically. Given these changes, a network like this also has to be set up to be dynamic. You only have to look at a topic like 3D printing – it's not just about producing parts, which would probably not be possible (not with these levels of flexibility) with other processes. It's more about looking at the overall value chain and, based on this, coming up with the smartest solution. This entails new competences in order processing, 3D-compatible engineering design, and

IT'S ABOUT LOOKING AT THE OVERALL VALUE CHAIN AND, BASED ON THIS, COMING UP WITH THE SMARTEST SOLUTION

embedding processes into existing development, production, and logistical structures. But you still have to maintain a focus on the competitiveness of companies and retain their business models using modern technology.

Turning to you, Professor Smets: You're closely involved in the topic of business optimization. How do you make a distinction with this compared to corporate development? And what makes business optimization successful?

We deal with optimization on an operational level. So it's about improving products and production by using new technology in such a way that it enhances the competitiveness of the company. That's linked with an understanding of success factors and introducing efficient control mechanisms to this area. "Corporate development" goes further: It includes aspects like organizational development, organizational change, and management. Obviously, that also means you have to understand business models, and this forms a link to the business strategy, one part of which is business optimization.

Professor Pufall: Product development is one option offered by business development and it's hugely important if a company wants to succeed, especially at SMEs. Which factors currently influence product development and which factors do you think will influence it in the future?

Today's products are increasingly smart, networked, and sustainable. That poses three central challenges for SMEs when it comes to product development. First, it will be increasingly important to develop services as a product or as an associated part of a physical product. Lots of these product functions will be made possible by or provided through software. Typical examples of this are smartphone apps that can be sold to go with the actual products, or smart add-on services such as predictive maintenance and related web services. This raises complexity, and software development becomes an even more important aspect of product development. Larger firms are increasingly reacting to this with model-based and virtual product development, or agile and evolutionary procedural models. Despite this, SMEs often struggle to adapt the approaches they take in product development because they lack the specialist departments. They often work according to sequential procedural models, clearly defined development phases, and fixed requirement lists issued by marketing or sales departments. This is an inefficient way to do things if you need to develop software-driven products iteratively based on a new business model.

The second point is that modern product development is based on a holistic perspective and takes all factors into account across all phases of the product life cycle. The aim is to get all stakeholders to interact with one another and avoid a silo mentality. So successful startups dovetail customers and other industry players with the right expertise extremely closely into the development process in order to boost their potential to innovate. That said, established firms also increasingly involve production engineers, logistics experts, certification agencies, and external stakeholders such as customer service technicians or customers in systems design in order to optimize the product benefits for everyone involved. Products shouldn't just be optimized in terms of functional performance, concentrating on specific disciplines while developing the details – they should also be improved for all of the product life cycle phases that follow product development. Products should be designed to be sustainable and suitable for production, maintenance, logistics, and recycling. Especially when it comes to sustainable product design, it's

important to understand all potential negative impacts of a product design, throughout the entire life cycle – as soon as possible, thinking about all disciplines. But SMEs often fail to understand the importance or the benefits of taking such a view, and they lack the expertise to conduct quantitative assessments.

And thirdly, modern product development and modern supply chain management will no longer take place among companies based on linear chains; they will increasingly be part of value creation networks. This will turn product development into a task that takes place across several different companies, on an increasingly interdisciplinary level, and specialists will be expected to work with others across different areas of expertise. This will place increasing emphasis on investments in intercompany project management, engineering based on end-to-end digital technology, and communication between all parties from different cultural backgrounds and time zones.

One factor of central importance is which parts of value creation the company takes on itself and which partners to work with.

One thing that is apparent overall is that for companies to prepare their product development for the future, they will have to regularly re-think and redevelop their procedures, processes, IT solutions, and organizational setups. This is where our team at C|T|B comes in by proactively helping SMEs design and optimize their development processes and lay the right emphasis according to the specific circumstances.

Successful companies create value by offering appealing products, efficient processes, and new business models, but it's a bumpy journey getting there. Where do you see the biggest challenges for SMEs, and what does the Steinbeis Competence Team do to help companies with these challenges?

Andreas Pufall:
The biggest challenge for SMEs is addressing the opportunities presented by digital transformation to keep their processes and products competitive. But digital solutions only make sense if they benefit the customer or companies, and that's precisely where the big challenge lies. For example there are still lots of firms with production processes dictated by a whole host of paper documents, with high stock volumes and bad synchronization between different departments. Under such circumstances, it would probably be counterproductive to network all of the different parts of production without thinking everything through or without looking into the benefits, even if there can be no denying that this would deliver benefit in the medium term.

Peter Philippi-Beck:
It's more about working up relevant approaches toward innovation, and these require interdisciplinary expertise and methodical and systematic approaches.

It's no longer a secret that many digital transformation projects at small and medium-sized companies were only successfully implemented because the right networks were in place. In a world of networks, companies are rarely in a position to adequately fulfill the needs of their customers by themselves. Our goal is to support companies with this complex process so they can successfully develop their business in keeping with defined objectives, based on the right technology.

PROF. DR. PETER PHILIPPI-BECK
peter.philippi-beck@stw.de (author)

Director
Steinbeis Transfer Center
Internationalisation – Equity Participation – Succession Regulation
(Ravensburg)

www.steinbeis.de/su/858
www.stz-ibn.de/

PROF. DR. ANDREAS PUFALL
andreas.pufall@stw.de (author)

Director
Steinbeis Transfer Center
Production and Product Development (Ulm)

www.steinbeis.de/su/2002

PROF. DR.-ING. HEINER SMETS
heiner.smets@stw.de (author)

Director
Steinbeis Transfer Center
Business Improvement and Organization (Coburg)

www.steinbeis.de/su/1999

USING COLORFUL PLASTIC BRICKS TO DEVELOP INNOVATIONS

STEINBEIS CONSULTANTS PAVE THE WAY FOR CREATIVE IDEAS USING LEGO® SERIOUS PLAY® MATERIALS AND METHODS

Who is not familiar with them, or who has never held one in their hands – those colorful little bricks that allow children to explore their imaginations? And now adults can start playing with them again – for business reasons, of course. Only this time, it's not about seeing what you can make. Lego® Serious Play® (LSP) offers materials and methods that allow companies and organizations to come up with innovations and develop creative concepts as part of a carefully coordinated process. Patrick Brauckmann, director of the Berlin-based Steinbeis Consulting Center Corporate.Business.Gaming. explains how.

Innovation is now a key driver of business development. Offering products or services that are different to those offered by the competition allows a company to grow. Innovations are rarely thought up by "someone at the company" – they're usually developed and worked up as part of carefully planned processes. On the surface, creativity and structured approaches would appear to get in the way of one another. But actually, there are ways to use creative processes to allow the two ends to meet, for example by using Lego® Serious Play® (LSP) materials and methods. These are suitable for all situations where creativity and entrepreneurial thinking are called for, or voices and ideas need to be listened to – on an equal footing and from all angles. This is because the best possible solution to a complex problem can only be identified if lots of people can be involved in a process and listened to. This is exactly how LSP works, by using specially developed materials and methods. Despite this, coming up with innovative ideas is only one possible use of LSP. It can also be used for lots of other topics, such as team development or even planning strategies for entire companies.

"THINKING WITH YOUR HANDS"

LSP workshops and sessions always start with a specific formulation of a problem within the context of the task at hand. Workshop participants are given small construction tasks that allow them to start talking about a certain situation facing the company and exchange views. There is a facilitator, whose task is to guide conversation and allow people to capture what they have discovered. Facilitators are more like mediators, who focus on ensuring people can discuss issues with one another on an equal footing and encourage people to come up with ideas. By thinking with their hands, all participants get into a creative flow and translate their ideas into models that people can see and relate to. This process allows people to discuss and share different ideas, which can be used later and pulled together in a common model. This model becomes a quintessential ingredient of idea generation, the basis for discussion between participants. Using the shared model also makes it possible to highlight mutual interdependencies with systems and discuss interactions with those around the company (such as clients). LSP is a strikingly vivid way to allow participants taking part in a workshop to use materials and methods to come up with extremely "hands-on" results. The output can be photographed and filmed, offering a number of highly efficient options for sharing key findings with other people at the company and decision-makers. The models basically do the talking and

Steinbeis consultants pave the way for creative ideas using Lego® Serious Play® materials and methods. Ally (left) and Lano (right) help change perspectives creatively.

explain the results of the workshop participants.

In Patrick Brauckmann's experience, this playful process allows ideas and potential innovations to be developed that would otherwise go undiscovered. "Time and again, it's amazing how specific the thinking is and how expedient it is working with your hands. Allowing the process to work intuitively – yet still guiding it – leads to results that would never otherwise happen," explains the Steinbeis consultant. Combining this approach with other methods makes it possible to develop and implement action plans, business plans, and other prototypical test scenarios.

Workshop participants developing innovative ideas in the care industry

Using iterative testing loops and rapid prototyping also makes it possible to quickly identify erroneous ideas and make corrections. Ultimately, this shortens innovation cycles and makes it easier to come up with ideas, and results can be quickly implemented and prepared for possible introduction. Another important aspect that should not be ignored is that the playful approach moves away from traditional ways of thinking and stimulates new areas of thinking. This broadens the bandwidth of concept development, and ideas become more imaginative: When people play, they can also try out things that might otherwise sound a bit wacky.

ONCE A TELETRANSPORTER, NOW A SOLUTION TO CARE SHORTAGES

This was the case when a teletransporter was invented at an innovation workshop – something seemingly far removed from reality. The underlying problem faced by the company – difficulties in logistics were hindering its logistics and international expansion – was summed up in a nutshell: The ideal solution really would have been a teletransporter to dispatch any product to any location in the world within seconds, at little cost. As the innovation workshop progressed, other, potentially implementable ideas were thought up and discussed to replace the teletransporter. By the end, two options were selected and tested as prototypes. Of course without the "crazy idea" at the beginning, no-one would have thought of a way to solve the problem.

At another workshop, Brauckmann asked the participants to name any kind of social problem. The participants soon zoomed in on the care industry. Developing ideas by coming at issues from a variety of angles allowed participants to come up with a number of different ways to solve problems and deal with care shortages. These could address a variety of difficulties related to the aging population. The workshop participants then chose a specific solution from the potential solutions and dug deeper. The emphasis shifted toward technological developments combined with more intensive personal care. By the end of the workshop, the participants arrived at an entirely realistic scenario. Using Lego® Serious Play® allowed abstract topics to become extremely tangible, discussions revolved around a specific model, and this made findings more descriptive.

These brief examples of workshop applications show that Lego® Serious Play® materials and methods can be used as efficient instruments in developing new ideas at companies. They even work in social contexts. A Steinbeis Consulting Center, Corporate.Business.Gaming. is specialized in workshops and seminars that use playful and agile methods in different ways to add value. Combining business simulations with LSP materials and methods allows the Steinbeis experts to deliver a completely new experience. Content becomes palpable and accessible – and with that, more memorable. In addition, results are generated that would not be possible using conventional methods.

PATRICK BRAUCKMANN
patrick.brauckmann@stw.de (author)

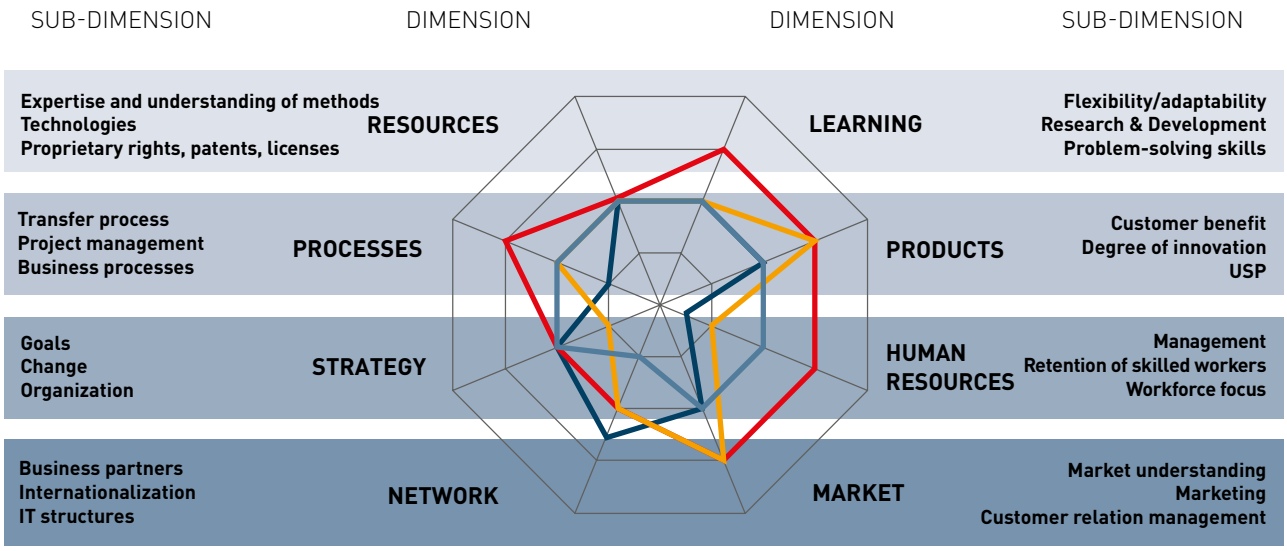
Director
Steinbeis Consulting Center
Corporate.Business.Gaming.
(Berlin)

www.steinbeis.de/su/1788
www.corporate-gaming.com

UPHOLDING SUCCESS DURING TIMES OF CHANGE

EFFICIENT AND EFFECTIVE SUPPORT WITH BUSINESS DEVELOPMENT

Dynamic markets, digital transformation, staff loyalty, HR development, the cost squeeze – companies have to follow so many different issues when preparing for the future. And at the same time, everything is getting more complex. No matter what challenges they face, the sector of industry, or the size of a company – successful business tomorrow requires pooled resources today. Accordingly, strategically existential decision-making requires a holistic view, often entailing a combination of different business instruments, which take time and are expensive. Support in this comes from Steinbeis experts Sabine Horst and Isolde Fischer, who have successfully developed a tried-and-tested consulting method based on the Steinbeis Enterprise Competence Check (ECC).



Example of a complete spider map with individual feedback marked in color

Sabine Horst and Isolde Fischer have based their consulting services on a combination of analysis and solution-based implementation. At the heart of their partnership lie synergies offered by their combined expertise in leadership competence, company cultures, interdisciplinary understanding, communication, and organizational development. Their projects show that these competences can be applied successfully to actual business practice.

FOCUSING ON THE FUTURE – WHEN A STRENGTH STARTS TO BECOME A PROBLEM

An attorney's office turned to the experts at Steinbeis. Digital transformation and a shortage of skilled workers had made it necessary to shift the business focus, and in some cases the areas the firm originally offered its services in had completely evaporated. The firm started out as a family-owned business and for years,

many core tasks of management had run smoothly, without major need to cross-check with other partners. Everyone was passionately involved in the business and committed; everyone knew what to do. Providing clients with professional support and keeping the customer satisfied was, and always had been, central to all services.

"What that implies, is not something we need to spend a lot of time talking about. We know we can rely on one another," the partners used to say. This was something they were proud of. Trust is something special, a highly prized asset at any company, something that is becoming increasingly difficult to maintain. But this kind of blind faith can also become a hindrance. As the nature of work became more and more complex, management often lacked the right instruments for solving conflicts, joint decision-making, or even strategic business development. Eventually, heightening tension between the partners in the business began to trickle down through the entire company. This was all happening as the firm was about to move into its third generation. The management tasks this would involve had therefore become even more important. There was no more room for tacit acceptance – also because the handover would take place in a time of sweeping change in the market.

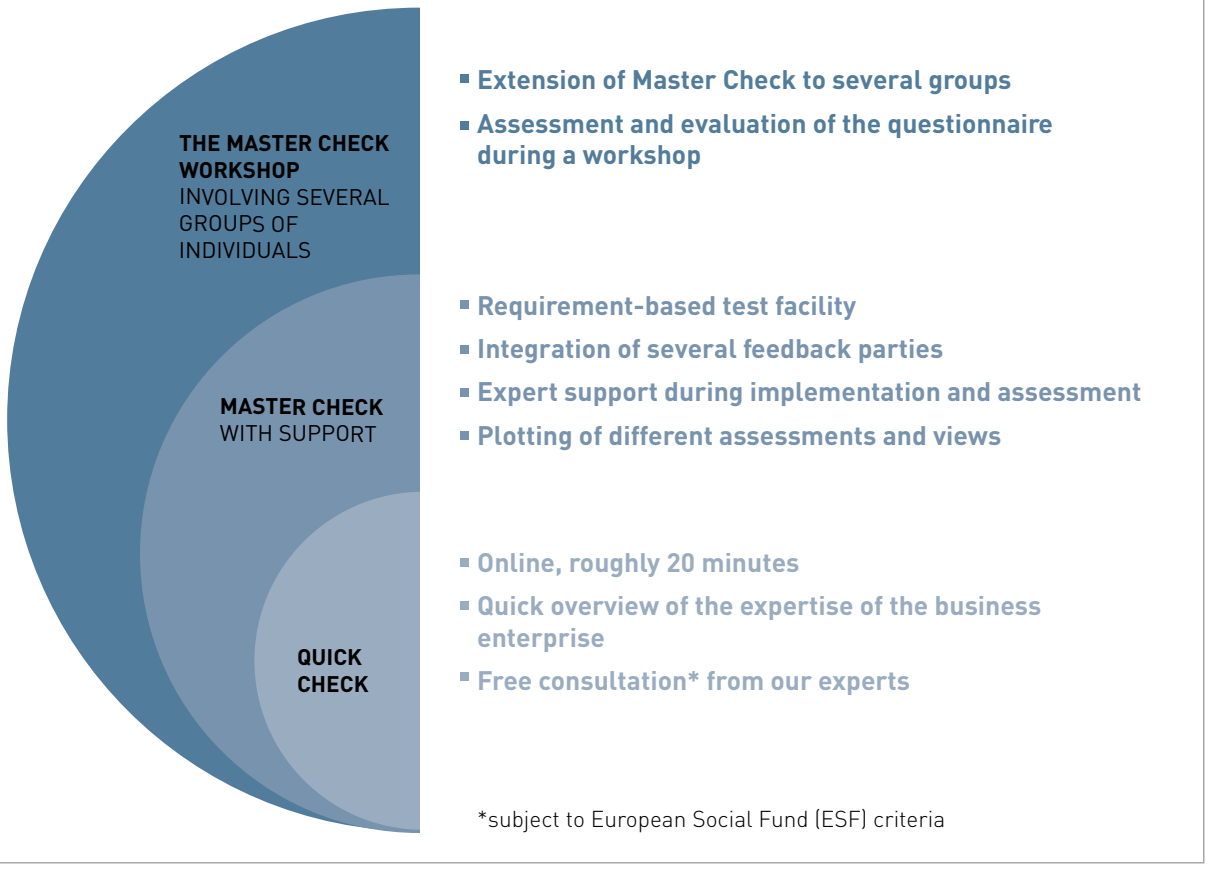
STEP 1: A SHORT CONSULTATION SESSION BACKED BY THE ESF

The assessment of requirements conducted by the Steinbeis experts formed part of an ESF-sponsored short consultation session. This resulted in a decision to use the Steinbeis ECC for a further consultation. The methodical, strategic assessment of business competences this offers played an essential role in all subsequent deliberations.

