TRANSFER

THE STEINBEIS MAGAZINE **03|22**

MANAGING RISK – SHAPING THE FUTURE

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DEAR READERS,

Until recently, we considered the very concept of a global pandemic or war in Europe as scenarios that were perhaps conceivable in principle, but overall utterly unrealistic – especially at the same time. Now both are a reality and they could even be just the tip of an iceberg. The world will face unanticipated global threats and crises more frequently in the future. The challenge to the global community is therefore to seek out new ways to deal with, manage, and adapt to such upheaval.

When it comes to innovation, resilience will become just as important as the now commonly used term sustainability. In other words, innovation will need to meet the challenges of unforeseen and extreme threats of a global nature. Preparing for such extreme threats, or XTs as we call them in risk research, is a major topic being looked at in joint research being conducted by Steinbeis with ETH Zurich. Changes in the needs of society brought about by XTs require responses that bring together multilateral approaches.

To cope with XTs, suitable and innovative risk and resilience methods are needed. Very few examples illustrate this better than a statement recently made by Ursula von der Leyen, President of the European Commission, in which she admitted "how vulnerable our energy infrastructure is."

At the same time, this is a challenge we must rise to. The only way to develop innovative solutions is to engage in cross-sector collaborations. To do that, it will be necessary to pool national and international competences. The challenge is to bring together contributions made by fundamental research, applied research, technology transfer, and politics. The European response to the aforementioned vulnerability of infrastructure includes resilience stress testing based on the latest scientific knowledge in combination with novel technology transfer mechanisms such as "resilience analysis as a service." This is already reflected in a new EU directive on critical infrastructure protection.

The scientific community with its diverse collaborations in the world of business can contribute to this in future innovation and technology transfer processes with the six resilience principles that have been developed: prudence, modularity, redundancy, diversity, adaptability, and integration. In times of XT, the approaches to risk and resilience research exemplified by the Steinbeis Network and the ETH Zurich Risk Center make it possible to assess innovation and its ability to support resilience.

The articles in this issue of TRANSFER magazine look at risk management from very different perspectives, offering a variety of exciting new insights. We wish you an interesting read!

With kind regards,

PROF. DR. ALEKSANDAR JOVANOVIC
aleksandar.jovanovic@steinbeis.de (author)

DR. HÉLÈNE SCHERNBERG
hschernberg@ethz.ch (author)

Professor Dr. Aleksandar Jovanovic (author) is manager of Steinbeis EU-VRI GmbH. A team of experts is engaged in research under the umbrella of Steinbeis EU-VRI, also offering advice on the assessment, analysis, and management of corporate and technical risk. Aleksandar Jovanovic currently holds a visiting professorship at ETH Zurich.
www.steinbeis.de/en/su/1190 | www.risk-technologies.com

Dr. Hélène Schernberg (author) is managing director of the ETH Zurich Risk Center and a lecturer for the Department of Management, Technology, and Economics at ETH Zurich. The risk center focuses on interdisciplinary research that integrates expertise not only within the center, but also across all areas of ETH Zurich with the aim of solving real-world, risk-related problems.
https://riskcenter.ethz.ch/

CROSS-SECTION

MANAGING RISK – SHAPING THE FUTURE

The history of humankind shows that **PROGRESS** is not possible without **RISK** – as we are witnessing in current technological, political, and social **DEVELOPMENTS.** The greater the **POTENTIAL RISK,** the more important it becomes to know how to cope with it, because **RISK MANAGEMENT** only succeeds if it allows you to minimize risk, and ideally it can even unveil unexpected opportunity offered by new challenges. In the articles that follow, the authors demonstrate their **PROJECT EXPERIENCE** with very different kinds of risks, from threats to liquidity to cyber risk and risks posed to energy supplies – just a few examples that illustrate how important it is to assess risk from many different **PERSPECTIVES.**

DOES BRINGING BENEFIT TO HUMANITY JUSTIFY DOING HARM TO THE ENVIRONMENT?

AN INTERVIEW WITH PROFESSOR DR. HABIL. RITA TRIEBSKORN, STEINBEIS EXPERT AT THE STEINBEIS TRANSFER CENTER FOR ECOTOXICOLOGY AND ECOPHYSIOLOGY

Risk perception always depends on public discussion and the extent to which topics are dealt with by the media. Currently, climate change, the energy crisis, and the Russian war of aggression are unquestionably in the spotlight. Despite this, as Professor Dr. Rita Triebskorn knows, potential risks also lie in areas beyond public and political debate. A Steinbeis Entrepreneur, Triebskorn is an expert in ecotoxicology and ecophysiology and deals with the impact of substances such as chemicals on the living environment. TRANSFER magazine talked to the Tübingen professor about the risk posed by dealing with such substances on a daily basis.

Hello Professor Triebskorn. Ecotoxicology and ecophysiology – those are challenging areas your Steinbeis Enterprise works in. Could you explain your work to us?

I'm interested in showing how the multitude of chemicals we deal with in our daily lives – such as those that enter the water cycle through our wastewater, or which are washed off from soil and enter rivers – together with other environmental stressors can affect the health of organisms. I look at the active ingredients or constituents of medicines, pesticides, cosmetics, detergents,

and dishwashing products, but also the artificial sweeteners we use in coffee, and disinfectants, which are used in large quantities worldwide, especially in times of Covid-19. Wastewater treatment plants based on conventional standards are often unable to completely remove such substances, so they end up in the effluent and go into the water system. As a result, throughout their lives aquatic organisms are exposed to a variety of such chemicals, all at the same time. These are referred to as trace elements or micropollutants because they occur in very low concentrations in the water cycle, i.e. as traces. Some trace elements are already being found in the groundwater today, and in drinking water, although fortunately they're mostly still in very low concentrations. So this areais not just important for our environment, but also for us as human beings – or to put it more clearly, it's a risk.

I consider it an important know-how sharing task of my Steinbeis Enterprise to research this topic and bring the knowledge we acquire into the public domain and politics. That's why as a member of several committees at the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety, and Consumer Protection, and for the EU, I'm strongly committed to reducing the emission of chemicals into our water bodies and putting possible measures into place to achieve this. The key thing is to introduce a fourth stage of purification at wastewater treatment plants, which can reduce the amount of substances entering bodies of water by up to 80%. Among other things, my Steinbeis Enterprise has developed a monitoring method for LAWA, a joint federal and state working group looking at water issues. The new method takes trace element pollution in water bodies into account when assessing water quality.

We humans influence our environment, very often in a negative way. You study the impacts of environmental pollutants on aquatic and terrestrial organisms. What threats do these pose and what can business and society in general do about such threats?

Of the many chemicals that get mentioned, little is yet known about the damage they might cause to vulnerable organisms. Even less is known about how the multitude of those substances interact with one another or act together. That's all the more astonishing given that we know that undesirable and unfortunately often unknown side-effects e.g. of pharmaceuticals can occur in humans, for example if we're also taking different forms of medication. Funding research in this area is therefore an important task for society and in many ways an obligation that should also be borne by industry.

There's already a strong body of data on some substances, such as the painkiller diclofenac, or certain antidepressants, which proves that concentrations of such chemicals in the nanogram per liter range are capable of harming the health and behavior of fish and other aquatic organisms. More intensive consideration should therefore be given to the trade-off between benefits to humans and harm to the environment in the future, and that should include consideration from chemical producers.

Given the increasing threat to our water resources, the German government has written a National Water Strategy, which is based on years of discussion surrounding water issues. That discus-

Paying more attention to pollutants in the environment – an issue Rita Triebskorn campaigns for on numerous political committees. © Dechema

sion actively involved representatives and stakeholders from very different areas, including myself. The National Water Strategy sets out future packages of measures for water protection. Of major importance is the introduction of the aforementioned fourth stage of processing at wastewater treatment plants.

In addition, a federal trace element strategy has been written as part of the government's stakeholder dialog process. This includes measures that have been and still are being adopted to reduce emissions of trace elements into the environment, with the support of numerous stakeholders from industry, the authorities, and science. Also, in keeping with this at the beginning of this year a federal center for trace elements was founded in Dessau. I've also been appointed as a member of an expert panel for assessing the importance of trace elements.

Not only politicians, but also each and every one of us can help reduce the number of chemicals entering the environment by being more careful about how we use medicines, personal care products, cleaning agents, detergents, and cosmetics. It's not difficult to achieve the same effects by halving the volume of a product we use, such as a shower gel, and this can help save the environment and the amount of money you spend. And under no circumstances should medicine leftovers be disposed of in the toilet or sink. The disposal methods for pharmaceuticals differ from state to state. The Federal Ministry of Education and Research provides plenty of information on this on the internet.

Aside from chemicals posing a threat to the environment, there are also other stress factors harming fish and other creatures. What other threats exist?

These days, organisms in our environment have to cope with numerous stressors, so-called multiple stressors, which often act upon them simultaneously. In addition to thousands of chemicals, these include macro- and microplastic pollution, competition from neophytes, and extreme weather conditions due to climate change. Hot summers like the one we experienced this year have severe consequences for aquatic organisms. For a start, entire sections of water bodies can dry up, but also high temperatures result in low oxygen levels with strong concentrations of substances in the remaining water, making it difficult for organisms to survive.

But it's not only drought that places a burden on aquatic and terrestrial ecosystems; climate change is also leading to periods of heavy rainfall. These inflict physical and hydraulic stress and result in the translocation of pesticides from agricultural land. There are also more frequent discharges from storm water overflow basins and as a result of that, untreated wastewater is discharged into water bodies. The Oder River disaster in the summer, which resulted in the death of roughly 200 tons of fish and countless other aquatic organisms, is a dramatic illustration of what happens when multiple biotic and

FURTHER INFORMATION

- **The National Water Strategy of the Federal Environment Ministry:**
  www.bmuv.de/themen/wasser-ressourcen-abfall/binnengewaesser/nationale-wasserstrategie
- **Disposal options for pharmaceuticals in German:**
  www.arzneimittelentsorgung.de
- **Stakeholder dialog on the German trace element strategy:**
  www.dialog-spurenstoffstrategie.de
- **The Water Chemistry Society of the German Chemical Society (GDCh)**
  www.wasserchemische-gesellschaft.de

abiotic stress factors come together in a delicate aquatic ecosystem. My Steinbeis Enterprise also champions this topic on behalf of the Water Chemistry Society at the German Chemical Society, particularly on the specialist committee for (eco)toxicological impacts, which I chair. My aim by being involved in this work is to ensure environmental risk assessments carried out on chemicals give more attention to the issue of mixed pollutants in the environment, as well as multiple stressors.

You also look at the impact and side effects of plant protection agents, because as a topic, it's becoming increasingly important to the area of global food production. What do you consider the potential areas of action here?

Reducing pesticide use in agriculture is essential for the survival of our terrestrial and aquatic ecosystems. But at the same time, some crop protection products are essential for food production – and incidentally, that also applies to organically produced products. The concept of integrated pest management already demonstrated many years ago that there are more environmentally friendly ways to use pesticides. This isn't about stopping pesticide use. But there do need to be changes in how they're used, in terms of quality and quantity, not just to match the needs of humans, but also those of the environment. This entails using substances that are as degradable and as kind to beneficial organisms as possible, it entails restricting the duration of use, and it entails optimizing application volumes.

The best tools for implementing this vision are financial incentives to engage in sustainable agriculture. The common agricultural policy of the EU has been stipulating and continues to stipulate such options, but in my opinion this hasn't yet been done rigorously enough. The intended way forward is highly commendable, however. In general though, if agricultural products are no longer approved in Germany, due to risks posed to humans and the environment, exporting them should be prohibited – which is also currently being considered by the Ministry of the Environment. Such chemicals, which are referred to as obsolete pesticides, are still being distributed internationally through export channels, and eventually they end up back on our plates and in the water cycle.

PROF. DR. HABIL. RITA TRIEBSKORN
rita.triebskorn@steinbeis.de (interviewee)

Steinbeis Entrepreneur
Steinbeis Transfer Center
Ecotoxicology and Ecophysiology
(Rottenburg)

www.steinbeis.de/en/su/0537
www.stz-oekotox.de

AVOIDING PAINS AND ACHIEVING GAINS

A STEINBEIS METHOD THAT IDENTIFIES RISKS AND AVOIDS A CRISIS

A crisis is a risk that actually happens. That may be a risk the company consciously enters into, or a risk it is not aware of. Risks can be posed by both internal and external factors, which can then develop into a corporate crisis. Is the business model still viable during a climate crisis? Is it sustainably competitive with respect to digital transformation in the economy and society? How resilient are supply chains in an age of globalization, especially given conflict of a military nature? How significant is the risk that the disruptive innovations of new market players could destroy the business model? Thomas Hösle, entrepreneur at the Steinbeis Consulting Center for the Prevention and Management of Crises, has developed a structured model for identifying risk at an early stage, thus helping to avoid crises.

These days, crises are becoming the norm rather than the exception, and as a result, companies increasingly face crisis situations that come in various guises. Whether it's a slump in sales, the threat of insolvency, an imploding segment of the market, mass lay-offs, environmental scandals, PR chaos, or a natural disaster, to a business, a crisis is any situation that endangers the ongoing existence of the company.

MORE ROOM FOR MANEUVER BY TAKING EARLY ACTION

Friction and information deficits in management often go unnoticed, or if they are perceived, it's because the working atmosphere is so bad. This can, however, lead to a genuine crisis in management, one that manifests itself in an inadequate corporate strategy or a lack of market focus. The result of this is declining market share, immediately followed by profit problems due to waning sales and net revenues. These, in turn, are a hindrance to required investments in the future. And the result of that can be an earnings crisis in which equity is eroded by negative operating results. This leads to liquidity bottlenecks and a growing volume of liabilities toward suppliers. A direct consequence of such a liquidity crisis can be insolvency. Something must be done – and quickly – yet there is limited room to maneuver.

The earlier a threatening situation is recognized, especially if it could develop into a crisis posing a danger to the overall company, the more leeway there is to take action. Conversely, the need to take action increases with each further escalation of a crisis.

SYSTEMATIC KNOWLEDGE ACQUISITION

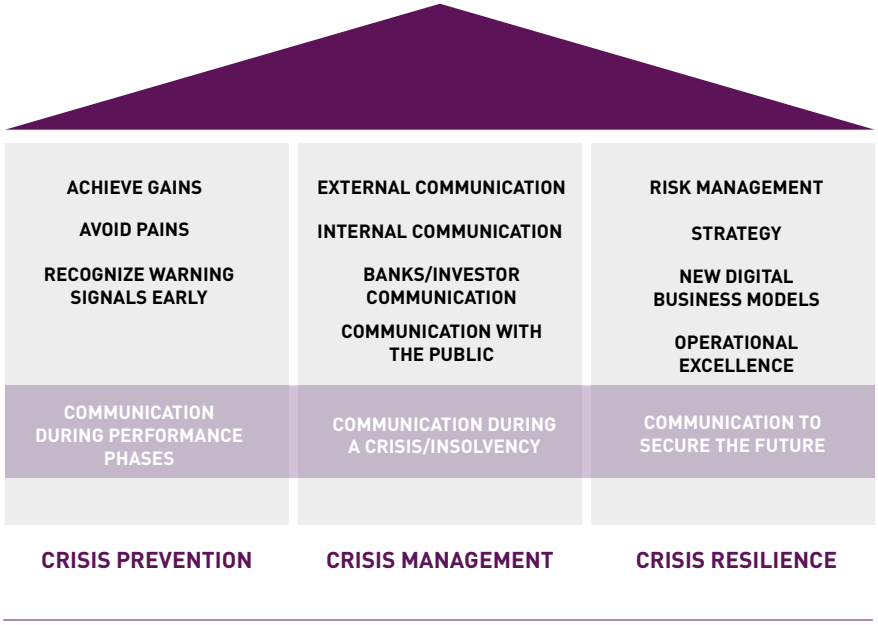
Identifying risk at an early stage and taking preventive action in order to counteract a crisis describes the specialist area of the Steinbeis Consulting Center for Crisis Prevention and Management. The experts from Pfullingen help companies identify potential risks, playing an active role in achieving concrete results. Their aim is to crisis-proof companies by equipping them with the resilience to understand the risks they face and prepare for a potential crisis. "This includes developing a strategy to secure the future in the long term, to develop new digital business models, and to strengthen operational excellence. To ensure that everything remains sustainable, we establish a system for continually monitoring individual measures," explains Steinbeis Entrepreneur Thomas Hösle.

Organizations can be assessed in qualitative terms, looking at strengths and weaknesses in a variety of fields of competence, by conducting a Steinbeis Enterprise Competence Check (ECC). To gain additional transparency, the Steinbeis consultants use an instrument called the Independent Business Review (IBR). Based on a variety of business evaluations, this identifies areas in which strategic and operational action is required in order to secure the future viability of a company. An IBR also offers a detailed analysis of communication measures, looking at both content and implementation. To identify potential risks going forward, an environment/arena analysis can be performed, including an analysis of issues, describing and identifying trends and underlying currents. This process identifies risks that are not only of relevance to the company but may also develop into a crisis.

These assessments focus specifically on pinpointing early indicators of undesirable developments and identifying warning signals. To do this, all company stakeholders are taken into account – such as business partners, investors, the social environment, but also internally when it comes to employees and the works council.

ACTIVE SUPPORT IN DEVELOPING SOLUTIONS

"Based on this, we develop solutions and a crisis prevention concept and define KPIs for before-and-after comparisons. We can also support companies during this phase on an interim advisory basis, but also in operational terms by becoming actively involved in implementing crisis resilience projects and temporarily taking on operational tasks,"



The Three Column model: communication in crisis prevention and crisis management
© Thomas Hösle, Steinbeis Consulting Center for Crisis Prevention and Management

says Thomas Hösle, explaining the numerous options for working with companies. This phase also includes the development of a communication strategy and overseeing ongoing communications at the company. Services are rounded off with the temporary assumption of operational communications as well as integration into internal company projects with the aim of realigning crisis-resilient communication measures.

AD HOC MEASURES AND SAFEGUARDING THE FUTURE IN THE EVENT OF A CRISIS

When risks have already developed into a crisis, what is needed first in terms of acute crisis management are ad hoc ideas. The priority later will be to reduce the company's vulnerability to crisis situations. Accordingly, Hösle and his team focus on developing solutions that will secure the survival of the company in the medium and long term across the entire business spectrum – such as business model development, new business development, new sales concepts, and new communication concepts.

Underscoring formal factors that can be of existential importance during a crisis, Steinbeis expert Hösle says: "Aside from conducting a scientific analysis of the crisis, we organize experts to conduct an audit based on IDW S6 standards. This can be important to ensure banks stay on board even in a time of crisis." The business recovery report is based on standards laid down by the Institute of Public Auditors in Germany (IDW) and analyzes whether a company experiencing a crisis can be successfully restructured in the long term. "Our experience and expertise in this area extend over many years, and this really comes into play when we're implementing the restructuring and recovery measures. There's a saying in the Swabian dialect that increasingly applies to us at this point. It goes something like 'Work, don't natter'," adds Hösle with a twinkle in his eye. During this time, the Steinbeis consultants provide support as "caretakers" or "interim air traffic controllers" and will even assume frontline responsibility as Chief Restructuring Officers (CRO).

To communicate effectively while a crisis is actually happening, it is also of fundamental importance to have a systematic emergency plan in place for stakeholder communications. To do this, tools such as an ad hoc stakeholder analysis or a media response analysis are used. To provide active help with communication management during a crisis, among other things the Steinbeis experts develop guidelines for internal and external communications. It may also be necessary to assume an interim function as a Chief Communication Officer (CCO).

ACT QUICKLY AND FOCUS ON GOALS – SPECIFICALLY, ACCORDING TO THE SITUATION

One thing that becomes particularly evident during a crisis is that companies face totally different problems. It is therefore important not to resort to frantically doing things just for the sake of it, but to come up with individual solutions that match the specific situation. Rapid and targeted intervention broadens the scope to take action and increases the chances of preventing the company from ending up in a situation that poses an existential threat.

THOMAS HÖSLE
thomas.hoesle@steinbeis.de (author)

Steinbeis Entrepreneur
Steinbeis Consulting Center
Prevention and Management
of Crises (Pfullingen)

www.steinbeis.de/en/su/2350

HOLGER HAGENLOCHER
holger.hagenlocher@steinbeis.de (author)

Freelance Project Manager
for Communication
Steinbeis Consulting Center
Prevention and Management
of Crises (Pfullingen)

www.steinbeis.de/en/su/2350

ON THE IMPORTANCE OF PROPER RISK MANAGEMENT

AN INTERVIEW WITH STEINBEIS ENTREPRENEUR PROFESSOR DR. TORSTEN HARMS OF THE STEINBEIS TRANSFER CENTER FOR FINANCIAL SERVICES

We live in a high-risk world and this affects people just as much as it affects companies. For companies in particular, it's important to identify threats and minimize or avoid any damage resulting from those threats. What does successful risk management look like, and what support do companies receive from the insurance sector? These were two questions TRANSFER magazine asked Professor Dr. Torsten Harms, Steinbeis Entrepreneur at the Steinbeis Transfer Center for Financial Services and a professor of Business Administration and Insurance at Baden-Wuerttemberg Cooperative State University in Karlsruhe.

Hello Professor Harms. You're very closely involved in the topic of insurance companies, whose core business is dealing with risk. What influence do recent developments – the pandemic, war in Europe, the energy crisis – have on people's understanding of risk and with that: the insurance industry?

We've witnessed an abnormal concentration of extreme crises recently, which have had a particularly strong impact on Western nations. Within the span of two decades, we've witnessed several global financial crises, war in Europe, and of course a global pandemic. On top of that, there are other risks like climate change, but also things happening due to global interdependences – think about things like supply chains, cybersecurity, and energy.

In classic terms, many of those risks are quite rightly uninsurable or only insurable subject to conditions, because almost the entire community of insured parties is affected by such catastrophic events. Insurance works by balancing risk between the insured parties, so it's not always possible to offer comprehensive protection, or at least it wouldn't be attractive to customers for pricing reasons.

The insurance industry is working fastidiously on solutions for companies, and in some cases it does offer good products, for example in cyber technology, or for business interuption, but at the end of the day, firms have to work first and foremost on their own risk management. When supply chains become increasingly fragmented – or minimal use is made of warehouses for cost reasons – that increases dependency. Those are the sorts of risks that weren't previously taken into account in the business optimization process.

Good risk management is an important part of successful corporate strategy. What's the best way to approach this, in concrete terms?

AS FOR RISK, OF COURSE A LOT OF ATTENTION IS BEING GIVEN TO CYBER RISK – ALMOST ALL INSURANCE COMPANIES NOW HAVE GOOD OFFERS IN THEIR PORTFOLIOS

The first and most important step of good risk management is to identify any risks you enter into. To do that, you have to develop a culture of risk throughout the company such that it sees threats not as "disruptions" or "exceptions," but as an integral part of running a business. Talking about risk on a regular basis, and openly identifying new threats, should be common practice.

Subsequently minimizing risk through steps taken at the company should always take precedence over covering for risk through insurance. Companies themselves are much more aware of the risks they're taking, and they have the required expertise and potential to do things to mitigate risk. In the future, running your own in-house risk management will be a key option for adding value in many industries. For example, presently roughly two-thirds of German manufacturers are affected by supply bottlenecks; this is where genuine competitive advantage is to be gained by securing access to more robust supply chains, with different ways to warehouse critical parts or switch plans if there are bottlenecks.

What changes are digital systems bringing to the insurance industry, as well as the risks it covers?

Digitech often allows you to find better solutions; for example, you can be more flexible with the timing of business inventory insurance. Similarly, it makes it possible to buy entirely inexpensive protection via derivatives, which can be traded internationally. One example of that is gambling on extreme temperatures, which can be hedged for on capital markets using weather derivatives. But despite that, the insurance industry remains a highly individual business in which it pays to enter into long-term business relationships.

As for risk, of course a lot of attention is being given to cyber risk; almost all insurance companies now have good offers in their portfolios. But it's just as important to take out cover for digital damage not resulting from external attacks, which might instead result from something you do yourself, such as misconfiguring back-up servers.

Talking of cyber risks, in your opinion what constitutes successful risk management in such areas, and are there any things firms need to think about in particular?

First of all it's important to remember that cybercrime is now a fixed element of the business environment. Dozens of companies experience cyberattacks every day. Fortunately, they're often very easy to detect and are purely planned as mass attacks, but all the same almost every large company suffers damage as the result of cyberattacks these days.

We're also increasingly witnessing hybrid attacks, which use a combination of IT technology and traditional methods. An example of that would be a break-in, physically on the premises, and the theft of unencrypted data – or, for example, people being impersonated by making fake CEO calls to get unwitting employees to give away confidential information.

