



Steinbeis



Steinbeis Foundation (Ed.)

CREATING MEANING,
CREATING VALUE.
STEINBEIS
1983 – 2023

Imprint

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Steinbeis Foundation (ed.)

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ENTRY



DEAR READER,

The modern era of the Steinbeis Foundation began forty years ago: In 1983, Johann Löhn laid the foundation for today's network of more than 1,100 Steinbeis companies with his system of entrepreneurial knowledge and technology transfer processes. He transformed the Steinbeis Foundation, named after Ferdinand von Steinbeis (1807 – 1893) and founded in 1971, into a framework for entrepreneurial knowledge and technology transfer.

Ferdinand von Steinbeis is considered the father of dual education in Württemberg. As a business promoter, he supported the transfer of knowledge and technology as well as the founding of technology-oriented companies. For some time now, we have been taking a closer look at Ferdinand von Steinbeis for various reasons and, in the course of the past forty years, at the history, origins and future of Steinbeis: because in a complex like Steinbeis, where, according to Heraclitus, nothing is more constant than change, everyday life is shaped by the present and the opportunities of the future – not really by looking back into the past. However, the challenges of this change make one thing clear: "The future needs origins" (Odo Marquard). This origin and our Steinbeis heritage in the sense of a cultural and entrepreneurial inheritance are increasingly important arguments for winning people over for joint, meaningful work, especially when it also serves to create and promote the common good.

FERDINAND VON STEINBEIS: "BUSINESS ANGEL" IN THE KINGDOM OF WÜRTTEMBERG

So who was our namesake and what does the Steinbeis Network have to do with him today and tomorrow? Ferdinand von Steinbeis is known to many as the founder of dual industrial training in Württemberg from 1853. His concept of knowledge transfer is characterized by a double duality, which Johann Wolfgang von Goethe already described: "It is not enough to know – one must also apply it. It is not enough to want – one must also do it". Regardless of whether Ferdinand von Steinbeis was aware of these criteria for successful knowledge transfer, which are still essential today, he defined his criteria in the context of knowledge transfer in his time, which was also extended to technology transfer, in this way: "Whoever wishes to devote himself to higher industry should never lose sight of the fact that it is a craft wedded to science and requires knowledge and skill at the same time [...]".

In his role as business promoter in the "Central Office for Trade and Commerce" of the Kingdom of Württemberg (Stuttgart), which was founded in 1848, Ferdinand von Steinbeis was a mentor for "start-up" companies and helped future company founders. For example,



→ he supported the founding of the companies Grotz (Ebingen), Württembergische Metallwarenfabrik (Geislingen), Schuler (Göppingen), Märklin (Göppingen), Hohner (Trossingen), Magirus Deutz (Ulm), Fein (Stuttgart), Voith (Heidenheim) and helped the start-up founder Gottlieb Daimler with a scholarship for his studies.

In the transfer of knowledge and technology, he relied on the principle of “transfer via heads”, which is still valid and effective today: explicitly, especially in teaching, also at trade fairs and implicitly via documents and publications. The first Steinbeis Foundation, established in 1868/69 in recognition and appreciation of his commitment, had the promotion of dual education as its main purpose.

The reason that prompted Ferdinand von Steinbeis to resign as President of the Central Office is also interesting for today: he was against protective customs barriers and believed that industry should be able to assert itself on the international market. In his opinion, the Württemberg Chamber of Deputies was too harsh on him for this – he drew his conclusions and resigned.

JOHANN LÖHN: STEINBEIS RELOADED

A century later, the modern era of today’s Steinbeis Foundation, which was established in 1971 as a non-profit foundation under civil law, began in 1983. The task of the foundation was the organizational support of the so-called Technical Advisory Services (TBD) at the state engineering schools (now universities of applied sciences) in Baden-Württemberg. The initial aim of the TBDs was to provide SMEs throughout the state with the consulting expertise of lecturers from the engineering schools in an unbureaucratic manner, but this was deliberately organized outside of the schools.

In terms of the state’s innovation system, the 1980s were characterized by a spirit of optimism, openness to technology and a profound recognition of the necessity of innovation for a state like Baden-Württemberg. Entrepreneurship was an essential part of the culture and a key element in successfully shaping the structural change (transformation) of the economy.

As Rector of the Furtwangen University of Applied Sciences and professor with entrepreneurial and concrete experience in knowledge and technology transfer, Johann Löhn used the two principles of public-private partnership (among other things in the concept of transfer centers – today’s Steinbeis enterprises – developed from the TBDs) and entrepreneurship to realize the entrepreneurial knowledge and technology transfer system that still characterizes Steinbeis today for the establishment and expansion of the Steinbeis network from 1983 as Chairman of the Foundation. This enabled a selfsustaining, entrepreneurial transfer process through competent minds.

→ **YOU CAN'T DO WITHOUT IT: COMPETENT MINDS, ENTREPRENEURSHIP
AND OPENNESS TO TECHNOLOGY**

For a long time, the reason for Ferdinand von Steinbeis' resignation as President of the Central Office did not play a role when considering connections to Steinbeis. This changes as soon as one considers protective tariffs not as a regulatory element, but more generally as a restriction of entrepreneurial freedom and looks at the steady increase in ("protective") rules in recent years with the consequence of restricting the necessary entrepreneurial freedom and thus the necessary entrepreneurship. With a view to the companies in Germany and Europe as a whole that Steinbeis needs for its successful entrepreneurial transfer activities, but also specifically for the Steinbeis companies themselves, this is an aspect that needs to be taken into account for a successful "strategy for tomorrow".