STEP 2: AN OVERVIEW FROM THE ECC MASTER CHECK

Horst and Fischer provided support during the EEC online check, which offers 360-degree feedback on relevant business competences relating to knowledge, innovation, implementation, and communication. Feedback was gathered from business partners, selected customers, third-party service providers, and staff. The average processing time of the online check was approximately one hour.

Different ways to use the ECC
© Dr. Sabine Horst, Steinbeis Consulting Center for Competencies. Communication. Cultures. and Isolde Fischer, Steinbeis Consulting Center for Economic Corporate Management



After answering the ECC questionnaire, the tool automatically creates a graph with an overview of the company competence profile, including an explanation of the findings. The individual assessments can be compared to one another, depending on the questions asked.

STEP 3: WORKSHOP FOR ASSESSING THE ECC

The different views and opinions offered by the ECC were then evaluated at a four-hour workshop. For the first two hours, the people who had taken part in the check survey explained their opinions. This was an important process, because the workshop allowed participants to explain and understand individual views. This stage thus showed the basis of everyday decisions made by different parties regarding the actions they take. The second stage allowed the different partners in the business to reflect on this information and think about the future. How do they feel about the differences and overlaps between the different views held by people? What does this mean for the strategic direction of the attorney's office? A number of big pennies dropped during this workshop, for everyone involved, ultimately resulting in a change in direction for the partners. One key factor in this was the realization that the firm faced some major threats, such as staff workload. This made it possible to outline four areas in which action was required:

- What do we want to keep the way it is?
- What do we need to strengthen and develop?
- In which areas do we need to add things?
- What should/must we stop right now?

CORPORATE SUCCESSION: TWO BECOME FOUR

The Steinbeis experts have also successfully applied the ECC to a project involving the takeover of an electrical engineering company. For age reasons, the two founders of the firm had decided to hand over their business to two employees and two external service providers. The new owners were to run the business together as the new directors of the company. These succession arrangements were also backdropped by an extremely dynamic market, and this also made it necessary to enter a new field of innovation. The four designated successors completed the ECC questionnaire in preparation for their new roles as company directors. Their focus lay in assessing the company and expectations regarding available expertise. They then evaluated the results of the questionnaire at a workshop with Horst and Fischer.

Again, when they looked at the results, the workshop participants were in for a surprise or two. It was the first time that all four – none with any experience in managing a business, all from different specialist backgrounds – had explicitly tackled some core issues; they had assumed everyone saw things the way they did. The Steinbeis consultation session delivered transparency and clarity, and it helped define the breakdown of different roles, accountabilities, responsibilities, the impact of change on related factors (which had been hugely underestimated), and personal identification with areas the firm needed to develop in – in terms of the organization and individuals.

"The use of Steinbeis EEC supports us in the application of our fundamental understanding in which we consult organizations and companies based on the salutogenesis. According to this, there are basic human needs that we understand also as leadership guidelines – meaningfulness, comprehensibility and manageability," say Horst and Fischer, summarizing their approach to consulting.

THE STEINBEIS ECC AS AN INSTRUMENT OF CORPORATE DEVELOPMENT

Using the Steinbeis Enterprise Competence Check (ECC) offers clear benefits in supporting business development:

- **Transparency:** A holistic view and revelation of blind spots, which are graphed and made visual and tangible.
- **Structure:** Complexity is reduced, enabling to set priorities. This makes it easier to deal with anticipated challenges.
- **Understanding and commitment:** Communication and obligation are fostered between different parties.
- **Efficiency:** Solutions quickly arise, focused on the actual needs of business.

DR. SABINE HORST
sabine.horst@stw.de (author)

Director
Steinbeis Consulting Center
Competencies. Communication. Cultures. (Stuttgart)

www.steinbeis.de/su/1550

ISOLDE FISCHER
isolde.fischer@stw.de

Director
Steinbeis Consulting Center
Economic Corporate Management (Leonberg)

www.steinbeis.de/su/1045

"BROAD SKILL SETS WILL REMAIN A KEY QUALIFICATION IN THE FUTURE"

AN INTERVIEW WITH BRUNO GROSS,
MANAGING DIRECTOR OF SAPHIR DEUTSCHLAND GMBH

Will HR specialists be able to lean back and relax in the future and hand selection over to ingenious software? Or can (and should) such decisions still be made by people? Steinbeis expert Bruno Gross (SAPHIR Deutschland GmbH) is convinced that only human beings are capable of making the final decision. Gross tells TRANSFER magazine why, how the recruitment market will change in the future, and why he and his colleagues have specialized in finding young talents for companies.

Hello Mr. Gross. How does a theologian end up at a company that mainly selects, recruits, and ties in "high potentials?" What role did your career at Steinbeis play in this?

I'm interested in people and that's had an influence on lots of my decisions, as it did with my theology degree. Basically, for me the big question is always how life can be a success for people.

It's the same in my current role. Working alongside my colleagues at SAPHIR, I'd like to line up challenging tasks and projects for young people and by doing this, allow them to unleash their full potential.

I've been shaped by Steinbeis, not just through my degree but also in my role at Steinbeis University, and as a result I tend to concentrate on what's possible in my work, without taking my eye off the horizon. Ultimately, manufacturing products or providing services is always about creating value and delivering prospects for the future. That's what it's all about. For me, that's Steinbeis.

Changes in the markets and the business environment challenge companies to think differently when it comes to corporate development. And this has an impact on recruitment, because training and employee skills dictate success as a business enterprise. Where do you see the biggest challenges for recruitment at the moment?

What we're experiencing at the moment is that lots of companies are still extremely conservative in how they approach things. What I mean by this is that they come along with a specific role and then look for a specific person with the right qualifications and experience for that role. I would recommend that companies don't define jobs in terms of the individual tasks they involve, but determine the problems and goals that need to be solved or achieved.

In some cases, the way people solve a problem should dictate the type of qualifications they need or the experience they should have. Despite this, in lots of other cases it's entirely possible to look for people who are in a position to approach an issue with open goals, so they approach things creatively and explore different possibilities. For example, an IT project doesn't have to be managed by a computer scientist – depending on the task at hand it could also be success-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fully managed by someone who studied humanities.

Of course, qualifications will continue to play an important role in the future. But broad skill sets will also remain a key qualification.

SAPHIR Deutschland GmbH is a specialist in recruitment, selection, training, and the retention of young talents. Why was that target group chosen?

There are historical and rational reasons for this. My predecessor, Bettina Rominger, set up SAPHIR in 2007 with Prof. Werner Faix because at the time, they both recognized that developments in the recruitment market needed answers that were suitable in strategic terms, and the answer came through recruitment becoming more differentiated and specialized in terms of contextual focus – it should develop into a separate field of activity.

This insight into future developments evolved and became a conviction that, for a variety of reasons, finding and recruiting young talents requires specialization and different communication than when you're dealing with someone like middle-aged specialists.

Also, it's a lot of fun working with young people who are looking for direction in their careers – in ways that match them as a target group; reaching out to them with projects that offer plenty of prospects for the future; accompanying them during the application process; and then lining up individual opportunities for them.

Which trends do you think will affect recruitment in the future, and HR development? Will candidates be selected by algorithms?

HR work is probably sometimes seen as a conservative part of business because it's about keeping things stable and reliable, whereas the "recruitment scene" tends to be a bit younger so it tries to be hip and enjoys experimenting because it needs to be adaptable. As a result, recruitment experts tend to be more open to new technological solutions – things like artificial intelligence.

I don't consider it impossible that there'll be purely "machine-driven" recruitment processes in several decades, but if there are, they'll be the exception. But otherwise, increasingly people will be supported by smart technology when selecting candidates, but even in the future the final selection process will still be carried out by human beings. I say that because machines will be able to say whether qualifications, experience, and skills are a good match for a certain role, but they won't be able to say if there's a good match in terms of the personal chemistry. The only way to find that out is for people to meet and get to know each other. So basically, machines will look after preselection and people will look after final selection – a bit like working with a partner agency.

Of course, if that's the setup, it's still possible that some bad judgments will be made – as the saying goes, to err is human. But people responsible for selection should take care of that, not machines.

BRUNO GROSS
bruno.gross@stw.de (author)

Managing Director
SAPHIR Deutschland GmbH
(Herrenberg)

www.steinbeis.de/su/1182
https://saphir-deutschland.de

SUCCESS IN THE CITY AND BEYOND

THE IMPORTANCE OF LOCATION TO THE SUCCESS OF A BUSINESS

What are the key success factors of a business enterprise? This question has preoccupied generations of scientists and business leaders, but it is becoming increasingly important given current developments relating to digital transformation and internationalization. Prof. Dr. Norbert Zdrowomyslaw and his colleagues at the Steinbeis Transfer Center for Network Planning and Evaluation in Stralsund have also been examining this topic in detail as part of a project looking at driving economic development and the promotion of small and medium-sized businesses in Mecklenburg-West Pomerania. Their particular focus lies in SMEs in the state and the role the region plays in economic growth. The lessons they have learned can be generalized and applied to other regions and companies.

Business structures are diverse and the overall economic circumstances companies face are constantly changing. If anything, change is even accelerating. Today's knowledge-based society thinks in increasingly short time lines in almost all areas of modern life, and no two companies are the same. Whether it's a small or medium-sized firm, or a major corporation, all businesses are confronted by the challenges of megatrends such as globalization, urbanization, digitalization, and individualization (Horx, 2011). To safeguard innovation and competitiveness, decision-makers have to meet and overcome a whole host of different challenges.

STRENGTHENING SMALL AND MEDIUM-SIZED BUSINESSES

Companies face particular challenges in areas characterized by poor infrastructure, especially in rural areas. It is essential that politicians and local stakeholders think about long-term goals and strategic needs, driving regional development and fostering SMEs, especially given the nature of Germany as the land of the "Mittelstand." For decades, the Federal Government has been trying to support and strengthen Mittelstand firms in the regional economy. In 2020, based on the collective task of "improving regional business infrastructure," a nationwide funding system will be set up, primarily targeted at areas with underdeveloped infrastructure. The idea is to offer nationwide federal programs aimed at funding innovation, digital technology, and skilled workers – also expanding regional infrastructures by offering special financing terms to support economic development within different regions.

TIME FOR COMPANIES TO ACT

The external and internal business environment faced by companies is subject to continual change, and the challenge of management is to shape this change. But to do this, organizational structures

also have to adapt to the changing situation faced by companies, or systems have to be realigned to maintain competitiveness and prepare for the future. This entails formal models such as change/transformation management, in order to systematically implement measures that foster change, in keeping with defined objectives and strategies.For many decades, scientists and business managers have observed the nature of megatrends and the numerous challenges posed to business and asked themselves an important question: What are the key success factors of a business enterprise? There is no such thing as a standard recipe for setting up a successful company or achieving long-term sustainable growth. For their firms to survive and remain competitive, company decision-makers have to continuously adapt monitoring and control processes in keeping with developments within the company. "In this fast-moving world, early recognition and risk management are becoming more are more crucial to the development and survival strategies of companies," summarizes Steinbeis expert Norbert Zdrowomyslaw. Politicians have instruments and measures they can introduce to combat the gradual drift away from rural areas and regions with weak infrastructures, and they can use these to safeguard jobs, but the decision-makers at companies and other organizations are on their own when it comes to their image as employers, recruitment, staff retention, training, education, and succession planning.

INNOVATIVE ADVANTAGE AND COMPETITIVE EDGE THROUGH COLLABORATIVE STRATEGIES

Business locations and companies more or less face both national and global competition. One of the main focal topics of the 2030 National Industry Strategy is how small and medium-sized manufacturers and major companies interact with one another when it comes to sustainable value creation: "The aim of the strategy is to strengthen key enabling technologies and fundamental innovations. Other points of emphasis include the structures that underpin networks and business clusters, accelerating how research findings are shared with small and medium-sized businesses and startups, and the technological promotion of innovation." This does not mean, however, that areas with weak infrastructures, rural areas, or small or medium-sized companies should ignore the possibility of collaborative strategies – quite the opposite. Communication skills and a willingness to enter into partnerships are extremely important, especially for SMEs. Given the fact that every city or region is basically competing for infrastructure investments, in-

Megatrends and challenges

CLIMATE CHANGE AND CLIMATE PROTECTION

MEGATRENDS

- **Globalization**
- **Urbanization**
- **Health**
- **Neo-ecology**
- **Connectivity**
- **Modern travel options**

MEGATRENDS

- **New work - knowledge work**
- **New education**
- **Women**
- **Individualization**
- **Aging (demographics)**

CHANGING VALUES AND CONSUMER BEHAVIOR

- **Stop the drift away from rural areas**
- **Worker protection**
- **Raise the appeal of employers**
- **Corporate succession**
- **Promote the appeal of a location more strongly – "do good and talk about it"**

BUSINESS STRUCTURES ARE DIVERSE AND THE OVERALL ECONOMIC CIRCUMSTANCES COMPANIES FACE ARE CONSTANTLY CHANGING – THEY'RE EVEN ACCELERATING.

vestors, new companies coming to the area, jobs, and tourist destinations, areas that are particularly weak in industrial terms and have very few hidden champions are highly dependent on strong networks and robust partnerships (Simon, 2012). This lends even more meaning to the saying that "We stand stronger together."

Awareness levels, image, and the appeal of a region are extremely important factors when it comes to stability and the growth of industry and companies. Regions are like complex service packages that need to be marketed, and they depend strongly on the interchangeability of "hard" location factors. "Soft" location factors such as culture, the innovation community, the creative scene, entrepreneurial spirit, or the special characteristics and unique features of a small city or region also play an increasingly important role when it comes to the perceptions of stakeholders, especially with respect to the appeal of a location, not to mention the competitiveness of a region and companies that are based there. Not all rural areas are in a position to advertise themselves by showcasing hidden champions or attractive employers. But every city or region has something special about it, its so-called unique selling proposition (USP). So a state like Mecklenburg-West Pomerania has to base its marketing strategy on other USPs to "score points" among its main stakeholder groups (Zdrowomyslaw et al, 2019).

PROF. DR. NORBERT ZDROWOMYSLAW
norbert.zdrowomyslaw@stw.de (author)

Project Manager
Steinbeis Transfer Center Network Planning and Evaluation (Stralsund)

www.steinbeis.de/su/0391

DANIEL WEDELL
daniel.wedell@stw.de

Research assistant, "Driving Economic Development and the Promotion of Small and Medium-sized Business in Mecklenburg-West Pomerania"

Steinbeis Transfer Center Network Planning and Evaluation (Stralsund)
www.steinbeis.de/su/0391

MAURICE MICHALIK
maurice.michalik@stw.de

Research assistant, "Driving Economic Development and the Promotion of Small and Medium-sized Business in Mecklenburg-West Pomerania"

Steinbeis Transfer Center Network Planning and Evaluation (Stralsund)
www.steinbeis.de/su/0391

LISA VOTHKNECHT
lisa.vothknecht@stw.de

Research assistant, "Driving Economic Development and the Promotion of Small and Medium-sized Business in Mecklenburg-West Pomerania"

Steinbeis Transfer Center Network Planning and Evaluation (Stralsund)
www.steinbeis.de/su/0391

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STEINBEIS NETWORK EVENT 2019

MORE THAN 500 STEINBEISERS AND THEIR GUESTS ATTENDED THE STEINBEIS DAY AND STEINBEIS NIGHT IN STUTTGART

It's that time of year when the summer is drawing to a close and the business schedule is quickly filling up with appointments, but one date is already inked in: the last Friday in September, when members of the Steinbeis Network meet up to take part in the Steinbeis Day and the Steinbeis Night, two important networking events. More than 500 people came to hone their networks at the 2019 events and take part in the exchange of ideas at the get-together.

The day started with brunch followed by workshops, short speeches, and discussion forums at the Hospitalhof in Stuttgart. Three topics were on the agenda, all currently occupying the thoughts of companies across all sectors of industry: staff recruitment and loyalty, sustainable commerce, and artificial intelligence. The spectrum of formats on offer underscored how it is possible to discuss these topics from a variety of angles, also highlighting the challenges companies face. The day was also a chance to forge networks, especially during the pitch events featuring individual Steinbeis Enterprises and the team sessions with Steinbeis Headquarters on the "snack and talk" islands. To round off the day on a cultural note, there was also a guided tour through the Hospitalhof to admire the wonderful architecture and an exhibition featuring the works of Ursula Christian.

The event then moved on seamlessly to an evening at the Liederhalle Arts and Convention Centre. Steinbeisers and their clients enjoyed a congenial evening in the relaxing atmosphere of the Beethoven Hall. As usual, there were culinary delights and fun musical accompaniment from the Silvio Dalla Brida Band, perfect preparation for the highlight of the evening: the bestowal of the Steinbeis Foundation Transfer Award – the Löhn Award. This year four project teams went home with an award.

Material Engineering Center Saarland (MECS, the Steinbeis Research Center) and TE Connectivity (Speyer) received an award for the functionalization of electrical contacts using high-speed laser structuring. An award was bestowed for a predictive maintenance system involving digital twins, the fruit of a project conducted by the Steinbeis Research Center for Design and Systems (Würzburg) with Koenig & Bauer Coding from Veitshöchheim. Three partners were awarded a prize for their shared involvement in the development of fiberglass-reinforced building concrete for complex free-form facades: FiberCrete, the Steinbeis Innovation Center from Chemnitz, Fiber-Tech Products (also from Chemnitz), and Medicke Metallbau from Glauchau. Finally, the development of an innovative manufacturing system for producing highly complex component surfaces earned a Transfer Award for the Steinbeis Transfer Center for Production and Organization (Pforzheim) and Optik-Elektro Huber from Mühlacker. The projects and award winners are introduced in more detail on the following pages.

EXCELLENT! COMPETENCE WORTHY OF AN AWARD

THE STEINBEIS FOUNDATION HAS HONORED FOUR PROJECT TEAMS WITH THE 2019 STEINBEIS FOUNDATION TRANSFER AWARD – THE LÖHN AWARD

Benefits add value – a guiding principle that shapes the work of the Steinbeis Network and the underlying idea behind the Steinbeis Foundation Transfer Award – the Löhn Award. The honor has been bestowed for over 15 years in acknowledgement of outstanding transfer projects. This year the award was shared by four project partners: Steinbeis experts from Pforzheim, Würzburg, Chemnitz, and Saarbrücken received the coveted award with their business partners at the Steinbeis Night in Stuttgart. Congratulations!

The Steinbeis Foundation Transfer Award – the Löhn Award – was initiated and first bestowed in 2004 to honor the unique achievements of Prof. Dr. Dr. h. c. mult. Johann Löhn, the former chairman of the Steinbeis Foundation. It is awarded annually in recognition of outstanding transfer projects in the competitive field of knowledge and technology transfer between science and business. What makes a project worthy of the award? On the one side, the transfer process should be particularly successful in qualitative terms, and on the other the sharing of know-how should be excellent, offering recognizable potential to transfer knowledge. The projects that are selected for the award are chosen by a jury, which includes members of the Steinbeis Foundation board, and the chairman and honorary members of the Steinbeis Foundation board of trustees.

In addition to the prize money, the winners receive a unique sculpture to take home. The sculpture, which was designed specially for the Löhn Award by Prof. Detlef Rahe (the Institute for Integrated Design, a Steinbeis Transfer Center in Bremen), symbolizes the idea behind Steinbeis transfer and the underlying system developed by Johann Löhn, which has been applied successfully through the Steinbeis Network since 1983. Two individual, yet complementary sculptures reflect the reciprocal transfer process, thus mirroring the "multi-dimensional duality" of a process that brings together independent partners working together for mutual benefit. The three-dimensional, interwoven, and overlapping double uprights were designed and sculpted using digital technology. The materials are produced using rapid prototyping and the very latest ceramic and metallic science.