Companies must therefore have a clear plan of action explaining what to do in the event of a cyberattack, including emergency procedures, and they should organize regular simulations to practice things. Simulations are a particularly good way for companies to learn how to act with more confidence in the first couple of days after a successful cyberattack.

Would you say there are now more risks posed to companies?

Absolutely, yes! The main reason for that is not so much that the world is increasingly risky, but that more and more things in the value chain are connected and fragmented. If one link in the chain breaks, entire sections of the economy collapse.

In the past, companies were rewarded with higher profits if they kept optimizing and breaking up the value chain; it appears that development has now run it's limits. So conservative approaches to business activities are more worthwhile than ever.

PROF. DR. TORSTEN HARMS
torsten.harms@steinbeis.de (interviewee)

Steinbeis Entrepreneur
Steinbeis Transfer Center
Financial Services (Karlsruhe)

www.steinbeis.de/en/su/2175

SUFFICIENCY OR EFFICIENCY – THE ANSWER LIES IN BETWEEN

AN INTERVIEW WITH PROFESSOR DR.-ING. STEFAN TENBOHLEN, STEINBEIS ENTREPRENEUR AT THE STEINBEIS TRANSFER CENTER FOR HIGH-VOLTAGE TECHNOLOGY AND ENERGY TRANSMISSION

Energy is an essential part of modern life. Having worked in the field of power and energy supply for nearly three decades, Professor Dr.-Ing. Stefan Tenbohlen, Steinbeis Entrepreneur at the Steinbeis Transfer Center for High-Voltage Technology and Energy Transmission and head of the institute of the same name at the University of Stuttgart, is very familiar with this fact. Among other activities, Tenbohlen also helps grid operators offer reliable energy supplies. TRANSFER magazine spoke with Tenbohlen about some of the projects he has worked on and the future of the energy sector.

Hello Professor Tenbohlen. It's a highly topical area at the moment, but you've been working in energy for almost 30 years now. When it comes to trends and developments, what for you have been the most important milestones in the energy sector during this time?

In the early years, deregulation and unbundling were high on the list of priorities. Policymakers at the time were striving to change the monopolistic structures of energy supply and move to a free market. Companies should no longer be responsible for everything, from generation to transmission, distribution, and selling electricity; customers should be able to choose electricity providers themselves. It was about deregulating the energy market by dividing up large companies into a number of smaller ones. That was the first step and an important one. Then came expansion into renewables, which was triggered by corresponding technology developments in the early 2000s. By 2009, annual capacity increase of around ten gigawatts was in place.

A 110 kilovolt overhead powerline

In more recent years, there's been a phase when things were a bit quieter, with five or six gigawatts per year. Of course, it's good to hear that the policymakers now aim to put up to 30 gigawatts in place per year from 2025. That would be three times what we had at the peak time, and five times what we're installing right now. So it'll be interesting to see if that really does happen.

The services provided by your Steinbeis Enterprise include fault investigation and the analysis of outages in the electricity grid. What does that involve for you?

Before a customer inquiry comes in, the experts at the affected companies will have already conducted an analysis of the problem. So by the time they approach me, the problem's usually gotten more serious and complicated. The first thing I do is read into the background, because various measurements have already been made and some things have been investigated. Then I have to work out if everything stacks up. Do the readings and results fit together? It's not uncommon for me to have to start by redoing the math.

For example, if an insulation system fails, which is often the main problem with high-voltage engineering, you have to calculate the electrical field to determine the stress. Then I check if they've used the right insulation criteria. But there are also cases when the problem is so severe that I have to bring in help. I can give you a recent example of that. I'm working on a project at the moment involving wind turbines; the transformers keep failing. They're filled with a special oil and they're subject to specific operational limitations. There aren't many experts in the world who can say exactly what's going wrong. But I've been working in this field for a long time, so I have lots of contacts who can provide help.

In what way do the insights you gain help manage or even minimize risks to energy supplies?

When you look at the individual circumstances of a fault, you learn how to adapt designs or operations – that's the bottom-up approach. So it's important to collect outage data and analyze everything, from start to finish. I'm the chairman of an international working group that investigates faults affecting power transformers worldwide. We collect information from everywhere, from Australia to China, India, South Africa, Europe, and South America, to see what the reasons are for transformer failures. To analyze faults, we take a top-down approach and come to conclusions regarding individual problems based on experience with the entire universe of data, and then we suggest corresponding measures to make improvements. The same working group also writes a report outlining how to make such components more reliable. The aim is to avoid future outages.

But new operational requirements have also become more important. This is a particularly significant aspect right now given energy shortages, or rather local bottlenecks in the grid, because operational resources can also get overloaded. So for example we're developing algorithms to determine the degree to which a transformer can be overloaded depending on ambient conditions. For instance, a power plant fails in the south and that means more power has to be transferred from the north. This

A power transformer connecting to the grid on a wind farm

helps grid operators make supplies more reliable.

Lots of stakeholders come into play – grid operators, policymakers, science. There are corresponding research programs in place to develop such solutions, but then those also have to be put into practice. This is a sector of industry that thinks in the long term rather than focusing on the short term, so you also have to convince people to use these kinds of tools in day-to-day operations.

We're currently in the middle of an energy crisis, so it's all the more important to think about the future. What factors do you think will determine the future of our energy? What new risks do we face? And how can we deal with those risks effectively?

That's not a technical question; it's almost a philosophical one. I sometimes use a comparison, which sounds a bit melodramatic but I don't find it entirely out of place: Take a petri dish with bacteria starting to grow in it. If you give those bacteria some nutrients to feed on, they'll grow – exponentially. The moment you remove the nutrients, they disintegrate. Ultimately, it's no different with us humans: The petri dish is the earth and the nutrients that fuel our development used to be, or still are, fossil fuels. As long as those are part of the picture, the exponential curve of our development gets steeper and steeper.

Keep hold of that picture, and then you have to ask yourself what would happen if those nutrients, in the form of fossil fuels, were no longer there? On the one hand because they've been used up, or on the other hand because using them triggers other developments, such as climate change, which calls into question the continuing existence of life on earth. Efficiency measures are certainly potential ways out of this, or making more use of renewables. But on the other hand, everyone has to make their own mind up: Do I really have to do all the things I do right now? Must I consume all those things, just because I can? Do I really need to fly on vacation three times a year, or maybe I should save resources, too?

In other words, sufficiency instead of efficiency, although the answer certainly lies somewhere in between the two. But I believe that for this to work, it's not just about individuals taking responsibility. Also, no matter how unpopular this area may be for politicians, legislation has to follow suit.

PROF. DR.-ING. STEFAN TENBOHLEN
stefan.tenbohlen@steinbeis.de (interviewee)

Steinbeis Entrepreneur
Steinbeis Transfer Center
High-Voltage Technology and
Energy Transmission (Ostfildern)

www.steinbeis.de/en/su/1014

A soiled silo before cleaning

CLEAN AND SAFE

STEINBEIS EXPERTS CURB DANGERS POSED TO HUMANS THANKS TO AN INNOVATIVE SILO CLEANING SYSTEM

Social prosperity and reliable supplies for the population require sophisticated and developed methods of agricultural production. Food and animal feeds supplied by agricultural producers are stored in silos before entering further processing or going into intermediate and final storage. This makes silos an indispensable if not crucial link in the supply chain. At the same time, however, it also makes silos an Achilles' heel in the value chain. The Steinbeis Innovation Center for Applied Product and Process Development (IPP) has been turning the spotlight on automated silo cleaning.

To bacteria, fungal spores, mites, and other pests, the inside of a silo is like the land of milk and honey. It's dark, nice and warm, there's plenty of condensation, and it's quick and easy to find a whole variety of nutrients. In a nutshell, these are ideal living conditions for undesirable silo inhabitants.

The inside of a silo with an access hatch (right) and a twin-arm cleaning robot

It's very easy for germs to multiply rapidly in contaminated silos, thus rendering entire harvests unusable.

A common method for dealing with animal feeds contaminated with bacteria is to treat everything with antibiotics. The consequences of this approach are already well known. Many problems of our times stem from this practice, ranging from antibiotic residues in wastewater to contaminated groundwater and the development of multi-resistant germs, which have been claiming more and more lives in recent years. Another invisible hazard is mycotoxin in animal feeds. These first attracted attention when livestock became increasingly susceptible to infections, developed behavioral problems, started refusing food, and began vomiting. There was also a rise in the number of underdeveloped calves and, ultimately, deficiencies in milk and meat quality. Improperly managed silos can thus quickly lead to economic problems for farms. In addition to health risks, they also pose considerable financial risks. It is also worth remembering the increasing importance of sustainable agriculture.

REGULAR SILO CLEANING PREVENTS GERM CONTAMINATION

To avoid risks to product safety caused by grains or feed becoming contaminated with germs or mold, it is essential that storage silos are regularly cleaned and thoroughly disinfected. The idea is to keep germs at permanently low levels inside the silo. Under EU hygiene legislation, any business that handles food is responsible for food safety and must comply with regulations and secure product safety. This is stipulated by regulations governing food hygiene and salmonella, as well as Regulation (EC) 183/2005, which lays down requirements governing feed hygiene. The latter regulation covers all activities of animal feed companies, spanning all stages

A silo cleaned by robot technology

of the feed chain, including primary production and the feeding of farm animals. However, it does not describe the methods or standards of implementation.

The insides of silos are danger zones for human beings. They're dark and covered in thick dirt and dust. They're not ventilated, they're difficult to get in and out of, and they're full of toxic gases and unavoidable aerosols. Not only does this make silo cleaning time-consuming, it can also be life-threatening. Current forms of technology make it possible to clean silos by taking systems into vessels and cleaning them manually, subject to extensive safety standards.

In the past, many serious and sometimes fatal accidents have occurred after entering into silos, and despite prevailing occupational safety regulations, even today silo cleaning is considered a dangerous and disliked grind that only certified companies are permitted to perform. Using hoisting ropes, scaffolding on the inside of the silo, industrial climbing systems, and a mobile carrier or pulpit, the inner surfaces of the silo can be cleaned by sweepers that agitate and redistribute dirt and grime. Respiratory exposure to the bacteria and mold spores contained in the dust generated by this process poses a major health risk and often the results of cleaning are unsatisfactory. The results are similar when tank spray heads are used. These are suspended into the silo and lowered in a tumbling and swinging motion in order to clean the surfaces. Some areas are missed during cleaning, however, and a lot is down to guesswork.

QUALITY ASSURANCE: CHALLENGES AND SOLUTIONS

Generally, there is no evidence that cleaning has actually worked. This is a weakness in the otherwise advanced quality systems of production chains, which are extensively documented and monitored, and as a result, this compromises elaborately planned and expensive quality standards. This state of affairs and the factors that drive it are

THEY'RE DARK AND COVERED IN THICK DIRT AND DUST. THEY'RE NOT VENTILATED, THEY'RE DIFFICULT TO GET IN AND OUT OF, AND THEY'RE FULL OF TOXIC GASES AND UNAVOIDABLE AEROSOLS

An item on the daily menu of many animals: moldy grain contaminated with mycotoxins

A silo-cleaning robot with a lighting and camera system for quality control purposes

part of a complex web of socio-political, procedural, and economic challenges, which the Steinbeis experts in Freiberg define as follows:

- **Food standards and feed quality are crucial for the well-being of humans and animals**
- **Grain and animal feed standards must be adhered to**
- **The ultimate priority is commercial viability and consumer protection**
- **Regular and thorough silo cleaning is an imperative**
- **Manual silo cleaning methods are costly, dangerous, and deliver poor results**
- **Tighter quality requirements and declining margins demand solutions that achieve automated, safe, and comprehensive silo cleaning, underscored by evidence that cleaning is effective**

The essential and most promising solution to these problems is to develop meticulous silo cleaning robots and introduce standardized quality control systems. The development of such systems is now receiving intense support thanks to the expertise offered by the Steinbeis Network. Founded in September 2022, the Steinbeis Innovation Center for Applied Product and Process Development (IPP) deals with tasks and issues relating to automated silo cleaning, also looking at its impacts. This includes topics such as the long-term operation of robot technology and microbial growth in silos over time. The focus at the Steinbeis Transfer Center for Mechanical and Plant Engineering (TMA) lies in the transfer of developments into practice and the dissemination of innovative and thorough cleaning technology developed by the inventor Bernd Pragst.

DR.-ING. KRISTIN MANDEL
kristin.mandel@steinbeis.de (author)

Steinbeis Entrepreneur
Steinbeis Innovation Center Applied Product and Process Development (IPP) (Freiberg)
www.steinbeis.de/en/su/2467

Steinbeis Transfer Center Mechanical and Plant Engineering (TMA) (Freiberg)
www.steinbeis.de/en/su/2468

RONNY WAGLER
ronny.wagler@steinbeis.de (author)

Steinbeis Entrepreneur
Steinbeis Innovation Center Applied Product and Process Development (IPP) (Freiberg)
www.steinbeis.de/en/su/2467

Steinbeis Transfer Center Mechanical and Plant Engineering (TMA) (Freiberg)
www.steinbeis.de/en/su/2468

BERND PRAGST
bernd.pragst@siloservice.de (author)

Managing Director
Silo Service Bernd Pragst (Friedland)

www.siloservice.de

STRENGTHENING RESILIENCE MEANS STRENGTHENING COMPANIES

THE STEINBEIS+ACADEMY RUNS TRAINING COURSES TO BECOME A RESILIENCE COACH/RESILIENCE MENTOR

"A crisis is a productive state. You simply have to get rid of its aftertaste of catastrophe." These are the words of Max Frisch and they're more relevant today than they have ever been. Although a crisis poses threats, it can also be an opportunity; but having the ability to understand this concept – and make good of it – takes resilience. But there's also good news. Anyone can learn resilience and become more resilient in the areas that matter most. Companies also stand to benefit from this, because people are their most important assets. It is against this background that competence institute unisono, a Steinbeis Transfer Institute of the Steinbeis+Academy, offers training to become a resilience coach/resilience mentor with the aim of promoting both personal and corporate resilience.

Spread over 21 days during the course of a year, the focus of training lies in both the personal development of individual course participants and the transfer of knowledge and methodologies. This provides everything a firm needs to strengthen its employees in the long term through the input of a resilience coach/mentor. The training culminates in a Diploma of Advanced Studies at the Steinbeis+Academy.

RESILIENCE – A CORNERSTONE OF CRISIS MANAGEMENT

Whether a crisis is exploited as an opportunity to develop and move forward, or is perceived as an event of cataclysmic proportions, depends on the individual resilience of those affected. The qualities of resilience – such as openness, flexibility, positive thinking, focusing on outcomes, and being able to access personal resourcefulness without hindrance – lay a foundation for making constructive use of a crisis. Such qualities not only strengthen the resil-

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ience of the individual, they have a similar ability to bolster resilience within organizations.

Organizational resilience comprises aspects such as IT redundancy and up-to-date crisis management plans. In March 2017, the International Standardization Organization (ISO) adopted a standard for organizational resilience. This now serves as a basis for implementing and evaluating the crisis resilience of an organization and its ability to adapt. Crucial aspects of company resilience affect its employees, however: Just like personal development in HR, resilient corporate cultures and self-learning organizational development revolve around people. The more resilient the individual employee, the more adaptable and creative teams are – and ultimately this applies to the overall company. It is precisely these qualities that help maintain a positive outlook during a crisis, leading companies forward in a progressive sense in times of digitalization.

IT'S NOT OVER YET, AND MORE MAY COME – IF IT HASN'T ALREADY

That's exactly how it feels right now – we're living from one crisis to another as if we're continuously stuck in the next crisis. This places tremendous demands on people to adapt. Absenteeism, i.e. the number of sick days at a company, is already an indication of the number of times employees have to take time off work. The opposite – presenteeism – poses another big challenge to companies, because employees still come to work despite feeling unwell. Symptoms on a variety of levels – from insomnia to headaches caused by stress, anxiety, panic attacks, and addictive behavior – prevent people from making good use of personal resources, assuming they are not already depleted. People may still show up to work every day, but if they're not feeling well, they can tap into no more than 70% of the energy they require to do their jobs.

THE EMERGENCY OUTPATIENT CLINIC

This is where a resilience coach/mentor can help companies by helping people who still show up for work every day despite feeling anything like fit and healthy in mental terms. Mentors regularly exchange ideas with the HR department in the area of personal development and occupational health management. They also offer made-to-measure services to staff and can organize coaching sessions to motivate people to reflect more about themselves and work on their behavior.

Step by step, this allows every individual and team – and thus the entire company – to adopt a healthy and open attitude, to become more adaptable, and to think more creatively. Adopting a positive attitude to things strengthens productivity in times of crisis. It is even possible for hidden strengths – hitherto unknown, because they were unneeded – to surface, also making individuals and the company resilient to emerging crises from within.

Coaches and mentors accompany employees in unearthing inner growth and mental strength. It is a tense time for labor markets and the shortage of skilled workers has now reached all sectors of industry. A sustainable concept in keeping with regenerative leadership is to work with what we do have access to, to protect what we do have, and to rebuild what is already there. Resilience should be a thread of continuity that forms the backbone of a company.

For further information and course registration, go to:

www.sti-kiu.com/resilienz-coach

SUSANNE HOLLMANN
susanne@hollmann-ulm.de (author)

Business trainer
Systemischer Coach
(Ulm)

www.hollmann-ulm.de

PETER SCHUST
peter.schust@steinbeis.de

Steinbeis Entrepreneur
Steinbeis Transfer Institute
competence institute unisono
(Ulm)

www.steinbeis.de/en/su/2171

GOOD USABILITY DELIVERS TIGHTER SECURITY

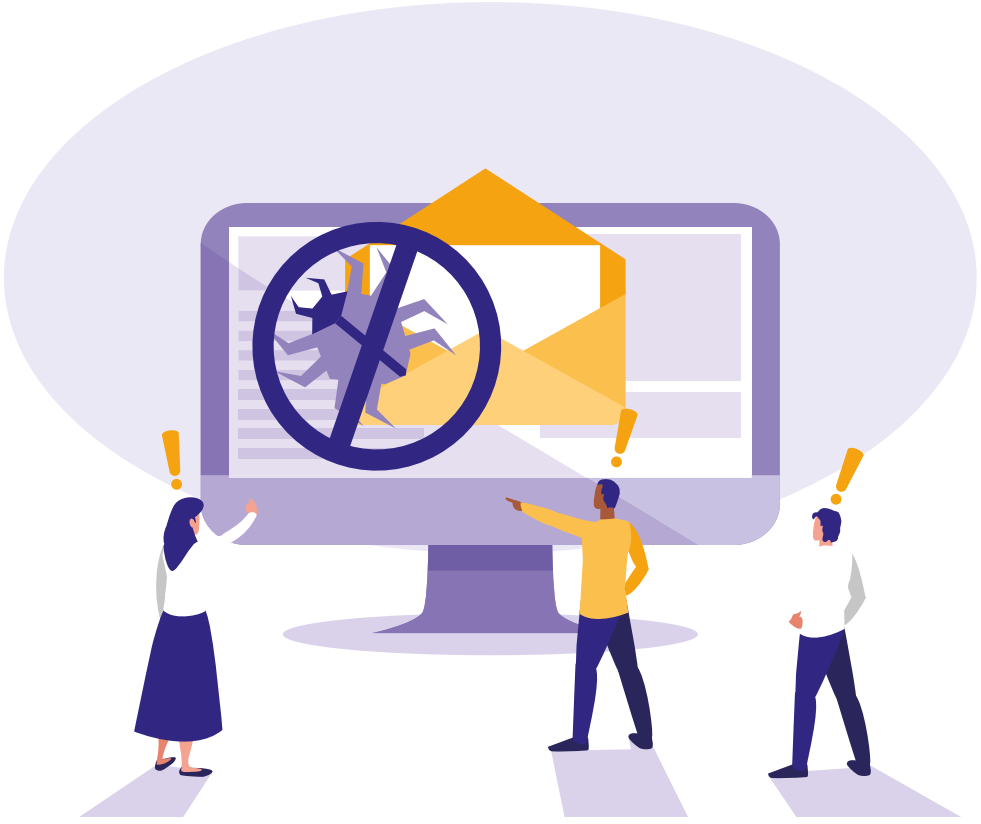
WHY SENSITIZING USERS IS A CORE ASPECT OF IT SECURITY

The modern world of work would be almost inconceivable without the support of IT systems. Connected systems and IT solutions also continue to make inroads into our private lives. Consider, for example, intelligent heating controls (smart home systems), which have gained in importance in the current energy crisis. This trend is being accelerated by more and more people coming into direct contact with IT solutions. Among other areas, Professor Dr. Andreas Heinemann (Darmstadt University of Applied Sciences/InCUPS, his Steinbeis Transfer Center for Internet Communication, Usability, Privacy, and Security) specializes in IT security and usability. This involves investigating how to mitigate cyber risk.

Video conferencing and digital learning were already being tested in elementary schools during the coronavirus pandemic. Similarly, efforts are currently underway to enable more and more elderly people to lead independent lives and remain self-sufficient for as long as possible. This is where IT provides support in the form of ambient assisted living solutions.[1]

This trend toward IT entering more and more areas of modern life, as well as highly connected devices, also harbors risks, however. The attack surface is expanding. Phishing, identity theft, and extortion through ransomware pose a threat to business and private individuals. The current shortage of skilled IT workers is exacerbating this situation, and through technical means alone, very few SMEs have the human resources and expertise to deal appropriately with threats.

Many IT systems require interaction with users, be they at companies or end customers in a domestic setting, and as a result it's important to understand users as part of a holistic approach to IT security. As early as 1999,



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Adams and Sasse described users as the "first line of defense."[2] This has two major implications. First, not only do people working for companies need to be much more aware of IT security issues, but so do private individuals, as the end users or customers of IT systems. Second, IT systems need to be set up so they can achieve as much as possible to avoid operating errors, or at least detect errors. This is a central demand of "usable security."

SECURITY AWARENESS AND USABLE SECURITY

Security awareness is often seen as a combination of three elements, comprising the awareness of potential threats, the required knowledge of appropriate protective measures, and correct action. All three aspects need to be reinforced among end users. Education and training in the form of courses, role-playing, simulations, and phishing prevention campaigns have become established as tools for improving security awareness among end users, although there has been controversy regarding the latter approach.[3] The challenge lies in the fact that cyberattacks on end users are becoming increasingly sophisticated. Also, end users rarely see IT security or the related aims of security as the most important purpose of their actions. For example, they want to read and send e-mails and will disregard the confidentiality of content.

Usable security is an interdisciplinary field of IT security and human-computer interaction (HCI) aimed at improving the usability of IT security functions without compromising security itself. The idea is to facilitate user-centered design by placing emphasis on end users, their capabilities, but also limitations.[4] If end users are highly diverse in nature, and can be broken down into user groups, planned products must offer good usability to all those user groups. Before launching a new IT security solution, successful usability testing should be carried out.

THINKING THROUGH THE DEFENSES AGAINST PHISHING ATTACKS

In the following, we toy with some ideas to look at the interplay between security awareness and usable security. To do this we use the example of a phishing attack. The aim of phishing is to elicit the account data and passwords of users in order to misuse such personal information. To do this, users are sent bogus e-mails, which do, however, reveal that they are phishing attacks just by examining embedded links. Users should therefore be generally aware of threats posed by cyber risks and they should also be in a position, without any doubt, to recognize threats.

This goes hand in hand with an understanding of the technical nature of URLs. For example, users should realize that there's something suspicious about https://www.arnazon.de rather than amazon.de. For the next step, users should work out the right course of action, i.e. they should first report attacks to IT or service providers, and then delete e-mails – without clicking on links. Good usability should help users with this. For example, if users first have to go to the trouble of clicking through a ticket system just to report a threat, they will be more reluctant to actually do something and inform their IT co-workers.

The only way to successfully mitigate cyber threats is if IT security is understood as an ongoing process and awareness is raised at an early stage. Given the ubiquitous presence of IT in our working environment and other areas, there should be an obligation to explain cyber risks early, for example in schools. Andreas Heinemann strongly recommends building on this understanding over the course of people's (professional) lifetimes by offering regular courses and staff training, always based on the latest findings of research. "The ideal would be if outstanding usability were to become established in the medium term as a mandatory quality factor for IT products that perform security functions," explains the Steinbeis expert from Darmstadt University of Applied Sciences.

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PROF. DR. ANDREAS HEINEMANN
andreas.heinemann@steinbeis.de (author)

Steinbeis Entrepreneur
Steinbeis Transfer Center InCUPS – Internet Communication, Usability, Privacy, Security (Darmstadt)

www.steinbeis.de/en/su/2128
www.incups.de

FROM UNCERTAINTY REGARDING PROBABILITY TO DATAISM

AN EXPOSÉ ON THREE GENERATIONS OF RISK MANAGEMENT

Ever since human thought and action have been handed down from generation to generation – both individually and collectively – importance has been placed on knowing or not knowing about the future. The word "uncertainty" has become a linchpin term for defining the nature and concept of risk, not only in ISO standards but also in many other areas. There are numerous other definitions of risk, which happily coexist and complement one another. Dr. Peter Meier, Steinbeis Entrepreneur at the Steinbeis Transfer Center for Risk Management, and management consultant Munok Kwon take a look back and forward at risk management for TRANSFER magazine, offering a personal and highly critical judgment of the discipline.