Industrialization in today's Germany began when Ferdinand von Steinbeis became professionally active. The associated transformation of the economy was characterized by entrepreneurship and a sufficient, effective openness to technology (with all its consequences) – just like the time 40 years ago, which was also associated with a transformation of the economy (triggered by a structural change, essentially driven by "electronification"), albeit at a different level and with different boundary conditions. If Ferdinand von Steinbeis were asked today what is needed for the current transformation towards a social, ecological market economy, his answer might be:

"Even in these times, there is a particular need for valuable entrepreneurship as part of the country's culture and a valuable openness to technology as an opportunity for solutions to problems that are still unimaginable today. We also need the willingness and the ability to assume certain risks, as well as technological diversity – without controlled incentive systems, which can also be a certain kind of 'protective tariff'."

Perhaps he would be self-critical enough to include in his answer the critical voices that were already present at the time, at least in part, about "factory-masterly" entrepreneurship (including child labor) and in "technology assessment" (at least in terms of its direct impact on people), namely that entrepreneurship as part of a country's culture also involves a commitment to culture, the people who shape it and nature, and that today there should be an open dialogue and broad social discourse before decisions are made about the framework conditions and their consequences for entrepreneurship and openness to technology. Today, he would perhaps also contribute his impressions to a solution-oriented discussion about leadership in key intelligence/

→ material-based technologies and/or growing, technology-open markets and effective education systems by traveling to the USA, China, India and Scandinavian countries (comparable to his trips to England and Belgium at the time). He would probably explicitly and in particular point out the more important than ever transfer via minds and the need for a consistent dual education system.

Would a Ferdinand von Steinbeis resign today due to the realization that the industry cannot assert itself on the international market (especially outside Europe) due to regulatory constraints? Who knows. What advice would he give us at Steinbeis with a view to the future, especially in today's Baden-Württemberg? Perhaps that could be his advice:

"I am concerned about entrepreneurship, its prerequisites, the necessary understanding of technology across the board and I see problems here. Today, Steinbeis is an intermediary between the creation of knowledge and the economically recognized application of this knowledge. However, this requires a sufficient number of transferable, competent sources of knowledge and adaptable companies. At the interface between knowledge creation and knowledge application, Steinbeis is an indicator of a country's innovation system. A country like Germany needs both across the board and at the top, especially in Baden-Württemberg as the home of Steinbeis also or again in the future

- capable, competent minds – through them, the still most effective principle of knowledge and technology transfer is possible, the 'transfer via minds': via the dual industrial training I coined, the technologically oriented university education and in today's Steinbeis' entrepreneurial knowledge and technology transfer. These competent minds also enable the necessary competent sources of knowledge and implementers in the economically recognized application
- Areas of trust in which certain risks can be assumed, particularly on the basis of competence. This is where the necessary efficiency and effectiveness or the helpful oversumption are achieved;
- a valuable openness to technology. In principle, this means that there is more diversity and more decision-making options for problem solutions with the same level of creativity;
- valuable companies. They preserve value in two ways, ideally and materially;
- value-oriented entrepreneurs. With them, there is a meaningful creation of benefit and common good.

- In particular, a formative entrepreneurial spirit, openness to technology and the courage and opportunity to take risks and thereby innovate must (once again) be a widely understood and accepted core of the country's culture."

For Ferdinand von Steinbeis, a key to the success of the transformation of the economy was a special way of educating people and companies. The challenges facing the education systems in Germany and their current limitations are well known. Here, too, the necessary competitiveness depends on competent minds. Assuming, for example, that technology-based CO₂ pollution can only be effectively reduced through technology, there is an urgent need for more of these competent minds who create, understand and apply technologies. What could be proposed in the spirit of Ferdinand von Steinbeis if there were too few (or even fewer and fewer) of these minds as a result of whatever developments? He seems to have already given the answer:

"Whoever wishes to devote himself to higher industry should never lose sight of the fact that it is a craft wedded to science and requires knowledge and skill at the same time", as far as is already known, "he must not be ashamed of manual labor, but he must also not remain a stranger in the sanctuary of science, but as far as the latter is concerned, he should preferably stick to what is necessary for his subject."

This statement applies to all levels and areas of education. As simple as it is to write, it is just as concrete in educational practice: If, in abstract terms, X heads are part of an educational process, a maximum of X heads can successfully complete the competence building process. This also applies to the distribution of potential competence among these X heads. Ferdinand von Steinbeis thought of education from the end – synergetically and focused on the two poles of knowledge and application. Education that ultimately produces competent minds across the board and at the top for the creation and application of knowledge is the essential basis for all solutions to problems. It is easy to imagine how Ferdinand von Steinbeis would answer the question as to the most urgent solution to the problems he "saw": "Effective dual education".