WC

AWARD WINNERS

STEINBEIS TRANSFER CENTER FOR PRODUCTION AND ORGANIZATION + OPTIK-ELEKTRO HUBER GMBH

OF HIGHLY COMPLEX COMPONENT SURFACES AND ROUGH EGGS

STEINBEIS EXPERTS FROM PFORZHEIM AND OPTIK-ELEKTRO HUBER DEVELOP INNOVATIVE MANUFACTURING PROCESS

There are two marked trends occurring in many fields of technology at the moment. The first is a significant shift toward miniaturization, and the other is higher levels of integrated technical functions within products. This goes hand in hand with a need for ultimate quality and functionality, especially in sensitive areas such as the aerospace industry and medical technology. The Steinbeis Transfer Center for Production and Organization in Pforzheim and Optik-Elektro Huber have successfully met these requirements: Their joint project has been honored with the 2019 Steinbeis Foundation Transfer Award – the Löhn Award.

Huber, an optical electronics company from Enzberg near the Baden-Wuerttemberg city of Mühlacker, is specialized in the production of small batches of highly complex mechanical parts used in aerospace and medical technology. For example, it produces components used in valves required to operate impeccably at temperatures as low as -100°C. It is not possible to use elastomer seals at such temperatures and as a result metal functional surfaces are needed to achieve the right seals, which typically involve tightly positioning metal on metal. This is only achievable if surfaces offer minimal levels of roughness and ultimate precision.

To meet such requirements, Huber joined forces with the Pforzheim-based Steinbeis Transfer Center for Production and Organization to develop a new process that would help eliminate the possibility of a variety of processes negatively impacting surfaces – from machining to final packaging before shipping.

Their fully automated solution revolves around an autonomous manufacturing cell that processes components individually in order to avoid potential damage inflicted on surfaces by parts accidentally bumping into to one another – without having a detrimental impact on the overall process. At the heart of the unit lies a new kind of cleansing system which allows factors with an influence on cleansing to be taken into account (temperature, cleansing time, mechan-

ical support, and chemical use). The system works in such a way that despite having to use extremely environmentally friendly cleaning agents, all required processes can take place in parallel to component machining. This safeguards ultimate quality standards at a minimal cost.

In addition to developing the technology behind the system and setting it up, the project partners planned a commercialization strategy to extend the new technology's potential field of application; this strategy is now being systematically implemented. The project has allowed both partners to demonstrate how an overarching approach to problem-solving and close collaboration between science and business can result in innovative technologies and concepts capable of securing competitiveness in the long term. Achieving this through the project has been honored by the Steinbeis Foundation Transfer Award – the Löhn Award.

"WE WANT TO SHOW OUR CUSTOMERS THAT WE ALLOW BOTH PARTIES TO BE SUCCESSFUL WITH OUR INNOVATIVE SOLUTIONS."

AN INTERVIEW WITH PROF. DR.-ING. HERBERT EMMERICH AND THILO HUBER

Hello Mr. Huber. You have been specializing in the production of miniaturized mechanical components for many years now. What were the challenges you faced when you turned to the expertise of the Steinbeis Transfer Center for Production and Organization in 2017?

We were working on complex components with extremely demanding surface requirements; with some parts we had really high reject rates, which were a result of the processes after milling and the nature of the part-handling process. We needed to find different ways to restrict or eliminate any possibility of external impacts influencing our automated process. Another more general issue was the throughput time for overall batches to go through all of the processes, because of the nature of our production and batch sizes. We needed to find a new method that would allow us to map the features of a production island in such a way that we could significantly reduce slack time between different stages of the processes, and thus reduce overall throughput times.

Turning to you, Professor Emmerich, your role model for implementing the project that has now received the Transfer Award came from the world of nature: raw eggs. I think you'll need to explain that one to us!

Special requirements need special solutions. I really do think I can compare the optical electronics made by Huber to raw eggs. Get the slightest thing wrong and it's impossible to avoid breaking them or producing rejects. The permissible roughness depths we deal with are sometimes less than one micrometer, so the only way to handle parts safely or avoid damage is to process each part individually. It goes without saying that you

can't process parts in sets with others, especially with supercritical cleaning processes. I don't think anyone would come up with the idea of putting loose sets of raw eggs through a cleaning device.

The project has now resulted in a prototype that is ready for use. Mr. Huber: In what ways are you already benefiting from this innovative development?

The prototype helps us in a number of ways. We're currently using the system to carry out further testing on process stability and make improvements. Of course, we also want to use this testing to identify any other potential areas of improvement and then apply what we identify directly to the next machines. That means we could use the machine in production right now if we wanted to. We're pleased to see that a number of potential customers have already become aware of the system through our publicity and they've been asking us about delivery times and when the technology will be available.

Professor Emmerich: Could you give us a sneak preview of the future? What potential is there for your project overall once the prototype phase has been completed?

Our objectives focus on two main areas. Naturally, on the one hand we want to bolster our competitiveness by using these systems in our own production, but we also want to demonstrate to our customers that we allow both parties to be successful with our innovative solutions. On top of that, we also want to think beyond the here and now, so we intend to position the system as our own product on the market in combination with powerful producers of tooling machines. So as you can tell, we won't get bored.

PROF. DR.-ING. HERBERT EMMERICH
herbert.emmerich@stw.de (author)

Director
Steinbeis Transfer Center
for Production and Organization
(Pforzheim)

www.steinbeis.de/su/735

THILO HUBER
t.huber@oeh.de

Managing Director
Optik-Elektro Huber GmbH
(Mühlacker)

www.oeh.de

AWARD WINNERS
STEINBEIS RESEARCH CENTER FOR DESIGN AND SYSTEMS
+ KOENIG & BAUER CODING GMBH

AIDED BY AI: PREDICTIVE MAINTENANCE USING DIGITAL TWINS

STEINBEIS EXPERTS FROM WÜRZBURG AND KOENIG & BAUER CODING REVOLUTIONIZE SERVICE AND MAINTENANCE

Artificial intelligence (AI), enhanced digital imaging, and new ways of interacting between systems continue to merge. This is paving the way for innovative product extensions, which could be especially useful in areas such as training, monitoring, and maintenance. For example, systems that can run checks on themselves reduce the need for service technicians to work on site, not only improving machine availability but also making it possible to operate systems much more economically. As part of a partnership with Koenig & Bauer Coding, the Steinbeis Research Center for Design and Systems in Würzburg has developed Kyana, a digital extension to a continuous inkjet printer system produced by Koenig & Bauer called alphaJET. Such printers make it possible to draw on data to add highly accurate codes to products at high speeds directly on the production line. The partnership between the two project teams earned them the 2019 Transfer Award from the Steinbeis Foundation.

Kyana is an AI-based software solution that communicates through voice commands and uses augmented reality (AR) to depict the complex internal mechanisms of printing systems using clear, interactive images. In the future, Kyana will work like a smart assistant capable of taking on a variety of tasks from training, to controlling devices, explaining maintenance processes or servicing procedures, and spotting material wear and consumption levels early. In parallel to this, over time the system learns how to analyze all kinds of external influences and draw on this information to ensure it maintains high printing quality and maximum availability.

Using AR, Kyana assumes its own persona. This expanded visual presence makes it easier to understand hardware and how it works. By using digital overlays, the system allows users to look at precise details inside the printing system. Combined with speech output, this simplifies maintenance work and repairs. The extended AI functionality also makes it possible to equip systems with a virtual hand, which can save a lot of legwork by using a digital twin when a device re-

quires remote maintenance. Ideally, this should make it possible to address faults more quickly and avoid long and expensive journeys for service personnel. This solution offers huge potential, also by analyzing acquired data and thus providing valuable resources for future applications, and this has earned the innovation the Steinbeis Foundation Transfer Award – the Löhn Award. The strong mutual trust between the two parties involved in the partnership is laying the ideal foundation for this potential.

"THE BIGGEST OPPORTUNITIES FOR THE FUTURE LIE IN SYSTEMIC COLLABORATION BETWEEN HUMANS AND COMPUTERS"

AN INTERVIEW WITH PROF. DR. ERICH SCHÖLS, SEBASTIAN GLÄSER, AND SANDRA WAGNER

Hello Professor Schöls. Artificial intelligence is one of those technology topics that really polarize at the moment. People who are against it say it's Pandora's box, but you see things differently. Do you think the dangers are manageable?

The way I see it at this point in time, artificial intelligence (AI) is still often overestimated. There's no questioning that the technological advancements are amazing. But I think we're still a long way from the dystopian predictions you see in lots of areas of the media. Right now, I can't think of a single development in the field of AI that would be capable of competing with the intellect of the human brain. But on a fundamental level, I have to say that used in the right way, it offers huge potential and I'm sure it will play an important role in the future. The real danger comes if it's misused by criminals, but we already have that problem with digital technology, even without AI. But of course there will be developments in the military area that are fundamentally problematic – although even in that area, the threat is mainly posed by people and not artificial intelligence.

The term "digital twin" shows that you have already brought people together to work closely with technology for your transfer project. Mr. Gläser: How did you use this underlying idea and combine it with AR for your award-winning project?

Kyana stands up in front of the user and acts as a kind of smart assistant or discussion partner. It's a "talking printer" that establishes a rapport with its immediate environment, and this allows it to build a "bridge of empathy" and start new relationships between humans and the machine. The AI uses augmented reality (AR) to adopt a 3D persona. AR heightens visual perceptions of the device and adds elements that allow you to dig deeper inside the hardware and understand how it functions. Operators can use the AR app to look at individual components and their functions, or understand service procedures, or access detailed information on the device's status or handling instructions.

Allowing people to use voice commands makes it possible to carry out remote maintenance with the support of AR by using the digital twin, and it's already

equipped with basic functions of self-evaluation, by which I mean predictive maintenance. One innovative aspect of the AR app is that it's coupled closely with a remote maintenance system. Support staff can access the device's digital twin with an AR headset. The system has a special hardware extension that allows service technicians to send synchronized hand movements and gestures to a graphical interface through an app on a tablet. The hand movements displayed by the AR graphics are so precise, you get the impression the service technician is actually standing in front of you. This really simplifies communication between service operatives and the customer, and it takes less time to solve problems and improve the availability of devices. It also saves a lot of traveling time. The digital twin provides an interactive foundation for a whole toolset of applications that optimize and extend the possibilities for people to collaborate with machines.

Hello Ms. Wagner. You took Koenig & Bauer Coding on this journey with Steinbeis into the world of virtual reality. In your role as Vice President of Sales & Marketing, do you question investments like this in terms of competitive advantage? What competitive advantage do you see in Kyana?

The biggest competitive advantage has to be the indisputable customer benefit. The support given by Kyana makes it possible to significantly enhance production reliability and hand over things like continual re-ordering of operating materials to Kyana. Customers don't have to think about yet another device in their production; they can concentrate fully on their own products.

Kyana also offers ways to monitor the functioning of our devices prophylactically and if necessary take corrective action or suggest alternative measures at the right time – it's good knowing our customers can enjoy so much more up-time or additional certainty in their production processes with this new technology.

It's still early days for artificial intelligence, so predicting what happens next is a bit like gazing into a crystal ball. Professor Schöls: Despite that, could you do this for us?

Artificial intelligence makes digital transformation even more important and powerful. It will bring about a positive change in lots of areas of our working lives, but also everyday parts of our public and private lives. We're already getting a first impression of the companionable enhancements and additions AI can make to the work of doctors. I see the biggest opportunities for the future in systemic collaboration between humans and computers. That said, artificial intelligence can only add value if its sphere of activity is based on guidelines and goals laid down by humans. If that's taken into account, we will be given new professions in the future and there will be qualitative improvements in existing professions.

PROF. ERICH SCHÖLS
erich.schoels@stw.de (author)

Director
Steinbeis Research Center for Design and Systems (Würzburg)

www.steinbeis.de/su/983
www.designandsystems.de

SEBASTIAN GLÄSER
sebastian.glaeser@stw.de (author)

Director
Steinbeis Research Center for Design and Systems (Würzburg)

www.steinbeis.de/su/983
www.designandsystems.de

SANDRA WAGNER
sandra.wagner@koenig-bauer.com

Vice President Sales & Marketing
Koenig & Bauer Coding GmbH (Veitshöchheim)

coding.koenig-bauer.com

AWARD WINNERS

STEINBEIS-INNOVATIONSZENTRUM FIBERCRETE (FC)
+ FIBER-TECH PRODUCTS GMBH + MEDICKE METALLBAU GMBH

MADE POSSIBLE BY BETOLAMINA®-CAST: INTRICATE FACADES MADE WITH CONCRETE

A STEINBEIS TEAM FROM CHEMNITZ JOINS FORCES WITH FIBER-TECH PRODUCTS AND MEDICKE TO DEVELOP INNOVATIVE FACADES USING A NEW KIND OF FIBER CONCRETE

Concrete is back in fashion as a construction material. It looks good, it's versatile, and it offers excellent material properties, making it a popular all-rounder. It is also used for covering building envelopes, typically by adding "curtain wall" elements. On the other side, concrete is relatively heavy as a construction material due to integrated steel reinforcements and the required minimum concrete coverage to prevent corrosion. In partnership with FIBER-TECH Products from Chemnitz and Medicke Metallbau from Glauchau, the Steinbeis Innovation Center FiberCrete, also from Chemnitz, has developed a fiberglass-reinforced building concrete called BetoLamina®-Cast as part of a research project. The partners also developed a technology for producing and mounting thin-walled facades, simultaneously significantly reducing weight and achieving excellent visual properties. The Steinbeis Foundation honored the three project partners for their work with the 2019 Transfer Award.

There is demand for concrete that does not contain steel for use in modern curtain wall facades. Not only should these deliver the required mechanical qualities, they need to have thin walls, offer plenty of design options and deliver high-quality surfaces. This takes ingenious material concepts, innovative installation technology, and a reproducible production strategy. Strong demand for such solutions led Medicke Metallbau – an one-stop provider of premium-value building envelopes – to travel to Chemnitz to meet the Steinbeis Innovation Center FiberCrete and FIBER-TECH Products. The priority for their joint project was to map the overall process chain, from mixing the formula required for the concrete to logistical considerations and on-site installation.

The new fiber concrete, BetoLamina®-Cast, was first used in an office building called Wilhelm Kaiser Hof in Cologne, which required a "freeform" facade measuring approx. 5,000 sqm. The facade contains vertical elements at different angles (lesenes), which cast unexpected shadows that change continuously depending on the angle of light. All requirements were met for the facade in terms of the smooth surface, premium exposed concrete, a sophisticated matte appearance, weathering resistance, and

robustness. Sharing insights from fundamental research at the Institute of Lightweight Structures at Chemnitz University of Technology with FiberCrete (the Steinbeis Innovation Center) offered the ideal vehicle for applying knowhow to this project. The Steinbeis Foundation Transfer Award – the Löhn Award was bestowed upon this project in acknowledgment of the close collaboration between the different partners and the successful transfer of research findings into practice.

"IT'S GOING TO BE EXCITING!"

AN INTERVIEW WITH ASSOCIATE PROFESSOR DR. SANDRA GELBRICH, FRANZISKA PFALZ, AND MARCUS MEDICKE

Hello Dr. Gelbrich. When you think about intricate parts, concrete's not exactly the first material you think of. You've done an impressive job in solving this apparent paradox. What makes your newly developed concrete so special?

Concrete is the world's most widely used construction material. Its special properties allow it to meet a variety of visual, structural, and construction requirements in the long term. Concrete offers excellent compression qualities but comparatively poor tensile strength, so it generally has to be reinforced with steel. Steel tends to start corroding when it's exposed to oxygen or moisture, so if it's inserted in concrete, it needs to be protected. As a result, concrete measuring several centimeters has to be added to cover steel and ensure there's a sufficient layer of alkaline in the concrete around the steel to shroud it from passive corrosion. But in turn, that means that concrete parts are solid and heavy and that raises resource requirements. So for a number of years now, people have been looking into steelfree reinforcement, for example by using alkaline-resistant glass and carbon fibers.

At the FiberCrete Steinbeis Innovation Center we've now developed a fiberglass-reinforced building concrete called BetoLamina® for use as a facade component. It's a new kind of white fiberglass concrete that offers excellent mechanical properties, outstanding durability, and magnificent visual qualities as an exposed concrete. BetoLamina®-Cast is a composition of five different materials, consisting of Portland cement, an aggregate with a maximum particle size of four millimeters, additives, a special admixture developed for the project, and alkaline-resistant glass fibers with a fiber length of 12 millimeters. This puts us in a position to create facade elements in complex shapes with a reproducible material thickness of two centimeters. We do this by producing a high-flow BetoLamina®-cast compound using particularly smooth formworks of fiberglass-reinforced plastics. We can also fulfill all kinds of design requests in terms of shape, surface structure, and color.

The products look excellent, they offer a variety of design options, and they deliver outstanding material properties, so our facade elements are in strong demand from architects and construction companies. Developing a new type of concrete is one thing in theory, but it's another making components out of it in practice.

Ms. Pfalz: You took on this challenge at FIBERTECH Products. What requirements did you have to meet to do this?

Our know-how at FIBER-TECH lies in working on complex projects in the field of fiber composites. We solve structural requirements and transfer results into our products. The Wilhelm Kaiser Hof project in Cologne was the first joint project between FIBER-TECH, Medicke, and FiberCrete, and it was also the first facade for which FIBER-TECH had to produce 5,000 square meters of building concrete according to extremely high standards, so the project consortium faced one or two more challenges than usually to be expected.

Step by step, we set up a production and storage unit suitable for producing complete concrete elements, including an extra manufacturing area and special rooms, and we had to acquire and finance all of the required production equipment ourselves. In parallel to this, we hired extra people and trained them. To ensure we could produce 2,000 facade elements – that were reproducible in serial quality, without a hitch – we also had to set up a fully functioning, reasonably economical production line. To produce the elements in all the right shapes, we also developed our own mold-making technology, also to avoid high production costs. The success of the finished building facade shows that the investment, effort, and patience were worth it – all in a new area of business.

Mr. Medicke: Your team at Medicke was called in for its construction expertise – to look at the fixing elements for the facade, parts logistics, and last but not least actually installing the facade. What was your experience with the project and how has this now benefited you?

Modern facades require steel-free concrete that not only delivers the right mechanical properties but also has thin walls and can be used in all kinds of designs. It also has to offer excellent surface qualities. This requires clever material concepts, innovative fixing technology, and a reproducible production strategy. Lightweight construction and freeform design offer modern facade builders a whole host of new ways to design and construct complex building solutions.

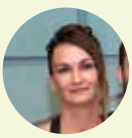
The Kaiser Hof in Cologne was the first time – as a one-stop provider of building envelopes – that we've used this new kind of technology based on thin-walled concrete. We had a great deal of challenges to solve in terms of engineering, logistics, and installation. Making the BetoLamina®-Cast Fiberglass concrete element meant we had to develop a completely new kind of substructure and test it so it could be approved for construction purposes. From the very beginning, it was particularly important that the mounting brackets didn't place unwanted stress on the fiberglass concrete elements and that they made them easy to attach without making mistakes.

To transport the 2,000m² of fiberglass concrete elements, we had to build special mobile trestles to ensure they could be moved around the construction site safely without damage. The large number of elements – which each measured around 3.5 meters in length – also required an sophisticated loading and logistics system, which had to be available at just the right time for installation. The thin-walled fiberglass concrete elements required particularly careful handling while being installed on the building by our specially trained staff. This also entailed trying out new handling methods before the project, which were tested repeatedly to ensure installation was carried out as smoothly as possible. The planning and handling experience we gathered on this project has provided us with a solid foundation for using BetoLamina®-Cast fiberglass concrete in other projects in the future.