In the course of his work, Peter Meier uses a definition that revolves around the value and statistical aspects of risk, which he describes as a "future, uncertain, and negative value-position." This definition makes risk measurable and manageable, just like other numbers. With their differentiated views, risk managers deal with risk in keeping with DIN standard ISO 31000:2018, which provides guidelines on managing risk. This contrasts with people in commercial roles, who see risk from their integrated perspective. This re-

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flects the dual nature of the "venture" of trading, hand in hand with unavoidable speculation regarding the future and corresponding impacts on the bottom line.

RISK MANAGEMENT OVER THE AGES

In the early 18th century, the Enlightenment brought revolutionary change to Europe with concepts of logical and mathematical statistics. Gaussian distribution became an important tool of risk assessment and management. This contrasts to China, where logical and mathematical views of the future were used to gauge the probability of different scenarios as early as the 5th century BC. While Europeans were still seeing natural phenomena as indications of supernatural and divine forces, the philosopher and sociologist Confucius and his contemporary, military strategist General Sun Tzu, were already establishing the fundamental concepts for the predictability of the future.

Fast-forward to the present day, and statistical views of risk are still dominated by predictions of future scenarios based on numerical simulations in combination with random numbers from the casinos of Monte Carlo. The crucial issue is which and how many numbers are subject to unfavorable or favorable forces. In 2007, the German philosopher Ludger Heidbrink conducted a comprehensive analysis of people responsible for decisions and actions against the backdrop of such high levels of uncertainty, viewing this as a feature of culture, one that is both contemporary and timeless, albeit changing. This is linked to the delegation of responsibility within organizations, as well as the classic practice of weighing up trust and control in relationships. This problem is amplified by the current situation, in which multiple crises are happening at the same time, and there is a

systematic search for certainty through information and knowledge, in order to compensate for risk through positive and certain numbers (Meier, Kwon, 2020).

RISK MANAGEMENT IN THE FUTURE

With all people, things, and non-things being digitized as part of the big data concept, we are currently witnessing a new, still incomplete, and revolutionary development, bringing with it the next level of managing uncertainty. Referring to big data in an article in the New York Times in 2013, journalist David Brooks coined the term data-ism as a synonym for a digital phase of the information society. But we also see anti-enlightenment within this change – the next cultural revolution, which is sweeping through all sections of society – in technological, social (including cultural and political), financial, and legal terms. This applies to both private individuals and the economy.

Whereas uncertainty characterizes the age before the Enlightenment and probability characterizes the age after the Enlightenment, dataism describes the current age. Previously, it was predominantly stories and words that were told and interpreted – thus verbally expressed prosaic and lyrical "narratives" – whereas now we predominantly witness the counting and calculation of numbers and characters, and thus written symbolic and logical "numeratives." To be part of those numeratives, humans equipped with natural intelligence need machines, which will soon be equipped with artificial intelligence. As such, humans are thus dependent on technology. Human beings are therefore relinquishing human intelligence and competence in a state of nirvana, a misunderstood digital system to which we have delegated responsibility for our own decisions and actions (Han, 2012).

Transparency and objectivity are only promised, but not delivered. As with any form of technology, the dual use of things digital is the new normal. Whereas people used to say knowledge is power, now they say data is power, which raises fundamental questions regarding our rights to data and the legitimacy of power based on it. In our opinion, admittedly critical, dataism is returning human beings to a new form of immaturity – one self-created, for which we ourselves are responsible.

Seeing risk as the prospect that there will be uncertain and negative numbers in the future has not yet been fully comprehended or defined within the context of big data. Learning AI algorithms (predictive data mining) are currently being used to trawl through big data, and data gathered over time (timeline data mining) is being analyzed within the context of learning. Qualitative data structures and the quantitative features of data patterns relating to factual and personal circumstances are being examined, interpreted, and applied to correspondences between the yesterday of the past, the today of the here and now, and the tomorrow of the future. Big data does not ask for the conditional and causal theories that affect if-then-perhaps; everything can be found in relevant data – it's all data. Nobody is interested in standard distribution curves anymore, but everyone still wants the data. And thus all kinds of organizations now run their own situation rooms and intelligence departments to search for, find, and analyze data that's pertinent to them within the pool of big data. Data will be considered particularly pertinent if it relates to the future, how uncertain the future is, and venture involving risk and opportunity.

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MUNOK KWON
munokwon@web.de (author)

Management consultant specialized in the internationalization of medium-sized companies
Employed by an international governmental organization from South Korea

DR. PETER MEIER
peter.meier@steinbeis.de (author)

Steinbeis Entrepreneur
Steinbeis Transfer Center Risk Management (Langen)

www.steinbeis.de/en/su/657

NO PROGRESS WITHOUT INNOVATIVE RISK MANAGEMENT

MANAGING RISK USING THE INTERNET OF THINGS AND ARTIFICIAL INTELLIGENCE

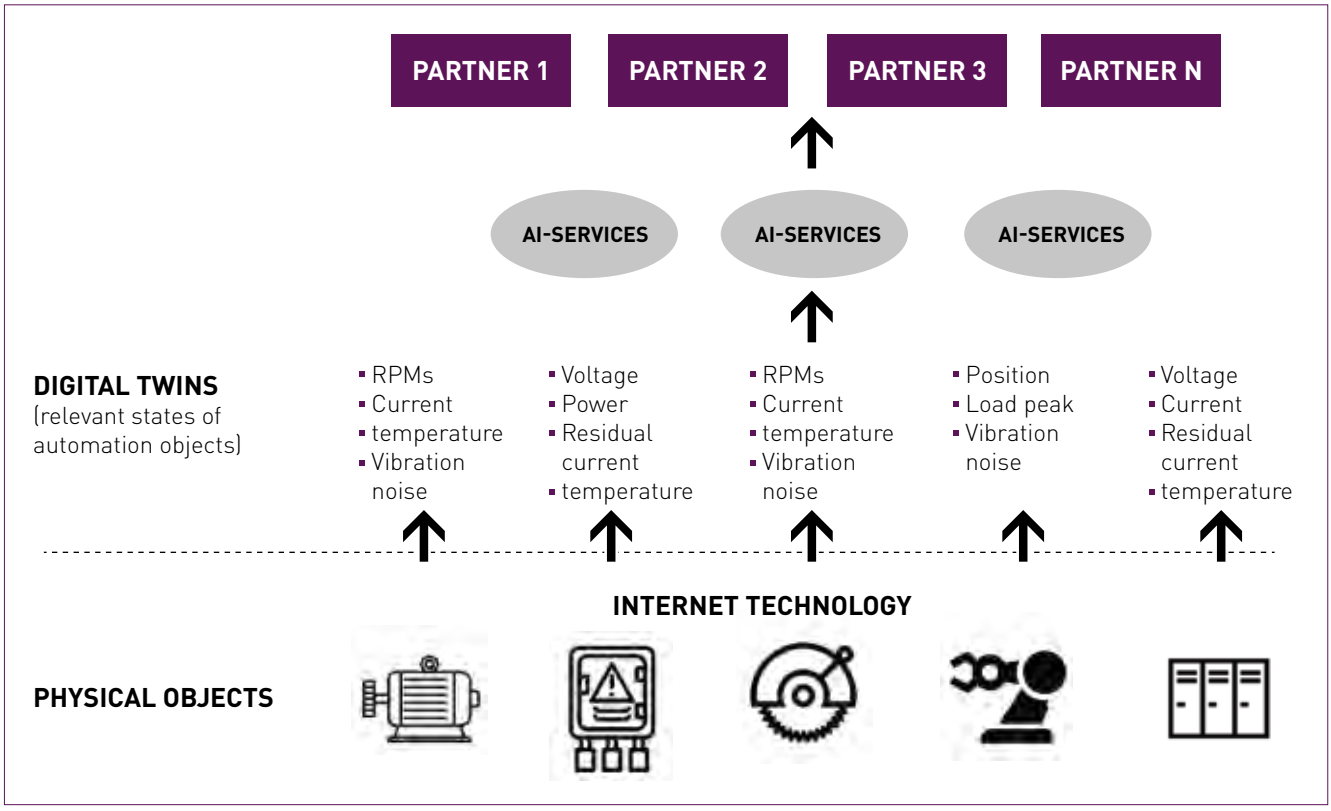
Emerging technology is a door-opener to new possibilities and novel opportunities, but it also entails new forms of risk or shifts in existing risk. This can have negative economic impacts, making it important to innovate – not only with technology, but also in risk management, tapping into those new forms of technology. Experts at the Ferdinand Steinbeis Institute have been investigating the best way to do this, also testing ideas they have developed directly in practice – in keeping with the Ferdinand Steinbeis Institutes' own philosophy that science should deliver sustainable benefit to the economy and society.

It's not uncommon for sawmills and agricultural operations to fall victim to catastrophic fires, often caused by the increased use of technical equipment, electric motors, and highly automated machines used to perform important tasks without direct human input. This increased use of technology is extending the scope of technological risk, and the probability of things going wrong is rising sharply in many sectors of the economy.

On the one hand, this is raising the level of required investment in technical solutions, such as fire detection systems and extinguishing equipment. On the other hand, companies in such risky areas of industry are finding it increasingly difficult, if not impossible, to insure against risk without negatively impacting the bottom line. Aside from tangible damage that can result from technical risk, the indirect consequences of damage are becoming increasingly important. When technical equipment is damaged, this often results in interruptions to operations and in the longer term, this impacts a company's ability to deliver. The economic consequences of such indirect impacts can be much more serious than the immediate damage. Given bottlenecks in the supply of spare parts and the long delivery times currently affecting replacement parts and machines, there has been a sharp rise in the importance given to downtime factors and corresponding disruptions in supply chains due to technical damage. As a result, there is growing concern in business and society in general that the increasing use of new technology will go hand in hand with a rise in technical risk, sometimes with dire economic consequences.

Technology is not only driving risk, it's opening up entirely new ways to manage risk. There are several promising ways to detect emerging risks even earlier (for example, by using better fire detection sensors) and these offer the potential to minimize direct damage (for example, by introducing tech-

TECHNOLOGY IS NOT ONLY DRIVING RISK, IT'S OPENING UP ENTIRELY NEW WAYS TO MANAGE RISK.



AIoT architecture for creating transparency as a basis for innovative risk management © Ferdinand Steinbeis Institute

nological innovations to extinguishing systems) and insure against commercial impacts.

BUSINESS AND ECONOMIC BENEFITS

Innovative risk management is not only helpful for individual companies, it also offers significant benefit to the economy: Value chains become more reliable, negative impacts on value creation can be avoided, and the rate at which new (automation) technologies are introduced can be accelerated. The only question is, how to make things happen.

To dig deeper into this issue, the Ferdinand Steinbeis Institute has initiated a Micro Testbed with partners from industry and the public sector looking at several potential solutions, which are currently being tested as part of a pilot study. The essential "ingredient list" for coming up with effective game-changers: a collaborative mindset, digital twins, and artificial intelligence to create transparency.

A COOPERATIVE MINDSET – LAYING A FOUNDATION FOR SUCCESS

In many cases, technical risks have several causes. These emerge both from the nature of products and how they are used. To identify and assess technical risks, different capabilities are required, although these are often not available to individual companies. To manage risk effectively, a key prerequisite is therefore a business ecosystem comprising different elements; i.e. an ecosystem should be initiated by involving a variety of companies offering different capabilities.

Aside from the ability of business partners to make decisions of a commercial nature, an indispensable basis for collaboration is the willingness of those partners to openly explore new realms – as partners of equal standing participating in a "forum of trust."

In the timber industry, for example, equipment manufacturers possess the process know-how and design capabilities to gauge technical risk relating to the current condition of equipment. Users – for example, the providers of industrial services or production companies – can assess the condition of equipment based on current use. Thanks to claims settled in the past, stakeholders in the insurance industry, who have a solid understanding of risk, have a comprehensive overview of the overall structure of risk. A good rule of thumb: The broader the skill sets within an ecosystem, the more effective it will be in avoiding risk. Therefore it is important for different partners involved in such arrangements to agree on the common goal of managing risk. They

will also need to come up with a joint agreement regarding roles and responsibilities, even if this may have disruptive implications for existing business models, as in the example of the timber industry and the insurance industry.

Accordingly, in the future the competencies required to participate in ecosystems will be extremely important for companies. An essential element of such competencies is the courage and willingness to share information so that it can be used by others and deliver benefit.

CREATING TRANSPARENCY WITH DIGITAL TWINS AND ARTIFICIAL INTELLIGENCE

To gain transparency, it's important that parameters required to assess risk for a given object of interest are available in equal measure to all stakeholders, and that they are up to date and of the required quality. Experience shows that a suitable architecture for this can be created by using digital twins. These draw on internet technology in the cloud to reproduce actual objects in a virtual environment.

A Micro Testbed set up in the timber industry uses parameters captured continuously by automation systems, such as leakage current, residual current, load peaks, vibration noise, etc. These are then made available virtually in digital twins. This provides complete transparency regarding the current status of equipment in a virtual environment, and enables monitoring from a variety of angles using (AI) algorithms. Understanding how to use digital twins, the application of AI technology, and in particular how to interpret results is thus a key competence. Experience with the testbed approach shows that with the right skill sets and a collaborative approach to using data on the technical status of equipment, technical risks become manageable.

DEALING WITH RISK: OUTLOOK

Using emerging technology for digitalization and automation purposes fuels technical risk that can result in significant commercial risk, especially in combination with conventional approaches to claim settlement. Methods of AIoT-based risk management thus offer a number of promising options for the future, not only providing opportunities of a commercial nature: There is also the potential to achieve overarching sustainability goals affecting society as a whole. However, to leverage this potential, there are still a considerable number of missing items on the "ingredients list." SMEs in particular would be well advised to move forward more quickly in rethinking their approach to sharing data, and they will need to acquire new skills when it comes to the AIoT.

MICRO TESTBEDS

Micro Testbeds allow companies to collaborate across different sectors of industry – in partnership and pragmatically – in order to introduce shared value creation processes, which they can experiment with together within a real business environment based on methods not used before.

The focus thus lies in trying out small-scale application scenarios. In doing so, existing technologies are used to allow new products and services to emerge through interdisciplinary collaboration against the backdrop of digital solutions and networking. The results gained from Micro Testbeds deliver benefit to all parties in unanticipated ways.

SEBASTIAN RENKEN
sebastian.renken@steinbeis.de (author)

Research Assistant
Ferdinand Steinbeis Institute
Stuttgart (Stuttgart)

www.steinbeis.de/en/su/2277
www.ferdinand-steinbeis-institut.de

LENA NOLLER
lena.noller@steinbeis.de (author)

Research Assistant
Ferdinand Steinbeis Institute
Heilbronn (Heilbronn)

www.steinbeis.de/en/su/2278
www.ferdinand-steinbeis-institut.de

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

Managing Director
Ferdinand-Steinbeis-Gesellschaft für transferorientierte Forschung gGmbH of the Steinbeis Foundation (FSG) (Stuttgart)

www.steinbeis.de/en/su/2276
www.ferdinand-steinbeis-institut.de

DARING TO TAKE RISKS!

MINIMIZING THE RISK OF INNOVATION PROJECTS WITH EU FUNDING

If people were not sometimes willing to take risks, there would be no innovations, no advancement or form of progress – and no chance to change the future for the better. For companies, the earlier the stage of a development project, the higher the risk they enter into, and that's something they know when they engage in innovation. It's also the reason why firms set milestones on their innovation roadmaps to gauge whether risks remain justifiable. This is also an important aspect with financing because innovation is not possible without investment. This is where Steinbeis Europa Zentrum comes in. For the past 30 years it has been helping companies make use of EU funding and thus mitigate the risk of innovation projects. It also provides companies with support in identifying the best form of financing, submitting applications, and implementing projects.

Minimizing risk and risk assessments have become increasingly important in an increasingly complex and globally interconnected world, and the intensity of recent challenges has only served to make people more cautious. Products and processes that have stood the test of time offer a certain degree of security, but they can also slow things down, and merely resorting to the tried and tested can be a handicap. If companies want to remain competitive, they know that they will need to be open to new markets and the challenges of modern society. This is especially true in times of crisis with all the challenges they bring. It is therefore important to seize the opportunities offered by emerging markets – without losing sight of risk.

EU FUNDING AND COLLABORATIVE RESEARCH PROJECTS REDUCE RISKS

Innovation needs the right options to invest heavily. When research is already extremely cost-intensive, this exacerbates the need to invest major sums of money in implementing projects or putting plant, products – and in the case of deep tech: often entire new factories – in place to serve markets.

The experts at Steinbeis Europa Zentrum have found that funding from the European Commission, which does not have to be paid back, offers enterprises the ideal opportunity to conduct research and development, and at the same time reduce risk. Most well-funded projects are based on collaborative research and development, which offers many advantages:

- **Collaboration with partners who take on sub-projects brings new ideas on board, thus making it possible to explore different lines of development. This increases the chance of jointly developing promising solutions – without becoming bogged down by obstacles.**
- **Joint funding for all project partners gives individual companies more room to breathe – particularly because co-funding can also go toward coordination efforts.**
- **Pure research projects (RIA = Research and Innovation Action) are eligible for 100% funding through the EU Horizon Europe program – for all project participants. The funding rate for projects with a stronger focus on market implementation (IA = Innovation Action) is still 70% of costs to companies, and even 100% for research institutions and universities. These high funding rates reduce the pressure to make investments, particularly on companies. They also help free up money that could be channeled into launch activities.**

In addition to any collaborative research they are engaged in, individual companies involved in disruptive innovation also have the opportunity to receive EU funding for the final steps of market introduction. If its funding experts are

impressed by a project, the European Innovation Council makes it possible to receive payments of up to €2.5 million in the form of a non-repayable grant.

SHAPING INNOVATION WITH THE RIGHT FUNDING

With suitable funding, it is therefore possible to significantly increase people's willingness to take risks. The possibility of spreading risk among project partners can also lower inhibitions. Support through EU programs allows research and innovation projects to receive funding of between 70 and 100%, establishing a good basis for collaboration between research teams and companies. This can encourage companies to embark on the first stages of projects and enter into new developments, products, and markets that they would feel reluctant about without financing.

This also opens the door to new possibilities and technological breakthroughs, leading to sustainable products that offer tangible commercial potential by building partnerships between industry, research, and the public sector.

Steinbeis Europa Zentrum has a wealth of experience and a high success rate in applying for and acquiring EU funding. Whether it's screening ideas, applying for funding, or implementing projects, the Steinbeis experts pave the way for EU funding by planning, structuring, and managing companies' innovation projects. The Steinbeis experts also look for suitable partners in other countries and ensure the effective transfer of ideas to sales markets.

DR. PETRA PÜCHNER
petra.puechner@steinbeis.de (author)

Steinbeis Entrepreneur
Steinbeis Europa Zentrum | Steinbeis EU for YOU (Stuttgart)
www.steinbeis.de/en/su/2016 | www.steinbeis-europa.de

Steinbeis IDEA Europe/Institute of the European Commissioner of the Baden-Württemberg Minister of Economics, Labor, and Tourism (Stuttgart)
www.steinbeis.de/en/su/2136 | www.steinbeis-europa.de

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

Senior Manager Public Relations
Steinbeis Europa Zentrum
Steinbeis EU for YOU (Stuttgart)

www.steinbeis.de/en/su/2016
www.steinbeis-europa.de

"DOING RESEARCH FOR THE SAKE OF IT, OR JUST TO GET FUNDING, IS NO USE TO ANYONE"

AN INTERVIEW WITH R&D MANAGERS DR. MICHAEL PESCHL (HARMS & WENDE GMBH & CO. KG) AND DR. JOHANNES MAURATH (MIMPLUS TECHNOLOGIES GMBH & CO. KG)

Harms & Wende from Karlsruhe and MIMplus Technologies from Ispringen successfully embarked on a journey of EU funding with the support of Steinbeis Europa Zentrum. The Harms & Wende experts are an impressive example of an SME specialized in resistor technology and friction welding not only developing circular economy strategies for future production scenarios, but also driving the circular economy in industrial manufacturing today. MIMplus, a wholly owned subsidiary of OBE Holding – a traditional, family-owned business and a leading manufacturer of components and assemblies for the medical technology, aerospace, automotive, luxury, and eyewear industries – has also met and mastered new challenges. One involved the recycling of rare-earth magnets, the other involved the development of innovative processes in the production of permanent magnets. In an interview with TRANSFER magazine, R&D managers Dr. Michael Peschl (Harms & Wende) and Dr. Johannes Maurath (MIMplus) offer insights into their experiences with such EU projects.

Hello Dr. Peschl, hello Dr. Maurath. How do you assess the risk for companies – in terms of lost know-how and having to share results with others – when decisive developments are carried out with European partners?

Michael Peschl:
The risk depends heavily on people's interests within the consortium. As soon as the applications come in, it's really important to ensure the consortium works on a complementary level, and it's not competitive. You also need to iron out commercialization rights, and any corresponding deals that are entered into should be captured good and early within a consortium agreement. Assuming those basic principles are adhered to, compared to the many benefits of joining forces with others we consider the risk quite low.

Johannes Maurath:
When you enter into this sort of collaboration with other companies, research institutions, or sometimes even competitors, of course the first thought is that you're going to lose know-how – because you have to work together, really closely, but that's also necessary to achieve the big goals you share.

But there are tremendous advantages to sharing your thoughts with others – not just for the sake of the project or the new technology you develop in the process, but also for the company itself. For example, if you consider how difficult it is to recycle rare-earth elements in Europe, it would appear unrealistic to do that by yourself, especially as an individual company in the SME sector. If, on the other hand, you're part of an international consortium, that would seem possible. It allows you to develop new technologies and win new markets with others.

To what extent does EU project funding mitigate risk for companies, especially when it comes to financing?

Michael Peschl:
When you're submitting applications – and afterwards during project implementation – you have to make sure the areas looked at by the project are in line with your corporate objectives. Doing research for the sake of it, or just to get funding, is no use to anyone. But if the project goals are a good fit with your own strategic agenda at the company, then EU project funding offers an outstanding level of support in significantly reducing technological and business risk.

Johannes Maurath:
Without EU funding, we wouldn't have been able to develop and finance such groundbreaking technologies in-house, not as a medium-sized company. Funding is a huge help, and it's absolutely crucial when it comes to promoting technology. Projects do also involve quite a bit of admin, but it's worth it when you consider the opportunities they pave the way for. Having Steinbeis Europa Zentrum working with us on the projects as a partner also helped us deal with the admin side of things, and any issues with the difficulties that arise could be cleared up quickly.

Why do you think so many companies are reluctant to approach the EU? What would you recommend to other companies?

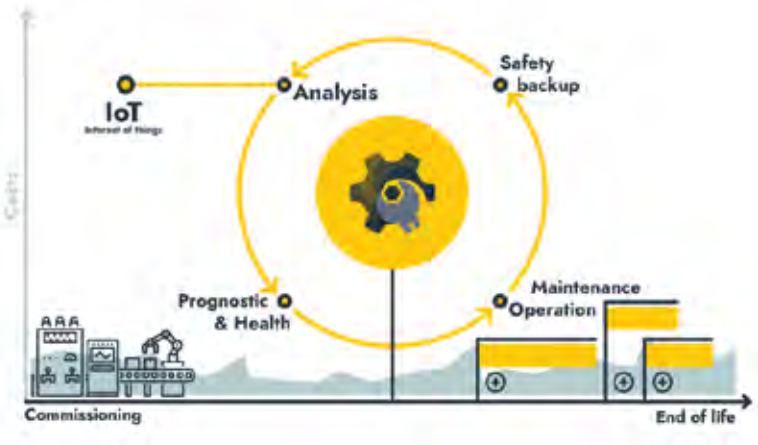
Michael Peschl:
There are a variety of EU funding programs and a number of regulations to go with them. At first glance, it makes entering the EU funding space feel a bit difficult for companies. Another reason for not taking the plunge could be the anticipated administrative burden when the project is up and running. That said, you also have those hurdles with domestic funding programs. In my experience, once you get started EU

THE CIRCULAR ECONOMY AND THE MANUFACTURING INDUSTRY

Industrial manufacturing plays a key role in innovation and growth in Europe. Obsolete machinery and downtime can lead to significant losses. This is where circular economy strategies may help. As part of an EU-funded project called RECLAIM, Steinbeis Europa Zentrum is working with a consortium of researchers and industrial enterprises from nine countries. One of those companies is Harms & Wende, home to one of five pilot sites that will test applications in the field of welding. The aim is to reduce the obsolescence of industrial plants and strengthen the economy and the environment. By retrofitting digitech on machinery, malfunctions and production downtime can be prevented, also improving net energy and material consumption. The EU is providing around €13 million of funding for the project, which involves 22 partner companies.