DUAL COMPETENCE DEVELOPMENT: JOKER IN A MULTIDIMENSIONAL TRANSFORMATION

Ferdinand von Steinbeis understood this double duality in terms of "science and craftsmanship" and "will/skill and manual labor". Basically, even back then, he was essentially concerned with the formation of competent minds with the ability to successfully apply knowledge in a situational, self-organized and self-responsible manner and with concrete action and successful problem solving. These are the skills that are essential for the success of the minds, especially in the transformation of an economy (at that time

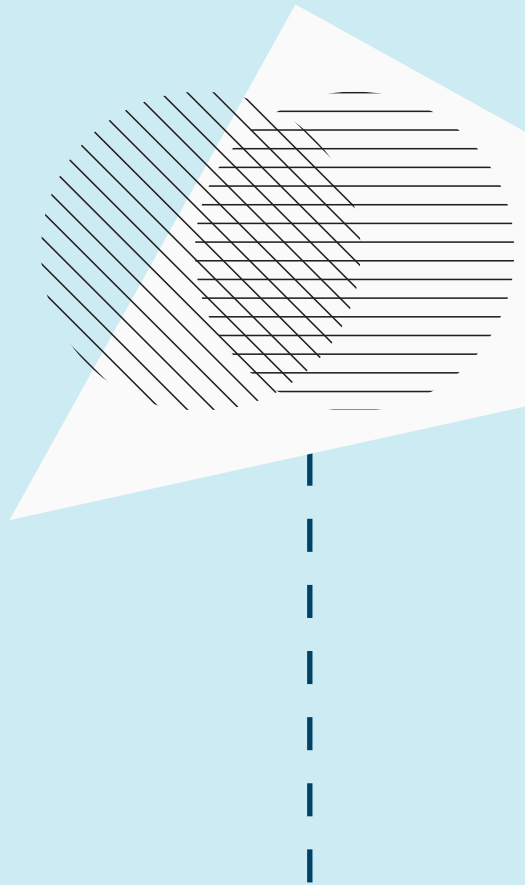
→ from an agricultural to an industrial economy).

Dual education to date has essentially implemented duality in the teaching and learning process locally: Education takes place in the company as well as at school, originally only in trade and vocational schools, but now also in cooperative state universities. Put simply, theory is taught at school and practice is taught in the company. The core principle here is the aforementioned transfer via minds.

Historically, the duality was initially only applied and implemented in relation to technology, and only in the course of time, with the increasing complexity of companies and the development of the economy and administration, was it also applied to economics and administration. Outside of this technology-oriented area of education, so-called higher education referred to the understanding of life, people, cultures and, in particular, nature. With the increasing importance of technology, this also included understanding it, at least in technical (secondary/higher) schools.

In the field of man-made technologies, the acquired expertise was used in particular and in a figurative sense to utilize and “master” nature, which was not created by man, as well as possible. The excessive use of technology, at least wherever potential fossil energy is converted into kinetic energy (for example, from coal to steam and piston movement to the moving wheel), has led to exploitation and imbalance and even damage to nature with the known consequences. The nature transformed by these technologies and their “derivatives” threatens to dominate us to a rapidly increasing extent – the associated processes are irreversible in the foreseeable future.

What if we were to design education in such a way that we learn to understand nature and its laws in such a way that we can live in it sustainably, combined with the need to (partially) repair it – only through and with technologies? In our opinion, this would be both the prerequisites and the consequences of this new approach to dual education:



- - Technology should be an essential part of all education: not just of the original industrial education, and even more so in a technology location such as Baden-Württemberg.
 - The consistent dual orientation of all education based on the original approach of Ferdinand von Steinbeis should be a general educational concept: always in the combination of theory imparting school and learning application in the "company". In this context, "company" does not refer to the goods-producing or service-providing enterprise in the narrower sense, but in a broader sense to the "value-creating/value-preserving facility".
 - The necessary understanding of/for technologies would "naturally" grow and be sufficiently available. It can only be the (new) technologies with which we can achieve the partial repair of nature. For this we need very many "technology heads" per se, but also heads who "only" understand and grasp technology and thus (better) assess it. Wouldn't it be logical to provide all those who know and teach also with dual education and training?
 - Precisely because you learn/are supposed to learn in a "school" for real life, precisely because these value-preserving/repairing technologies (in the broader sense, especially in relation to digitalization and the conversion of knowledge into skills) will be decisive for real life in the future: We are sure that Ferdinand von Steinbeis, based on the necessity of knowledge about technologies and their real-life effective application, would now use this fundamentally necessary, dual competence building of minds to cope with a multidimensional transformation!

Ferdinand von Steinbeis, with the circumstances of his time, realized the duality of education in terms of place and time. Today, school education, including dual education, is still mainly place-based in classrooms, organizationally mainly by institutionalized teachers and, due to the necessary allocation of resources, timetable-based. The core idea of duality does not actually provide for a separation of the place of teaching and the place of application per se, but rather—in the sense of Löhn's dynamic synergy of poles—a complementary, dynamic exchange of theory and practice, or knowledge and application, designed with added value. For us, there is also no question here that Ferdinand von Steinbeis, with today's circumstances, would also consistently organize the transfer via minds in terms of the mutuality and reciprocity of the "learners"/"teachers" and "questioners"/"knowers" in a lifelong dual manner.

As an aside, shouldn't this duality today also apply to presence and the technologybased independence of time and place made possible by digitalization?

In principle, the consistent duality does not contradict Alexander von Humboldt, who is quoted as follows: "Having learned Greek could in this way be no more useless to the carpenter than making tables is to the scholar". Basically a reciprocal and mutual duality.