Ms. Gelbrich: You already know about the next big project your team will be implementing. Can you tell us briefly what the next collaborative project will involve for you?

I would describe using BetoLamina®-Cast on the new Wilhelm Kaiser Hof office building in Cologne as a remarkable success. We're now carrying out ongoing developments to the product in keeping with market requirements. The projects we're looking at include different surface structures, colors, shapes, construction techniques, and mounting technology. We're also working on new technologies for the formwork and production of the elements. We've already started the facade on the German Institute for Standardization (DIN) building in Berlin. One particular challenge for us is composing a new kind of premium concrete mix and integrating designed glass particles in DIN blue on site, in a way that allows material content, optimized packing density, and fiber reinforcement to deliver the required mechanical properties yet still meet optical expectations in terms of the design and structure. It also has to be possible to process the new material mix using open casting and then finish the surface using sand-blasting. To select the right materials, we have to make sure the designed glass particles remain stable in the alkaline medium of the mineral matrix, and that they achieve the right density. It's going to be exciting!

PD DR.-ING. HABIL. SANDRA GELBRICH
sandra.gelbrich@stw.de (author)



Director
Steinbeis Innovation Center
FiberCrete (FC) (Chemnitz)

www.steinbeis.de/su/1612
www.fibercrete.de

FRANZISKA PFALZ
info@fiber-tech.de

Managing Director
FIBER-TECH Products GmbH
(Chemnitz)

www.fiber-tech.de

MARCUS MEDICKE
m.medicke@medicke.de

Managing Partner
Medicke Metallbau GmbH
(Glauchau)

www.medicke.de

AWARD WINNERS
STEINBEIS RESEARCH CENTER MATERIAL ENGINEERING CENTER SAARLAND (MECS)
+ TE CONNECTIVITY GERMANY GMBH

EXAMPLES FROM NATURE: HIGHSPEED LASER STRUCTURING FOR A NEW GENERATION OF ELECTRICAL CONTACTS

STEINBEIS EXPERTS FROM SAARBRÜCKEN AND TE CONNECTIVITY GERMANY USE LASER STRUCTURING TO OPTIMIZE SURFACE PROCESSING

As nature already knows, all surfaces are structured geometrically on a variety of different microscopic scales, and thanks to evolution they are perfectly matched to perform the required function. Until now, technical surfaces have been classified mostly in terms of roughness, which highlights the enormous potential that must have been overlooked over the years. Enter Material Engineering Center Saarland (MECS), the Steinbeis Research Center, which has developed an innovative laser-based structuring method for quickly and efficiently treating almost any kind of surface. After many years of collaboration with TE Connectivity Germany, a global market leader in the field of electrical connectivity, the center's approach has proven to be a disruptive innovation. The partnership earned the two project partners the 2019 Transfer Award from the Steinbeis Foundation.

How did the partnership come into existence? The number and complexity of onboard electronic systems contained in modern cars is intensifying, such that the average vehicle is now fitted with more than 2,500 electrical contacts, through over 250 connectors. The current visions of future car functions, such as those required for autonomous driving, are posing more and more challenges to industry. Of crucial importance in this respect are factors such as low electrical contact resistance and the need to minimize the required insertion force of the increasing number of connectors found in cars. The experts at Steinbeis and TE engaged in an ambitious project and decided to use a patented technique called direct laser interference patterning (DLIP). This makes it possible to significantly improve the contact properties of electrical connectors and thus manage increasing levels of electrification in cars.

Aside from the outstanding achievements that resulted from the long-standing partnership in technical terms, the

collaboration between the Steinbeis Research Center Material Engineering Center Saarland and TE Connectivity is an ideal example of successful transfer – from initial, fundamental work carried out in the laboratory to optimizations made to specific products, and the construction of a pilot plant used in the high-speed laser structuring of electrical connectors suitable for use in serial production in industry. There could be no doubting that this successful partnership would result in acknowledgement from the Steinbeis Foundation through bestowal of the Transfer Award.

"THE COMBINATION OF GEOMETRIC PRECISION AND TECHNOLOGICALLY ECONOMICAL SPEEDS IS UNIQUE."

PROF. DR.-ING. FRANK MÜCKLICH AND DR.-ING. HELGE SCHMIDT SPEAK TO TRANSFER MAGAZINE

Hello Professor Mücklich. You are conducting research into surface morphology with your Steinbeis Research Center colleagues at Material Engineering Center Saarland (MECS), going down to the micro- and nanometer range. Your project partner, TE Connectivity, is an international market leader in electrical connections. Could you set the ball rolling for us and explain what led to this outstanding project between the two of you?

The original starting point for the successful partnership between MECS Steinbeis Research Center and TE was two completely unconnected doctoral theses in the field of electrical connector contacts, written entirely independently of one another. There was Dr.-Ing. Michael Leidner working at TE Connectivity using simulation software to model the ideal structure of surfaces on electrical connectors, and at the same time there was Dr.-Ing. Kim Trinh, who was working at the MECS Steinbeis Research Center, looking into the experimental implementation of tiny, microscopically fine, periodically structured surfaces on electrical connector contacts using DLIP laser technology. Both researchers were analyzing electrical and tribological properties, each discovering astoundingly similar results, but using completely different approaches and working completely independently of one another – an impressive basis for an extraordinarily successful partnership. The key point of contact came when their results were presented at a conference in the United States.

Modern cars contain an increasing amount of electrical technology, which by default needs connectors – something you benefit from at TE Connectivity, Dr. Schmidt, but that also creates challenges in development. How specifically?

The increasing number and complexity of electronic systems in modern cars automatically raise the requirements that have to be met by components and structural elements in order for any future functions planned within the overall system to work. It has to be ensured that any electrical contacts established through connectors will last and work reliably, in dry or damp conditions, but also in cold and hot climates, despite engine and driving vibrations. Aside from remaining stable under these kinds of harsh conditions, because connectors include an increasing number of poles,

it's also necessary to reduce the friction coefficients of contacting surfaces – and with that, the insertion force. This has to be safeguarded under continual, longterm electrical contact resistance.

Professor Mücklich: You use direct laser interference patterning, or DLIP, when structuring connections. Was this technology predestined to be used for your project?

All surfaces in living nature are structured on a microscopic scale as a result of ingenious optimizations brought about by evolution, so as a result they're adapted excellently for the function they're required to perform. So why, until now, did we accept the roughness found on technical surfaces after manufacturing? One reason was that the methods that were available for structuring the surfaces we needed were insufficient on a universal level for designing microscopically accurate and geometrically adaptable surfaces – not in ways that were also quick and thus efficient in economic terms. DLIP now allows us – for the first time – to produce microscopically detailed periodic surface patterns, efficiently and on almost any kind of material. By using DLIP, not only can we produce micro-, sub-micro-, and nano-scale surface structures in a variety of forms, we can even do this at the kinds of conveyor belt speeds encountered in manufacturing, in record times, on several hundred connectors per minute. The combination of geometric precision and technologically economic speeds is unique among all other methods used to date.

You didn't just stop at surface structuring for your transfer project. You also developed a pilot plant for serial production, which creates the impression that this partnership is by no means over yet. What are your plans for the future?

Our transfer achievements until now offer tremendous potential in technological and commercial terms. DLIP methods are totally inexpensive and because you can process materials without touching them, the laser technology is very gentle on resources. At the same time, the manufacturing costs are only marginally higher because of the tremendous production speeds, even though you drastically improve the tribological properties of the connector contacts. The technology should be ready after the twelvemonth validation phase in 2019 and 2020, so it should be integrated into serial production at TE in 2021. To support this process, we intend to launch a startup next year, which will focus on making DLIP machines available for automated industrial manufacturing, and then we want to use this highly innovative technology to enter further markets in the future.

PROF. DR.-ING. FRANK MÜCKLICH
frank.muecklich@stw.de (author)

Director
Steinbeis Research Center
Material Engineering Center
Saarland (MECS) (Saarbrücken)

www.steinbeis.de/su/1294
www.mec-s.de

DR.-ING. HELGE SCHMIDT
helge.schmidt@te.com

TE Fellow / Technical Expert
Automotive Engineering
TE Connectivity Germany GmbH
(Bensheim)

www.te.com

SMART BENCHMARKING: PRODUCT LIFE CYCLE MANAGEMENT WITH INTERNATIONAL PROJECTS

STEINBEIS EXPERTS HELP MEDIUM-SIZED BUSINESS STANDARDIZE ITS PLM

Managing and administering data can be quite challenging, especially if you have to deal with the rapid kind of growth witnessed in new target markets in Asia and Europe, which make it necessary to localize products and development projects. In an effort to maintain its competitive position as the international market leader, Manz decided to introduce internationally uniform product life cycle management (PLM) and focus its systems more closely on use in development and engineering design. To this end, the company turned to the in-depth project experience of the Steinbeis Transfer Center for Innovation and Organisation, with its expertise in conducting complex software evaluations involving heterogeneous CAD and PLM systems.

Based in Reutlingen, Manz is an international high-tech mechanical engineering company. With many years of experience in automation, laser processing, image processing, measurement technology, wet chemistry, and reel-to-reel processes, the company provides manufacturers and suppliers with innovative production systems, mainly in the fields of photovoltaics, electronics, and lithium-ion batteries.

PLM FOR EFFICIENT DEVELOPMENT PROCESSES

The emergence of new target markets, rapid growth in Asia, changing conditions for suppliers and customers, and increasing demand for products to be localized, present a continual string of new and challenging demands on IT systems used with CAD and PLM systems, especially when it comes to development and engineering design. By introducing an internationally uniform PLM system, Manz wanted to safeguard the long-term efficiency of its development processes across all operations and sites.

To ensure it selected the right PLM solution, the company turned to the expertise of STZio, the Steinbeis Transfer Center for Innovation and Organization. The experience offered by the Steinbeis consultants allowed the company to conduct an objective assessment of development within a short time frame, as well as other departments directly involved in development processes. The experts also helped the firm develop a target vision.

INTEGRATION INTO THE SYSTEMS ENVIRONMENT

The interdisciplinary team working in CAD and PLM administration quickly recognized (as did users in other departments, later down the line), that as well as just looking at CAD data administration across different sites, the project would also have to consider integration into the existing IT architecture. The selection criteria focused on factors relating to usability and interaction with the CAD software used at Manz.

"The idea of the project was to address two key issues," explains Roland Mann, who spearheaded the project and is responsible for the central CAD-PLM department at Manz. "The first was the interdisciplinary nature of international teams working in this area and the diversity of requirements, which we had to gain consensus on. Even within development, we had to reconcile different business units or individual aspects such as mechanical solutions, electronics, and software. But also, we would have to deal with overlaps between the different PLM systems due to the vast number of tasks they covered, and if necessary this would mean investigating procurement requirements for other systems." The team of Steinbeis consultants successfully applied a systematic method based on their highly specialized know-how and certain interpersonal skills, allowing them to work with stakeholders as partners of equals, provide training, and translate everything into a benchmarked schedule of tasks that would also be comprehensible to systems manufacturers. For each software solution that came into consideration, benchmarking workshops lasting several days were organized involving a 20-strong international project team, which then identified the optimum PLM system for Manz.

THE ADVANTAGES OFFERED BY THE STZIO METHOD

After the project, Mann noticed that "it had been quite a big project and tons of work, but the STZio method had given us some excellent project documentation and at all times before, during, and after the actual benchmarking process, we were totally in control of what was happening. As a result, our approach and the results were completely transparent, such that at any stage the project team could call on support from management or anyone else not directly involved in the project. With an international evaluation project of this magnitude, that can be highly advantageous and this makes people less panicky about working on the project – anything that doesn't go to plan can be solved quickly and permanently. Naturally, this also applies to subsequent user acceptance when the system is rolled out for implementation internationally."

The support provided by the Steinbeis consultants made it possible to pick a solution in just six months. One team of key users has already started its preparations for the roll-out phase and the system is expected to go live in 2020. The direction has now been set for an internationally uniform PLM system, making it possible to work on development projects efficiently across all company sites, even at an international level. Manz has thus optimally prepared its CAD-PLM department for existing and new requirements and crucially, this will help ensure it stays one step ahead in this important area.

PROF. DR.-ING. JOACHIM FRECH
joachim.frech@stw.de (author)

Director
Steinbeis Transfer Center
Innovation and Organization
(Eislingen)

www.steinbeis.de/su/539
www.stzio.de

OLIVER BREHM
oliver.brehm@stw.de (author)

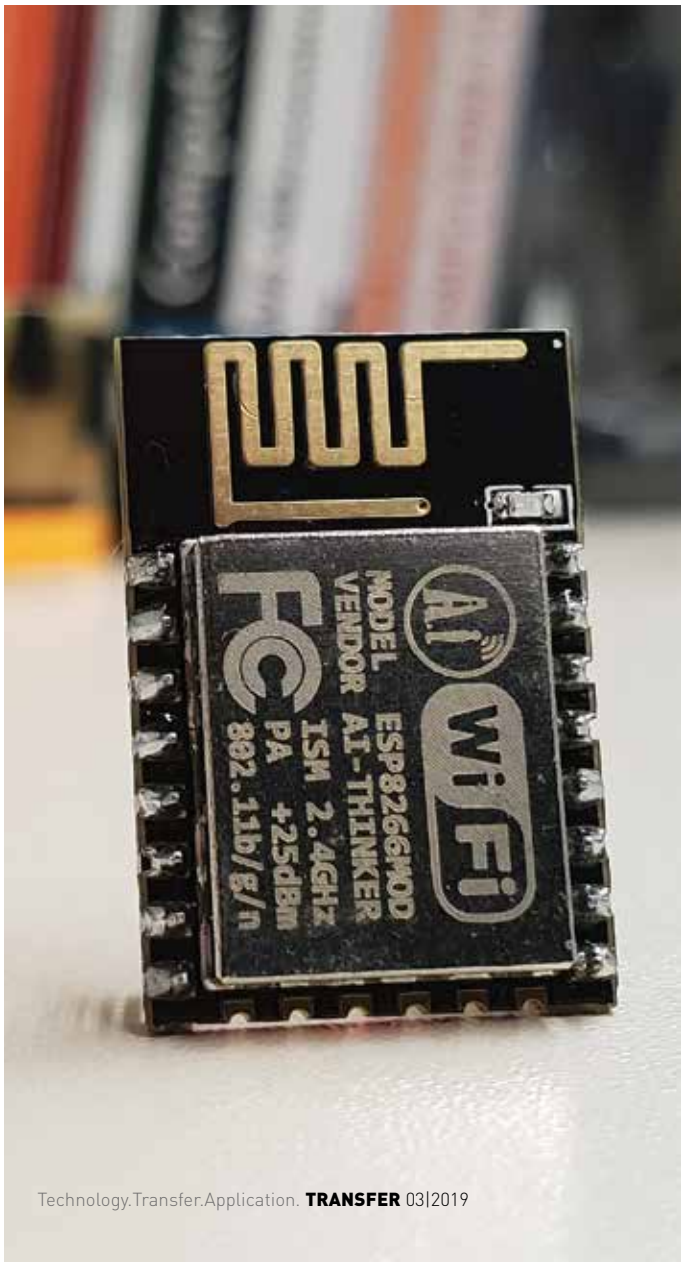
Director
Steinbeis Transfer Center
Innovation and Organization
(Eislingen)

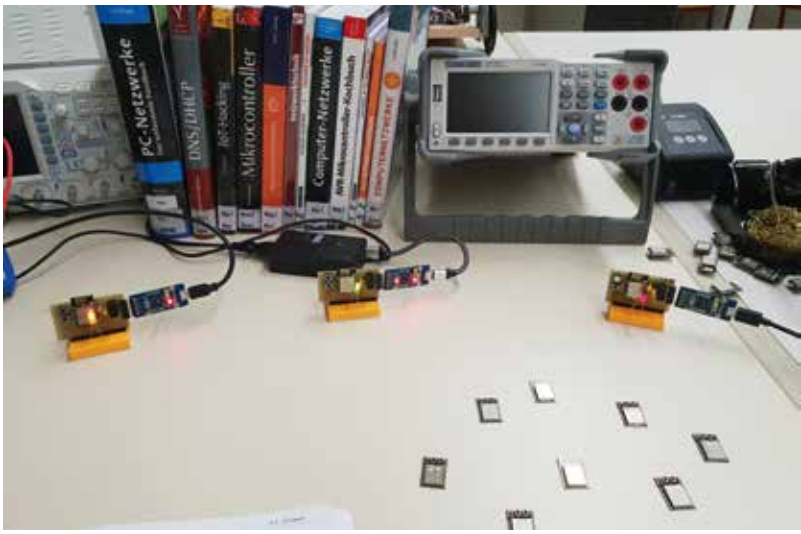
www.steinbeis.de/su/539
www.stzio.de

FOREST FIRE DIAGNOSTICS – WITH ADDED POTENTIAL FOR MUCH MORE

FOUR YOUNG RESEARCHERS DEVELOP A SYSTEM FOR MONITORING WIDE AREAS OF LAND

The news has been full of dramatic footage recently – forest fires, completely out of control, wreaking havoc on natural habitats and endangering people, wildlife, and the environment by churning out huge volumes of carbon monoxide and dioxide. Four young researchers have now set themselves an ambitious goal as part of a project called Swarm Cubes. Their aim: to develop an early warning system that will prevent forest fires spreading to large areas. In the meantime, the IoT initiative has taken the project far beyond the original realms of forest fire diagnostics such that it now offers features that could be useful for the smart cities of the future.



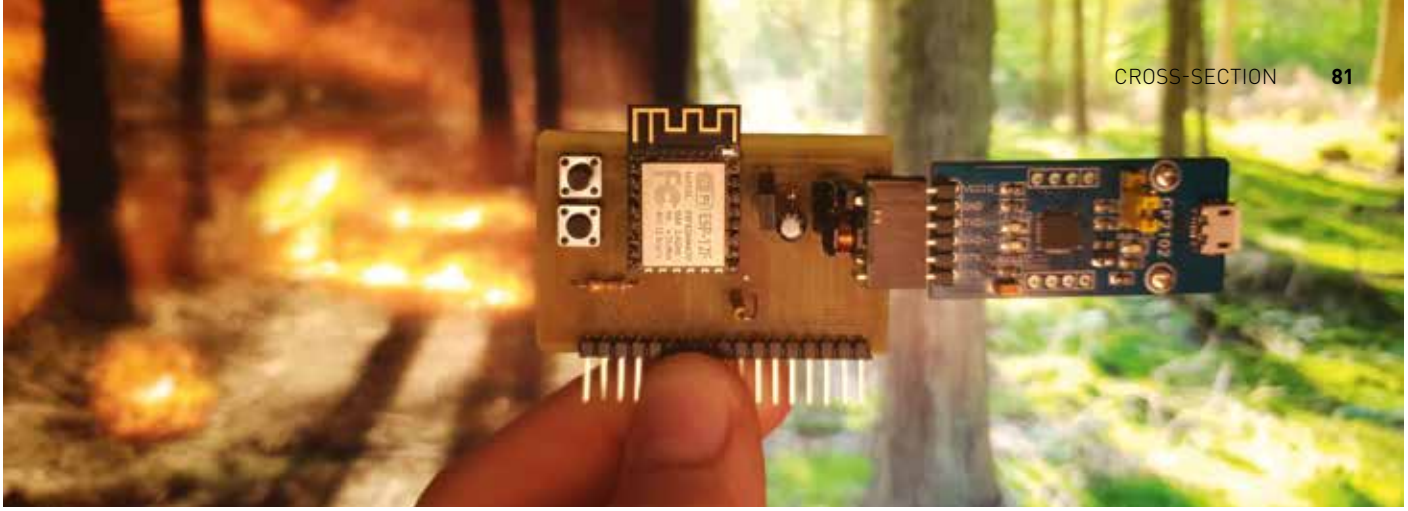


A WiFi chain based on an ESP8266EX chip

An ESP8266 module

INTERESTED IN FINDING OUT MORE ABOUT THE PROJECT?