For more information, go to

www.reclaim-project.eu



The vision of the RECLAIM project

funding programs are even a bit easier, and above all more flexible. That's why it's a good idea to kick things off with an experienced partner at your side, or bring in professional support to accompany you during the application process.

Johannes Maurath:
Even if, on the face of it, the bureaucracy side of things feels a bit intense – and I'm sure this deters a lot of SMEs from taking part in such projects – we'd recommend that every company take advantage of the EU funding. To work, it's important that you strike the right balance within the project consortium between research and industry, so you work together on an innovative technology that also holds promise for your own company. Then the opportunities that arise from the projects and the funding are definitely worth it.

RECYCLING OF RARE-EARTH ELEMENTS

IWith the support of Steinbeis Europa Zentrum, in 2014 OBE was granted a subsidy of over €1 million to take part in REProMag, an EU project looking at the efficient production of permanent magnets from recovered rare earths. The initiative also involved setting up sustainable recycling processes. Success continued with further EU funding of €13 million for the SUSMAGPRO project, which in addition to OBE also involved its subsidiary, MIMplus Technologies. SUSMAGPRO involves working alongside other partners to raise market-ready technology to an industrial scale. Under the third successful EU application, project REEsilience, more work is underway on the supply chain itself. This €12 million project has been funded by the EU since July 2022 as part the Horizon Europe program.

Steinbeis Europa Zentrum provided support with the application process for all three projects, and has also assumed responsibility for project management, communication, and the commercialization of the project results.

More information:

www.steinbeis-europa.de/de/aktuelles/beitrag/die-lieferketten-fuer-seltenerdmagnete-nachhaltiger-und-sicherer-gestalten

The SUSMAGPRO project is making an important contribution to rare-earth magnets in the circular economy.

DR. MICHAEL PESCHL
info@harms-wende.de (interviewee)

Head of Research & Development, Harms & Wende GmbH &Co. KG (Karlsruhe/Hamburg)

www.harms-wende.de

DR. JOHANNES MAURATH
infomim@mimplus.de (interviewee)

Head of Research & Development, MIMplus Technologies GmbH & Co. KG (Ispringen)

www.mimplus.de

BUILDING TRUST AS A MEANS OF AVOIDING A CRISIS

STEINBEIS CONSULTANT HOLGER HAGENLOCHER EXPLAINS HOW COMPANIES CAN PREPARE THEMSELVES BETTER FOR TIMES OF CRISIS

Every entrepreneurial undertaking is fraught with risk. Even during the startup stage, new companies have to accept the possibility that their products and services may not invoke a response or may not generate enough revenues. Products may even stack up in the warehouse after production. Steinbeis Consultant Holger Hagenlocher discusses how establishing a strong foundation of trust between companies and different stakeholders can help when it comes to dealing with a crisis.

MANY BENEFITS STAND TO BE GAINED BY BUILDING TRUST

Entrepreneurial activity always goes hand in hand with risk. Sometimes risks are entered into knowingly, such as deciding to sell products in a market marred by political uncertainty, or becoming unilaterally dependent on suppliers in global markets, or making production decisions despite not knowing if something will succeed. Though, companies are often unprepared when a risk evolves into a full-blown crisis. They could, however, prepare themselves properly for such situations and run through emergency scenarios beforehand. This allows Plan B to be whipped out of the filing cabinet and it becomes possible to adopt a systematic approach, covering both key business necessities and any communication measures that will need to be taken.

IDENTIFYING RISK WITH A BUSINESS ENVIRONMENT ANALYSIS

If risks exist already and are known, the task of corporate communications is to actively make key stakeholders aware of the problem, thus sensitizing others and laying the groundwork for action as a business. To take appropriate precautions, companies need to be well informed when it comes to market developments, emerging technologies, and consumer trends.

A business environment analysis establishes the status quo on the market, identifies developments and trends early, and helps companies spot any risks of a social, political, or technical nature that may exist. Among other things, such assessments include a stakeholder analysis. In addition to examining the degree to which certain reference groups hold influence or power, this analysis looks at their attitudes and needs, also with regard to communication. In addition, a so-called issue analysis can be used to systematically root out trends and topics, and identify "weak signals" – i.e. indications of any problems that could potentially arise in the future. Specific issues, such as emerging environmental awareness, the looming climate crisis, the threat of armed conflict, but also the emergence of technical developments of a disruptive nature, can be mapped in good time through issue analysis and addressed in strategic and operational terms through issue management. The earlier any such risky issues are identified, the greater the room for maneuver and the better one can prepare to react to a potential crisis.

This provides organizations with a comprehensive foundation for decision-making regarding the future strategic direction of business operations. Analysis does not replace continuous media monitoring, however, and that includes following social media in order to react to developments at short notice.

CRISIS PREVENTION AND RESILIENCE

If, despite all, a crisis does occur unexpectedly and people are correspondingly unprepared, the trust of stakeholders in a company and its products is key to weathering out the crisis. Studies indicate that firms that enjoy a high level of trust among stakeholders are in a better position and quicker to overcome a crisis. Similarly, there are correlations between the reputation and brand awareness of a company and its crisis resilience. Further surveys show that companies that score highly on trust are more successful in markets. The logical conclusion from this is that trust not only makes a company more crisis-proof, but it is also an asset of the company portfolio.

The trust afforded by investors, customers, suppliers, and the workforce also plays an essential role in managing transitions during company sales, takeovers, and periods of management suc-

cession. The stronger the trust in a company or brand, the higher the customer loyalty and retention in times of change and crisis.

REDUCING COMPLEXITY

If trust is a critical factor, it's important to define exactly what trust means and how it can be built systematically in strategic terms. The world of VUCA is characterized by uncontrollable complexity – in any given situation, people are now free to choose between many different courses of action. However, customers have very little time to make decisions and this leaves them with no opportunity to consider all potential courses of action. Since customers only collaborate with others if they're sure they can rely on them to do certain things in the future, they bank on trust (or distrust) to mitigate the complexity of a situation. Sociologist Niklas Luhmann therefore sees trust primarily as a means of reducing complexity. Trust is also of pivotal importance to business organizations, both in B2C and B2B interactions with customers. At the same time, Luhmann regards trust as a "risky down-payment" for those who invest trust. People who invest trust make themselves vulnerable to those they place their trust in, because the trustworthiness of the latter can never be fully controlled or predicted.

TRANSPARENCY CREATES TRUST

In interpersonal relationships, trust is engendered through positive experiences. It stems from a sense of confidence that other parties will not disappoint after expectations are placed in them or they make a promise. This is because trust is not something that can be implemented, dictated, learned, or paid for. Companies should therefore continuously maintain positive relationships with key external and internal stakeholders. Many benefits stand to be gained by building trust. For example, trust can significantly enhance company competitiveness. It accelerates many internal processes, for example because certain controls can be done away with in daily work. People at a company are more motivated to go about their work if their tasks take place in an environment marked by trust and appreciation, and this also reduces the costs of processes. The consequences of squandered trust can be correspondingly negative.

There are many ways in which transparency helps build trust in a company. Nearby residents gain insights into things happening beyond the factory gates; employees and shareholders receive advance information on future developments at the company. The easier it is to understand decisions and actions that are taken – and the better they are explained and communicated – the more this transparency fuels trust, and that helps when a company needs more understanding from key stakeholders in a situation of crisis. If instead of a heightened sense of trust there is a prevailing climate of mistrust, risks can quickly develop into an escalating crisis.

THE IMPORTANCE OF MATCHING COMMUNICATION WITH ACTION

To foster trust both between and beyond organizations it is therefore important that companies ensure they engage in credible communication and that they focus on ethical and moral principles.

Trust is a consequence of professionally managed communication and one of the most important aspects of corporate communications. Accordingly, the most important goal of corporate communications must not be awareness per se, but to instill trust and understanding in the actions of a company. In keeping with this, communication must not be seen exclusively as the sharing of information. Instead, communication must also be consistent with the actions of those who communicate. Trust is boosted when expectations and promises are met. This results in stakeholders investing renewed trust in a company and, bit by bit, this makes a company more crisis-resilient.

HOLGER HAGENLOCHER
holger.hagenlocher@steinbeis.de (author)

Freelance project manager
Steinbeis Consulting Center
Business Coaching
(Stuttgart)

www.steinbeis.de/en/su/0882
www.steinbeis-uc.de

SIMULATIONS HELP MANAGE RISK AND COMPLEXITY

STEINBEIS EXPERTS CONDUCT TESTING OF COMPLEX DRIVING SCENARIOS

Vehicles offer more and more features, with everything now from straightforward assistance systems to allowing the vehicle to drive itself. Despite the obvious benefits, these features also bring risks, which need to be tested in development by conducting simulations. Vehicle simulations work through a variety of driving scenarios, which are captured in description languages. Depending on the scenario and driving maneuver, this results in high levels of complexity. The more complex a scenario, the greater the risk that it doesn't match desired testing requirements and this might give a false impression that a test was successful. Key performance indicators (KPIs) can be used to assess the quality and complexity of scenarios. The experts at Steinbeis Interagierende Systeme GmbH (IAS) have been using a variety of KPIs to compare two different description languages for test scenarios.

In addition to open standards such as OpenSCENARIO 1 and 2, a variety of languages are now available for describing simulation environments and testing scenarios, analogous to those used in the development of driver assistance systems. The experts at IAS have been helping with the development and application of such domain-specific languages (DSLs) for several SAE levels of driving automation.

KPIS – CRUCIAL NUMBERS IN SIMULATIONS

KPIs are needed to assess the efficiency of DSLs in different simulation environments and testing scenarios, particularly when it comes to development, application, and scalability. The Steinbeis experts compared the KPIs of two examples based on identical scenarios. Each was described using two different DSLs. OpenSCENARIO 1 and the EBTB language co-developed by IAS were used as the description languages. Two modeling notations were used: XML and a shorthand notation (SN) transformed from and to XML. Both OpenSCENARIO and EBTB described the runtime vehicle behavior within simulations.

Two reference scenarios were used to make initial comparisons, using the two languages as examples. A simple scenario was used to demonstrate a simple lane change, and a more complex scenario extended this situation to include stopping and acceleration. The idea of using two scenarios was to reveal dependencies and identify whether the results of one scenario were random or could be replicated in other scenarios.

The IAS experts compared the following KPIs in the simulation:

- **Number of lines of code**
- **Number of events and actions:** events and actions needed for the language to model the required scenario
- **Number of values assigned:** the number of lines with a fixed value, such as vehicle speed or acceleration time
- **Number of characters (with and without spaces/tabs)**
- **Nesting/indentation depth (maximum depth):** the number of tabs or nesting depth

A DIRECT COMPARISON BETWEEN TWO SCENARIOS

The first table (p. 44) shows measured KPIs for a simple lane-change scenario. The low values show a more simple description of the scenarios. Relative values for the SN are given in parentheses. EBTB and OpenSCENARIO 2 have the lowest values.

The second table shows the metrics of the more complex lane-change-stop-and-go scenario. The figures show an

The lane-change scenario

The lane-change-stop-and-go scenario

increase in the number of lines of code and an even greater increase in the number of characters in the respective test cases.

The third table makes this even clearer, showing expansion in the languages from the simple to the more complex scenario. OpenSCENARIO 2 works with the fewest lines of code, enabling scenario description with minimal code. The short notation in EBTB comes in second place, but is less expanded. OpenSCENARIO 1 requires the most lines of code and characters to describe the respective scenarios in the experimental setup. A comparison of the lane-change and lane-change-stop-and-go scenarios showed an enormous increase in lines and characters.

EBTB scenarios are more compact and less complex in the SN. The IAS experts attribute this to the XML notation, since OpenSCENARIO 1 has a very high

TABLE 1	EBTB (SN)	EBTB (XML)	OpenSCENARIO 1	OpenSCENARIO 2
Lines of code	46	53 (115 %)	120 (260 %)	16 (34 %)
Events	4	4 (=)	4 (=)	3 (-1)
Actions	6	6 (=)	4 (-2)	4 (-2)
Assigned values	20	20 (=)	20 (=)	13 (-7)
Characters	1062	2551 (240 %)	6236 (587 %)	508 (48 %)
Characters (without spaces)	843	1951 (213 %)	3238 (384 %)	337 (40 %)
Maximum depth	4	4 (=)	12 (+8)	4 (=)

TABLE 2	EBTB (SN)	EBTB (XML)	OpenSCENARIO 1	OpenSCENARIO 2
Lines of code	60	71 (118 %)	166 (277 %)	24 (40 %)
Events	6	6 (=)	6 (=)	5 (-1)
Actions	8	8 (=)	6 (-2)	6 (-2)
Assigned values	26	26 (=)	30 (115 %)	18 (69 %)
Characters	1345	3312 (246 %)	9269 (689 %)	753 (56 %)
Characters (without spaces)	1060	2512 (237 %)	4566 (431 %)	480 (45 %)
Maximum depth	4	4 (=)	12 (+8)	4 (=)

TABLE 3	EBTB (SN)	EBTB (XML)	OpenSCENARIO 1	OpenSCENARIO 2
Lines of code	130 %	134 %	138 %	150 %
Events	+2	+2	+2	+2
Actions	+2	+2	+2	+2
Assigned values	+6	+6	+10	+5
Characters	127 %	130 %	149 %	148 %
Characters (without spaces)	126 %	129 %	141 %	142 %
Maximum depth	=	=	=	=

number of structural elements. These are reduced to a minimum in the shorthand notation of EBTB. With more complex scenarios involving a large number of commands, actions, and events, this difference keeps increasing.

SIMULATION MAKES COMPLEXITY VISIBLE

The example scenarios clearly show that complexity increases as the number of commands increases. It's useful for people managing tests to be aware of this complexity. A quantitative evaluation using KPIs makes it possible to make the right decisions with an influence on future test scenarios. Testing involving high levels of complexity can be investigated with an eye to making them more precise and, as far as possible, avoid disappointing outcomes. Given the increasing complexity of vehicle functions, it's important to address the exact testing requirements without being negatively influenced by other factors.

DR. DANIEL ULMER
daniel.ulmer@steinbeis.de (author)

Managing Director
Steinbeis Interagierende Systeme GmbH (Herrenberg)

www.steinbeis.de/en/su/1913
www.interagierende-systeme.de

JORDI BEECK
jordi.beeck@steinbeis.de (author)

Assistant
Steinbeis Interagierende Systeme GmbH (Herrenberg)

www.steinbeis.de/en/su/1913
www.interagierende-systeme.de

DANIEL ELSENHANS
daniel.elsenhans@steinbeis.de (author)

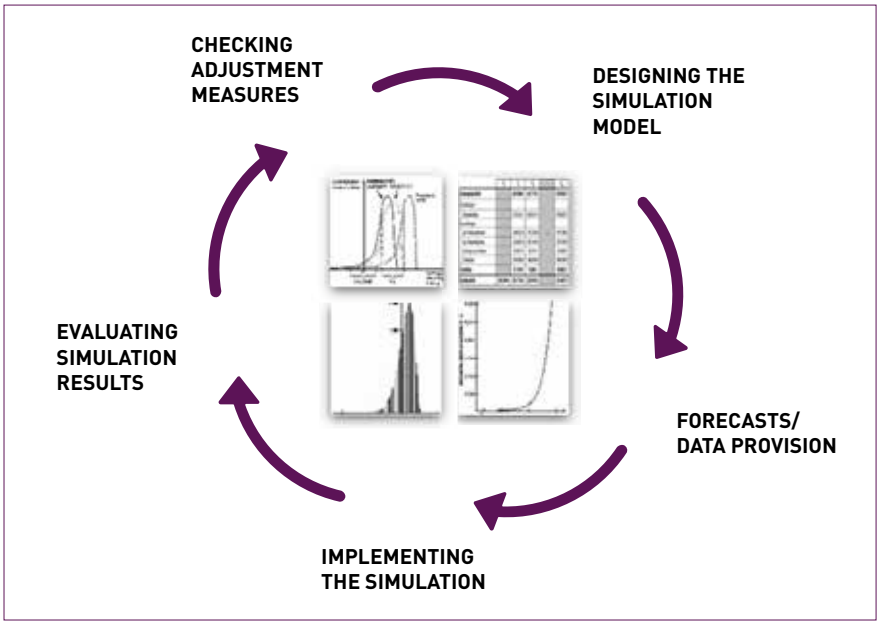
Assistant
Steinbeis Interagierende Systeme GmbH (Herrenberg)

www.steinbeis.de/en/su/1913
www.interagierende-systeme.de

MASTERING THE CHALLENGES OF LIQUIDITY MANAGEMENT

HOW TO USE SIMULATION TOOLS TO BOOST OPERATIONAL RESILIENCE

The coronavirus pandemic, the collapse of the supply chain, runaway inflation, the current energy crisis – these are stormy times for companies and, among other things, their survival depends on their ability to manage liquidity professionally. The previous article looked at the use of simulation tools in technical areas (see article starting on page 42), but simulation tools can also provide timely pointers on liquidity problems and help companies introduce appropriate countermeasures. Professor Dr. Alexander Baumeister, Steinbeis Entrepreneur at the Saarbrücken Institute for Controlling Innovations, a Steinbeis Innovation Center, and a professor of business administration at Saarland University, provides TRANSFER magazine with an overview of the advantages of such instruments.



The application phases of a simulation of liquidity risk

The safety net introduced by the last German government offered a package of measures aimed at safeguarding the ongoing viability of companies during the coronavirus pandemic by, among other things, helping with liquidity. The package (called a "protection shield" in German) included more flexible treatment of short-time allowances, help with the flow of tax payments, and easier access to credit. Another package of measures is currently being launched – a "defense shield" against exploding energy prices that promises companies help with liquidity.

These are tense times. In August 2022, the year-on-year rise in the selling prices of industrial products hit an all-time high of 45.8%. As a result, many companies are feeling the squeeze on their liquidity. Their procurement costs are exploding and they are unable to pass costs on to customers quickly enough in their selling prices. It is essential that firms plan their liquidity carefully and identify any bottlenecks in cash flows posing any potential threats to their very existence – and that they do this early enough to introduce countermeasures. Help is now available, including for small and medium-sized enterprises, in the form of simulated numbers. These were the subject of a project called InsoKURZ, which was funded by the Saarland State Chancellery and implemented by experts at Saarland University and the Saarbrücken Institute for Controlling Innovations. The project looked at the development of a simulation tool for use in insolvency forecasting.

ANTICIPATING LIQUIDITY ISSUES EARLY HELPS BOLSTER BUSINESS RESILIENCE

Increasing operating cash flows usually go hand in hand with (opportunity) costs. This is because, to name just some examples, shortening the payment terms of customer liabilities can put a strain on turnover; offering discounts as an incentive to settle invoices more quickly automatically cuts revenues; and sale-and-lease-back arrangements, or selling receivables, result in corresponding leasing or factoring fees. Conversely, under Section 17 (18) of the German Insolvency Code, planned cash flows must be managed such that (as far as possible) there is no threat of (imminent) insolvency. It is therefore crucial to match the scheduled stock of payment instruments as carefully as possible to the patterns and timings of due payments. The earlier it can be anticipated when there will be potential shortfalls in operational liquidity, the more lead time a company has to take measures aimed at making necessary adjustments. Any help with the planning process will therefore have a direct impact on enhancing operational resilience.

SIMULATION TOOLS HELP WITH LIQUIDITY PLANNING

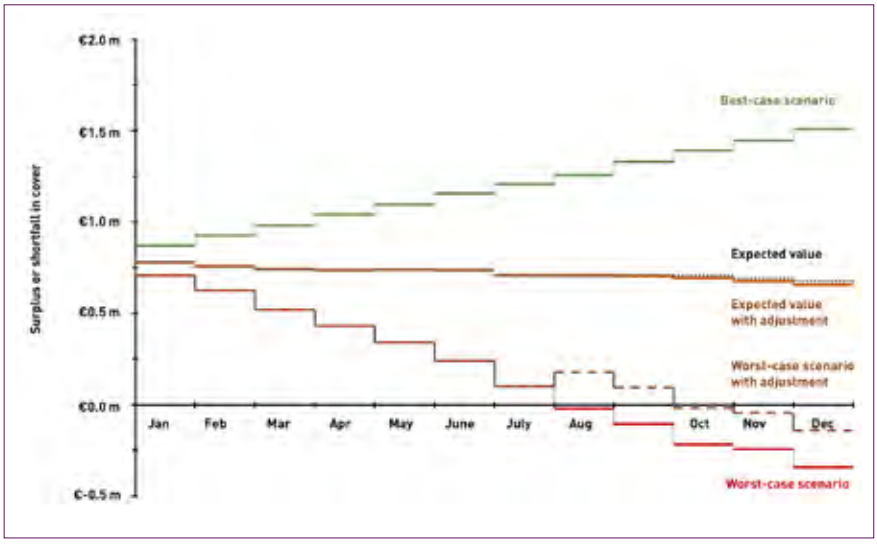
Future incoming and outgoing cash flows are always subject to risks. These may, for example, be the result of exchange rate fluctuations, changes in commodity prices, or changes in customer payment patterns. Planning liquidity according to the anticipated or most probable figures, a common approach in small and medium-sized enterprises for resource reasons, can be problematic because this generally ignores risk, thus depriving firms of information that is valuable for management control purposes. Although companies are required to assess impending insolvency under Section 18 (2) of the German Insolvency Code (InsO), and this entails checking whether liquidity reserves and surpluses arising from operations are mostly likely to cover existing payment obligations [1], future obligations and the probability of possible shortfalls should also be included in liquidity planning in order to be in a position to decide whether potentially positive outcomes should be abandoned in favor of securing liquidity. Simulation results can provide a useful foundation of information for doing this, by allowing different assumptions to be made regarding forecast operational cash flows. These can be recorded, as required, and can even be evaluated using common software. Such

calculations provide users with a representation of liquidity over time underpinned by probabilities. By merging simulation results, judgments can be made regarding impending payment bottlenecks and necessary changes to planning.[2]

USING SIMULATION TO ASSESS LIQUIDITY MEASURES

Companies would only be advised to forego profit contributions for higher liquidity reserves if this can be offset by a corresponding lower probability of experiencing liquidity bottlenecks. Similar to any form of insurance, decision-makers must contrast the price of hedging with risk reduction in order to judge measures according to their willingness to take risks. To do this, however, they will need detailed probability profiles of adjustment alternatives, which even small and medium-sized enterprises can generate with simulation models, for example by using an Excel spreadsheet.[3]

Classic liquidity plans or financial plans can be used as a basis for designing simulation models, and these should be available at the company anyway. If – as is often the case in small and medium-sized enterprises – there are no sophisticated risk management processes in place, particular attention should be given to carefully identifying relevant risk factors. Sometimes this will involve compromises regarding how realistic modeling can be made and the resources a firm can afford to invest in calculations. Significant improvements can already be made to liquidity planning based purely on deterministic methods if, for example, instead of basing forecasts specifically on procured materials, at least one aggregated forecast is drafted for individual groups of materials or total material expenditures. When setting up the simulation model, it should be ensured that there is sufficient flexibility to capture adjustments – that need to be checked – in liquidity developments, such as taking advantage of payment deadlines by accepting a lost discount. Even standard software such as Excel allows to compare values needed to simulate the results of different adjustments, and these can be used to select the ones that are suited to the risk propensity of decision-makers.



Example of simulated scenarios with adjustments made for lost discounts

The figure above shows an example of simulated liquidity over time for an SME, showing a one-year horizon broken down by month. Plotting net maximum and minimum monthly liquidity, as calculated by the simulation, produces diverging scenarios that, in the worst-case scenario, point to the risk of a shortfall starting in August. Since the expected value is positive, it depends on risk propensity whether anticipatory countermeasures should be taken.

This example shows the effect of making full use of payment deadlines at the cost of lost cash discounts. Positive changes to liquidity shortfalls, brought about by such adjustments, are offset by lower levels of anticipated liquidity. Decision-makers can only judge whether this makes sense by assessing the risk profiles generated by the simulation. The one-off expense of introducing simulation-based liquidity planning is thus offset by the many benefits enjoyed in the long term.