→ If, as promoted in the Ferdinand Steinbeis Institute's #techourfuture initiative, it is in the interest of all of us to develop the technological competence of all minds through understanding and comprehension, then Humboldt's conviction can be applied to this. We mean this in the sense that a technology can be understood as a "foreign language", the carpenter in general as a mind not educated in a significant "language" (who does something directly useful in practice) and the scholar is seen as a knower (who understands and teaches) – further thought and concretely related to AI as a technology (as a specific generative artificial language) and accelerator of the digital transformation of the economy, science and society as well as a key for the "[partial] repair" of nature.

BUSINESS DEVELOPMENT TAKEN FURTHER: START-UP, -IN AND -FURTHER

As mentioned at the beginning, Ferdinand von Steinbeis helped as a business promoter in the "Central Office for Trade and Commerce" of the Kingdom of Württemberg to "form" companies, some of which continue to shape the state's economy to this day. For Ferdinand von Steinbeis, "start-ups" were an essential element in successfully shaping the transformation of the economy. From these "start-ups", a medium-sized industry and economy developed, which to this day form the basis for a developing (large-scale) industry. One of the strengths of the German economy over a long period of time was and still is a middle class that is structurally renewing itself through "education" and companies that are renewing themselves (and innovating) through competent minds. This corporate "education" was promoted by a necessary openness to technology, entrepreneurship as part of the cultural heritage and a focus on competitiveness. These characteristics and qualities are essential for the economic success of a state like Baden-Württemberg.

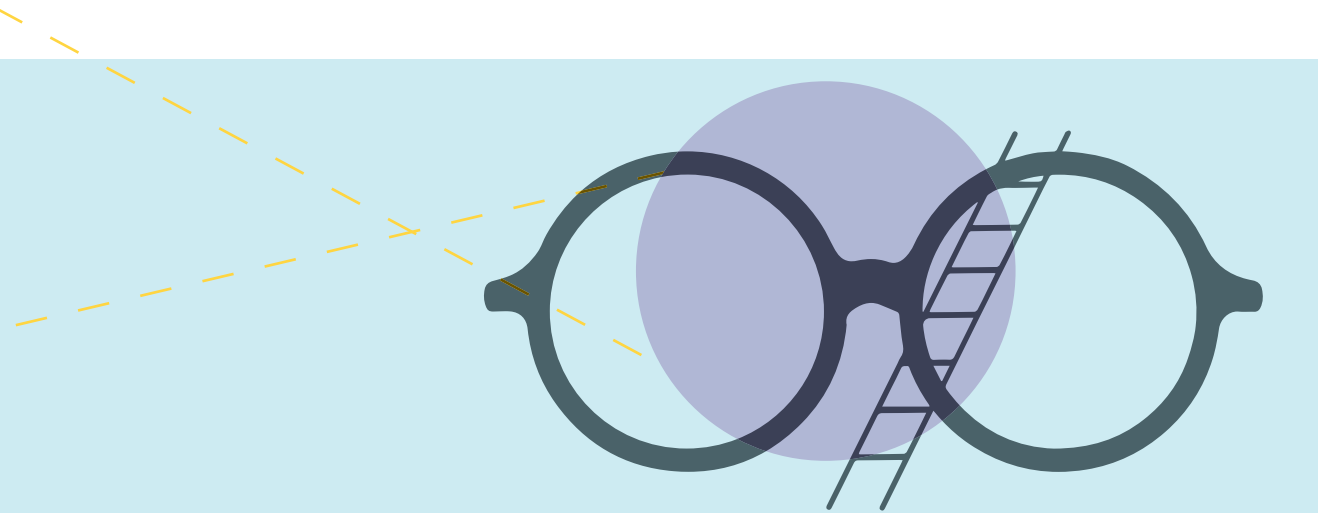
While US-style start-ups were of little importance for a long time for various reasons when assessing the performance of the German economy, they have since gained in importance as such, particularly in the course of digitalization. The numerous technology-based startups that are still taking place today were and are organic and not fundamentally geared towards the capital market. A diverse, resilient system of medium-sized entrepreneurs and companies emerged, some of which became large companies or were "absorbed" into other companies.

Nowadays, start-ups geared towards the capital market are needed, as this is the only way to achieve the necessary rapid maturity of a technology and/or the necessary rapid growth. The consequence of an often associated "exit" is – in simple terms – the disappearance of at least one entrepreneur and thus of a company character necessary for a medium-sized company (unless the head becomes the entrepreneur of a newly founded company again).

- Start-ups are also an important element for success in the current transformation. With the "exit" and the company hopefully continuing to be effective for the country, but especially with the opportunity (Ferdinand von Steinbeis' modern interpretation) to form competent entrepreneurs such as companies in and for "the" SME sector: An "exit" of the entrepreneur can be used for a "start-in" at existing, (hopefully) local companies by implementing new technologies or business models there – definitely also to create larger companies as leading partners for smaller companies. A "remain" of the entrepreneur can be used for a "start-further" to create new businesses ("SMEs", especially entrepreneurs) based on the technology and the business model.