If you're interested in hearing more about the research or supporting the young team of researchers, feel free to get in touch with them directly!



The main components of a swarm cube

David Kern, Annely Felicitas Böbel, Valentin Paulweber, and Akhil Hoque from Reutlingen – four ambitious researchers working on a common goal. For the last year, they have been conducting research at the high school student research center in the small Baden-Wuerttemberg city of Eningen. They recently won the youth research initiative Jugend Forscht, competed for the Artur Fischer inventors' prize, and have appeared at the iENA inventors' show in Nuremberg.

The most effective early warning system for forest fires is currently based on identifying smoke visually. One major disadvantage of this is that systems issue notifications for any kind of smoke-like pattern, such as chimney smoke or dust caused by harvesting, so as such, it is not entirely reliable for spotting forest fires. It is also not suited to identifying underground fires. The researchers from Reutlingen have taken an alternative approach to analyzing information. Their system comprises a mesh-like network of WiFi chips (so-called cubes) which transmit live information such as relative humidity, ground moisture, absolute temperature, and concentrations of different gases. This removes any dependence on having to detect smoke, not only making it possible to identify forest fires, but to a certain extent also allowing forecasts to be made. To enable the system to work on rechargeable batteries, Kern and his co-researchers are currently writing an algorithm that allows WiFi junctions to transmit information at coordinated intervals. This algorithm should ensure that the network recharges itself and uses energy efficiently. By combining this technology with different types of sensors, large areas can be analyzed in a user-friendly manner. The team is also designing a circuit board and housing to adapt the technology to different conditions.

To make the innovative product interesting in financial terms, the Swarm Cubes use an ESP8266EX chip, a 32-bit processor core microcontroller with an SPI, and a wireless LAN interface. To ensure batteries and solar panels are as compact as possible, the researchers are setting up the network without routing tables and at certain intervals it will be put it into a deep sleep for variable periods. In sleep mode, energy consumption is in the microampere range, significantly reducing energy requirements. To ensure units do not self-ignite, the electricity supply will be fitted with safety features and mounted in a special housing.

Using an IoT network also makes it possible to offer some interesting ideas for smart cities. As miniature autonomous devices, Swarm Cubes establish a network using radio frequencies and pass on information. Such a technology could be used for monitoring public trash cans in order to plan more efficient waste management, for smart watering of public parks, for measuring particulate matter, or for measuring temperatures in specific places. This would allow municipal authorities to optimize their services, enhance efficiency, and use energy more efficiently.

The project has received strong support from public sector facilities, universities and the business sector, but managing a project of this magnitude requires significant resources. The researchers are therefore looking for further financial backing for materials, tools, circuit boards, electrical components, rechargeable batteries, and 3D printers. It's an undertaking that will undoubtedly be worth it for the four ambitious young researchers!

DAVID KERN
hr.david.kern@gmail.com (author)

Friedrich List High School
(Reutlingen)

VALENTIN PAULWEBER
vale.paulweber@gmx.de

Friedrich List High School
(Reutlingen)

ANNELY FELICITAS BÖBEL
annelyboebel@gmail.com

Friedrich List High School
(Reutlingen)

AKHIL HOQUE
hakhil496@gmail.com

Friedrich List High School
(Reutlingen)

Qi-Tech and exclamo, winners of the YOUNG FOUNDERS competition, in San Francisco: Jan (left), Julius, Milan, Paul, and Kai

WHERE THE FUTURE ALREADY STARTS TODAY

WINNING "YOUNG FOUNDERS" TEAM DESCRIBES ITS JOURNEY TO SILICON VALLEY

The entrepreneurial spirit of the students was almost palpable in the Porsche training center in Stuttgart in June, and the future business founders bubbled with excitement at their trade show booths. This could only mean one thing: It was the national finals of the YOUNG FOUNDERS competition again. Among the competitors were Milan von dem Bussche and Paul Nehme, both students at St. Katharinen High School in Oppenheim (Rhineland-Palatinate), and Kai Lanz, Jan Wilhelm, and Julius de Gruyter from Canisius College in Berlin. These were the students who emerged as winners out of the more than 4,000 entrants to the high school contest, which was organized by the Steinbeis Innovation Center for Business Development at Pforzheim. In the end, the jury awarded a joint first prize to both teams. The reward for the young business founders: a guided tour to the cradle of entrepreneurship, Silicon Valley – funded as in past years by Steinbeis. The five young men embarked on their journey in late October and their guide for the tour was YOUNG FOUNDERS jury member Professor Dr. Nils Högsdal. No sooner had they touched down again in Germany, the young travelers emailed us their travel report.

"Once we'd gotten over the exhausting flight across the Atlantic and even more exhausting customs controls, we finally found ourselves standing outside of the airport in San Francisco.

There it was: the downtown skyline and we immediately got excited about the journey ahead. We were finally there. We could start enjoying the trip we won at the YOUNG FOUNDERS contest in the summer.

We ordered an UBER ride to our downtown hotel. It would be a bit misleading to say we had proper plans for the first two days, so we just got on with getting to know the city. We saw the seamless transition between Chinatown and the financial district. They say you experience the future in California a couple of years before it hits the rest of the world. And we did: There were electric scooters everywhere, and autonomous cars – as if it's quite normal. We even got to try out an Amazon Go store. They've got cameras that notice when somebody removes an item from the shelf. When you walk out the front door, the price of the item is debited to your personal Amazon account – completely automatically. No cashiers behind a checkout.

On the Saturday, Professor Högsdal joined us and we finished our sightsee-

The winners alongside YOUNG FOUNDERS jury member Prof. Dr. Nils Högsdal (left)

THE WORK CULTURES AT THE BIG PLAYERS ARE REALLY DIFFERENT

ing trip around San Francisco by visiting Golden Gate Overlook. From there, we traveled on to Silicon Valley where some exciting encounters awaited us. In the evening, we met Björn Hermann, the founder of Compass, who won YOUNG FOUNDERS in 2005. We also visited the Airbnb headquarters and went to the Transatlantic Sync conference in the evening.

Over the next couple of days, we visited the headquarters of Facebook, Apple, and Google. We also viewed the Tesla factory in Freemont. We got to see startups, accelerators, and makerspaces like BirdEye, the German Accelerator, Hothouse, and D-School. We went to Stanford University and met professors and students, founders of startups, and their co-workers. We got to talk about different economic models and the successes and failures of experienced founders.

Afterwards we drove down from Silicon Valley to Los Angeles, where our journey ended. There are so many things we brought back with us from the discussions we had and visits, such as the work cultures of the big players, which are really different. At Apple, they're quite secretive and every detail of the Apple Park building has been designed in the Apple style. At Google, we sat in a surprisingly simple building and the culture felt more open. At Airbnb, a lot of devotion had gone into the meeting rooms, so they had things like the first rented Airbnb apartment and a replica of the War Room from Dr. Strangelove. The company's a bit younger than Google and Apple, and the culture almost feels a bit playful. For example, a couple of years ago they still had a Head of Inebriation who was responsible for alcohol procurement. But they've still got ping-pong tables in the offices, beer after 4pm, and a bubble ball bath. The one-on-one sessions with Björn Hermann, Michael Pollmann, Jenna Danielson, and Frederik Hermann were a good opportunity to gain some insights into everyday life in Silicon Valley and the mentality there. We also heard from Björn and Frederik what work is like at a startup.

The Transatlantic Sync conference was the ideal chance for us to forge networks with other German people in Silicon Valley. The line-up of speakers was really impressive: Andy von Bechtolsheim (founder of Sun Microsystems and investor), Christoph Keese (author of the book Silicon Valley, which we could also listen to as an audio book on the car

journeys), and John Hennessy (professor at Stanford and a board member at Google).

Of course a lot of the impressions we gained were just buzzwords and hot air. But Silicon Valley is and will remain an impressive and inspiring place – a place where the future is already happening today. During the week we spent there, we enjoyed the American lifestyle and even started to adjust to it. We sat in an eight-seater Ford rental car and listened to two audio books about startups and the Valley, and sometimes we listened to American music from the 70s. For us, our lasting impression of life in California was of huge all-you-can-drink beakers, oversized cars and refrigerators, but also the cheap and yummy burgers at In-N-Out.

And here's an overview of our trip in numbers: 7 travelers, 7 nights, 1,300 miles on the road, 43 burgers, 3 startup visits, 3 tours of big companies, and countless impressions and unforgettable experiences."

THE YOUNG FOUNDERS CONTEST FOR HIGH SCHOOL STUDENTS

The YOUNG FOUNDERS competition is also enticing winners again this year with a trip to Silicon Valley. Students and apprentices have up to the beginning of January to submit a business plan for their innovative business concepts. To help, there is an input screen on the competition website. All business plans are individually assessed by the jury. In February, a business simulation starts (an online company simulation). Finally, the competition finishes in June 2020 with a grand final in Stuttgart.

YOUNG FOUNDERS has been sponsored by the Federal Ministry of Education and Research since 2002 and features prominently on the list of student competitions recommended by the "assembly of ministers of education of the German states." The Steinbeis Innovation Center in Pforzheim is responsible for the underlying concept and running the competition. Alongside Steinbeis, YOUNG FOUNDERS is supported by a number of prominent sponsors: ALTANA, the Klingel Group, and Zeiss. The main sponsor is Porsche.

For more detailed information on the federal competition (in German only): go to **www.jugend-gruendet.de**

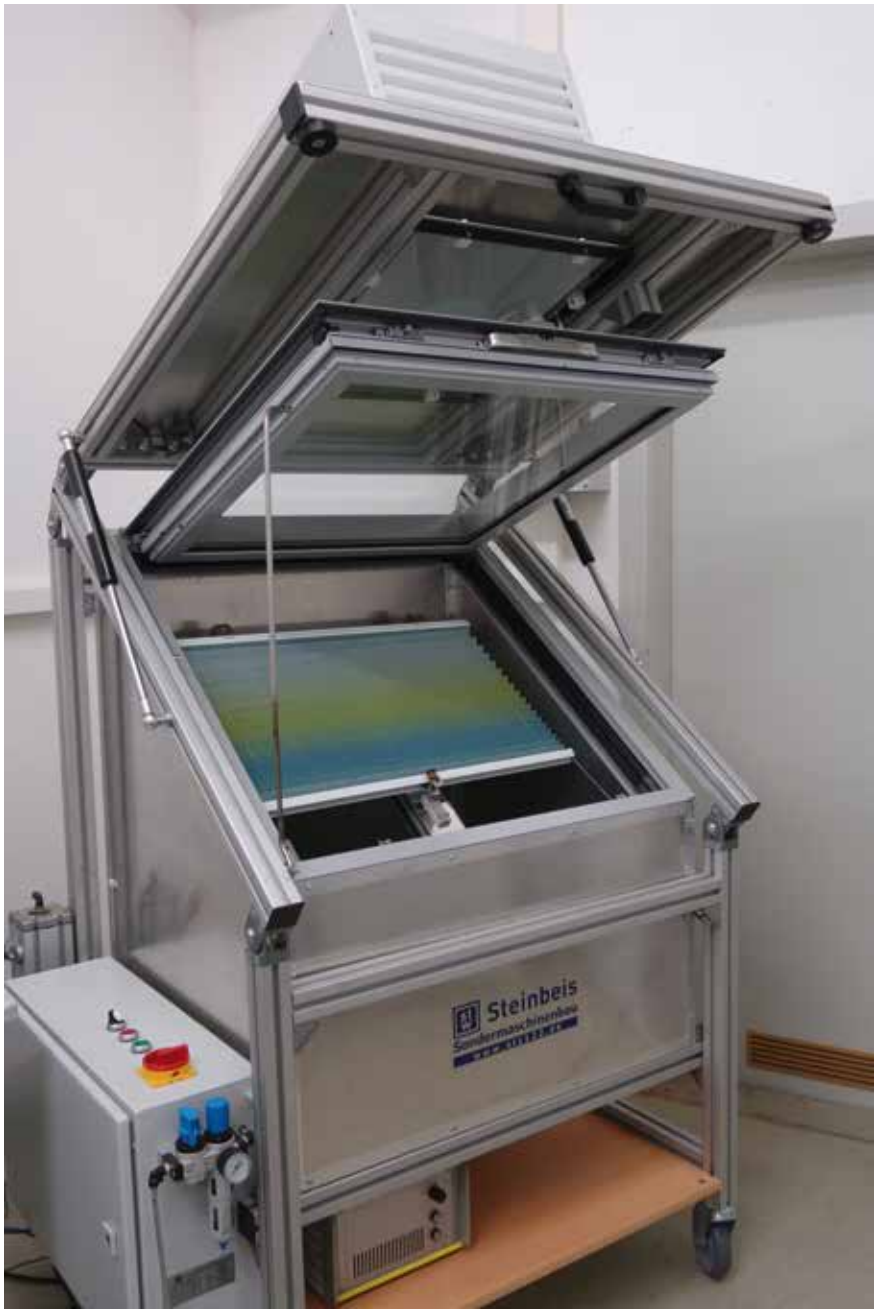
FRANZISKA METZBAUR
franziska.metzbaur@stw.de (author)

Project manager
Steinbeis Innovation Center
Business Development,
Pforzheim University (Pforzheim)

www.steinbeis.de/su/1363

SUNSHADES AND SUSTAINABILITY

A TEAM OF STEINBEIS EXPERTS ARE WORKING ON THE DEVELOPMENT OF A METHOD FOR SELECTING SUN PROTECTION SOLUTIONS



There is increasing public awareness of issues relating to sustainable products and systems, which should not only fulfill their intended purpose but also save resources and energy – and be easy and efficient to re-use. Such requirements also affect projects relating to buildings. The German Sustainable Building Council (DGNB) has developed a sustainability concept for assessing and certifying such projects. It looks at six key areas: ecological, economic, sociocultural, and functional factors, technology, and process and site quality. The idea is to assess and select the large number of materials that are now used in buildings. The Saxon Textile Research Institute (STFI), a research faculty at TU Chemnitz, joined forces with the Chemnitz-based Steinbeis Transfer Center for Drive and Handling Technology in Mechanical Engineering to look into different ways to bring an array of sun protection measures applied to buildings into harmony with sustainability criteria and functional requirements.

A usage simulation unit for testing equipment with fabric interior sun protection

Glass areas offering indoor or outdoor protection from the sun function as an overall system. Sunshade elements make it possible to regulate temperatures and keep rooms comfortable and as such, they constitute part of the overall building design, not only because they reduce the impact of heat in the summer but also because they save energy and provide climate control. Fabric sun protection at the workplace also makes it possible to meet requirements laid down under DIN standard EN ISO 9241-6, which dictates workplace lighting. By optimizing lighting conditions, sun protection can even help raise productivity at the workplace. It also makes it possible to minimize lighting energy requirements by optimizing the use of natural daylight.

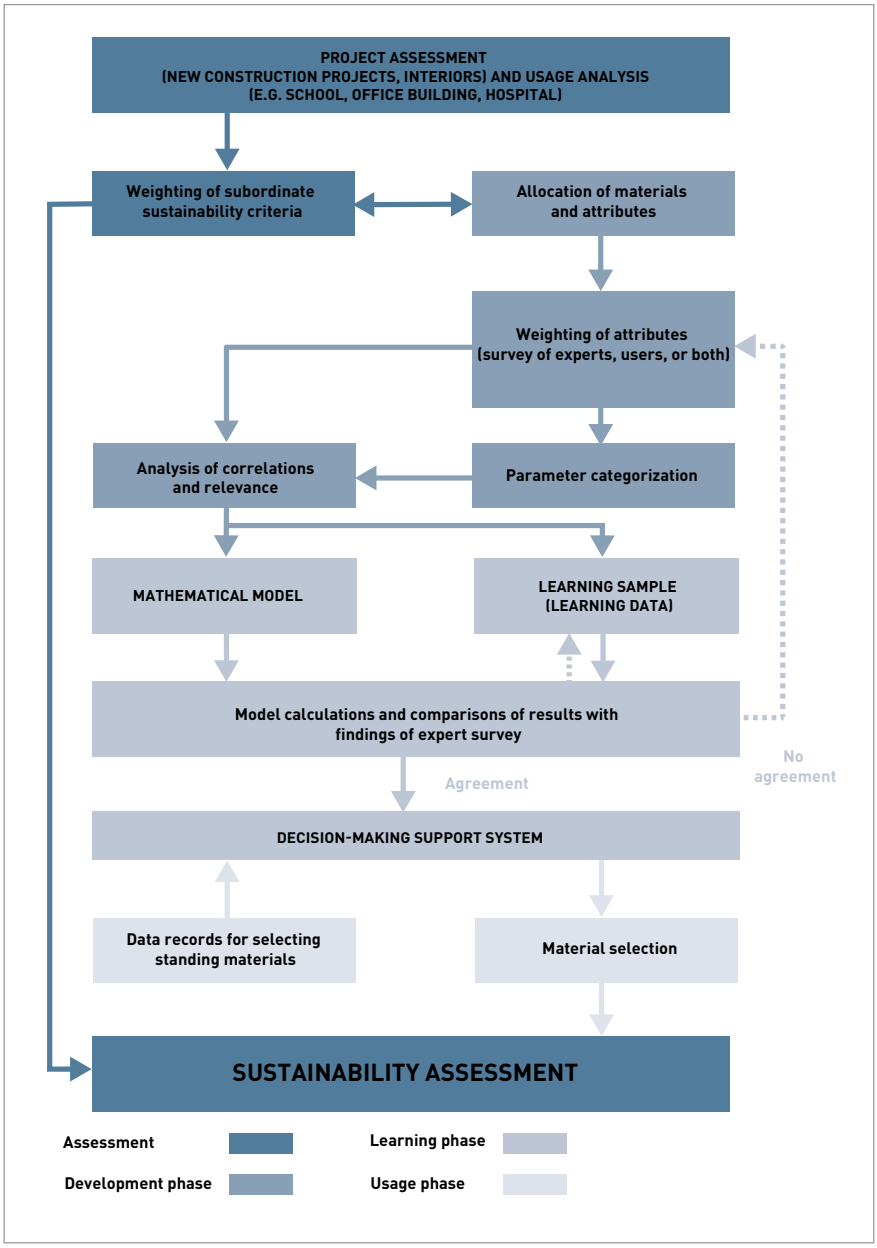
As part of a research project sponsored by the Federal Ministry for Economic Affairs and Energy (project ref. MF150060), the Saxon Textile Research Institute (STFI) and the Steinbeis Transfer Center for Drive and Handling Technology in Mechanical Engineering have developed a method for selecting sun protection fabrics in keeping with key parameters affecting construction projects so that these fabrics can be included in sustainability assessments. In addition to sustainability issues relating to the actual technology or environment, one factor that plays an essential role with fabric sunshades is durability because it affects sustainability with respect to the life cycle cost of a building.