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UNIV.-PROF. DR. ALEXANDER BAUMEISTER
alexander.baumeister@steinbeis.de (author)

Steinbeis Entrepreneur
Steinbeis Innovation Center
Saarbrücken Institute for Controlling Innovations (saar#cinnovaton)
(Saarbrücken)

www.steinbeis.de/en/su/2408

CROSS-SECTION

CURRENT PROJECTS FROM THE STEINBEIS NETWORK

THE 2022 STEINBEIS NETWORK EVENT

REVIEW AND IMPRESSIONS

Rather than raising the curtain, it was a case of finally opening doors again on September 30, and a large number of Steinbeis entrepreneurs responded to the invitation and came to the Steinbeis campus in Stuttgart. For decades, the last Friday in September has been chosen as Steinbeis Day – a regular event in the schedule of the Steinbeis network that was forced to press the pause button for the last two years due to the pandemic. This made it all the more noticeable how much the guests and their hosts had missed the chance to talk to each other in person, and everyone made full use of the opportunity to meet up again.

The event was a fresh start in more ways than one, after the organizers decided to give the day a bit of a makeover, reflected most obviously in the new location. Following the opening of the Steinbeis campus last year as a central meeting place for the network and headquarters of the Steinbeis Foundation, for the first time the entire event was held in Steinbeis's own buildings.

After energetic talks, discussions, and in particular the first Steinbeis NetworkDialog (see following pages), in the late afternoon the guests were invited to round off the day in a more relaxed atmosphere. In addition to a tour of the architecture on the Steinbeis campus and a tour of Hohenheim Botanical Garden, the guests were offered insights of a very different kind. This moved on seamlessly to the Steinbeis Campus Evening at the Steinbeis House for Management and Technology (SHMT).

Culinary delights accompanied by atmospheric music performed by Neonbeige – the later the event moved on into the evening, the more the conversation shifted to the bar at the Steinbeis House in Hohenheim. The feedback from guests highlighted that a repeat would go down very well!

THE NEXT STEINBEIS DAY WILL TAKE PLACE ON SEPTEMBER 29, 2023 ON THE STEINBEIS CAMPUS IN STUTTGART.

CORPORATE COMMUNICATIONS
uk@steinbeis.de

Steinbeis Headquarters (Stuttgart)
www.steinbeis.de/en

NETLOG: STEINBEIS NETWORKDIALOG

PREMIERE OF THE NEW STEINBEIS DISCUSSION FORUM

Also on Steinbeis Day, all Steinbeis entrepreneurs were invited to the first Steinbeis NetworkDialog, or NetLog for short. This new forum, which will be held annually in the future, focuses on dialog between multiple people and on a number of levels with the aim of building and promoting networks. Networks and personal exchange with others in the form of dialog are essential elements of the Steinbeis network, and given the shift to virtual meetings and digital discussion, both are gaining in importance.

The starting point for NetLog – as a new form of interacting with others – was the realization that transformation and convergence will be defining processes in coming decades, not just for people, but also for companies, and organizations. This continual process of change requires an equally steadfast ability to adapt. The solutions that will be required to given problems will be identified less and less by individuals. The usefulness of communities and collaboration will be determined by the value they add; overall, "less" will need to be "more." Competitive advantage will then stem from the value of networks, especially when this results in greater efficiency and effectiveness in solving different problems by building on skills in synergy. To acquire the right skills to innovate, companies, organizations, and the stakeholders who support them will also require technological competence. The increasing level of convergence between technology expertise and management consulting offers significant potential to tap into such network value.

Within the Steinbeis network, on the one hand attention is focusing on networks that come in a variety of formats. Some involve several Steinbeis enterprises (SEs), forming part or even the core of a network. Others involve just one SE, playing a part in creating (network) value, or acting as an enabler. It has also been observed that networks have reached different stages of maturity: from the initiation phase, to planning, impact, and finally review.

The first Steinbeis NetLog event was an opportunity for such value-adding networks to showcase themselves within the context of the Steinbeis network and engage in dialog with other network members and guests. The selection of networks at the event was as diverse as the topics that are currently impacting our economy and society. The projects that were presented and discussed during the event reflected a number of success stories from the Steinbeis network, all of which were implemented with partners or are still being implemented.

FOCAL TOPIC:
THE ENERGY INDUSTRY

Going by the motto "Solutions for the Heating Transition", Steinbeis entrepreneur Professor Dr.-Ing. Manfred Norbert Fisch presented an SE network that was launched from scratch. His talk demonstrated that the transition to alternative sources of heating requires interaction across an entire system, involving all forms of renewable heat generation. Heating networks are an opportunity to decarbonize the heating supplies of entire cities, villages, and neighborhoods. The ideal system in terms of energy use and economic factors will be found by leveraging potential on a local level and spaces available for energy generation. The goal of the network is to showcase and offer consulting services and different ways to make things happen, spanning a broad range of topics. Initial discussion had already taken place before the event and the Steinbeis Day marked the first chance for the network to meet face to face.

FOCAL TOPIC:
DIGITAL TRANSFORMATION

Representing the transfer platform Baden-Württemberg Industry 4.0, in his speech at the Steinbeis Day Professor Dr. Daniel Palm highlighted the difficulty of implementing digital transformation at companies. The Baden-Württemberg Industry 4.0 transfer platform is a Steinbeis Innovation Center formed by a network of three universities funded by the state, providing examples of initial solutions and thus showing how SMEs in particular can overcome different challenges.

FOCAL TOPIC: MICROMOBILITY

Steinbeis Entrepreneurs Professor Dr.-Ing. Wolfgang Nendel and Mirko Spieler have enjoyed a successful partnership for some time with external companies as part of a network looking at the area of micromobility. For a project funded by the Federal Ministry of Education and Research,

the partners are investigating travel using smart pedal vehicles (SPVs) in the connected and digital cities of the future. A flexible, quick, and environmentally friendly format of micro-travel, SPVs are designed to offer firms an innovative and sustainable solution for use in urban environments.

FOCAL TOPIC: NEW WORK

Steinbeis Consulting Group Personal (SCGP) and Steinbeis Consulting Group Digital Business Transformation (SCG DBT) have been working together as micro-networks as part of an interface project. During Steinbeis Day Professor Dr. Arnd Gottschalk, a member of the SCGP, highlighted the challenges and key success factors affecting companies as transformation occurs in the world of work. The New Work movement offers employees greater levels of flexibility and individuality, but in many areas the shift in corporate culture has not yet reached top management and working processes. His network has therefore developed its own offering of collaborative services in the field of New Work, based on holistic and systematic approaches to change management with the aim of supporting successful transformation.

The first kick-off event will be followed by further NetLog events looking at a variety of topics. The unanimously agreed goal will be to keep expanding the Steinbeis network, to promote strong partnerships, and to develop a diversity of dialog formats that support networking.

DR. MICHAEL ORTIZ
michael.ortiz@steinbeis.de (author)

Head of Corporate Development
Steinbeis Headquarters (Stuttgart)

www.steinbeis.de/en

STEFANIE ZEBITZ
stefanie.zebitz@steinbeis.de (author)

Project Manager
Corporate Development
Steinbeis Headquarters (Stuttgart)

www.steinbeis.de/en

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"IF YOU ENJOY DOING SOMETHING IT'S NEVER A BURDEN"

SUCCESSFUL SUCCESSION IN THE MAKING – AN INTERVIEW WITH PROFESSOR EDMUND HAUPENTHAL, URSULA SCHULZ, AND HANS-JÖRG BLEY

The fact that the name says it all is probably not too much to say about the Steinbeis Transfer Centre TOP: For 30 years, the team spearheaded by Steinbeis Entrepreneur Professor Edmund Haupenthal has been supporting small and medium-sized companies with expansion, dealing with times of crisis, and making firms fit for future issues such as globalization, digitization, and Industry 4.0. Their approach has always been based on a holistic view of the client's technology, organization, and personnel – or TOP for short. Reaching the milestone of 30 years, and simultaneously handing the baton on to the new management team – Ursula Schulz and Hans-Jörg Bley – were reason enough for TRANSFER magazine to meet up and exchange ideas with Steinbeis Chairman Professor Dr. Michael Auer.

Hello Professor Haupenthal. When the Steinbeis Transfer Center was founded in 1992, what's now called Industry 4.0 used to be called CIM – Computer Integrated Manufacturing –, providing a name for the center. Even then it became clear that the secret to success was not so much technology in itself, but the skills required to apply technology. Did that also form the focus of your consulting work at the time?

And has that focus changed over the years?

In the years before I took over the center in Gottmadingen, I had been working on CIM topics as a consultant, for more than seven years, and I had already dealt with the topic for my diploma thesis. At first it was a huge motivation to be able to take full responsibility for introducing this way of thinking to customers, with the concepts it involved. But I soon realized that this desire for paperless and frictionless processes and workflows – forging networks and controlling operational factors centrally – wasn't that easy to implement. Sure, it was possible to show the potential to make rationalizations by using computer-assisted machine tools, and to show how that would change production processes, but that still didn't result in "work without controls and commands." I had to accept that

The new management team is ready to go: Hans-Jörg Bley and Ursula Schulz succeed Edmund Haupenthal at the turn of the year.

humans still play an important part. So in the years that followed, I focused more on organizational structures and workflows, and looked at the people. We developed a tool for conducting individual enterprise checks and offered it as a product, mainly through multipliers, especially banks and tax consultants.

Around the same time, the name of the Steinbeis Transfer Center changed to TOP. At that time, lots of loan officers were overwhelmed by the rating requirements imposed under Basel I and II. We helped with company assessments, we provided advice on ratings, and we succeeded in offering important ways to develop companies positively. But in addition to improving the personal performance, it was always a matter of importance to address all topics relating to technology, organization, and personnel through additional project managers. Those topics kind of came up "automatically" by taking a comprehensive look at companies as part of the enterprise check tool.

At the same time, this development in our services increasingly took us into issues dealing with corporate restructuring. This also predetermined the next steps and very quickly there were related services such as budgeting, liquidity planning, expert reports in accordance with IDW S6, new funding options through investments, and search for investors. This put the signposts in place for stepping into what's become my main area of work on a personal level: company succession.

Turning to you Ms. Schulz and you Mr. Bley: Hello! You're taking over management of the enterprise from Professor Haupenthal at the end of the year. When we were talking about this beforehand, you expressed tremendous respect for the value Mr. Haupenthal has given to his network and his customers. You're already actively working for the enterprise and contributing with your own areas of specialism. Which direction do you now want to go in with the Steinbeis Transfer Center TOP, now that you're directly responsible for it?

We met seven years ago and have been working with Edmund Haupenthal at the Steinbeis Transfer Center TOP ever since. From the very beginning, it's been a very fruitful process of exchange, as equals, which we've valued tremendously. When you're an independent consultant, it's extremely valuable to spar with fellow consultants and keep developing the value proposition for our SME clients. The rest comes from having the powerful Steinbeis brand behind you, as well as the philosophy that shapes and drives the Steinbeis network. And because of that, our guiding principles for the future will be consulting as a partner of equals and working together in teams on a regional basis. That includes collaboration between project managers and, similarly, working together with our clients. Our project managers bring extensive experience in industry to the table. This is something our clients value just as much as the fact that in their hearts, they're team players. That's also reflected in the future line-up of the people who head our team. For us, these are long-term prerequisites for supporting SMEs in the region in these times of volatility.

And you Professor Haupenthal, what specifically was it that appealed to you in 1995 when you took over the Steinbeis Enterprise in Gottmadingen from your predecessor, Walter Beck? What pointers did he give you for the journey ahead? Anything you'd like to share with your successors?

Initially, from 1994 onwards, I worked as a project manager. At the beginning I was a consultant, Edmund Haupenthal, and I soon began to realize that it wasn't easy drumming up assignments on your own as a consultant. When I went cold-calling, the first thing I'd hear was always, "Why don't you send us your details and we'll get back to you!" Having the strong Steinbeis brand behind me suddenly allowed me to experience completely different things in the acquisition process – as a "Project Manager of the Steinbeis Foundation for Economic Development." Even when I cold-called, it was immediately, "When do you have time to come over?" When Walter Beck made the decision to move to Stuttgart, I knew right away I wanted to take over the Transfer Center – even though the products that were previously offered in Gottmadingen, especial-

Edmund Haupenthal (left) and Michael Auer

ly the St. Gallen Management Seminar, would move with Walter Beck to Stuttgart, and that would leave behind no products for the Transfer Center. But as I said, the shuffle still worked very well. I still thank Walter Beck, from the bottom of my heart, for placing confidence in my know-how and the trust he invested in me – that I would continue to run the center successfully. He said a crucial thing to me at the time: Edmund, you need products! That motivated me to develop the enterprise check tool.

I'm delighted to have found two successors in Ursula Schulz and Hans-Jörg Bley. The areas they both work in are an indispensable gain in developing the center. It would make me so happy to see clients and business partners place their trust in them, in the same way they've placed their trust in me all these years. And incidentally, I'd also like to pass on to my successors the tip I was given by Walter Beck: Develop products!

Professor Auer: Well-planned succession is an essential prerequisite for a seamless and smooth transition to the next generation of managers, especially with entrepreneurs. Networks like the Steinbeis network rely on the minds of individuals, so naturally they change when individuals change. Can you use the example of the Steinbeis Transfer Center TOP to tell us what – compared to 1992 – you consider to be the main developments in the network?

Since 1983, which marked the beginning of this "modern era" of the Steinbeis Foundation, enterprises have been identified internally by using numbers. The Steinbeis Transfer Center TOP is number 151. The most recently founded enterprise is number 2470. The overall number of all actively operating enterprises belonging to the network is more than 1,100. That shows that the network has expanded considerably in quantitative terms and it has continually reinvented itself.

When it was founded, the Steinbeis Transfer Centre CIM, the predecessor of TOP, was one of the first few companies in the network whose "head" was not a professor in an entrepreneurial sideline position, but a full-time consulting Steinbeis entrepreneur. This was a new kind of Steinbeis Enterprise – and, among others, Edmund Haupenthal played an important role in moving forward with the enterprise he'd taken over, by consistently positioning it as a "consulting center" – that now reflects an important group of Steinbeis enterprises that possesses specific competencies, in a diversity of areas, thus significantly shaping the quality and the comprehensive potential of the Steinbeis network to solve problems.

Just as Edmund Haupenthal experienced as a project manager, in the early years it was the Steinbeis Foundation

for Economic Development, alongside Johann Löhn, the founder of the Steinbeis Foundation of today, that created the image and acted as a door-opener. In the meantime, it plays an important role as an umbrella organization for the network and gives it a sense of purpose. That said, in essence Steinbeis is now perceived through its enterprises and their wide-ranging competencies, particularly in the sense of trust it instils. That goes hand in hand with the passionate Steinbeisers who define what we are – such as Edmund Haupenthal, and of course in the future, his successors in their new roles, Ursula Schulz and Hans-Jörg Bley.

The success of the handover from Edmund Haupenthal to Walter Beck was something special and it was the first of its kind. These days successful handovers between entrepreneurs, especially from one generation to the next, are also an essential aspect at Steinbeis; they needed to secure a certain degree of continuity in the way we preserve value – and values – and establish a solid basis for the required development or transformation of the enterprises and Steinbeis.

Professor Haupenthal, your passion for consulting will stay with the Steinbeis team over the coming years in individual projects. Nonetheless, hopefully you'll now have time for all the things you didn't have time for during all those years of work. What personal projects are now at the top of your agenda?

Well, first of all I can confirm that consulting has always been a passion of mine and something I've enjoyed doing. The way I see it, if you enjoy doing something it's never a burden. Despite that, looking back I do realize that for a long time I neglected some of the things around me. I have a family with two wonderful children and, in the meantime, three grandchildren, who – like my friends – have been short-changed of many hours together because of my work commitments. I'd also like to do more sport; I'll invest more time in golf and hiking in the future, and I'd also like to explore distant shores I've only seen pictures of until now.

CRISIS CONSULTING WITH HEART AND SOUL

Edmund Haupenthal can rightly be called a veteran of corporate development. After graduating from the University of Karlsruhe with a degree in industrial engineering, the native of Saarland worked in corporate planning and CIM areas for both large and medium-sized companies. He has been an independent consultant and adviser to companies for more than 30 years.

In 1995, he took over from Dr. Walter Beck as director of the Steinbeis Transfer Center CIM in Gottmadingen, which is now based in Ravensburg and called TOP. He is also the CEO of a consulting firm specialized in corporate succession and has been lecturing at the universities of St. Gallen and Ravensburg-Weingarten since 1999. Haupenthal has been an honorary professor at the latter university since 2008.

The focus of his work lies in supporting the holistic corporate development of companies. This also includes the planning and organization of company handovers and succession. For many years, he has been sharing his expertise as an advisory and supervisory board member of medium-sized enterprises.

PROF. EDMUND HAUPENTHAL
edmund.haupenthal@steinbeis.de (interviewee)

Steinbeis Entrepreneur
Steinbeis Transfer Center
Technology - Organization - Human Resources (Ravensburg)

www.steinbeis.de/en/su/151
www.stz-top.de

URSULA SCHULZ
ursula.schulz@steinbeis.de (interviewee)

Steinbeis Entrepreneur
Steinbeis Transfer Center
Technology - Organization - Human Resources (Ravensburg)

www.steinbeis.de/en/su/151
www.stz-top.de

HANS-JÖRG BLEY
hans-joerg.bley@steinbeis.de (interviewee)

Steinbeis Entrepreneur
Steinbeis Transfer Center
Technology - Organization - Human Resources (Ravensburg)

www.steinbeis.de/en/su/151
www.stz-top.de

PROF. DR. MICHAEL AUER
michael.auer@steinbeis.de (interviewee)

Chairman of the
Steinbeis Foundation Board
(Stuttgart)

www.steinbeis.de/en

INDUSTRY 4.0 BEYOND NATIONAL BORDERS

MOROCCAN STUDENTS WORK ON AUTOMATION PROJECTS FOR COMPANIES

Students from universities in Morocco are gaining valuable qualifications and using cutting-edge German technology for industrial automation projects on behalf of German and Moroccan companies. It's all part of an industrial practice program in the field of Industry 4.0, or connected manufacturing. Developed by the CCoA, a center of excellence specialized in automation, a number of leading German electronics companies have been involved in the program since early 2021. The CCoA project is managed by a team at Steinbeis University, which has already supported more than 500 participants through the program.

INVEST FOR JOBS

Under its Invest for Jobs brand, the German Federal Ministry for Economic Cooperation and Development has pulled together a range of offers aimed at supporting European and African companies in their efforts to boost employment in Africa. The objective of the development policy is to work with companies in creating and maintaining good jobs and training opportunities in (currently) eight partner countries – and to improve local working conditions.

More information:

www.invest-for-jobs.com

The CCoA is funded through a special training and employment initiative at the German Federal Ministry for Economic Cooperation and Development. Going by the name Invest for Jobs, the initiative is partly being run by the German Society for International Cooperation (GIZ) in collaboration with the Moroccan Ministry of Industry and Trade.

Morocco is establishing itself as an important industrial location and a logistical hub for the African continent. The aim of the CCoA was therefore to support knowledge sharing in the field of automation and digitalization technology in key industrial sectors in the country, especially in the automotive and food industries.

To kick off the project, numerous interviews were conducted with Moroccan companies as part of a CCoA study looking at the automation and digitization levels in selected industries in the country. The results of the survey are providing important impetus for the development of a digitalization roadmap, which will aim to improve the competitiveness of Moroccan industry and make the employment market fit for the future.

CONNECTED MANUFACTURING AND INDUSTRY 4.0

A central aspect of the program was to offer training to key influencers, including professors at the most important universities in Morocco, on the development and application of the methods of connected manufacturing, looking specifically at the context of Industry 4.0 using PLCnext, a platform provided by Phoenix Contact. In addition to the deployment of industrial software, the course also included the presentation of architectures, protocols, and development tools for industrial applications in the field of the industrial internet of things (IIoT), as well as human-machine interfaces (HMIs).

The CCoA pilot project was conducted by Götz Jäckel, who has lectured on Industry 4.0 in higher education for many years. Jäckel highlights that the technology and topics covered by courses were not geared to the industrial processes typically encountered in developing countries. Instead, training has been based on equipment that is state of the art for training within the context of Industry 4.0. "I was surprised – in a positive sense – by the preparatory training and high standards of university education in Morocco. There's not much difference between the courses here and those organized for graduates of universities of applied sciences in Germany," says Jäckel. He also found it remarkable how highly motivated the course participants were, investing their weekends in learning about new technologies. "The training offers an excel-

COMPETENCE CENTER ON AUTOMATION (CCOA)

The knowledge-sharing project of the CCoA brings together companies such as Siemens, Phoenix Contact, Rittal, and the German Electrical and Electronic Manufacturers' Association (ZVEI). Also a partner of the project, the Deutsche Messe Technology Academy has joined forces with industry and universities in Morocco to organize around 20 information and networking events, all addressing topics with a bearing on production technology.

The CCoA publishes the details of current events through LinkedIn and its website. People interested in receiving information on events are invited to register with the CCoA community.

Further information: www.competence-automation.ma

lent basis for cooperation between the participating universities and educational institutions in Morocco, and industry in Germany and Morocco – in all fields of industrial automation," stresses Dr. Ardin Djalali, CCoA project manager at Steinbeis University.

A PRACTICAL APPROACH TO KNOWLEDGE SHARING

For the next stage of the project, the CCoA team ensured there was strong emphasis on practical application. Industrial enterprises from Germany and Morocco were invited to provide universities and students with assignments. These should be as concrete and practical as possible – without incurring extra costs by offering assignments, and without entailing further obligations on behalf of the companies. The CCoA succeeded in attracting 27 leading industrial companies and technology networks to provide assignments and discover the talent pool in Morocco.

Industry 4.0 experts reviewed 59 project proposals in total and these were forwarded to the Moroccan educational institutions participating in the program. Roughly 500 students applied to participate in the projects. Presenting alongside non-profit organization EduNet, in September 2022 the CCoA unveiled the results of a student competition organized at one of the most important technology conferences in Morocco, SADASC in Marrakech. Phoenix Contact, which played an instrumental role as a partner of the CCoA training courses and is a leading company in the German electronics industry, will honor outstanding projects with the Young Talents in Automation Award. This will include financial support for the teams to continue developing their ideas. John Ulrich Fimpel, who has supported the CCoA from the beginning as a business scout for the industry association ZVEI, describes the next tasks of the project: "We want to attract companies and networks in Germany and provide them with a totally straightforward and practical way to get to know the economic potential of one of Africa's most important emerging industrial markets."

The CCoA website presents some of the profiles of students, whose skills are representative of a unique talent pool for building industrial know-how in Morocco. The CCoA experts in Morocco and Germany also offer industry stakeholders different ways to directly approach students and universities with queries. The plan is to extend the current phase of the project and focus more clearly on startups and SMEs in Morocco. Events will also be organized, not only to foster further development of young Industry 4.0 talent, but also to promote business matchmaking between Germany and Morocco.

HANS GÄNG
info@localglobal.de (author)

CEO
local global GmbH
(Stuttgart)

www.localglobal.de

DR. SARAH KUNKEL
sarah-fee.kunkel@steinbeis.de

Project Manager
Competence Center on Automation
Graduate School of Leadership & Management of the Steinbeis University (Berlin)

www.steinbeis.de/en/su/2232
www.competence-automation.ma

CAREFUL! IT'S HOT AND CUTS LIKE A KNIFE

STEINBEIS EXPERTS DEVELOP A PLASMA CUTTING TORCH FOR THE THERMAL CUTTING OF MULTI-MATERIAL COMPONENTS

Materials development is advancing in leaps and bounds in a number of areas of industry, especially in the automotive sector, rail vehicle construction, and plant engineering. All of these areas use a variety of materials such as steel, aluminum, plastics, composites, and components made from a mixture of materials. An increasing number of metallic parts offering particularly high material strength are also finding their way into car body construction. But at the same time, rescue workers attending road accidents must be able to use thermal means to take strong car body parts apart quickly and precisely in order to free injured passengers. Having recognized this issue, a team of researchers at Intelligent Functional Materials, Welding and Joining Techniques, Implementation – the Chemnitz-based Steinbeis Innovation Center – joined forces with SGE, an equipment development specialist, to develop an innovative plasma torch that uses thermal energy to cut through electrically conductive and non-conductive components, independent of material type.