Over the past forty years, the Steinbeis Foundation has developed into a network of companies with competent minds based on the duality of economic recognition of knowledge created in knowledge and technology transfer and in fundamental entrepreneurship. Another duality – in the synergy of the poles "decentralized and centralized" – played an important role: decentralized Steinbeis enterprises (SE) within the central Steinbeis framework (Steinbeis). Over the past four decades, more than 2,000 SEs have been founded within the network. Not all of them were founded as classic start-ups, but some of them were founded as start-ins or start-further companies, both within the network and outside of it. A major challenge for the SEs and Steinbeis is to live entrepreneurship despite the ever-increasing regulatory bureaucracy and to further develop the helpful framework for this.

Steinbeis' own corporate "education" with the competence building carried out by the SEs at external companies/organizations through knowledge and technology transfer, as well as through the so-called dual scientific research of the Ferdinand Steinbeis Society, was expanded by the direct education of minds by Steinbeis in external companies: It takes place on the one hand, in particular, via the so-called project competence courses at Steinbeis University and, on the other hand, via training and consulting by Steinbeis enterprises.





→ **IMPETUS FOR SUCCESS: LÖHN'S IMPULSES**

The successes of Steinbeis today are the successes of "Steinbeisers" – Steinbeis entrepreneurs and Steinbeis employees. They are based on the system of Johann Löhn, who built and expanded Steinbeis with his inimitable style, the possibilities and rules of his time and his method. He used the freedoms given, available and created to him to solve problems, often unconventionally, and in particular to enable people to do things that would otherwise only have been thought of, left undone or even prevented. An essential element of his method are the so-called "impulses", which have shaped numerous users of his method, including us. The following impulses are particularly important for our work at Steinbeis and for the Steinbeis network:

CLIMATE OF SYSTEMATIC COINCIDENCE!

This means having a constellation with a systematic approach that promotes and recognizes a random opportunity (e.g. for the founding of a new company) and provides the framework for its realization. This sounds simple, but there are challenges involved in creating and maintaining an appropriate climate: for example, promoting the necessary tolerance and diversity despite and with rules, with the necessary consistency and creativity despite and with convenience, with effort and effectiveness despite and with composure, and with systematic simplicity despite and with complexity.

NO DISADVANTAGE CAN BE SO GREAT THAT THERE CANNOT BE AN ADVANTAGE!

Significant advantageous structural developments in the Steinbeis system arose from a disadvantage that had occurred. For example, the reason for founding Steinbeis GmbH & Co. KG für Technologietransfer was the abolition of tax concessions for research and development services; with its founding, it was now also possible to participate in legally independent companies.

IT'S NOT HOW THINGS ARE, BUT WHAT PEOPLE THINK OF THEM!

For us, this impulse is particularly important for facilitation itself, for service provision and problem solving in general and especially for the position of a Steinbeis headquarters in a decentralized Steinbeis network.

→ ***SYNERGY CANNOT BE COMMANDED!***

This applies to the interaction between people and, through them, indirectly between companies and organizations. Network value creation – i.e. value creation in and through networks – is playing an increasingly important role both within the Steinbeis network and beyond. In particular, the digitalization that is driving and enabling the current transformations is an essential basis for the associated technologies.

WE SAY THANK YOU!

We would like to thank all Steinbeisers for their commitment and success, which has made Steinbeis the valuable brand it is today over the past forty years.

We would like to thank the authors of the following pages for their valuable contributions to a publication that aims to present the essence of Steinbeis in a fundamental, exemplary and kaleidoscopic way rather than its history. →|



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STEINBEIS

today is based on the Steinbeis Foundation for Economic Development named after Ferdinand von Steinbeis, the Lohn principle of the entrepreneurial knowledge and technology transfer process and its dynamic synergy of poles and the Steinbeis companies with their Steinbeis entrepreneurs in the Steinbeis network.

Large parts of the german version of the previous article appeared in the publication series 92 "Wirtschaftsförderer und Start-up-Mentoren: Ferdinand von Steinbeis und die Steinbeis-Stiftung heute" by the Swabian Society (published 2023 in Stuttgart).

NOTE ON THE SOURCES:

All historical information used here is taken from the publications of Günther von Alberti (Steinbeis 1971-1991, Stuttgart 2008; Ferdinand Steinbeis 1807-1893, Stuttgart 2016) and Sigrid Friedrichs (Steinbeis 1983-2008, Stuttgart 2009). They have not been explicitly marked here to make the article easier to read. The aforementioned quote from Alexander von Humboldt can be found in the article "Bildung – zwischen Ideal und Wirklichkeit" by Heinz-Elmar Tenorth at www.bpb.de/themen/bildung/dossier-bildung/503718/bildungsbegriffsbestimmungen [last accessed 10.09.2023].

PART 1





CREATING MEANING



BUSINESS PROMOTERS
AND START-UP MENTORS:
FERDINAND VON STEINBEIS
AND THE
STEINBEIS FOUNDATION
TODAY

SUCCESSFUL TECHNOLOGY TRANSFER: FROM A START-UP TO AN INNOVATIVE PRODUCER

**A company history that Ferdinand von
Steinbeis would have accompanied.**

Image processing is the technical analog to the human sense of sight. In technology, it has a similar significance to the human ability to capture and process images: More than 90 % of information about our environment is taken in through our sense of sight. The Steinbeis Quality Assurance and Image Processing team in Ilmenau is working on the technical equivalent in the form of digital image processing sensors as a key technology. With their technical expertise, the Thuringian experts are drivers of innovation for large companies at both national and international level. In the early 1990s, Prof. Dr.-Ing. Gerhard Linß and Dr. Peter Brückner founded the Steinbeis Transfer Center for Quality Assurance and Image Processing in Ilmenau under the umbrella of the Steinbeis Foundation and thus made a commercially successful start to technology transfer.