STRESS IMPOSED ON SUNSHADE MATERIALS

Previous testing had already looked in detail at the durability of sunshades used in buildings compared to testing carried out on a laboratory scale. A variety of stresses come together in use, and these have an impact on materials: radiation (from sunshine), changes in temperature, humidity, and mechanical stress. Accordingly, a cyclical stress procedure was designed for laboratory testing in order to replicate realistic operating conditions for the kinds of fabric sunshades that are used indoors, including pleated blinds, roller blinds, curtains, and vertical lamella blinds.

TESTING UNITS FOR FABRIC MATERIALS

To run its complex testing procedures, the Steinbeis Transfer Center designed



The modeling and selection system

and constructed its own technical equipment. The stress testing units that were developed consist of a thermally insulated test chamber with a window on top. The fabrics undergoing testing (measuring 600 x 600 mm²) are moved pneumatically inside the testing unit. This is to simulate the opening and closing of blinds in use. Temperature and humidity cycles are also regulated inside the test chamber. An "artificial sun" has been mounted above the window to subject samples to the kind of radiation emitted by the sun. Depending on requirements and the durability of material samples, testing normally lasts three to seven days. Each complete testing cycle corresponds to roughly two years of actual use.

The Steinbeis Transfer Center for Drive and Handling Technology in Mechanical Engineering also designed and constructed a further unit specifically for testing larger sun protection equipment measuring up to one meter in width and two meters in length. These units work in a similar way to the stress test units. Materials are subjected to stress in four time-controlled testing chambers with varying temperatures, relative humidity levels, synthetic sunshine, and mechanical movements (opening and closing of windows).

As well as examining samples on the day of testing, the project team also looks at samples before and after each testing procedure. Visual criteria are assessed – such as waviness, structural changes to surfaces, loose adhesives, or cracks – and findings are logged and placed into categories. This categorization process also includes changes in dimensions and material mass. The criteria for the different categories were defined by the project team with a working group at the Industrial Association for Interior Privacy Screens and Sun Protection.

ONGOING DEVELOPMENTS IN THE RESEARCH PROJECT

Although the fundamental project requirements have already been fulfilled, the project is by no means over. Only recently, the project team extended its testing facilities so that they can simulate the stresses sun protection materials are exposed to when they are used outdoors. Its units are therefore capable of replicating bending strain resulting from sunlight, rain, or temperatures just above freezing.

The testing procedures and devices have now been certified and are already in active use for industrial projects at the Saxon Textile Research Institute's testing facility. To include sun protection fabrics in sustainability assessments of planned developments, irrespective of whether a project relates to new or renovated buildings, the experts have also developed a mathematical model for their research project. This gives planners, architects, and providers of building equipment a decision-making instrument for selecting sun protection materials that match the individual requirements of a building and its intended use. It also validates the parameters of sun protection materials (such as visual, thermal, and acoustic variables, as well as durability) with weighting factors, and these are then categorized according to different correlations and mapping algorithms (development phase, learning phase).

Once the system is actually in use, materials are only offered to planners and designers if they meet defined requirements. This approach was chosen so that other application scenarios or other groups of materials (such as flooring materials) could be looked at.

The project team has confirmed that the solution can be applied to business practice. A sun protection unit that features fabric has been included in an evaluation of sustainability factors for renovations being carried out to school buildings. Due to a conservation order on the facade, it was only permitted to mount sun protection units on the inside of the building.

RAINER KLITZSCH
rainer.klitzsch@stw.de

Project assistant
Steinbeis Transfer Center for Drive and Handling Technology in Mechanical Engineering (Chemnitz)

www.steinbeis.de/su/122
www.stz122.de

HEIDRUN MEHLHORN
heidrun.mehlhorn@stfi.de (author)

Saxon Textile Research Institute (STFI), a research faculty at the Department of Test Procedure Development at TU Chemnitz

www.stfi.de

PATRICK REINHARDT
patrick.reinhardt@stfi.de (author)

Saxon Textile Research Institute (STFI), a research faculty at the Department of Test Procedure Development at TU Chemnitz

www.stfi.de

THIS IS THE EDUCATION CAMPUS CALLING: THE POWER OF DIGITAL TRANSFORMATION IN HEILBRONN

THE FERDINAND-STEINBEIS-GESELLSCHAFT (FSG), ITSELF PART OF THE STEINBEIS FOUNDATION, SETS UP AN OFFICE WITH ANOTHER FERDINAND-STEINBEIS-INSTITUTE IN HEILBRONN

Teams from the Ferdinand-Steinbeis-Institute and the Dieter Schwarz Foundation pictured with project members at the signing ceremony
© Magmell

Digital transformation, networking – buzzwords of modern times. Discovering how they can bring about change of a purely technological nature and deliver tangible benefits to society and the economy – this is the mission of the Ferdinand-Steinbeis-Institute (FSTI). The FSTI provides an interdisciplinary hub for carrying out transfer-oriented research, functioning as a research faculty of Steinbeis University. Since November, the FSTI has had its own team working at the education campus in Heilbronn. The Ferdinand-Steinbeis-Gesellschaft (FSG) is now going to expand the Ferdinand-Steinbeis-Institute Heilbronn (FSTI HN) with the support of the Dieter Schwarz Foundation.

The FSTI conducts research into economic and societal change stemming from the increasing shift toward digital technology and networking. The new FSTI unit in Heilbronn was founded recently on the city's education campus with the primary aim of exploiting opportunities offered by digital transformation. It works as a transfer-oriented research institution to expand the educational horizons of the education campus in Heilbronn, also offering a port of call for innovative partnerships in research and teaching. The education campus in Heilbronn offers the ideal prerequisites for these aims, and plans are already underway to collaborate closely with university organizations and other facilities based on the campus. The transfer-oriented focus of the research institution will be supported in keeping with the philosophy of Steinbeis. Accordingly, all projects will revolve around "dual" scientific research.

"Combining our experience and expertise with other partners on the education campus offers a unique opportunity to build a digital transformation hub that will not just focus on research, but also on tangible benefits to companies and the local population in and around Heilbronn," highlights Prof. Dr. Heiner Lasi, director of the Ferdinand-Steinbeis-Institute.

THE STARTING PHASE AND FOCUS OF THE FSTI HN

The team of 30 or so specialists at the FSTI comprises up-and-coming scientists and more experienced researchers from different disciplines, and it has already embarked on its first projects. At first only a small team will be working on the education campus, collaborating closely with FSTI head office in Stuttgart. The interdisciplinary FSTI team will mainly focus on digitalization and autonomization in order to help drive the implementation of digital transformation within companies based on tried-and-tested Micro Testbed methods (see separate box). The new partnership options this will result in, between science and academia on the one hand and industry

on the other, will be underpinned by scientific support in order to develop methods, concepts, and recommendations for regional stakeholders.

All FSTI activities revolve around the principle of "dual scientific research" based on scientific standards, hand in hand with societal and thus also commercial influences. To this end, the FSTI works with multiple local partners on multidisciplinary collaborative research projects. Based on this foundation, the aim of the FSTI HN for the first five years is to build on past research results, not only to provide development opportunities for the scientific community, but also to deliver societal and commercial benefit to the Heilbronn region.

As a sponsor of the German regional team of the Industrial Internet Consortium (IIC), the FSTI will set up the first IIC Academy in a German-speaking country on the campus. Digital solutions with proven track records at an international level and within real companies will provide a basis for teaching and education programs for students and business leaders in the region. The education campus will also derive benefit from the global reach of the IIC by organizing local events with an international profile, and they will be supported in this by leading global partners in industry.

THE FERDINAND-STEINBEIS-INSTITUTE AND THE MICRO TESTBED METHOD

Digital transformation is a multifaceted process of change and challenges. The pioneering work carried out by the Industrial Internet Consortium (IIC) through the use of so-called testbeds shows just how pragmatic companies can be in their approach to change. Testbeds involve several companies working together as partners, using web-based networks operating through open standards to try out and subsequently implement new value creation scenarios transcending different sectors of industry.

As the designated host of the IIC German Regional Team, the FSTI has recognized the opportunities offered to German companies to work through scenarios with the potential to deliver benefit by drawing on current IoT technology within the context of actual business. The FSTI developed the Micro Testbed method based on insights gained by the IIC. The aim of a Micro Testbed is to implement concrete projects in order to pinpoint interdisciplinary value creation scenarios and deliver these based on experimentation in partnership with different enterprises (ecosystems). The Micro Testbed method lays emphasis on exploring small application scenarios. In doing so, existing technologies are used to allow new ecosystems, products, and services to emerge through interdisciplinary collaboration, with a bearing on digital solutions and networking. The results gained from Micro Testbeds deliver benefit for all parties in ways that were previously unimagined.

One area of emphasis for the 25 Micro Testbeds that are currently underway or live is small and medium-sized enterprises, spanning all sectors of industry including manual trades.

The Micro Testbed method developed by the FSTI is based on a non-liner multi-stage process. Seven steps to success lie at the heart of the model:

1. Initiation of a Forum of Trust with business enterprises from different sectors of industry
2. A neutrally moderated process for exchanging ideas, drawing on specialist knowledge and scientific expertise
3. The generation of small, interdisciplinary application scenarios for adding value across all sectors of industry
4. Selection of generated application scenarios
5. Specific planning of technological implementation
6. Hands-on introduction at companies on site
7. Evaluation and ongoing development of application scenarios in ecosystems

↑ Left to right: Prof. Dr. Michael Auer (Steinbeis Foundation), Prof. Dr. Heiner Lasi (Ferdinand-Steinbeis-Institute), Michael Köhnlein (Ferdinand-Steinbeis-Institute), Peter Wittmann (Ferdinand-Steinbeis-Institute), and Manfred Weigler (Dieter Schwarz Foundation) © Magmell

FUNDING FROM THE DIETER SCHWARZ FOUNDATION

The Dieter Schwarz Foundation is backing the new research institution by providing funding and helping in the long term with office space on the education campus. The FSTI HN will be provided with offices in a high-rise building alongside the Technical University of Munich, Heilbronn University, and the Fraunhofer Institute.

As Prof. Reinhold R. Geilsdörfer, director of the Dieter Schwarz Foundation, underscores: "Having the Ferdinand-Steinbeis-Institute set up an office is an ideal complement to activities on the education campus and it will inject new energy. Having another research institute on board will galvanize collaboration between the institutions and promote Heilbronn as a site of scientific and research activity."

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ALL PROJECTS WILL REVOLVE AROUND 'DUAL' SCIENTIFIC RESEARCH.

PROF. DR. HEINER LASI
heiner.lasi@stw.de (author)

Director
Ferdinand-Steinbeis-Institute
Heilbronn (Stuttgart)

www.steinbeis.de/su/2278


SAP
next-gen
Lab

BOOSTING INNOVATION THROUGH DIGITAL COLLABORATION

STEINBEIS EXPERTS CONDUCT RESEARCH AT THE NEXT-GEN LAB ON THE EDUCATION CAMPUS IN HEILBRONN

Can using more efficient, purely digital solutions optimize or even replace complex offline innovation processes? This is the question being examined by an interdisciplinary, international think tank called the SAP Next-Gen Lab on the education campus in Heilbronn. The test lab is looking at new types of digital methods and "innovation generation" techniques. Its goal is to revolutionize established offline innovation processes and methods by turning to cloud-based solutions with the aim of creating unique products, services, and smart business models for small and medium-sized business – and doing this more cost-efficiently. One way to achieve this is to use cloud-based software to come up with innovations through new methods, approaches, and use cases. The Steinbeis Consulting Center for Social Media Management & Digital Business Model Innovation is a partner of the Next-Gen Lab.

The Next-Gen Lab sees itself as a kind of micro testbed for international, interdisciplinary, application-centric transfer research that transcends different universities in order to come up with methods and approaches for developing sustainable innovations in the cloud. Experts at the micro testbed are currently researching the possibility of digitalizing two approaches: Science Fiction & Design Thinking and Business Model Innovation. These are being looked at as a part of interdisciplinary, exploratory, experimental studies and involve analyzing methods in multi-generation teams of students, scientists, and experts from actual business practice.

This application-based secondary research on developing investigated methods and procedure models is aimed at generating digital, disruptive innovations and is being carried out in collaboration with SAP Germany, Cisco Systems, Vico Research & Consulting, and Lamano, plus universities, research institutions on the Heilbronn education campus, and other international partners such as MatchLab from the United States.

This is where the experts at the Steinbeis Consulting Center for Social Media Management & Digital Business Model Innovation come in with their specialist know-how. Depending on the focus of research, they are testing new kinds of cloud-based software systems, working with partners and testers on an interdisciplinary level to look at things such as compatibility, the user experience, usability, and expandability in actual application areas with respect to generating innovations.

AN ECOSYSTEM FOR ACCELERATING INNOVATION

The micro testbed provides all of the partners involved in the project with a kind of "forum of trust" that makes it possible to pinpoint overlapping interests and develop joint solutions which correspond with the expectations of all partners. The companies work in testbeds pragmatically, as partners, and across all sectors of industry in order to realize and experiment with common value creation scenarios in a real business setting and experiment in ways that have not been tried out before. In doing so, the focus lies in using small application scenarios. This makes it possible to come up with new types of products and services within the context of digital technology and networking. It's an approach that has already been found to work and has already been used successfully a number of times at the Ferdinand-Steinbeis-Institute (FSTI), which belongs to the Steinbeis Foundation.

The transfer research conducted at the Next-Gen Lab allows partners from industry, medium-sized firms, research institutions, and startups from all sec-

Prof. Dr. Sonja Salmen (Steinbeis) (left) and Katrin Redmann (SAP SE)

tors of industry to act as customers or research partners. They are called Challenge Providers.

Complex applications no longer need to be set up or maintained "on demand" or "as a service" by companies or universities themselves. At the same time, this approach minimizes investment and security risks. This comes hand in hand with reductions in the implementation and maintenance outlays of new types of IT applications, since infrastructure and applications can simply be taken from the cloud for a small investment. Cloud computing, the internet of things (IoT), and artificial intelligence (AI) offer new approaches to optimizing workplaces in a way that adds value. They also pave the way for collaborative working methods based on smart networks of self-controlled equipment and applications. Approximately 60% of people working in Germany believe that their current IT workplace no longer meets necessary requirements (PAC 2017).

It is predicted that digital transformation of the workplace could raise productivity by up to 33% and reduce delivery costs by 26% (IDC 2016).

One important factor when optimizing digital collaboration is the ability of existing applications to allow different communication channels to be integrated,

DIGITAL BUSINESS MODEL INNOVATION (DBMI) AND DIGITAL DESIGN THINKING (DDT)

- **The benefits of online collaboration**
  - Substantially shorter meetings since people no longer need to travel; more straightforward preparation
  - No disadvantages when it comes to implementing creative tasks with digital technology; blending learning methods appear particularly promising
  - Shorter iteration cycles possible during projects – especially relevant with respect to the rapid pace of AI-centric change
  - Practical experiences with research projects are replacing preconceptions regarding inefficient online collaboration
  - Digital added value: Automatic documentation makes it easier to concentrate on active collaboration; possibility to export materials; integration of digital content; different ways to offer feedback; surveys; presentation options

- **The benefits for industrial partners in the innovation ecosystem**
  - The business units of industrial partners receive support with innovation
  - Customer behavior forecasting provides customers with an inexpensive option for making personalized products and services available in advance
  - Development of novel and new kinds of business fields, products, and services
  - The customer experience makes it easier to realize more fail-safe innovations and services
  - Functional prototypes can be made to showcase innovative products or services

- **The benefits for SMEs and education bodies in the innovation ecosystem**
  - A space for experimentation and proactively trying out a culture of failure, ICT tech, network leadership, and new techniques – without risk
  - Employees become ambassadors of new tech-driven innovation methods Digitalization potential becomes tangible
  - Media skills for students, company employees, and professors
  - Development of ideas for introducing innovative, new kinds of research and learning
  - Research projects in partnership with business can be positioned within an interdisciplinary context, across individual or multiple universities
  - Usability testing of collaborative tools

- **The benefits for other industry sponsors in the innovation ecosystem**
  - Identification of business opportunities
  - Empowers the next generation of innovative engineers
  - Combines German engineering culture with the spirit of Silicon Valley
  - Integrated within the global innovation network of SAP Next-Gen Labs

not just within the right context, but also across different manufacturers (e.g. voice communication, video, persistent messaging, chatbots, whiteboards). In an economy based on collaborative networks, straightforward interaction is essential across different value chains and companies, and this must come with coherent identity management and end-to-end encryption.

The Next-Gen Lab is still developing – and doing so successfully. In September, Prof. Dr. Sonja Salmen, director of the Steinbeis Consulting Center for Social Media Management & Digital Business Model Innovation, was asked to head up the Chapter of Digital Design Thinking & Business Model Innovation and thus represent a lighthouse location: "The SAP Next-Gen Lab on the education campus in Heilbronn can now consider itself an innovation hotspot of the worldwide Next-Gen community. These hotspots stand for tried-and-tested methods that help forge and promote links between industrial partners and academic thought leaders, researchers, students, startups, partners from the tech community, partners, and SAP experts – all with a shared purpose," explains Salmen. Her work on transfer research will involve working alongside specialists from the Steinbeis Network, colleagues at universities, and industrial enterprises to conduct interdisciplinary, international studies on accelerating innovation as part of the SAP University Alliance Community. This innovation ecosystem allows Challenge Providers to realize new kinds of sustainable products and services faster and more intuitively. They can also engage in brainstorming sessions, science fiction methods, design thinking, business meetings, and different phases of business model innovation processes.

EXPERIENCES WITH PILOT PROJECTS

The experts at the Steinbeis Consulting Center for Social Media Management & Digital Business Model Innovation have conducted experimental studies with over 50 specialists and managers since 2015. One thing all studies had in common was the outcome: The digital customer experience and innovation can be realized globally for a small time and money investment, and it will be accepted by business and science. The underlying technologies used for the experimental studies were SAP Jam, Cisco(r) WebEx Meetings and Teams, and a selection of special software solutions. The pilot studies were conducted within the context of several research projects: Smart Homes for Best Agers (partner: Stuttgart Chamber of Craft Industries); A Self-Integration Platform for Migration to the EU (a startup concept); Digital Sales Innovation in Stationary Wholesaling (partner: Transgourmet Deutschland); Reconciling Careers with Families within the Context of Smart Homes (partner: Better@Home Service).

QUICK CHECK: A FUTURE LEADERSHIP MINDSET

Interested in finding out if you're already reaping the full potential of digital transformation? Find out in no more than 15 minutes by using the Online Quick Check. It's part of a research project being conducted by Heilbronn University and the Steinbeis Consulting Center for Social Media Management & Digital Business Innovation: Smart Service at SMEs. The quick check is free and you can view your confidential results immediately.

https://lamapoll.de/stw-mindset

Interested in becoming a Challenge Provider? Are you a specialist interested in experiencing the Next-Gen Lab? Simply get in touch with the authors!