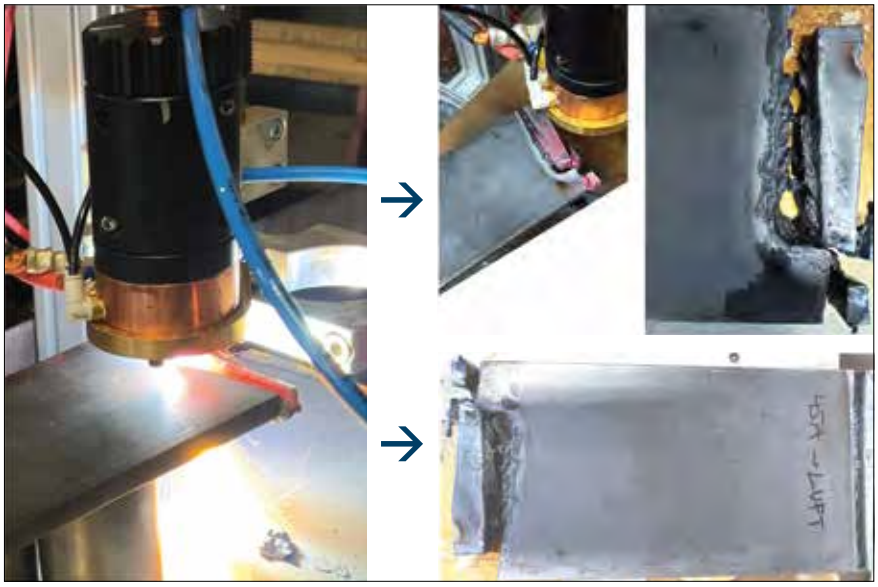
The project team was quick to realize that the technical and technological complexity of the project could only be addressed by leveraging the principles of non-transferred plasma arc welding. This involves using an internal burning arc to thermally ionize the outflowing process medium within the torch head in the form of plasma gas or pure air. The process would make it no longer necessary to apply current to components, such that the flame cutter can also be used on thermoelectrically non-conductive materials. A prerequisite for developing such a cutting torch is a flame cutting system with the required strength and efficient cooling.

REQUIREMENTS FOR THE PROTOTYPE

Before the engineers could get down to business, they first had to define and determine technical process data. This information formed the basis of the overall process engineering concept for the plasma arc cutting process, including which materials to use, the functional parts of the torch, process engineering performance, and the newly designed torch cooling system. The team working on the project defined the following technical parameters and criteria for the torch prototype:

↖ The torch prototype featuring a plasma cutting torch with a non-transferred arc

- **A functionally reliable flame cutter system based on non-transferred plasma arc technology with a maximum torch capacity of 200A**
- **Error-free arc ignition, delivering strong arc performance and high process stability**
- **The possibility to use untreated air and inert gases as the process medium**



Plasma cutting tests involving the thermal cutting of metallic components

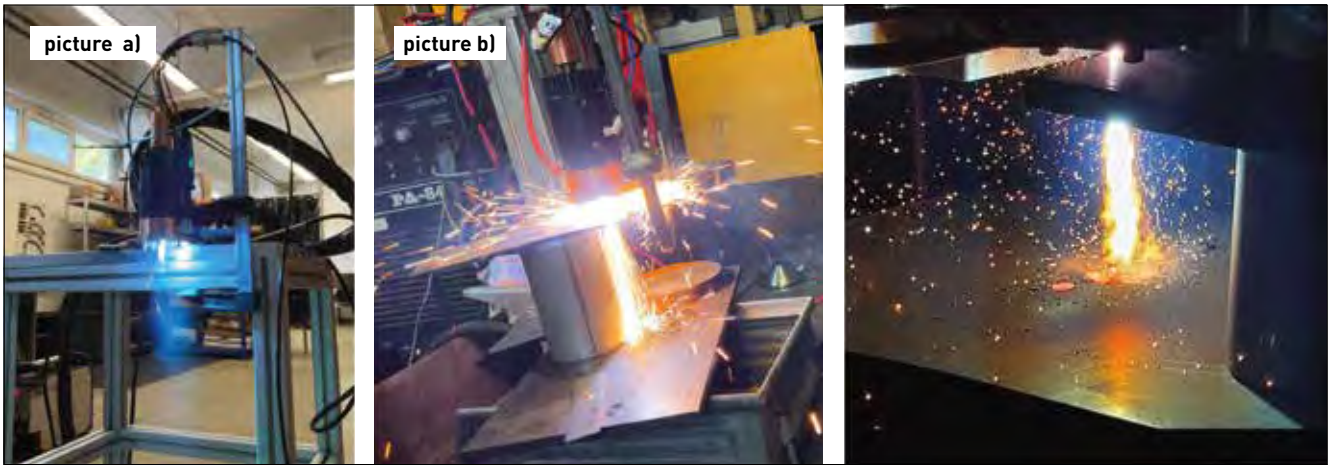
- **Double cooling in the torch head to provide a powerfully cooled electrode/cathode (round electrode) and plasma nozzle/anode**
- **Adjustable spacing controls between the cathode and anode**
- **The possibility to determine process parameters for the thermal cutting of metallic and non-metallic materials, based on defined cutting depths, cutting speeds, and burner intensity**

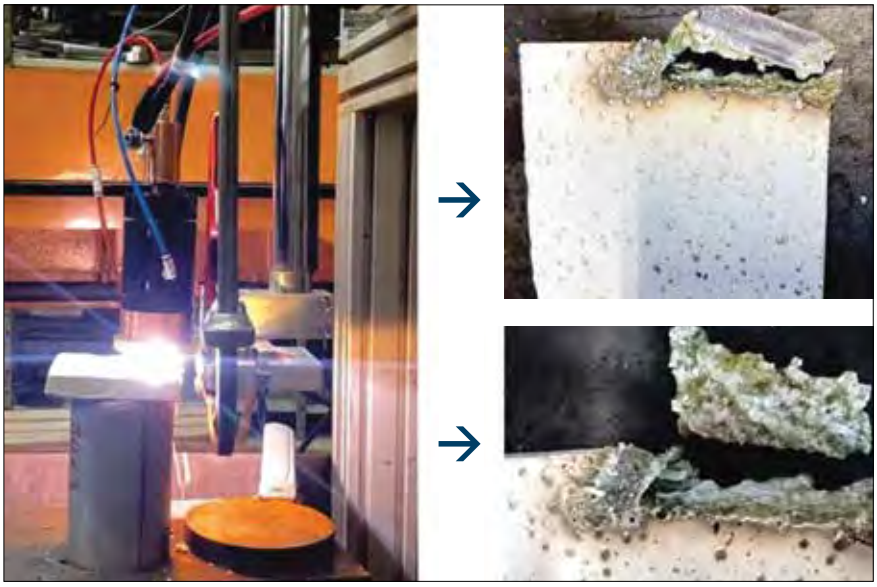
Referring to these criteria, the Steinbeis experts worked with SGE to build a prototype burner. Non-transferred plasma arc technology proved to be suitable for the plasma cutting torch to achieve the required electrical torch rating of 200A. As required, the head of the plasma cutting torch was fitted with the powerfully cooled round electrode/cathode, offering regulated cathode spacing and a cooled anode. As a result, the plasma cutting arc formed between the cathode and anode is capable of burning independently of current being applied to components.

PUTTING THE PROTOTYPE THROUGH ITS PACES

The new prototype burner was subjected to rigorous testing. Numerous cutting tests were conducted on steel components and non-metallic materials, and the prototype proved effective not only in terms of the process, but also when it comes to function and performance: electric potential, ignition, gas-tightness, watertightness, process performance, burner cooling – flawless on all counts. For the ignition process, use was made of a

An arc forming on a non-transferred plasma cutting arc with the assembled torch prototype, using different electric currents and air as the process medium: a) I = 80A, b) I = 130A





Plasma cutting tests involving the thermal cutting of non-metallic components

high-frequency ignition unit from a power inverter or plasma current source. The project team conducted detailed testing of the process on the prototype, looking at thermal cutting performance on multi-material components and composites. The result: a torch prototype offering zero defects and a reliable plasma arc, effective torch cooling, and powerful cutting, especially when using air as the process medium.

To conclude the project, validation work was carried out on the new prototype of the plasma cutting torch. Cutting tests were conducted on steel materials, concrete, and plastics, looking at component thicknesses and cutting depths ranging from 1 to 30mm, cutting speeds of 500 to 2,200mm/min, currents ranging from 45 to 150A, and air pressure flow rates of between 5.0 and 5.8 bar. As expected, the team detected no signs of wear or thermal damage on the electrode/cathode and plasma nozzle. The temperatures measured at the cooled plasma nozzle/anode ranged from 60 to 120°C, at currents of between 45 and 150A as well as different cutting depths and speeds. The tests clearly showed that the double cooling method applied to the torch head to cool down the active electrode/plasma nozzle areas works well with the defined torch output of 200A. For the project team at the Steinbeis Innovation Center for Intelligent Functional Materials, Welding and Joining Techniques, Implementation and the experts at SBU, it was thus clear that they had achieved what they set out to and successfully completed the project!

ASSOCIATE PROF. DR.-ING. HABIL. KHALED ALALUSS
khaled.alaluss@steinbeis.de (author)

Steinbeis Entrepreneur
Steinbeis Innovation Center
Intelligent Functional Materials, Welding and Joining Techniques, Implementation (Chemnitz)

www.steinbeis.de/en/su/1644

FRIEDEMANN SELL
friedemann.sell@steinbeis.de

Project assistant
Steinbeis Innovation Center
Intelligent Functional Materials, Welding and Joining Techniques, Implementation (Chemnitz)

www.steinbeis.de/en/su/1644

DR. JUR. LARS KULKE
lars.kulke@steinbeis.de

Steinbeis Entrepreneur
Steinbeis Innovation Center
Intelligent Functional Materials, Welding and Joining Techniques, Implementation (Chemnitz)

www.steinbeis.de/en/su/1644

ALEXANDER PFAFF
apfaff@sgegmbh.de

Managing Partner
SGE Spezialgeräteentwicklung GmbH (Pirna)

www.sgegmbh.de

DR.-ING. HAYDER AL-MASHHADANI
hayder.al-mashhadani@steinbeis.de

Project assistant
Steinbeis Innovation Center
Intelligent Functional Materials, Welding and Joining Techniques, Implementation (Chemnitz)

www.steinbeis.de/en/su/1644

TIM KRAUSE
tkrause@sgegmbh.de

Project assistant
SGE Spezialgeräteentwicklung GmbH (Pirna)

www.sgegmbh.de

SUCCESSFUL EVENTS AND WHAT'S IMPORTANT TO CREATE A LASTING IMPRESSION

INSPIRATION FROM THE EVENT TEAM AT STEINBEIS EUROPA ZENTRUM

↑ Gendered Innovation Networking Event, July 2022 Stuttgart. © Hanna Schäfer

Think about the things you remember for a long time and all have something in common: They are linked to emotions. Or to be more precise, deep-seated emotions. According to Paul Ekman, these are surprise, disgust, anger, sadness, fear, and joy. The Steinbeis Europa Zentrum event team taps into two of those six emotions: surprise and joy. Every successful event includes elements that link to at least one of those two emotions – ideally even both. Every year, the Steinbeis experts organize a variety of events, involving plenty of variation regarding processes, purpose, and format. The team has gained valuable experience over the years and tried out a number of creative formats. It has also learned what doesn't work. In the following, the experts share some of the do's and don'ts of events.

Why are we particularly likely to remember events if they're linked to emotions? Emotional messages lead to a particularly intense "depth of processing." Stimulus processing no longer takes place subconsciously or automatically, but instead switches to serially and volitionally controlled processing mode. That's exactly what you want to happen with an event, because the information that's conveyed and stimuli compete intensely with other stimuli. Our brains take in roughly eleven million bits of information every second through our sensory channels. However, only a fraction of this – around 40 bits of information – is processed consciously. Evolution has trained our brains to filter out the important information from the deluge of stimuli. This is evaluated emotionally, effecting an emotional response such as arousal, or in particular situations a reinforcement of our behavior. It also leads to certain cognitive processes or subjective feelings (based on Scherer, K. R. (2000), Psychological models of emotion).

When you're organizing an event, it's crucial to produce stimuli – impulses that are perceived as important, linked to an emotion, and stored in the long term. Do that, and the event will be remembered for a long time. In the following four examples, we would like to show how this can work for a straightforward meeting, a larger company get-together, or an external workshop.

INSIGHT #1: TIME LIMITS

Whether you call it a slam, a pitch, or PechaKucha, event formats have one thing in common: You're playing with time. Time limits are now a firmly anchored element of event design. Everything revolves around the idea of moving beyond long-winded and thus attention-sapping presentations. If you set a time limit for presenters, and sometimes even strictly limit the num-

Campfire-Session, Event Unicorn or Transformer, Baden-Württemberg 2019. © Reiner Pfisterer

Clean energy for EU islands Forum 2022, May 2022 Rhodos. © Siora Keller

ber of presentation slides, out come concise, memorable, and entertaining presentations that stimulate creativity and capture the attention of the audience.

We tried this out and succeeded in 2019, for example at the Unicorn or Transformer in Baden-Württemberg event, which we organized for the Baden-Wuerttemberg Ministry for Economic Affairs. After a morning of keynote presentations and discussion sessions, the participants were assigned to so-called campfire sessions to look at different instruments used to fund innovation. The people we asked to lead the sessions talked about their topics in a five-minute presentation. This provided an initial overview of the different sessions, allowing questions to be discussed openly with the whole group and unresolved issues to be clarified. Shifting the proceedings off the stage and into smaller discussion groups fulfilled a second purpose of augmenting attention, which brings us on to our next insight, the topic of movement.

INSIGHT #2: GET THINGS MOVING

A simple ingredient for gaining attention is animation. When triggered by movement, our brains automatically redirect their focus back to the action. This actually works in two directions.

Barcamp, Smart Cities Marketplace Forum 2022. © Esben Pejstrup

Firstly, it affects the presenters: When presenters move around on the stage, move into the audience, or get the audience to look in a different direction, they're guaranteed to grab attention. As a result, we advise presenters to move around during presentations or speeches! Secondly, movement is also an important recipe for success for the audience: Stand up, walk around the room, change the panel discussion, or conduct a live vote and a passive audience transforms into an active audience.

We really got things moving at the two-day Clean Energy for EU Islands Forum 2022 in May of this year in Rhodes. The first day took place in a conference room on a boat and a nearby island, taking us out of the room, out to sea, and into life on an island. Not only was that a good match with the topic of the event, but it also actively involved the participants in it and created lasting memories.

INSIGHT #3: STEPPING OUTSIDE COMFORT ZONES

Getting participants to step outside their comfort zones and see things from a different angle is never easy, but when it works, there are clear effects when it comes to lessons learned and memories. So why not get people participating in an event to present themselves? Role reversal adds a distinctly different feel to a conference, especially for the audience. A number of event formats can be used to reverse roles, such as planning a so-called BarCamp. Whether this is made part of a conference or used as a stand-alone format, it's an open approach to a convention using topics, sessions, and workshops that are not pre-defined. The sequence and contents of such "non-conferences" are established by the participants themselves at the beginning of the event; things take shape as the event progresses. An overarching topic can be laid down, but it doesn't have to be. What is crucial for the event to succeed is that the participants become involved.

A BarCamp was organized for this year's Smart Cities Marketplace Forum as part of a European Commission initiative of the same name, for which we are spearheading the communication campaign. Participants in the internal working groups were allowed to try out role reversal. Establishing an overarching theme made it possible for different stakeholders to open up their ideas (new local working groups) to discussion, to find like-minded people, and even to establish a basis for a new working group in the form of an initial concept paper.

INSIGHT #4: LIMITS

It takes a great deal of effort and passion to plan and run a big event. Expansive exhibition halls and packed rooms are impressive, but to forge connections that last and stoke emotions, a good event sometimes needs the exact opposite: small groups, a friendly atmosphere, and intensive discussion. We advocate looking closely at event planning and occasionally simply "planning small." This works extremely well with networking events and workshops, which often require small groups. At the same time, setting limits may also be important for the target group. For example, it might be better for an event to only address a specific target group – such as women or men if it's about gender equal-

WHEN YOU'RE ORGANIZING AN EVENT, IT'S CRUCIAL TO PRODUCE STIMULI

ity, or only participants from the energy industry if it's about a specific technology.

An example of a particularly atmospheric event we organized took place at the Steinbeis Europa Zentrum offices in Stuttgart in July. After joining forces with INNOVATIVE WOMEN, we hosted a limited networking event called Gendered Innovation to bring women together and allow them to network. The event started with a presentation, after which the participants engaged in dialogue, exchanged ideas, and provided one another with inspiration. This resulted in rewarding conversation, new contacts, and the feeling of having moved forward together.

HOLISTIC EVENT MANAGEMENT

Steinbeis Europa Zentrum has been running successful international congresses for more than 30 years, looking at a variety of current innovation topics. These now also take place in different physical, hybrid, and digital formats. The focus lies in a holistic approach to event, information, and communication management. This includes moderation, media, and methodological skills covering a variety of specialist topics.

The services offered by the event team range from end-to-end planning to conceptual planning, the actual running of events, and related communication measures. Most of the events are run on behalf of the Baden-Wuerttemberg Ministry of Economic Affairs, Labor, and Tourism, the State Ministry of Baden-Wuerttemberg, and the European Commission.

SABINE HAESSLER
sabine.haessler@steinbeis.de (author)

Events & Communications Manager
Steinbeis Europa Zentrum
Steinbeis 2i GmbH (Stuttgart)

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

HANNA SCHÄFER
hanna.schaefer@steinbeis.de (author)

Senior Events &
Communications Manager
Steinbeis Europa Zentrum
Steinbeis 2i GmbH (Stuttgart)

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

OLGA MARSCHALEK
olga.marschalek@steinbeis.de

Team Manager
Events & Communications
Steinbeis Europa Zentrum
Steinbeis 2i GmbH (Stuttgart)

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

"THERE'S NO SUCH THING AS INNOVATION WITHOUT FAILURE"

AN INTERVIEW WITH STEPHANIE ECKER, CHAIRPERSON OF THE SUPERVISORY BOARD OF STEINBEIS HOLDING GMBH

The Steinbeis Network realizes the visions of the man to whom it owes its name, Ferdinand von Steinbeis, in the fields of business, technology, and education. Among other pursuits, this involves entrepreneurial technology transfer as well as the concept that within vocational training, there is a relationship of duality between theory and practice. Based in Munich, Steinbeis Holding GmbH hails back to another branch of the family that makes a reality, through several shareholdings, of the concept of value-oriented entrepreneurship developed by Ferdinand and Otto von Steinbeis. TRANSFER magazine spoke to Stephanie Ecker, Chairperson of the Supervisory Board, about the things that make the group of companies special, its history, and how sustainability manifests itself in the holding company of today.

Hello Ms. Ecker. You came to Steinbeis Holding from the publishing industry. That's a big change, even if both areas involve lots of paper. How did that move come about and what challenges do you face in your new job?

As a member of the Steinbeis family now in its fifth generation – counting onward from Otto von Steinbeis, the company founder – ever since my childhood I've grown up with the paper mill, which used to be run by my grandfather. So paper of all forms and its production have always shaped my life and been with me. After doing an apprenticeship at a science publishing company, completing a degree in economics, and doing freelance work at an art book publishing company, it was a wonderful challenge for me to work as a publisher.

My departure from management in the fourth generation makes it the first time there's no longer a family member on the executive board – our involvement is now restricted to the supervisory board. As chairperson, I consider this role of supporting senior management, sharing my interest and understanding, a great privilege, while not losing sight of our family DNA. It's important, especially in such challenging times, for management of the holding to know it can count on the full loyalty of the family. It's growing continuously, and I think my most important challenge is to convey that.

© Steinbeis Holding GmbH

For us under the umbrella of the Steinbeis Foundation, the name Steinbeis is associated with a number of defining characteristics, the key ones of which are dual knowledge sharing and technology transfer, entrepreneurship, and innovation. What characteristics associated with the Steinbeis name distinguish Steinbeis Holding GmbH?

I can only fully concur with that description, because as far as possible those values are still held high and ascribed to at Steinbeis Holding and its subsidiaries. Education and training are an integral part of our entrepreneurial undertaking, which is why we work very closely with the Nordakademie in Elmshorn, and we'd also be interested in closer collaboration with Steinbeis University. But also knowledge sharing between the individual companies is not only something we encourage, it's essential. We firmly believe that social responsibility is an intrinsic part of running a business and it's against that background that innovation should happen.

Perhaps one thing that still distinguishes us is that we see curiosity and failure as one thing. There's no such thing as innovation without failure – it's just a matter of recognizing when to reconsider decisions. For example, in the 1990s we had a vision of expanding into Asia, but we quickly realized that as a medium-sized German company we'd overdone it.

Steinbeis Holding looks back on a company history of more than 150 years. What were the most important cornerstones of its development as a company?

The moments when the company adapted to new situations in society, and in order to do that even stepped away from traditional business models and products to make way for new ideas – those were milestones in our company history. The first cornerstone definitely has to be turning away from the timber business built up by Otto von Steinbeis, with the adventure in Bosnia and the Wendelstein Railway, and becoming a paper mill. The decision to supply Germany, as an emerging economy, with office products – especially self-adhesive labels – resulted in the setting up of Zweckform, the brand, which for a long time was very successful. Switching to recycled graph papers led to a completely new approach in terms of our orientation, and that laid a cornerstone for the guiding principles of our company today. We now define ourselves as a circular-economy enterprise. Our aspiration of extending the life cycle of resources is something we're also upholding in our new line of business – plastic recycling.

This clearly demonstrates that sustainability is extremely important at your company, not just in a business sense but also in terms of the technology. What are the success factors and challenges here?

We made a commitment to sustainability and the circular economy more than 40 years ago when we switched from color papers containing wood particles to recycled paper. Since then, it has become part of our identity that all projects and products should be considered against this background. Our every endeavor is to use resources as sparingly and efficiently as possible, and that applies all the more in a business that's as energy-intensive as ours is. We were very early to adopt a holistic stance on energy issues, so more than a decade ago we built our own waste-to-energy plant and invested in solar and wind energy, as well as biogas plants. Our aim is to anticipate all kinds of challenges and meet them with technological innovation. It's an approach that takes patience and liquidity, and maybe that's a success factor of family-owned businesses. They think much more in the long term and are prepared to be more patient going along with such developments. If you look at our involvement in different forms of energy generation, we're now reaping the benefits of a learning curve we started climbing when electricity prices were affordable, and now that's enabling us to be reasonably well prepared for the current crisis.

STEPHANIE ECKER
info@st-holding.de (interviewee)

Chairperson
Steinbeis Holding GmbH
(Munich)

www.st-holding.de
www.st-holding.de/generation-steinbeis

EFFECTIVE QUALITY ASSURANCE IN SPRING PRODUCTION

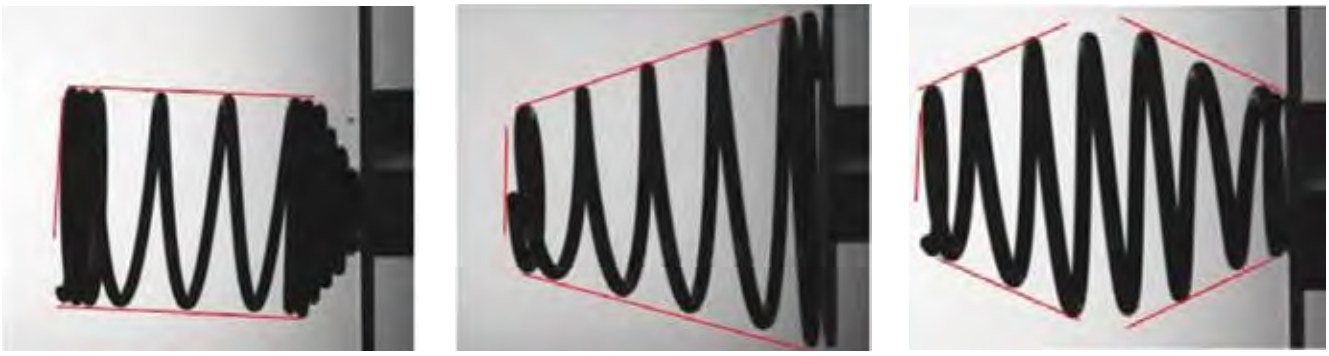
STEINBEIS ENTERPRISE DEVELOPS IMAGE PROCESSING SYSTEM THAT DELIVERS HIGHER QUALITY AND CUTS COSTS

A camera-and-lens measuring unit used with in-line quality control loops

Springs. They're found in almost all areas of our daily lives and ensure mechanical parts move correctly. For example, you'll find them in cabinets used as tension springs, or used as compression springs behind light switches next to staircases. The average car contains around 8,000 springs. This makes the quality and accuracy of springs particularly important when it comes to production. Quality assurance and imaging specialist Steinbeis Qualitätssicherung und Bildverarbeitung GmbH has developed an image processing system that cuts manufacturing costs and safeguards product quality.

The goal in spring manufacturing is to produce springs in the required quality, to continuously monitor quality, and to improve product quality on an ongoing basis. To safeguard quality in spring production, quality control loops can be introduced. These involve the use of quality control lines, quality control devices, quality reference variables, quality control deviations, and quality control parameters. For example in spring production, quality control reference variables are based on target values and a range of tolerances for the factors that dictate quality. To introduce quality control loops in practical terms, control systems need to be automatic and adaptable. They also have to match different processes and work pieces. Performance adhering to quality requirements thus depends on a combination of product and process quality control loops. One way to control quality in spring production is to use quality control charts.