HOW IT ALL BEGAN

When the chemistry is right, it often doesn't take much for a successful initial ignition – this was our experience with our beginnings in the Steinbeis network. To stay with the metaphor, it was in June 1992 when the Steinbeis model was introduced to the newly-formed German federal states at the IHK Erfurt in Thuringia. At this very eventful time, during the transformation of an entire state, we recognized opportunities for the technology transfer we had in mind. We entered into talks with Steinbeis to see whether we could also make use of the Steinbeis transfer model. In the weeks that followed, we experienced how unbureaucratically this was possible. Just two months later, in August 1992, we were fully operational with our Steinbeis Transfer Center for Quality Assurance and Image Processing, which we had founded in Ilmenau under the Steinbeis umbrella.

In 1992, we received an uncomplicated liquidity loan for our first project, which we were able to pay back after just six months. And it is not without pride that we can say today that the development of our entrepreneurial activities has gone uphill in leaps and bounds since then. The synergies between our Steinbeis company Quality Assurance and Image Processing and the specialist departments at Technische Universität Ilmenau have also played a key role in the growth of our transfer activities. The university management also supported us and significantly promoted the founding of further Steinbeis companies in Ilmenau. With this positive attitude behind us, further Steinbeis centers with professors were established in Ilmenau.

FROM DEVELOPMENT TO PRODUCTION

Twelve years of transfer work and a large number of projects later, we took the decisive step towards becoming a production center under the Steinbeis umbrella: As a driver of innovation, we developed in close cooperation with Carl Zeiss Industrielle Messtechnik GmbH a new optical sensor system for high-precision, flexible optical coordinate measuring technology, the video-optical sensor "ViSCAN", and have transferred it to production. This enabled us to add the option of image processing to the existing tactile measuring system.

The video-optical sensor, which can be freely positioned in the measuring volume, enables the combined tactile and non-contact measurement of complex parts in the overall system. The fast and flexible electronic lighting control of the ViSCAN sensor provided the world's first innovative option for fully automatic adjustment of image capture parameters.

- With the ViSCAN sensor system, a comprehensive and versatile modular system for image acquisition, image evaluation and optical measurement has been available for the Carl Zeiss coordinate measuring machine series for many years and is still produced and used worldwide today.

INNOVATION AS THE DRIVING FORCE

This status as a developer and producer had to be consolidated in the years that followed. We achieved this in particular with our 2008 transfer project with Reutlingen based WAFIOS AG. Together with the specialist for wire processing machines, we developed the "Spring-Test" image processing system for their spring coiling machines. The system measures the geometry of up to 900 springs per minute, compares them with the tolerances and sorts them.

The aim of the project was to significantly simplify the operation of the image processing system on spring coiling machines, while at the same time increasing measuring accuracy. The result was the innovative and user-friendly image processing system "SpringTest" for one hundred percent quality testing in spring production. The increased ease of use for the user gave WAFIOS a clear competitive advantage over the competition. At the same time, our Steinbeis Transfer Center was able to consolidate its position as a producer, as we not only developed the new image processing software but also continuously supplied the entire image processing system. In parallel to the software, we developed an industrial-grade measuring camera with cables and lighting in various sizes. This means that WAFIOS has a standardized supplier for the entire image processing system.

Does innovation take time? Not necessarily: Only one year passed between the first concrete discussions with WAFIOS at the beginning of 2007 and the completion of the prototype systems in March 2008, which were seamlessly transferred to series production at our Steinbeis Transfer Center. The rapid and successful implementation of the innovative image processing system in the machine was only possible thanks to the close cooperation with the Steinbeis Transfer Center for Spring Technology in Ilmenau and the Department of Machine Elements in the Faculty of Mechanical Engineering at the Technische Universität Ilmenau. Their support during the operation, conversion and test phase was a significant contribution to the fast and successful realization of the project.

→ IT ALSO WORKS INTERNATIONALLY

As a development service provider in an increasingly global economy, collaboration with international partners and customers is now standard practice. We completed our first transfer project with a Japanese partner in 2011 and benefited from it on many levels. We developed intuitive software for an optical tool presetter for the NT TOOL Corporation from Takahama City.