PROF. DR. SONJA SALMEN
sonja.salmen@stw.de (author)

Director
Steinbeis Consulting Center for Social Media Management & Digital Business Model Innovation (Nordheim)

www.steinbeis.de/su/1670
www.sbz-socialmediamanagement.de

ALEXANDER FRIEDRICH
alexander.friedrich@stw.de (author)

Project manager
Steinbeis Consulting Center for Social Media Management & Digital Business Model Innovation (Nordheim)

www.steinbeis.de/su/1670
www.sbz-socialmediamanagement.de

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THE POWER OF SCATTERED LIGHT: CHECKING ROUNDNESS, WAVINESS, AND ROUGHNESS IN A SINGLE PROCESS

MEASUREMENT TECHNOLOGY MAKES CHECKS IN BEARING PRODUCTION MORE EFFICIENT

Bearings are precise machine components with extremely tight specifications when it comes to the roundness, waviness, and roughness of rolling elements and bearing rings. Production processes are subject to tolerances down to the submicron. There is a special measuring device for checking roundness and waviness, and another for surface roughness. Parts are tested randomly in the lab and this causes certain problems. To do justice to increasingly strict quality requirements, it is becoming more and more important to conduct a larger volume of random tests. But at the same time, it should not take up more time to do quality checking. So what happens next? Experts at the Würzburg-Schweinfurt University of Applied Sciences, the Steinbeis Transfer Center for Bearing Technology in Herzogenaurach, and OptoSurf from Ettlingen think they have found the solution: an optical measurement technique based on scattered light.

Their technology uses light deflected by surfaces. These deflections make it possible to gauge roundness, waviness, and roughness in a single sweep. To keep the work environment clean, measurements can be made automatically with scattered light and integrated into production processes such as honing and grinding. Cycle times are also shorter than the time taken with contact measurement methods. A team of researchers at Würzburg-Schweinfurt University of Applied Sciences, the Steinbeis Transfer Center for Bearing Technology, and OptoSurf have been examining measurement technology in more detail as part of a shared project sponsored by the Bavarian State Ministry for Science and the Arts and the European Union. The initiative also comes under a European Social Fund (ESF) project focusing on digital knowledge sharing in the field of innovative measurement technology for SMEs. The ESF project is being carried out at Würzburg-Schweinfurt University of Applied Sciences.

LIGHT SCATTERING TECHNOLOGY

Light scattering technology is an alternative approach to measuring and capturing the micro-geometry of engineered surfaces. The angle-resolved measurement of scattered light is based on the laws of light reflection and a model of "mirror facets." When light strikes a rough surface, it is deflected by micro-angles[6]. This deflected light is transformed to the focal plane by the processes of Fourier optics. A detector is used to record the distribution of intensity, which corresponds to the frequency distribution of the scattering angle. This scattered light method is also capable of assessing the macro-geometry (form profile) of surfaces. The readings taken with scattered light measurement can be calibrated. Roundness and waviness can be equated to international standards. The optical result for surface roughness (Aq) is a new parameter that does not correlate with more generally used values such as Ra and Rz, but instead with the occasionally used value Rdq.

FOURIER ANALYSIS OF FORM PROFILES

One suitable method for predicting roughness is to analyze geometric profiles based on Fourier analysis, also because bearings are stimulated harmonically. "The underlying idea is that a track ball on the ring surface should stimulate vibrations in the bearing. There are different ways to stimulate the bearing: broadband excitation or harmonic excitation," explains Dominik Helfrich, a director at the Steinbeis Transfer Center for Bearing Technology. Harmonic excitation is more pleasant because it just generates one tone, which can change during modulation[1].

The bearing industry usually measures shape and waviness in a precision measurement room, ideally with a shape tester. "It's not recommended to do that in

measuring the waviness of ball screw drives

a production environment because vibrations can skew the measurements. It's easy for those skewed measurements to result in expensive misinterpretations," highlights Prof. Dr.-Ing. Stephan Sommer, director of the Steinbeis Transfer Center for Bearing Technology and Professor at Würzburg-Schweinfurt University of Applied Sciences. To determine roundness, a low-pass filter is used. This eliminates high-frequency constituents (waviness and roughness). To assess high-frequency constituents, the profiles are examined using fast Fourier transformation (FFT). Frequencies in the mid to high frequency range (>25 waves/cycle) often result in complaints due to the noise they create[1].The milling procedure of honing results in optimized surface treatment, improved roughness, improved absolute form deviation, and a reduction in the amplitudes of frequency spectrums. As a result, conducting a Fourier analysis of form profiles is a standard procedure in quality assurance.

LIGHT SCATTERING TECHNOLOGY IN THE BEARING INDUSTRY

Assessing quality in bearing production requires precise measurements. Tolerances are extremely tight and manufacturers have to produce large batches within short cycle times. Until now, using conventional measurement techniques has only made it possible to analyze samples in order to see if they are compatible with processes. This makes it easy to overlook random errors in the production process. As a result, it would be hugely beneficial to have 100% in-line monitoring processes. The experts at Steinbeis have been developing a test machine with experts at Würzburg-Schweinfurt University of Applied Sciences. Their device contains a scattered light sensor for measuring the form, waviness, and roughness of rolling elements. It can also be integrated into production lines. This makes it possible to offer 100% monitoring of the rolling path of outer rings. One typical defect encountered in the serial production of ball bearings is that the rolling path is not honed properly. When this happens in the area where rolling elements come into contact with the body of the roll, at some point there's a good probability that the bearing will get loud. Such errors can only be discovered by chance during random inspections.

The project team ran tests with scattered light and defined 1,024 overlapping measuring points for scattered light all around the bearing ring. Well-honed surfaces had Aq values within the defined tolerances. Polished rings had Aq values significantly higher than the tolerances. This makes it possible to identify specific areas that have been badly honed. Similar results can be achieved by assessing the geometric form of the ring. With an inadequately honed bearing, the roundness profile will show signs of waviness in the area around the milled surface. The amplitude spectrum will also reflect this error and as a result,

the ring will have defects and be removed after the declining tolerance curve is noticed during 100% checking. The test machine developed for the research project takes less than a second to measure and evaluate a bearing ring. One key prerequisite for taking measurements is a clean surface.

Another application area for scattered light technology is measuring the waviness of rolling elements on ball screw drives. Ball screws are a common component in the electronic power steering of modern cars. The surface quality of the rolling path plays a decisive role when it comes to the noise generated by the steering system, and a key aspect of this is the waviness of the area of the rolling element that comes into contact with the ball and ring. Final processing can eliminate waviness, which is typically caused by previous processes. One major challenge is the different functional emphasis of bearings during operation. If final processing only concentrates on one side of a bearing, it is not possible to conduct a meaningful evaluation with measured coordinates since both walls are measured. The scattered light device is able to swivel the sensor and specifically attribute the waviness of both walls to the rolling path.

The demand for high-quality rolling contact bearings is rising in the automotive industry. Scattered light provides a traceable measurement technology that calculates statistical roughness values (Aq) and is adaptable to different production methods such as honing and grinding. At the same time, it offers integrated macro-angles making it possible to ascertain geometric profiles. The technology is robust, fast, non-contact, and can be used in manufacturing areas to carry out 100% monitoring of production processes. As a result, the research team is completely won over by the idea!

DOMINIK HELFRICH
dominik.helfrich@stw.de (author)

Director
Steinbeis Transfer Center for Bearing Technology (Herzogenaurach)

www.steinbeis.de/su/2148
www.steinbeis-waelzlagertechnik.de

PROF. DR.-ING. STEPHAN SOMMER
stephan.sommer@fhws.de

University of Applied Sciences Würzburg-Schweinfurt (Schweinfurt)

www.fhws.de
Facebook: https://bit.ly/34dqkwn
Youtube: https://bit.ly/35khGfM

BORIS BRODMANN
b.brodmann@optosurf.de

OptoSurf GmbH (Ettlingen)

www.optosurf.de

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"WE NEED EXPERTS, BUT AT THE SAME TIME THEY SHOULD BE GENERALISTS."

AN INTERVIEW WITH PROF. DR. RÜDIGER HAAS, DIRECTOR OF THE STEINBEIS TRANSFER INSTITUTE FOR TRANSFER TECHNOLOGIES AND INTEGRATED SYSTEMS (SITIS), AND OLIVER BREHM, DIRECTOR OF THE STEINBEIS TRANSFER CENTER FOR INNOVATION AND ORGANIZATION

In an era of digital technology, will people become superfluous one day? Steinbeis experts Prof. Dr. Rüdiger Haas and Oliver Brehm believe strongly that digital transformation will not be possible without people – and that if anything, human factors will actually be central to the success of digital transformation. An essential aspect of this, however, is that companies prepare their employees for the new situation. How, and the role played by staff training concepts in this, was the subject of an interview carried out by TRANSFER with the two experts.

Hello Professor Haas. Digital transformation and the increasing level of convergence between different fields of technology and sectors of industry are considered the most important factors when it comes to Economy X.0. Do you agree with this assessment, and if you do, what challenges and opportunities do you envisage for small and medium-sized enterprises moving forward?

Yes, I do agree with this assessment. And it raises a question for companies: What structural changes will this lead to and how should we deal with them if we want to get transformation to work? Big companies are much better prepared for this than the smaller, medium-sized ones. As an example, I'll just point to two areas that show the particular challenges SMEs now face: one is staff training and the other is technological advancement. Dealing with these challenges properly could deliver benefits on a number of fronts: more flexible production, quicker turnarounds, and more effective plants in general.

You're smiling, Mr. Brehm. Do you agree with that?

Absolutely, I agree entirely with Mr. Haas. Although I would say that as a rule you have to look at the fine detail when it comes to Economy X.0. I think I speak for all when I say we prefer to see humans in the product development process as the hidden success factor of digital transformation for small and medium-sized companies. The companies may have limited resources, but they should still get on with their daily business by working with the best of the best; they should safeguard the market viability of existing business models through state-of-the-art technology; and at the same time, they should still develop new business models. That's going a bit further than just performing a balancing act. Not only that, but at small companies this all affects the same people.

So even in times of digital transformation, people remain the ultimate resource. But lots of employees tend to shy away from the challenges that arise with increasing levels of digital technology. A question for you, Mr. Brehm. What should companies do about this?

Big companies already have their own academies or training concepts, and these are usually matched to long-term HR development. Most SMEs don't, and they often have little understanding of the fact that staff development should be part of this, as a fixed ingredient of business development. Undergoing further training has not been something that goes without saying. But now, people – not just managers, but also the workforce – are realizing that this has to change. At first they find this quite unsettling. But it's important that companies take this anxiety seriously and involve people in planning staff training concepts as early on in the process as possible.

In July, we organized a convention on human factors in an era of digitalization, so we took a look at this topic. But if I'm honest we weren't really surprised at the outcome of the event: Everything is dictated by a balancing act – we need experts, but at the same time they should be generalists. We need to find a way to ensure people communicate on an interdisciplinary level within heterogeneous teams, even if individual team members speak a completely different language. People need to be in a position to work on an abstract level and deal with the sometimes conflicting interests of hard spec-

DIGITAL TRANSFORMATION WILL NOT BE POSSIBLE WITHOUT PEOPLE – IF ANYTHING, HUMAN FACTORS WILL ACTUALLY BE CENTRAL TO THE SUCCESS OF DIGITAL TRANSFORMATION.

ifications and agile methods – without bumping into things. Some people have lost touch with this willingness to move outside their own comfort zones, inch their way right up to the border, and maybe even strike upon a completely radical new solution. So a culture of staff training needs to develop within companies. But if it does, it has to happen quickly, or it won't be geared to change. This is one area where I see extremely good opportunities for companies, especially small ones, to score points in the future.

Professor Haas: If companies should be planning their own staff training concepts, will this require managers to possess certain competences? Are they up to it?

Not really, no. But they can bring in help from outside, in the same way they do with financial advisers, legal experts, and classic business management. That said, the idea that they may have to get help from skilled workers trained in teaching skills is a new concept for lots of people. And then comes the next difficulty: Lots of these experts are difficult to find in the market. Until now, teaching skills, or vocational and technical teaching skills, haven't focused on the stages of personal or working life that people have already been in for years – these people want and indeed should receive training all their lives. For some years now we've been looking into the topic of "technical training in an industrial context" because there's a need to explore this field – not just on a theoretical level but also in practical terms – to be ready for the challenges that are coming.

Mr. Brehm: What methods do you apply when you're working on a project in the field of HR development and management consulting?

From the many projects we've worked on over the last 20 years at our Transfer Center, looking at things like CAD and PLM systems, we've developed a method for implementing sustainable change within companies and gaining broad acceptance from employees. We call it smart benchmarking. It doesn't matter whether it's an innovation relating to a system, an organization, a process, or a technological innovation – we've made our approach so systematic that training, finding solutions, and implementing change is practically in the hands of those people who are affected.

Professor Haas: To what extent is technological progress really a challenge for German business? Haven't we already been a pioneer in this area for years?

Our pioneering role is not something that can be taken for granted. For example, useful indicators for the ability of a country to innovate are patent registrations and the number of publications. But if you look at these figures in relation to the size of the population, we're lagging behind in terms of publications compared to other EU countries like Denmark, Finland, Luxembourg, the Netherlands, Sweden and a few others. The share of globally relevant patents is also higher in countries like Sweden, Switzerland, and Japan. And that's despite the fact that spendings like gross domestic investment in research and development have doubled in business in the last 20 years. So we can't afford to sit back and wait, we need to do more research, more intensively, at the universities. But for that to work, we need a different overall setup and structural changes at the universities.

PROF. DR. RÜDIGER HAAS
ruediger.haas@stw.de (author)

Director
Steinbeis Transfer Center for Transfer Technologies and Integrated Systems SITIS (Karlsruhe)

www.steinbeis.de/su/1289
www.sitis-steinbeis-haus.de

OLIVER BREHM
oliver.brehm@stw.de (author)

Director
Steinbeis Transfer Center Innovation and Organization (Eislingen)

www.steinbeis.de/su/0539
www.stzio.de

ONCE A STEINBEISER, ALWAYS A STEINBEISER

STEINBEIS HONORS KLAUS DANKSAGMÜLLER, FACTORY PLANNER IN BODY AND SOUL

It's 1985 again and a young Klaus Danksagmüller has just started working at TBD, the technical consulting service in Ulm. At the time, nobody could have imagined what a long-lasting relationship it would be between the two parties. Fast forward 34 years, and Steinbeis is now honoring the outstanding achievements of Klaus Danksagmüller with the Steinbeis Award. The honor is awarded to distinguish Steinbeisers for particularly successful projects, or to acknowledge a person's special character, their underlying attitude, or their ability to act as a role model.

There can be no doubt that all of these descriptions apply to Danksagmüller. Before joining the TBD, the thoroughbred engineer completed an apprenticeship as a toolmaker and studied production engineering at the former University of Applied Sciences in Ulm. In 1990, Danksagmüller took over Steinbeis-Transferzentrum Fabrikplanung GmbH following the sudden death of Prof. Dienstdorf, and managed the center alongside Roland Frank and Karl-Heinz Spatzal.

The Steinbeis Enterprise was founded in 1985 as a technical consulting service at Ulm University of Applied Sciences. Since then, it has developed into a professional consulting, planning, and supervisory partner for projects in the field of factory planning. The enterprise supports firms at every stage of the planning process, from initial analysis to final implementation, and its core competences lie in digital factory planning – perfect preparation for the challenges of digital transformation for the customers of the Steinbeis experts. In 2012, Danksagmüller, Frank, and Spatzal founded Steinbeis-Transferzentrum Fabrikplanung GmbH with the aim of doing more international business.

In recent years, Danksagmüller and his colleagues have experienced more peaks than troughs with their Steinbeis Enterprise and have always stayed true to their aim of "adding value for your success in the market." The fact that this was the right direction to take things is reflected in the number of successful projects implemented by the center and its large number of satisfied customers.

On October 1, 2019, Danksagmüller passed the baton to his former comrades-in-arms Roland Frank and Karl-Heinz Spatzal, but he will remain available to support his colleagues and the Steinbeis Network as a partner of Steinbeis-Transferzentrum Fabrikplanung GmbH. As Danksagmüller says himself: "In the same way as when we worked as a team at the transfer center, we will always consider ourselves part of the 'Steinbeis Team.'"

↑ Left to right: Roland Frank, Uwe Haug (Steinbeis Headquarters), Klaus Danksagmüller, and Karl-Heinz Spatzal

ROLAND FRANK
roland.frank@stw.de (author)

Director
Steinbeis Transfer Center Factory Planning (Neu-Ulm)

www.steinbeis.de/su/0096
www.stz-fabrikplanung.de/

KLAUS DANKSAGMÜLLER
klaus.danksagmueller@stw.de (author)

Partner
Steinbeis-Transferzentrum Fabrikplanung GmbH (Neu-Ulm)

www.steinbeis.de/su/1619
www.stz-fabrikplanung.de/

MAKING THE FUTURE TANGIBLE: INDUSTRY 4.0 MEETS "LEARNING FACTORY"

STEINBEIS AND THE COUNTY OF SCHWÄBISCH HALL SUCCESSFULLY LAUNCH LOCAL STAFF TRAINING CONCEPT

The changes brought about by Industry 4.0 (smart production/connected manufacturing) can be particularly challenging for firms and their employees. But what can companies do to prepare apprentices, staff, and managers for a working world that is still not fully developed? One answer is provided by Learning factory Industry 4.0, the Steinbeis Transfer Center from Schwäbisch Hall. In 2016, an alliance was formed between the four vocational schools in Crailsheim and Schwäbisch Hall and a variety of innovative firms. Together, they set up what are now highly networked and partially virtual engineering and machine production facilities across two sites.

The concept behind a learning factory is to prepare specialists and the next generation for the demands and working conditions of smart factories. Training and staff courses show workers how machinery can be operated based on actual industry standards. They can also practice how to work with ultra-modern, networked machinery and are introduced to every stage of the working process within overall value chains – from initial requests from customers to engineering and product delivery. As such, learning factories provide a comprehensive understanding of digitally networked production processes in a learning environment based on actual business practice. They are a particularly effective way to provide small and medium-sized firms with pointers on how to deal with and establish Industry 4.0 methods themselves.

THE SITE IN SCHWÄBISCH HALL: METAL SHEET PROCESSING

The Schwäbisch Hall learning factory offers laser-cutting machinery, a bending machine, and a measurement unit for producing different parts from sheet metal. It has a web-based information platform to allow authorized users to work quickly and economically, providing them with straightforward access to all process data. For example, design engineers, buyers, sellers, and even customers can view all required information on their end devices. Thanks to the data exchange standard OPC Unified Architecture, information can be shared securely and reliably across different machines (or products) provided by different manufacturers.

THE SITE IN CRAILSHEIM: FILLING SYSTEM

The learning factory in Crailsheim offers filling facilities. Receptacles of different sizes are required for the filling system at the site, and these are designed and produced in Schwäbisch Hall. The entire site has been replicated virtually. As a rule, users produce virtual models before entering the system so they can reduce throughput times on the filling machines. The system can also be

State secretary Katrin Schütz and David Schneider at the award ceremony for "100 Locations for Industry 4.0 in Baden-Wuerttemberg" © Martin Storz

The filling system in the learning factory in Crailsheim
© Crailsheim Vocational School

viewed with a virtual reality headset to allow other parts to be looked at below the surface so that they can also be analyzed. The facility delivers an overview of the overall process from 3D production of receptacles to different filling techniques and packaging.

Both of the learning factories in Crailsheim and Schwäbisch Hall are connected through the same network. This creates a virtual value creation network to reflect real situations in the networked economy of Industry 4.0. It also provides close links between different locations within the county. The learning factory concept is based on three pillars: an Education Factory, a Competence Factory, and a Demo Factory.