Quality factors are managed by setting intervention points (UIP, LIP), warning points (UWP, LWP), and a center line (C) on a quality control chart. If spring measurements remain within the intervention and warning points, processes can continue as before. If they fall beyond those limits, which are calculated using distribution methods, systems are automatically interrupted to regulate the process and a search begins for the cause of deviations. If a measurement lies beyond a warning point, it's important to observe processes more carefully. The effectiveness of controls depends on the position of intervention points on the control chart.



Automatic detection of different types of springs (cylindrical, conical, double conical)

RETROFITTING IMAGE PROCESSING SYSTEMS TO DETECT SPRING TYPES

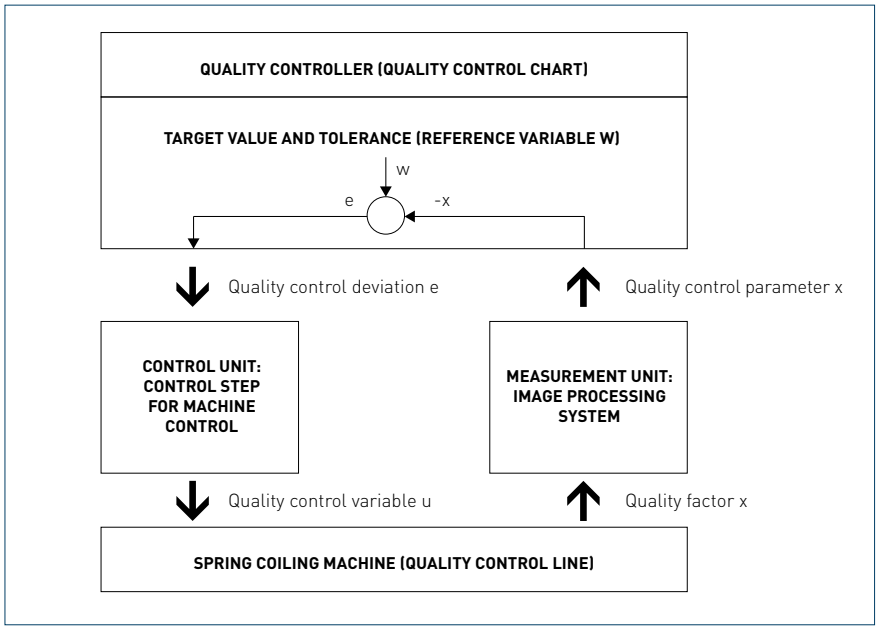
Springs are subject to extremely high quality standards, including spring geometry. This is where the expertise offered by Steinbeis Qualitätssicherung und Bildverarbeitung comes into play. The Steinbeis experts from Ilmenau have developed an image processing system called SpringTest. Their system can be fitted on modern spring coiling machines, delivering 100% spring geometry inspection in production. An essential component of SpringTest is an automatic, in-line "camera-and-lens" measuring unit, which recognizes different types of springs (cylindrical, conical, double conical) in captured images and measures the geometry of springs, such as length and diameter. "The entire system comes with measurement software based on a special image processing system that compares target geometries with tolerances and feeds control deviations into the machine control unit," explains Managing Director Steffen Lübbecke.

STEINBEIS SYSTEM CHECKS QUALITY ATTRIBUTES

Monitoring schedules should be kept straightforward and safe. At the same time, they should minimize downtime on spring coiling machines. Once machine operators have set up the machine to process a new spring, they just need to press a monitoring schedule button and the unit starts to detect the type of spring. This enables the system to set up a new monitoring schedule based on appropriate parameters – and the machine is ready for production. The software automatically detects the type of spring and its position, determining suitable measuring points for each spring under observation.

Another feature of the test software is that it can automatically track measuring points. Springs involve fast-moving manufacturing processes and as a result, the exact positioning of each spring tends to deviate from the previously produced spring due to vibration. The job of the software is to determine the new position of each spring as a result of that vibration and track measuring points accordingly. This allows up

Components and configuration of a quality control loop in the in-line quality control system of a spring coiling machine



Quick image backlights come in four sizes to match the different sizes of springs

Images of oscillating springs (horizontal, oscillating down, oscillating up)

to 900 produced springs to be inspected per minute with regard to geometry such as length or diameter. To do this, measurements are compared with control and tolerance limits. For example, if a spring is too long the software in the image processing system interrupts the process and automatically adjusts the spring length to ensure the next spring is of the correct length again. Tolerance limits stored by the system make it possible to sort springs automatically.

The system includes a special image processing software module for analyzing and measuring different spring geometries. To do this, it compares values for the diameter and length of each spring (which are supplied by the measuring unit with the camera) looking at target and tolerance values. If a spring deviates from given quality control values, i.e. if a measurement lies outside tolerance limits, a command is transmitted to the machine control unit.

FLEXIBILITY TO ADAPT TO OTHER MONITORING REQUIREMENTS

"The optical in-line inspection method described here for spring coiling machines has performed excellently in practical application, time after time, and it can also be used for other components. For example, it can also be used to conduct visual inspections on nails, screws, and other bent wire components," says Managing Director Professor Dr.-Ing. Gerhard Linß. One of the biggest benefits offered by the special image processing system is that it makes it possible to cut the cost of scrapping and reworking parts. With a small number of adjustments, the system can also be transferred to a variety of intermittently and continuously manufactured components, thus offering the Steinbeis Enterprise from Ilmenau a whole host of opportunities to keep developing its solution.

STEFFEN LÜBBECKE
steffen.luebbecke@steinbeis.de (author)

Managing Director
Steinbeis Qualitätssicherung und Bildverarbeitung GmbH (Ilmenau)

www.steinbeis.de/en/su/1544
www.sqb-ilmenau.de

PROF. DR.-ING. HABIL. GERHARD LINß
gerhard.linss@steinbeis.de (author)

Managing Director
Steinbeis Qualitätssicherung und Bildverarbeitung GmbH (Ilmenau)

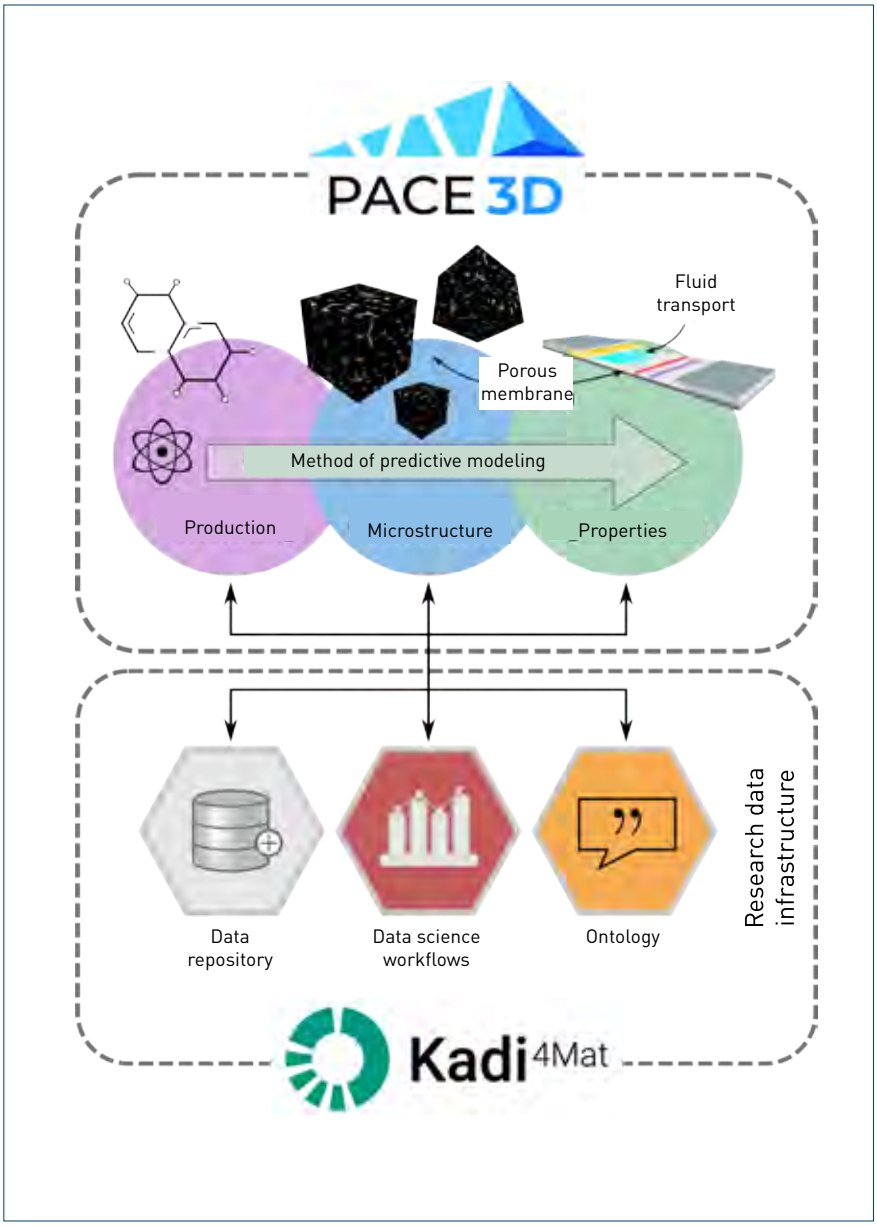
www.steinbeis.de/en/su/1544
www.sqb-ilmenau.de

THE FUTURE OF MATERIAL DEVELOPMENT IS MADE TO MEASURE AND EFFICIENT

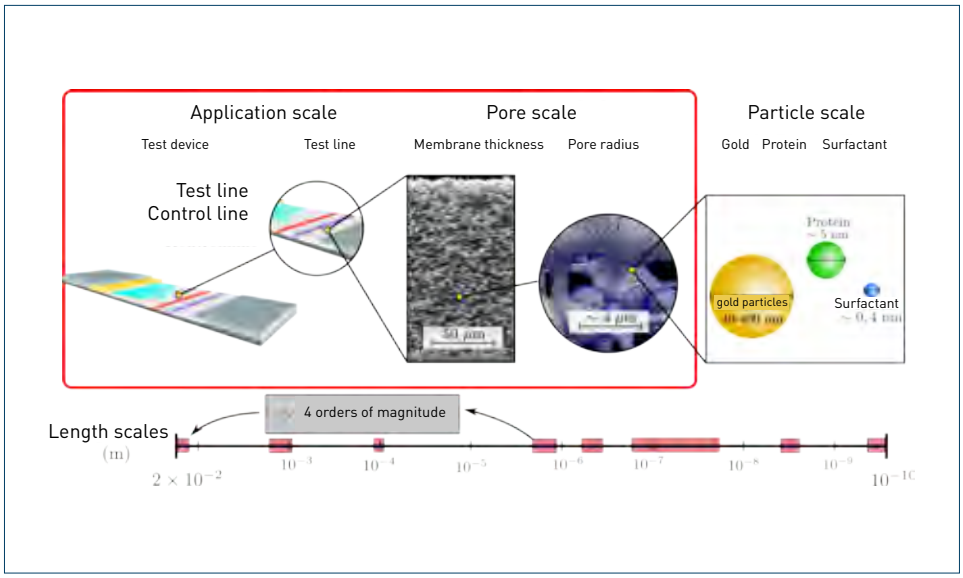
STEINBEIS EXPERTS USE PACE3D SOFTWARE TO DESIGN MICROSTRUCTURES AND ANALYZE DATA

Materials lie at the heart of many future challenges, especially in healthcare, medical technology, and strategies for dealing with climate change, resource conservation, energy supply, and energy storage. Understanding material properties and knowing how to influence them exactly as required makes it possible to improve technical components and develop new kinds of modules. Modern material simulations have now reached a stage of development such that many insights can be gained into the complex microstructures of individual materials and composites. Methods of sensitivity analysis based on simulations and data are making it possible to develop microstructures and thus also materials faster than in the past. To do this, experts at the Steinbeis Transfer Center for Materials Simulation and Process Optimization in Karlsruhe are using Pace3D simulation software developed at Karlsruhe University of Applied Sciences. In the following article, the team presents examples of best practice.

Simulation data help identify the relationships between the causes and effects of microstructures and material properties by using advanced methods of data science and machine learning. Knowing this not only allows new materials to be developed with made-to-measure microstructures, it also becomes possible to design enhanced processes. "As an integral part of a dynamically adaptive development cycle, material simulations enable us to



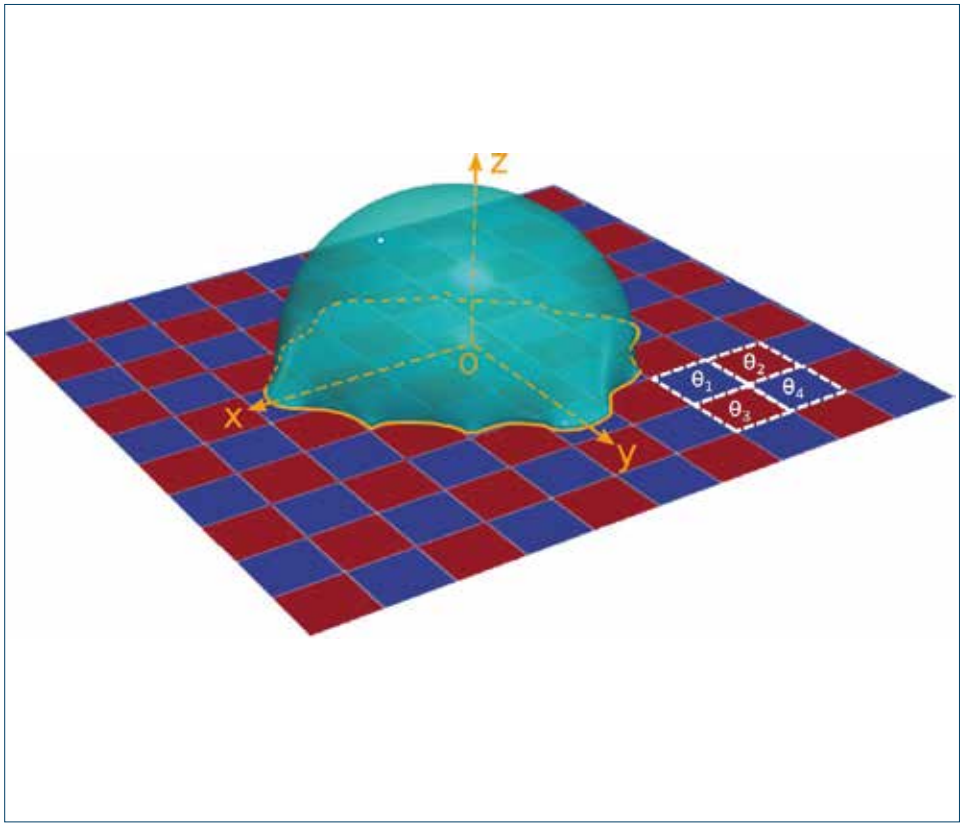
Development cycle for determining the relationships between microstructures and material properties © Steinbeis Transfer Center for Materials Simulation and Process Optimization



Simulation and the data-driven design of new membrane structures in medical testing applications
© P. Altschuh [5]

design new materials based on data, more quickly, and as a result they're an indispensable tool of material development for us," says Steinbeis entrepreneur Professor Dr. Britta Nestler, highlighting the importance of simulation software.

Pace3D [1,2] is a comprehensive modular software package for microstructure simulation. Optimized for use with high-performance computing (HPC) systems, it is being applied by the Steinbeis Transfer Center for Materials Simulation and Process Optimization to the computer-aided design of microstructures, involving a variety of materials and applications. In addition to concrete contractual projects, licenses of the software are being sold for use in development processes in material production and processing.



Simulation of a droplet of liquid on a structured surface
© F. Wang (for further simulation studies, see [6])

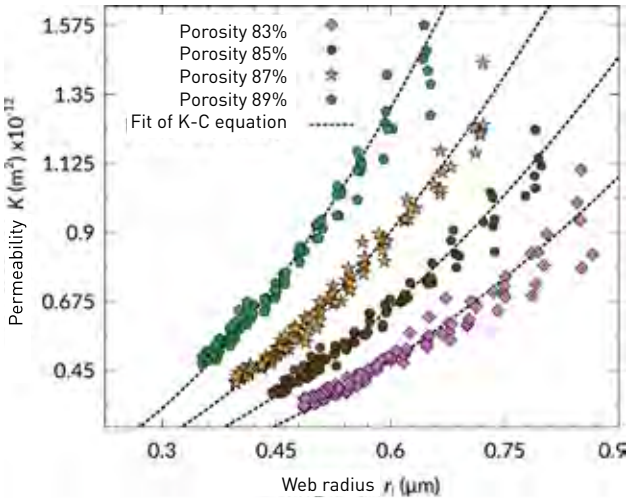
PACE3D – SUCCESSFUL BEST PRACTICE APPLICATIONS

The software can be used in a number of ways. For example, with the help of Pace3D, open-pore membrane structures required for medical diagnostic testing (such as rapid COVID tests) can be specifically designed to optimize fluid transportation. Another example: Analyzing the directional porosity and permeability of different rock substrates is central to the design of geothermal plants, energy storage systems, CO_2 storage, and the planning of efficient groundwater purification.

In addition, microstructure simulations make it possible to create detailed designs of surfaces in hydrophilic and hydrophobic areas. These help with the management of wetting processes and liquid droplet distribution in fields such as medical technology, microfluidics, the 3D printing of electronic circuits, and other applications.

AN EFFECTIVE TEAM: PACE3D AND KADI4MAT

The Pace3D software framework has been developed using C/C++ on Linux systems since 2001. It has been programmed to be modular, its build cor-



Porosity-permeability determination on porous membrane structures with variable web thickness © Steinbeis Transfer Center Materials Simulation and Process Optimization

responds to integrated physics models, and it uses full parallelization, offering impressive scaling properties on HPC systems. Pace3D comprises a compendium of methods used in data preparation, data transfer, and data evaluation, thus enabling integration into holistic multiscale modeling.

In a research culture in which open science is now a self-declared goal, a central role is played by open data alongside open access publication. As a result, Pace3D offers programming interfaces and close collaboration options with Kadi4Mat, the open source research data infrastructure [3,4]. This newly created platform makes it possible to follow FAIR principles (so it is findable, accessible, interoperable, and reusable) in order to drive science and innovation in the digital age. Kadi4Mat allows research and development data to be made available for other uses, also ensuring data remains reproducible in the long term. The aim in coordinating the development of the Pace3D and Kadi4Mat software is to set up electronic lab books, data analysis tools, and, resulting from those, workflows. It is also aimed to construct material science ontologies.

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PROF. DR. BRITTA NESTLER
britta.nestler@steinbeis.de (author)

Steinbeis Entrepreneur
Steinbeis Transfer Center Material Simulation and Process Optimization (Karlsruhe)

www.steinbeis.de/en/su/1272

MICHAEL SELZER
michael.selzer@steinbeis.de (author)

Steinbeis Entrepreneur
Steinbeis Transfer Center Material Simulation and Process Optimization (Karlsruhe)

www.steinbeis.de/en/su/1272

IF IT'S NOT TRANSLATED INTO ACTION, IT HAS NO VALUE

HOW TO BRING A CORPORATE STRATEGY OF EXPANSION INTO HARMONY WITH COHERENT CORPORATE VALUES

Based in Gottmadingen in the state of Baden-Wuerttemberg, CONRADYGRUPPE forms an umbrella over several cleaning companies in southern Germany and Switzerland. Its 4,500 employees work across a group of companies, generating annual sales of over €100 million. An important strategic goal of the family-owned business, now in its second generation under the management of Thomas Conrady, is business expansion. To help CONRADYGRUPPE succeed with its integration of all brands and companies into the corporate group, Steinbeis expert Ute Villing of the Steinbeis Transfer Institute for Leadership Psychology, HR and Organizational Development has been involved in the process. Offering many years of experience and expertise, Villing has been working with the corporation in an advisory capacity since 2019.

COWA Service was founded by Felix Conrady in Singen in 1965, making it the oldest brand within the group of companies. In those days, the firm was a cleaning specialist for large indoor areas, but after spotting the telltale signs of things to come, Conrady Snr. laid a foundation for the **CONRADY**-GRUPPE enterprise of today. The company quickly gained a foothold in the region and only five years later, it expanded into southern Germany and Switzerland, also forming partnerships in six European countries. It also set standards with its own cleaning products, its own methods, and its own quality assessment system. COWA has been operating in the cleanroom cleaning market since 1991. Its acquisition of SHS also brought advanced hotel cleaning into the corporate portfolio. Two further companies joined the group in 2015, dias and GMC, significantly expanding COWA's footprint in Bavaria and Switzerland.

EVERYTHING UNDER ONE ROOF

In 2020, **CONRADY**GRUPPE was formed, bringing COWA, dias, GMC, and SHS under one roof. In 2021, they were joined in the group of companies by service-system, a firm from Freiburg, followed by the Swiss company qualiServ in 2022. Since then, **CONRADY**-GRUPPE has been an industry player throughout German-speaking Switzerland. The group of companies now pools a variety of core competencies and experience, allowing many to benefit from shared knowledge, a lean organization, and a broad range of products and services. "To secure the future of our company and safeguard our direct presence on site, which is really important for commercial cleaning, we want to continue expanding," says Thomas Conrady, explaining his expansion strategy. "We're aware that this strategy also means we'll have to be careful how we integrate the different types of companies into our group – and their employees – so that over time, everyone feels that they belong."

Summer event –Trainees of the **CONRADY**GRUPPE on the canoe trip © Katharina Honold

Leaders on the move © Katharina Honold

Client advisor during a workshop with Ute Villing © **CONRADY**GRUPPE

The values of the **CONRADY**GRUPPE in large format © **CONRADY**GRUPPE

CONSULTING EXPERTISE FROM THE STEINBEIS NETWORK

As the corporation has evolved, Conrady Jnr. decided to seek external support with integration of the different companies, especially when it comes to organizational planning and HR development. In the fall of 2019, he contacted Steinbeis Entrepreneur Ute Villing, who, after exchanging views with senior management, brought different groups of employees into the equation to draft a concept for the next steps of organizational development. Despite a number of delays caused by the pandemic, Villing set about working on the project. In addition to participating in a number of events – in order to get to know the different organizations and their people – she also facilitated workshops and acted as a sparring partner to Conrady and the rest of **CONRADY-**GRUPPE management. Motivated by her principle of familiarizing herself with the work of her clients, Villing also spent the occasional day with cleaning

Experience together – hold together – grow together © **CONRADY**GRUPPE

staff, helping them to clean company buildings and schools. "It was the only way to gauge the support staff need on site," says Villing, explaining her motivations.

EXPANSION OF HR DEVELOPMENT

A decisive factor with rapid expansion within a group of companies is the introduction of systematic HR development. The aim should be to maintain training levels, or better still: improve training. To continue offering staff development prospects and thus also compensate for skilled worker shortages, training was given to a whole host of workers and managers, who were also promoted from within the company. There are now many examples at **CONRADY**GRUPPE of employees with little knowledge of German, or a lack of understanding of the company, developing into managers. To develop human resources, Villing worked with Conrady and the rest of the management team to plan first steps, also supporting Daniel Kramer, head of HR, with the introduction of performance review meetings. The new system is currently being rolled out across the entire group of companies. Work is also underway to introduce a staff training program that will include modules such as management development, the psychology of leadership, and a train-the-trainer program. Here, too, Villing is providing help with concept development and will also take on some parts of the program as a trainer.

GUIDELINES BASED ON A COMMON VALUE SET

To successfully integrate different types of companies under the same roof, it is essential to share a common understanding of values, and these values must be made tangible. When COWA was founded, naturally there was already a common vision, a philosophy, and a culture and these were shared, embraced, and believed in within the company. But growth also entails change – not just in terms of the organization, but also when it comes to communication, regional expansion and, not least, management structures. Within the last three years, 90% of managers working in central services have been new to the fold. The goal of Conrady is to make the group of companies more tangible as a community – for all managers, other staff, and customers. "Values are even more important now than they were then. There's fierce competition in the market, skilled workers are in short supply, and customers want to sense and experience the added value they gain from us. So our DNA must be perceptible – inside and outside the company."

CULTURAL INTEGRATION – A KEY SUCCESS FACTOR

Acquiring a company means looking closely at the so-called cultural fit. Since customer loyalty in the service industry is largely shaped and secured by the people on the ground, i.e. team leaders, customer service representatives, and people managing service centers, it is good to know who you are dealing with – in good times and bad. In essence, this is no different than aptitude testing when hiring a new recruit. So it's important with company acquisitions to conduct an appropriate assessment of the key people. This is not

without difficulty during the negotiation phase, and to paraphrase Shakespeare, often "the wish is father to the thought." The next challenge when merging organizational structures is cultural integration. This presupposes that communication is clear, open, and transparent and that time is invested in a detailed analysis. It is important to adhere to timelines and not promise the earth, so that the process remains sincere and reliable for everyone. This is about agreeing on a common denominator – a set of values that everyone involved in the process can identify with.