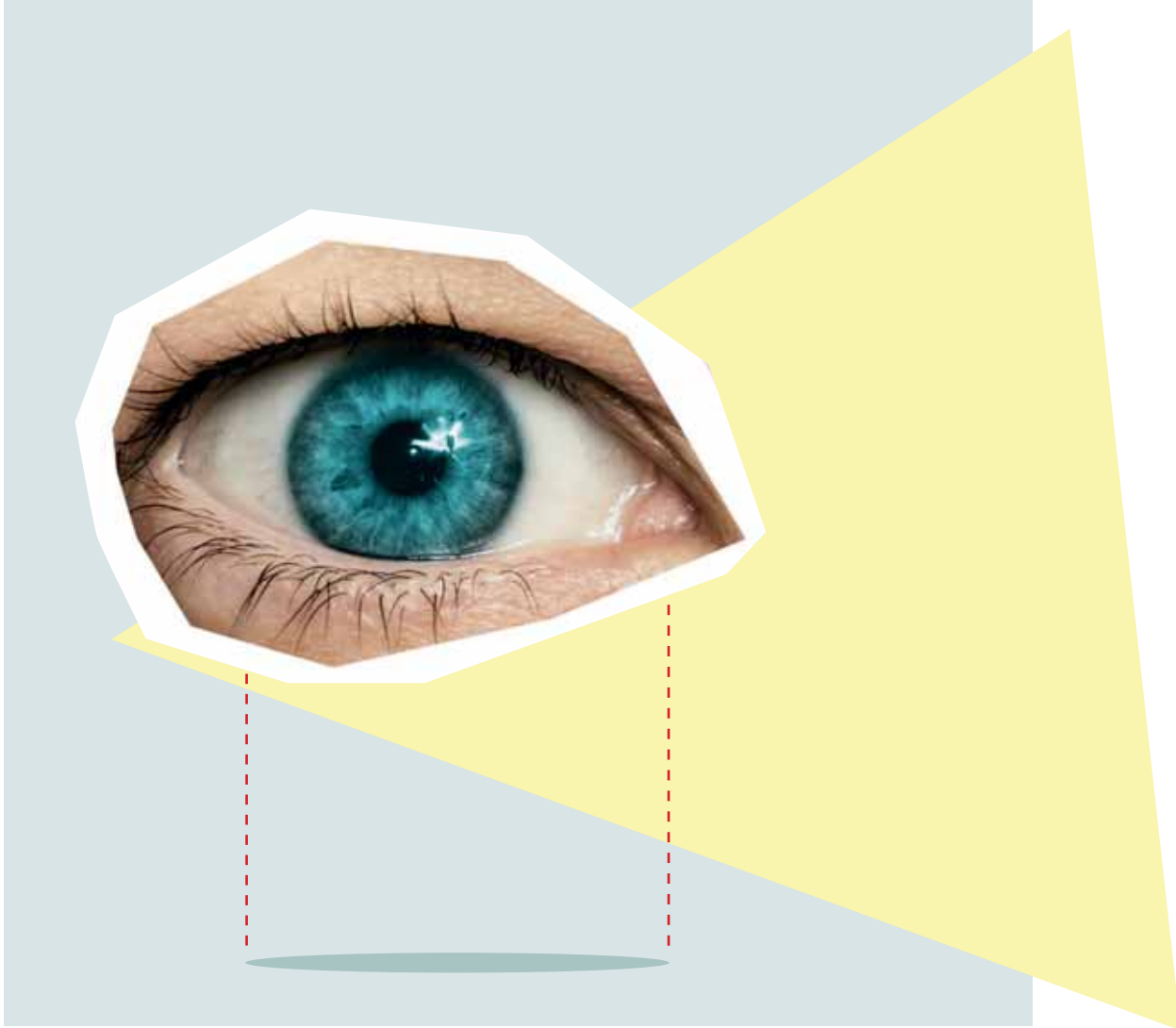
NT TOOL was looking for a partner to develop a new optical tool presetter (OTP) for the non-contact measurement and presetting of different tools. The project task for our Steinbeis team was to design, develop, implement and bring to series production a touchscreen-capable, intuitive operating software for an OTP.

The innovative software interface of the OTP, which we developed together with design:lab weimar GmbH, is characterized by a clear structure and reflects the five most important work steps of the operator in five so-called palettes. All important information for the respective work step is available exactly when it is needed and non-essential information is hidden. The MagicEye developed includes a special function integration. It logically reflects the actions of an operator at the tool spindle.

The added value of this transfer project went far beyond technical innovation. It enabled several students involved in the project to do an internship abroad at NT TOOL in Japan, which turned out to be a win-win situation for everyone involved in the project: For the students as a milestone during their education and an important personal experience, for NT TOOL and our Steinbeis team as an essential bridge between Japanese and German culture and a considerably simplified communication. Active communication was an important project topic in its own right due to the great distance and differences in mentality between Germany and Japan. It also included the extensive transfer of know-how to the Japanese colleagues in order to lay the technical foundations for future decisions.

THE CHALLENGE OF ENTREPRENEURSHIP

One of the key challenges in technical research, development and application is evident in the cooperation with and requirements of our customers: copying something that already exists is merely a task of diligence, but in the end it can hardly survive on the market.



- At the same time, not every project should reinvent the wheel. The challenge therefore lies in questioning the familiar and finding better or new solutions and bringing them to commercially recognized application – that sounds far easier than it is in practice.

The associated transfer is only successful and long-lasting if more than just folders, files, publications and products change location. On the one hand, the challenge is to motivate the know-how givers and convince them that the transfer does not mean a loss, but rather added value. On the other hand, the know-how takers must be made aware that it is better to adopt something new and unfamiliar first, because this is the basis for the next, then own, thing. The entrepreneurial process is ideally suited to this: Because here, the added value and what is one's own are essential in terms of principle and economic evaluation.

We started our entrepreneurial journey at Steinbeis in the traditional way with a legally dependent transfer center within the network. This transfer center provided us with the framework to successfully shape our entrepreneurial technology transfer process and enabled us to manufacture small product series.

In 2011, we took the step from being a legally dependent transfer center within Steinbeis GmbH & Co. KG für Technologietransfer to becoming an independent Steinbeis company for quality assurance and image processing. This step was a long-term strategic decision for our corporate development, also with regard to succession planning.