THE EDUCATION FACTORY

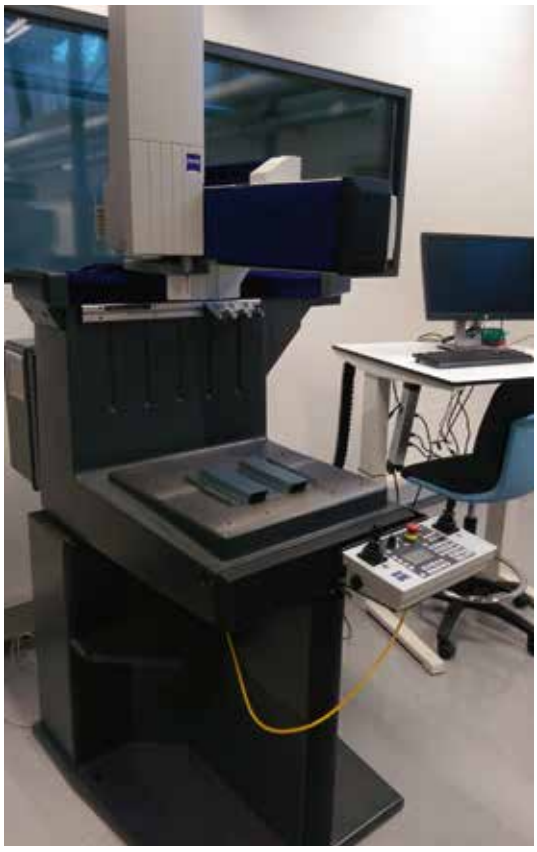
The Education Factory allows students to gain an early understanding of new demands and how Industry 4.0 is changing the nature of value chains. The virtual value creation network reflects real situations encountered in the networked economy of Industry 4.0. The aim is to create a benchmark for staff training in the field of sheet metal production.

The skilled workers of tomorrow can use virtual companies to practice working with ultra-modern, networked machines and learn all of the different stages of work processes within the context of overarching value creation – from initial requests from customers to engineering and product delivery. Once every academic year, the students are organized into interdisciplinary groups across different grades, according to each individual training course. The idea is to allow more experienced students to work on projects with less experienced students so they can share their knowledge.

THE COMPETENCE FACTORY

In the future, the Competence Factory will offer preparation courses to specialists and the next generation of skilled workers on the requirements of Industry 4.0.

Students will work in small interdisciplinary teams. The specifics of the training courses are currently still at the planning stage and the idea is to cover different topics relating to "Workplace 4.0" with workshops and presentations. To set the ball rolling, a groundbreaking workshop was already organized called "Welcome to the world of digital technol-



The laser-cutter, bending machine, and measurement unit in the learning factory in Schwäbisch Hall
© Schwäbisch Hall Vocational School/Trumpf

ogy – the future will need a better understanding of reality."

THE DEMO FACTORY

The Demo Factory allows managers and business leaders to make use of the ecosystem offered by the learning factory, plus external centers in the network, and form visions and evaluate business models.

The experts at the Demo Factory come from a variety of disciplines and are available for questions and support. Interdisciplinary workshops are organized, offering an opportunity to develop/redevelop business processes and business models. The new operative approaches this results in can then be worked up and tested directly at the learning factory, complete with migration paths. This turns Learning Factory 4.0 into a test lab for manual trades and SMEs, providing a suitable tool for developing and evaluating strategies for implementing Industry 4.0 themselves.

One thing that makes the learning factory in Schwäbisch Hall special is that it was not set up by buying in a prefabricated modular system. Instead, an individual workshop of learning has been created by bringing individual, mainly local companies together. This involves both industrial and commercial schools, which work together in close collaboration. It's a concept that works: In July 2019, Learning Factory 4.0 and its sites in Schwäbisch Hall and Crailsheim were named among the "100 locations for Industry 4.0 in Baden-Wuerttemberg" by Secretary for the Economy Katrin Schütz in Stuttgart.

DAVID SCHNEIDER
david.schneider@stw.de (author)

Steinbeis Transfer Center:
Learning factory Industry 4.0
(Schwäbisch Hall)

www.steinbeis.de/su/2029
http://lernfabrik-40.de

SVENJA BRASSEL
s.brassel@lrasha.de (author)

Schwäbisch Hall District Office,
Office of Economic and
Regional Management
(Schwäbisch Hall)

www.lrasha.de

HONORARY PROFESSORSHIP FOR SUPPORTER OF THE DANUBE REGION

THE TECHNICAL UNIVERSITY OF CLUJ-NAPOCA IN ROMANIA BESTOWS HONOR UPON DR. JONATHAN LOEFFLER

The Technical University in the Romanian city of Cluj-Napoca has awarded Dr. Jonathan Loeffler, director of Steinbeis 2i, an honorary professorship (Prof. Honoris UTCN). The university announced the award in recognition of his commitment and personal contributions to the setting up of Danube Transfer Centers in Romania and other countries along the Danube region. The aim of this Steinbeis initiative is to bolster the competitiveness of economic players along the Danube region based on the Steinbeis model.

The professorship honoris causa was awarded in the presence of a large audience at the Technical University by Prof. Dr. Nicolae Burnete, President of the Senate, on October 9. "I am proud that our efforts are bearing fruit and this is now receiving strong recognition," said Jonathan Loeffler at the award ceremony. "And I'm particularly pleased at the way the support provided by the professional team at the Steinbeis-Europa-Zentrum over the years has enabled us to acquire numerous European projects – measures that go hand-in-hand with our collaboration in the Danube region. It's thanks to their dedication that we have succeeded in hauling European funding on board, plus lots of other initiatives."

SOURCE OF IDEAS FOR TRANSNATIONAL PARTNERSHIPS

As part of the "Less Developed Regions" initiative in Romania, Jonathan Loeffler also provides expert support to the General Director of Regional Policy and Urban Development on behalf of the European Commission. Since 2012, he has been working to bolster the competitiveness of companies in the Danube region and is a source of ideas for many transnational partnerships.

One example is in Cluj-Napoca, where the Steinbeis-Europa-Zentrum (SEZ) and Steinbeis 2i offer a number of programs to foster knowledge sharing and technology transfer.

Both Steinbeis Enterprises are members of a variety of networks including the Transylvania IT Cluster and Cluster Mobilier Transilvan. They also provide support on submitting EU applications for research projects in Cluj-Napoca and form a close partnership with the Danube Transfer Center in Cluj-Napoca (DTC), particularly thanks to its director, Professor Sorin Popescu. For example through their involvement in an Interreg project called Made in Danube, the project partners have enabled stakeholders in the area to gain access to research results in the field of bio-economics. They have, also introduced measures to support business start-ups as part of the Danube-Chance 2.0 project.

TRANSFER CENTERS IN THE DANUBE REGION: LOCAL ONE-STOP SHOPS

Steinbeis-Europa-Zentrum first initiated the setting up of Danube Transfer Centers in 2012 with the aim of bolstering the competitiveness of business stakeholders in the Danube region. The experts were initially backed by the State Ministry of Baden-Wuerttemberg. The network now includes members in Cluj-Napoca und Bucharest (Romania), Nitra (Slovakia), Novi Sad (Serbia), Maribor (Slovenia), Gyor (Hungary), Ruse and Sofia (Bulgaria), and Vukovar and Zagreb (Croatia). The one-stop shops set up through the partners allow industry and stakeholders in innovation to gain better access to know-how and the resources offered by the scientific community.

ANETTE MACK
anette.mack@stw.de (author)

Senior Manager Public Relations
Steinbeis 2i GmbH (Stuttgart)

www.steinbeis.de/su/2017
https://www.steinbeis-europa.de/dtc
http://dtcnetwork.eu/

EXPERTISE AND FORESIGHT – 15 SUCCESSFUL YEARS IN OPHTHALMOLOGY

STEINBEIS EXPERTS MARK ANNIVERSARY AT TÜBINGEN UNIVERSITY

In October, the department of ophthalmology at Tübingen University Hospital celebrated a "biological cell division." eyetrial, the Steinbeis Transfer Center at the department of ophthalmology headed up by Prof. Dr. med. Barbara Wilhelm and Dr. med. Tobias Peters, joined comrades and other companions to look back on 15 highly successful years of knowledge transfer.

In a very personal video, Prof. Dr. med. Eberhart Zrenner ran through the success story of the Steinbeis center. Fifteen years ago, setting up the organization was not a simple formality. It took a lot of courage from everyone involved. So how did it all start? In 1998, the eye clinic in Tübingen and one of its employees, Eberhart Zrenner, faced a number of challenges. There was a growing corpus of studies on ophthalmology, new regulations that had to be respected, and everyone expected ultimate quality. But what is the best way to organize and coordinate work when interacting with pharmaceutical companies as part of the everyday activities of a university hospital? How should finances be secured? And how does one deliver value for science and business at the same time? To take on these challenges, Zrenner banked on a variety of useful insights he had gained at his Steinbeis Transfer Center for Biomedical Technology and Function Testing, which he had learned to use as the ideal bridge between the world of academia and the world of business.

The success of a transfer center depends strongly on the capabilities of its staff, but Zrenner had a lucky break and soon got to know Barbara Wilhelm. Zrenner first carried out an ophthalmology study at a company in 1999 and within a couple of years, the field had become so successful that the next step had to be to set up an independent Steinbeis Enterprise – the former center for "autonomous nervous systems" under the management of Wilhelm. The experts were accompanied on their new journey by Prof. Dr.-Ing. Sylvia Rohr, who played an important role in backing and supporting the new enterprise as a member of Steinbeis management. In 2004, Wilhelm started working with Tobias Peters and before long, the duo acted as joint managers in extending the reach of the company. In 2009, the center was renamed and became the current Steinbeis Transfer Center eyetrial, under the department of ophthalmology. At the same time, it has grown into a highly respected study center for ophthalmology in Germany.

Today, the center is responsible for the entire department of ophthalmology at Tübingen with a heavy focus on conducting clinical studies. Translational aspects of studies also play an important role. The center currently employs 15 people, and their competence and commitment have turned the center into a successful business enterprise. It's win-win for everyone: The Steinbeis Transfer Center offers the full gamut of entrepreneurial transfer options and is self-funding; aside from benefiting from the expertise offered by its people, the Department of Ophthalmology benefits from the acquired third-party funding. Hospital director Prof. Dr. med. Karl Ulrich Bartz-Schmidt and Prof. Dr. Marius Ueffing, director of the research institute, were keen to express their gratitude that the study center was set up, plus the important translational role played by the eyetrial Steinbeis Transfer Center in applying new therapeutic developments to patient practice.

The competence held by the team is now well known beyond Tübingen University. The German Ophthalmological Society has now transferred the chair of the working group for clinical study centers to Barbara Wilhelm, and thus also the remit of fostering greater consistency within the ophthalmic study culture in Germany.

THE SUCCESS OF A TRANSFER CENTER DEPENDS STRONGLY ON THE CAPABILITIES OF ITS STAFF

Staff at the eyetrial Steinbeis Transfer Center being congratulated at the Department of Ophthalmology during the anniversary celebrations in October

In 2015, the Steinbeis Foundation also honored the outstanding success of project work at the center with the Steinbeis Foundation Transfer Award – the Löhn Award. This award was bestowed for the LUVIS project, which was carried out in collaboration with Visus GmbH and resulted in standardized conditions for contrast sensitivity testing.

At a get-together organized to mark the anniversary, a large number of guests were in attendance to offer congratulations and look backward and forward with Wilhelm and Peters. They also used the occasion to celebrate 15 – or more like 20 – years of success with Steinbeis. Both of the Steinbeis directors joined Zrenner in underscoring their gratitude for the courage and commitment of everyone in making a success out of the center: The university hospital and the department afforded the center a high degree of freedom and trust, Steinbeis gave its support to the formation of a completely new kind of business model, and – last but not least – all employees at the center struck exactly the right balance between thinking and acting simultaneously as scientists and entrepreneurs – ideal prerequisites for the next 15 years (at least). The way ahead is already known. On November 1, Peters became the sole director of the Steinbeis Transfer Center and Wilhelm will continue to support the work of the center as his deputy.

DR. MED. TOBIAS PETERS
tobias.peters@stw.de (author)

Director
Steinbeis Transfer Center eyetrial,
Department of Ophthalmology
(Tübingen)

www.steinbeis.de/su/799
www.stz-eyetrial.de

PROF. DR. MED. BARBARA WILHELM
barbara.wilhelm@stw.de (author)

Director
Steinbeis Transfer Center eyetrial,
Department of Ophthalmology
(Tübingen)

www.steinbeis.de/su/799
www.stz-eyetrial.de

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YVONNE HÜBNER
edition@steinbeis.de

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MEDIATION – QUARTER IV EDITION, 2019

→ **WWW.STEINBEIS.DE/SU/0941**

DIFFICULT CONTEMPORARIES

GERNOT BARTH, BERNHARD BÖHM (ED.)

We meet completely different people in all walks of life – at work, at the supermarket checkout, at a relative's birthday party. Sometimes it's pleasant, enlightening, reassuring, simply fun. But on other occasions these encounters can be challenging, mainly because we're confronted by people whose characters are quite simply "difficult". So it's not uncommon for the sparks to fly. But in a similar way to dealing with stormy weather, there are also ways for you to adjust to certain situations, react sensibly, and solve conflict in an appropriate manner.

In this edition of MEDIATION, our specialist magazine turns the spotlight on "difficult contemporaries". Read about the strategies that can help you at work and at home in awkward situations, so you keep a steady nerve, and discover how dealing sensitively with different personalities can help prevent conflict arising in the first place. You also discover how the psychoanalyst Sigmund Freud got into highly personal arguments himself. Other fascinating articles in this edition of the magazine include:

- People who make mediation difficult. People who are bad mediators. Who, where?
- Mediating among people who speak different languages – people with little understanding
- When no-one is in a good mood
- Why mediation goes wrong because of know-it-alls, troublemakers, grumblers, etc.
- Successful mediation through understanding people better

Aside from the main topics, this edition includes a variety of fascinating topics and useful ideas. For example, Verdi trade union chairman Franz Bsirske outlines his vision of the social state in the 21st century. You can also discover what mediators, trainers, and coaches need to think about when it comes to data protection and how to adhere to the current General Data Protection Regulations. Finally, we go on a flying visit to Morocco and introduce you to the things that create social harmony in the country.

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FREE

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THE UNSEEN FACE OF METALS

→ WWW.STEINBEIS.DE/SU/0627

ART CATALOG PRODUCED FOR THE 2019 STEINBEIS ART EXHIBITION

URSULA CHRISTIAN | STEINBEIS FOUNDATION (ED.)

Metal can be found all around us in everyday objects, decorative items, luxury goods, and last but not least construction materials. On the outside you see shapes, colors, and reflective properties. But it's only when you look at metals under the microscope and peek inside, that you work out how metal objects were produced or processed. To do this you examine their structures, which also say something about the properties they can deliver. To inspect metals at a microscopic level, they have to be lavishly prepared by grinding and polishing. The textures of the metal can then be brought out and made visible through acid treatment. Under the microscope, metal grains, crystals, and spikes can be seen, often with light and dark effects. Some forms of acid treatment or optical contrasting methods help you to highlight special color effects. By distorting metals in special ways in certain areas, applying special optical processes, you can then select certain areas of an image and create some spectacular effects.
This art catalog features images from the 2019 Steinbeis exhibition in a single album combining pictures and descriptions.

2019 | paperback, b&w, 347 pages, German

€39.90 [Germany]

ISBN 978-3-95663-219-8

A DISTRIBUTED REFERENCE MODEL FOR ACCOUNTANTS' OFFICES

→ WWW.STEINBEIS.DE/SU/0403

MODEL FOR SOLVING DIGITAL TRANSFORMATION STANDARDS AS PART OF THE FEDERAL ADMINISTRATION'S E-GOVERNMENT STRATEGY

MICHAEL SCHULZ

The digital availability of tax-relevant business transactions in ERP modules used by clients is also impacting the work carried out by third-party accountants, since all business transactions generated in ERP modules can be transmitted seamlessly by allowing technical setups and process options to interact with one another, thus shifting the responsibility of organizing such processes to the accountant's office. Accountants therefore require collaboration solutions that facilitate digital data exchange in the long term, such that business dealings can be shared between clients (connected to ERP systems), external accountants (who draft annual accounts), and the government revenue services (electronic data transfer) – without jumping between different media formats – and this offers potential to automate processes and professionalize declarations and consulting. This can be achieved by expanding fields of technological integration (e.g. continual connections, autonomous functions) through the introduction of innovative IT, also expanding the core competences of accountants to include IT and interface know-how. The goal should be to involve third-party accountants in the early dynamic phases of the client's data processing so that taxation issues can be identified early and unclear business transactions are not entered into the financial accounts until they have been checked.

2019 | paperback, b&w, 428 pages, German

€39.90 [Germany]

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THE IMPORTANCE OF RECONCILING WORK PRIORITIES AND FAMILY LIFE IN ADDING APPEAL AS AN EMPLOYER

→ WWW.STEINBEIS.DE/SU/1462

DEVELOPMENT OF A SCIENTIFIC CONCEPT BASED ON INSTITUTIONAL ECONOMICS AND BEHAVIORAL SCIENCE INCLUDING EXPERIMENTAL ANALYSIS

ANJA QUEDNAU

In recent years, striking the right balance between family life and a profession has developed into a key social issue. Given socio-demographic developments and skilled worker shortages, companies are keen to improve the work-life balance of their employees. Despite this, there is insufficient research in German-speaking countries into the impact of family-focused HR policies on the appeal of employers. This is the starting point for this dissertation by Anja Quednau. Drawing on institutional economics and the theories of behavioral science, it starts by developing a theoretical explanatory model. This is then assessed empirically using research broken down into two parts, consisting of an online experiment and an adaptive choice-based conjoint analysis. The dissertation finishes by examining implications for the worlds of science and business.

PREVIEW

EDITION 01|2020
Feature topic: Autonomous mobility
Planned publication date: April 2020

Will flying taxis become our way of solving travel requirements in the future? Who is actually responsible for controlling autonomous drones? And are autonomous cars really waiting for us around the next bend? Autonomous travel is one of those "technological megatrends" with major social ramifications. But for each and every one of us to really get under the skin of the technology topics of the future, we need the right knowledge. The Ferdinand-Steinbeis-Institute at the Steinbeis Foundation is using the hashtag #techourfuture to pull together information, across the board, on any topics with a bearing on everyday life in order to explore the opportunities and threats posed by emerging technology. In the next edition of TRANSFER, the feature topic will look at the trend toward autonomous travel and attempt to sketch a map of where the journey might be taking us.

SCHEDULE OF EVENTS

Our Steinbeis events for specialists are an opportunity for experts from the fields of science, academia, and business to discuss current issues relating to business competence, engineering, and consulting. Want to make sure you don't miss a future event? Simply add your details to our online distribution list:

→ **STEINBEIS.DE/ONLINEVERTEILER**

#TECHOURFUTURE: TECHNOLOGIE*BEGREIFEN ("GRASP TECHNOLOGY") IN MEDICINE
March 27, 2020

STEINBEIS CONSULTING DAY
June 25, 2020 | Steinbeis House of Management and Technology, Hohenheim, Stuttgart

STEINBEIS DAY
September 25, 2020 | Steinbeis House of Management and Technology, Hohenheim, Stuttgart

For further information, go to **WWW.STEINBEIS.DE/VERANSTALTUNGEN.**

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EDITOR
Steinbeis GmbH & Co. KG für Technologietransfer
Willi-Bleicher-Str. 19 | 70174 Stuttgart | Germany
Phone: +49 711 1839-5 | E-Mail: stw@steinbeis.de
Internet: transfermagazin.steinbeis.de | www.steinbeis.de

EDITOR-IN-CHIEF
Anja Reinhardt

EDITORIAL COORDINATORS
Anja Reinhardt, Marina Tyurmina
E-Mail: transfermagazin@stw.de

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

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