CORPORATE VALUES – DOING WHAT YOU PROMISE TO DO

As befits a self-respecting company, the corporate values were developed as part of a joint process, with everything captured in writing and shared through different channels of communication – in all areas of the network of companies. Although this process is a familiar one to many, since the methods used are usually similar, with **CONRADY**GRUPPE things were nonetheless different – and this was palpable. The topic did not disappear into a filing cabinet. Instead, the values were made tangible on a notional level – with a brochure of values, plus video statements on each individual value with practical examples. In addition to that, the values could be experienced in practice through shared activities beyond the borders of different regions or group companies – at trade shows, project kick-offs, or workshops on the topics of everyday life or the future. And those values are being embraced and believed in by all. The key to successful integration is communication on all levels. This is now central to the entire management team's perception of itself, because in addition to expansion, another challenge day in, day out at the company is cultural diversity, so that people from over 50 nations work together well, show tolerance, are open, and respect one another.

As Conrady adds, "Corporate culture is a living entity, and in our case this means that more than 50% of staff numbers and the sales turnover of **CONRADY**GRUPPE stem from the companies that joined the group. It's in the nature of things that existing corporate values are added to, or they're slightly modified. But you can't call the fundamental corporate culture into question: We want to inspire people, we want to develop – and we live by our principles. We're mindful and tolerant of colleagues and customers – because we trust each other."

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

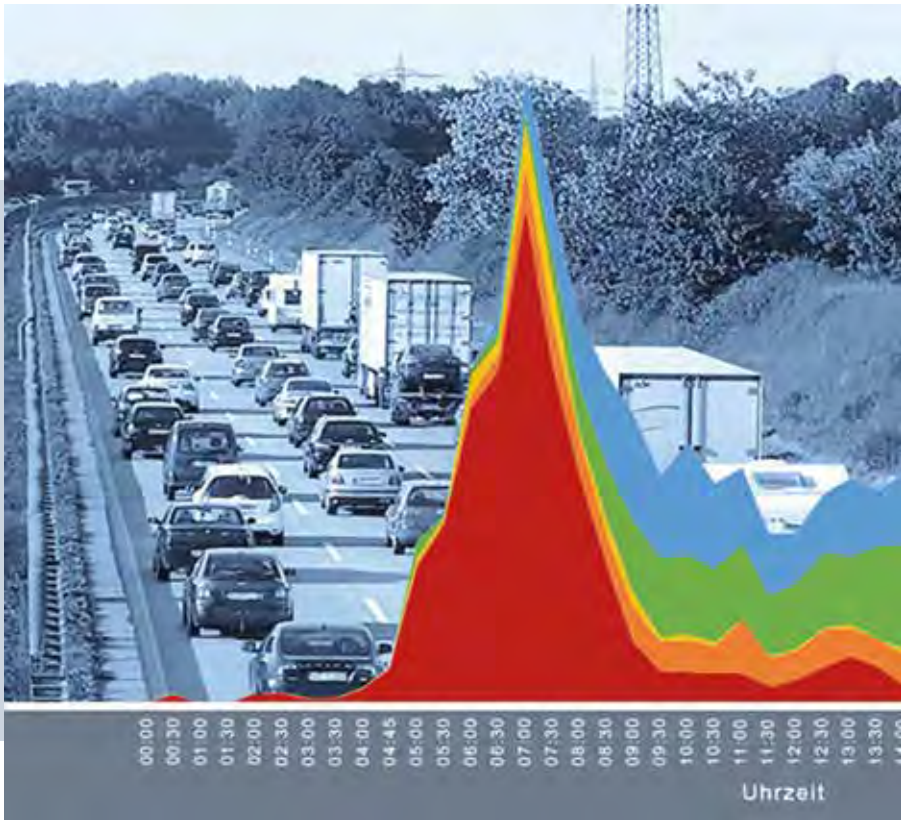
Steinbeis Entrepreneur
Steinbeis Transfer Institute
Leadership Psychology, HR and Organizational Development
(Gosheim)

www.steinbeis.de/en/su/2255

THOMAS CONRADY
TConrady@conradygruppe.com (author)

CEO
CONRADYGRUPPE
(Gottmadingen)

www.conradygruppe.com



NN-FAND: UNDERSTANDING THE DEMAND IN TRAFFIC FLOWS

STEINBEIS EXPERTS USE AI METHODS TO ANALYZE TRAVEL PURPOSES

In the German federal trunk route network automatic traffic counting stations are installed which permanently record the number of vehicles passing certain intersections. These counts result in repeating demand profiles, which are the basis for dimensioning the infrastructure. It is not known, however, what the motivations i.e. trip purposes are behind these demand profiles. As part of a project called NN-FAND, experts at the Institute of Transport Studies at Karlsruhe Institute of Technology (KIT) together with STASA Steinbeis Applied Systems Analysis conduct a feasibility study on possibilities to merge information on the temporal demand profiles at counting stations with other contextual information and data. The idea is to gain insights into the demand structures in terms of the different travel purposes which superpose to the measured profiles in the highway network for allowing an improved understanding for dimensioning the road infrastructure.

The Federal Ministry of Transport and Digital Infrastructure (BMDV) uses permanent traffic counting systems to automatically and continuously monitor the volume of vehicles passing through the intersections of the federal highway network. The information collected is used to dimension the road infrastructure, e.g. the number of lanes required to serve existing demand – efficiently and without disrupting traffic.

However, by reasons of technological, demographic and societal processes the demand volumes are likely to change at least in the split up of different travel purposes. And this is likely to affect the dimensioning as well.

NN-FAND PROVIDES MORE AND BETTER DATA

Although continuous automated counting offers insights into the timing and progression of traffic volumes in the form of demand profiles, there exists until now only rough information on the breakdown of that profile to different

Tracking travel patterns: NN-FAND is examining the motivations for driving vehicles. (Source: KIT-IfV based on data from the German Mobility Panel)

mFUND

As part of the mFUND innovation initiative, since 2016 the Federal Ministry of Transport and Digital Infrastructure (BMDV) has been funding data-centric R&D projects with a bearing on digital and connected travel, or so-called Mobility 4.0. Project funding is underpinned by active professional networking between stakeholders in politics, business, public administration, and research, as well as the provision of open data on the mCLOUD portal.

For more information, go to

www.mFUND.de

trip purposes or the user groups. The aim of the NN-FAND project is therefore to come up with simple estimates, to derive information from the demand profiles who is travelling and why. Standardized travel behaviour surveys such as the German Mobility Panel conducted by the German Minister of Transport and Digital Infrastructure (BMDV) contain information on the trips performed by individuals by mode, purpose and timing however without spatial reference.

Demographic and societal trends have a direct influence on travel purposes. For example, the share of the population working is likely to decline due to demographic changes. In addition, physical means of transportation are increasingly being replaced by "virtual travel," for example due to people working from home. "This results in different patterns of travel motivation, especially during periods of peak demand, which are relevant for infrastructure dimensioning," explains Professor Dr. Günter Haag, Managing Director of STASA.

Having examined the data from the mobility surveys, the project team has drafted "ideal" trip purpose differentiated demand profiles to provide usage patterns based on defined characteristics. These are being used to reproduce the demand profiles for individual fixed counting stations. For example, AI methods are being used to transfer usage patterns to other counting station data by looking at the similarities between infrastructure and environmental factors (type of location, position within the network). The aim is to gain a better understanding of usage patterns (trip motivations, users) and arrive at a causally justifiable prediction of the robustness of measurements under different circumstances.

To conduct its evaluations and merge information from different sources, the team of experts at STASA is using innovative AI methods, with the ultimate intention of demonstrating the specific applicability of those methods to the feasibility study.

DEMOGRAPHIC AND SOCIETAL TRENDS HAVE A DIRECT INFLUENCE ON TRAVEL PURPOSES.

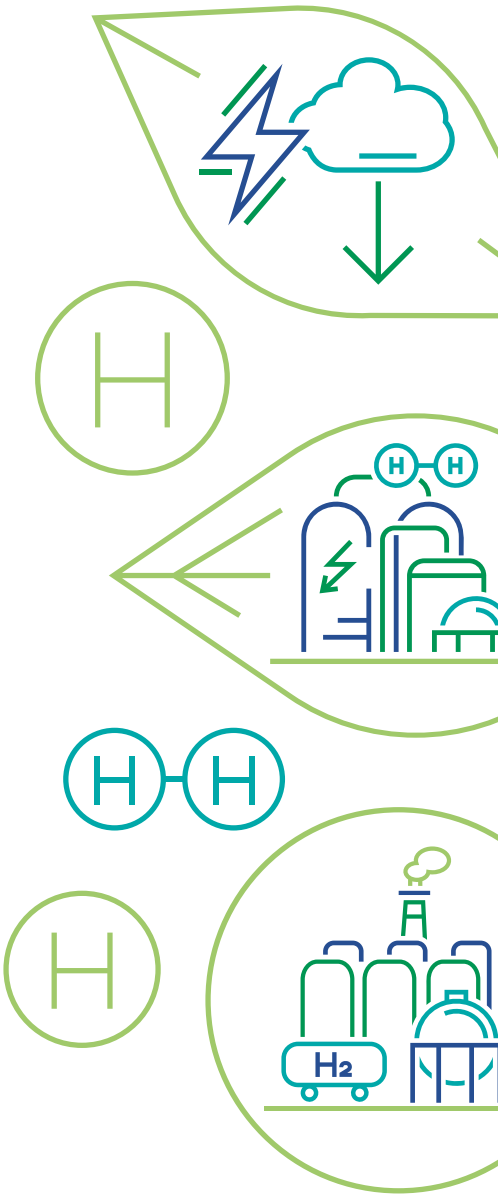
PROF. DR. HABIL. GÜNTER HAAG
guenter.haag@steinbeis.de (author)

CEO
STASA Steinbeis Angewandte Systemanalyse GmbH (Stuttgart)

www.steinbeis.de/en/su/1390
www.stasa.de

"THE FUTURE OF HYDROGEN IS GREEN"

STEINBEIS EXPERTS ANALYZE THE ELECTROLYZER MARKET



Hydrogen is considered an energy source of the future. Until now, producing hydrogen has almost exclusively involved using fossil fuels. This is for economic reasons. As part of H_2 Districts, a research project commissioned by the Federal Ministry for Economic Affairs and Climate Action, the experts at the energieplus Steinbeis Innovation Center have been investigating different ways to produce hydrogen by using water electrolysis in decentralized locations in close proximity to customers. Six showcase neighborhoods have been chosen in Baden-Wuerttemberg as urban and suburban locations for implementing the project and producing so-called green hydrogen.

To understand the technical and commercial challenges of this form of hydrogen production, the Steinbeis team conducted an analysis of the electrolyzer market. Their study was based on interviews with energy providers and producers. They also conducted secondary research. The results provide an overview of current industrial production capacities, investment costs (capital expenditures), efficiencies, stack temperatures, and the challenges faced by providers in selling and distributing green hydrogen.

The sector for water electrolyzer producers has all the hallmarks of new and expanding markets, which tend to be fragmented. The market is occupied by a large number of producers, the majority of which have built up comparatively limited capacities, and in some cases they can still only point to a handful of client references. The reasons for this fragmentation are the regional nature of markets and the low degree of automation in manufacturing.

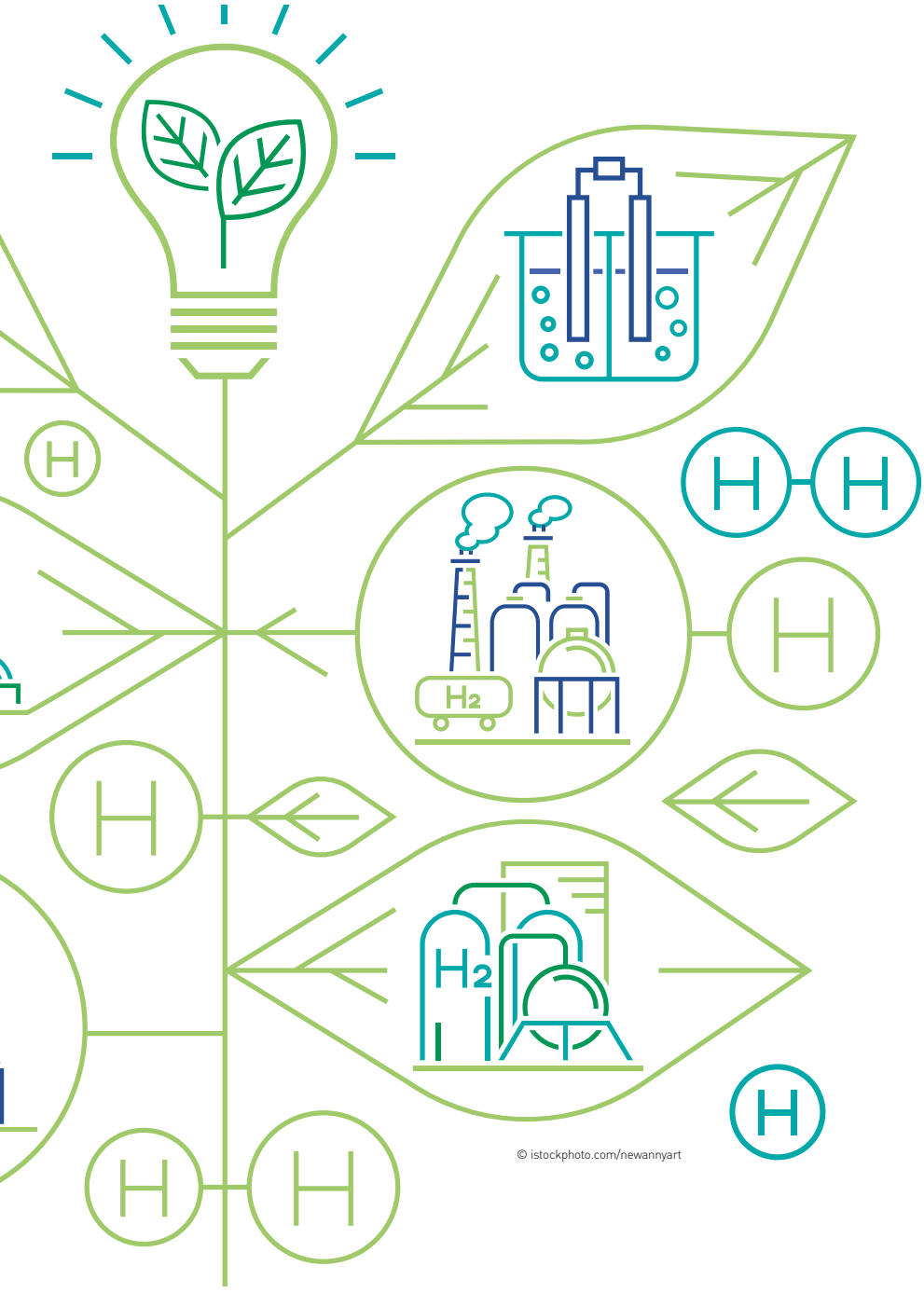
WATER ELECTROLYZERS – PRODUCTION CAPACITIES

According to the German government's National Hydrogen Strategy (NHS), the capacity of electrolyzers will increase in the country from 70 megawatts currently to 10 gigawatts in 2030. In other words, industrial ramp-up will increase by a factor of 140 over the next eight years. The providers surveyed for the market analysis indicated that in 2022, their supply capacity stood at 3 gigawatts per year. This is the electrical capacity of electrolyzers that could be made available in a particular year. Supply capacity is expected to rise to a total of 15-20 gigawatts per year by 2025. Even if there is a sharp rise in demand, this should not result in any bottlenecks on the supply side.

ELECTROLYZERS – COSTS AND EFFICIENCY

CAPEX levels across all processes for large-scale plants stand at around €1,000 per kilowatt of electricity. It is, however, sometimes difficult to make comparisons because not all producers offer the same scope of services with regard to the balance of plant (plant periphery; BoP). CAPEX levels could also fall significantly, since a growing number of producers plan to expand their increasingly automated production lines. With proton exchange membrane electrolyzers (PEMEL), the share of costs accounted for by BoP in 2020 was 55% [IRENA, 2020]. Market volumes have risen since then, although the Steinbeis experts also believe that economies of scale will continue to fuel significant cost reductions in this area as well.

Electrical efficiencies were on a similar level for all of the products that were surveyed, although solid oxide electrolyzers (SOEL) were not included in the analysis due to process-related



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WASTE HEAT RECOVERY CAN SIGNIFICANTLY INCREASE OVERALL EFFICIENCY

heat requirements. It is difficult, however, to compare manufacturer data, as there is no standard or guideline to act as a norm for determining comparable conditions for efficiency.

Waste heat recovery can significantly increase overall efficiency. Regarding stack temperature, all current products are suitable for supplying existing or new districts with heating energy via local heating networks. Furthermore, the stack temperature of most alkaline electrolyzers, which averages 76°C, is theoretically high enough to also provide heated domestic water. In practice, however, there are obstacles that make it difficult to use waste heat: Systems housed in containers often use compact heat exchangers with small transfer surfaces and correspondingly high temperature differences, and this requires very low inlet temperatures for the cooling medium. If heat pumps are used, inlet temperatures are crucial for the evaporation temperature of the refrigerant. To ensure heat pumps achieve high efficiencies or performance coefficients, it would be advantageous to use larger heat exchangers and higher inlet temperatures.

ELECTROLYZERS – PERFORMANCE AND FUNDING

There are currently thirteen publicly known electrolysis plants in operation in Germany with a capacity of more than 1 megawatt (as of 2022). They

have a total capacity of 70 megawatts. Of the seven electrolysis operators and owners that were interviewed, two were unhappy with the lack of standards in the stack market. In their opinion, it would be good if they were not tied to the original manufacturers when replacing stacks. They also harbor doubts regarding the speed with which service engineers from non-European manufacturers are available in the event of malfunctions.

Regarding the scale-up announced by politicians, five of the seven operators complained that there are not enough customers for further investments and that there is insufficient demand for green hydrogen. This is also reflected in the way green hydrogen has been used until now: Six out of the thirteen large-scale electrolysis plants currently feed hydrogen into the natural gas grid. Only six supply hydrogen to industry. For economic and environmental reasons, green hydrogen should primarily be used in industrial processes that are otherwise difficult to decarbonize [Agora Energiewende, 2021].

"Fast-acting implementation strategies and long-term funding instruments are needed to increase demand for green hydrogen. Although the market ramp-up of P2G technologies and the exploitation of economies of scale can be expected to significantly reduce investment costs in the long term, the decisive factors will be the future price of green electricity and the achievable full-load hours of electrolytic hydrogen production. The hydrogen market ramp-up should be developed and promoted in a European context, thus leveraging economic and geopolitical advantages," recommends Steinbeis Entrepreneur Professor Dr.-Ing. M. Norbert Fisch. The total production costs of large-scale plants are largely driven by operating and maintenance costs, which is why more attention should also be given to other measures. CO_2 prices are currently still too low to have a significant impact. Redefinition and increases are needed in this area. As previously stated in its national hydrogen strategy, the federal government plans to use "carbon contracts for difference" (CCFD). This is where the government covers the additional costs of climate protection projects in the steel and chemical industries, indirectly providing incentives to engage in hydrogen production.

Established in 2021, the H_2Global Foundation is also expected to contribute to this. The goal of the foundation, a collaboration between private-sector companies and the federal government, is to establish an auction platform for hydrogen products (similar to an exchange system), which will regulate both international procurement and sales in Germany. Similar to the CCFD approach, the initial price differences between procurement and selling would be covered by the federal government. In addition to previously introduced measures, it might also be worth considering a quota system that obligates selected industries to increase their use of green hydrogen [e-mobil BW GmbH, 2022]. Such a system could amplify the effectiveness of the aforementioned mechanisms. All of the above measures could offer synergies not only in the area of climate protection goals in Germany, but also regarding market ramp-up, and the Steinbeis experts are of the view that both should be pursued more vigorously.

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PROF. DR.-ING. MANFRED NORBERT FISCH
manfred-norbert.fisch@steinbeis.de (author)

Steinbeis Entrepreneur
Steinbeis Innovation Center energieplus (Braunschweig/Stuttgart)

www.steinbeis.de/en/su/1725

DR. CHRISTIAN KLEY
christian.kley@steinbeis.de (author)

Steinbeis Entrepreneur
Steinbeis Innovation Center energieplus (Braunschweig/Stuttgart)

www.steinbeis.de/en/su/1725

BENJAMIN TRIPPE
benjamin.trippe@steinbeis.de (author)

Assistant
Steinbeis Innovation Center energieplus (Braunschweig/Stuttgart)

www.steinbeis.de/en/su/1725

TIM SORG
tim.sorg@steinbeis.de (author)

Assistant
Steinbeis Innovation Center energieplus (Braunschweig/Stuttgart)

www.steinbeis.de/en/su/1725

SIMON MARX
simon.marx@steinbeis.de (author)

Assistant
Steinbeis Innovation Center energieplus (Braunschweig/Stuttgart)

www.steinbeis.de/en/su/1725

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AUCTION PRICES AND FUNDAMENTAL REAL ESTATE VALUES

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THE IMPORTANCE OF THE MINIMUM BID IN AUCTIONS

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Auctions are increasingly coming into use in the real estate industry as a pricing mechanism. People participating in auctions usually have an expert valuation at their disposal for guidance purposes. For the average market stakeholder, values derived from such sources constitute the fundamentally justifiable price of a real estate item, and ideally this should take into account the features of an asset and market conditions. As a rule, transaction prices subsequently achieved in auctions can sometimes deviate considerably – in either direction – from the market value determined by experts. This raises a question: Why do such differences occur? One particularly important factor in such instances is the minimum bid. With the exception of foreclosure auctions, there is no standard procedure for determining minimum bids.

The subject of this paper is therefore to examine which factors are taken into account when establishing minimum bids for open auctions, as well as factors that may potentially justify high or low prices.

GENERATING CROSS-INDUSTRY VALUE IN IOT ECOSYSTEMS

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Designing business models in IoT ecosystems is a major challenge for wholesale companies. The status of research illustrates that existing approaches do not sufficiently consider changes within the context of IoT ecosystems or the specific nature of the wholesale sector.

This paper offers a methodological approach that supports wholesale companies with the design of business models in IoT ecosystems. In order to achieve this research goal, five case studies were conducted in different areas. Based on these case studies, eleven steps were derived. These are supplemented by interviews with 13 experts from the wholesale sector. In the course of this survey, 59 business capabilities were identified. The scientific findings of this paper have been converted into a toolbox tailored to the wholesale industry, with the aim of producing tangible results that can also be used by wholesale companies. Finally, the output of this work was assessed in group interviews with six wholesalers.

PREVIEW

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Technology for SMEs
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For the last two years, Steinbeis TRANSFER magazine has focused primarily on productive solutions offered by the experts of the Steinbeis Network. In 2023, our authors will adopt a slightly different approach in their articles. The authors in our three issues will shout out for "SME Innovation!" In the first issue of 2023, we show the often hidden potential of innovative technology offered by medium-sized enterprises. The pragmatic approaches adopted by such companies, in combination with their heartfelt passion and detailed, often highly specialized expertise, are a recipe for success for hi-tech projects, which are generally implemented by such "hidden champions" unnoticed by the general public. The experts at Steinbeis offer insights into the challenges and highly specific requirements of technological innovation at small and medium-sized companies.

ONLINE INSIGHTS

Going online and talking with our authors:
Two of our events – **STEINBEIS LUNCHBREAK** and **3 QUESTIONS FOR...** – offer a unique opportunity to gain deeper insights into the projects presented in **TRANSFER** magazine.

THE STEINBEIS LUNCHBREAK. A QUICK MORSEL WITH...
www.steinbeis.de/lunchbreak and www.youtube.com/c/steinbeisverbund

3 QUESTIONS FOR...
www.steinbeis.de/drei-fragen-an sowie www.youtube.com/c/steinbeisverbund

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EDITOR
Steinbeis GmbH & Co. KG für Technologietransfer
Adornostr. 8 | 70599 Stuttgart | Germany
Phone: +49 711 1839-5 | E-mail: stw@steinbeis.de
Internet: transfermagazin.steinbeis.de | www.steinbeis.de

EDITOR-IN-CHIEF
Anja Reinhardt
Adornostr. 8 | 70599 Stuttgart | Germany
anja.reinhardt@steinbeis.de

EDITORIAL COORDINATORS
Anja Reinhardt, Marina Tyurmina, Luisa Dietrich
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 5,500 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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