→ We regard both our initial Steinbeis Transfer Center and the Steinbeis company Quality Assurance and Image Processing (SQB) as elements of successful business development by Steinbeis. Steinbeis was our start-up mentor and is our network today, to which we feel particularly connected through the decentralized, entrepreneurial technology transfer process within the central Steinbeis framework.

A FIRM EYE ON THE NEXT GENERATION

You can't promote potential young talent early enough. Our close proximity to Technische Universität Ilmenau offers advantages for both sides: students have the opportunity to complete their internships, project seminars, final theses in conjunction with their studies and even doctoral theses with us. Our specialist subjects are the cross-sectional disciplines of industrial image processing, measurement technology, quality assurance and quality management. We also benefit from this form of cooperation and gain valuable contacts with young talent. The early promotion of young talent is also the basis of a network in which we organize school and student excursions to trade fairs in our industry together with partners from the region.

ACHIEVING MORE TOGETHER

In the environment of Technische Universität Ilmenau, this network has given rise to the "Vision Valley", which aims to attract and promote future image processing specialists together with numerous other small and medium-sized companies.

Networking in the region and beyond is an important concern for us and a driver for new ideas and collaborations, which is why we are actively involved in various networks. These are, in particular, the Spectronet – International Collaboration Cluster for Photonics and Machine Vision and the Thuringian Center for Mechanical Engineering (ThZM). As an active member of the German Society for Quality (DGQ), we help shape quality standards. Furthermore, SQB GmbH is actively involved in a large number of research projects and in project-accompanying committees and industrial advisory boards, for example currently in the Multimedia Green Tech Bearings project (Würzburg-Schweinfurt University of Applied Sciences) and in the RUBIN-AMI joint project. Various employees are also involved in continuing professional development at Schmalkalden University of Applied Sciences and are active on the supervisory board of CiS Forschungsinstitut für Mikrosensorik GmbH in Erfurt.

→ **YOUR OWN ROOF OVER YOUR HEAD**

20 years after our first steps in the Steinbeis network, we have noticeably and above all visibly adapted our infrastructure to our success. Between 2011 and 2013, our company building was constructed near the campus of Technische Universität Ilmenau. Since then, our team has been working on 1,100 square meters of floor space and with all the requirements that are placed on modern production and modern working conditions – an essential prerequisite for being prepared for the future. →|



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**THE ILMENAU EXPERTS HAVE ALREADY
BEEN RECOGNIZED FOR THEIR TRANS-
FER PROJECTS WITH MULTIPLE AWARDS,
INCLUDING THE STEINBEIS FOUNDATION'S
TRANSFER AWARD – LÖHN AWARD**

2004

„ViSCAN“: Light-Based Precision Measurement
Project partner: Carl Zeiss Industrielle Messtechnik GmbH
More about the project:
<https://tinyurl.com/mwswf788>



2008

Development of an innovative image processing system for
quality control in spring production
Project partner: WAFIOS AG
More about the project:
<https://tinyurl.com/yc5rx43y>



2011

Development of intuitive software for a new optical tool
presetter
Project partner: NT TOOL Corporation
More about the project:
<https://tinyurl.com/525ckv2c>



**IDEA.
DEVELOPMENT.
APPLICATION.**

**Steinbeis enterprise Quality Assurance and Image Processing (SQB)
From idea to development to industrial application**

Since 1992, the Steinbeis team led by Prof. Dr.-Ing. habil. Gerhard Linß and Steffen Lübbecke in Ilmenau has been advising on industrial image processing and the automation of inspection processes. SQB is located in the immediate vicinity of Technische Universität Ilmenau campus. This innovative environment ensures the permanent transfer of the latest research results into industrial practice, as well as practical experience back into research and teaching.

“TRUE INNOVATION COMES FROM THOSE WHO CHALLENGE THE STATUS QUO”

Four decades separate the founding of a company by Ulrich Dietz on the one hand, and Dr. Mitja Echim and Professor Dr. Christof Büskens on the other side. What unites them is their passion for digital and their roots in the Steinbeis network.

The term “business start-up” has several levels of interpretation: In addition to the aspect of an entrepreneurial (new) start, the personal implications play a decisive role. After all, setting up a business and becoming self-employed is a risk for founders. This was just as true in Ferdinand von Steinbeis’ days as it was in the early days of today’s Steinbeis network in the 1980s, and it remains true today, even if the failure of a business idea is seen first and foremost as personal development, especially in the Anglo-American world. Ulrich Dietz made the decision to become self-employed around four decades ago and shares his experiences in conversation with Dr. Mitja Echim and Professor Dr. Christof Büskens. The two scientists from Bremen founded the company TOPAS Industriemathematik in 2022 as part of the Steinbeis network.

Mr. Dietz, passion for digital technologies – despite all the technical changes, this is what has driven you since 1987: Back then, you ventured out of the Steinbeis Transfer Center for Information Technology, which was founded in 1985, and founded what is now GFT Technologies SE. To what extent was your Steinbeis experience a “springboard” for you?

Dietz: My time at Steinbeis was an excellent basis for our own entrepreneurial activities. In particular, working with Professor Löhn gave me a lot of insight into goal-oriented management. My time at Steinbeis was like a practical, advanced business-school education.

If you look back on around 40 years of entrepreneurship: In your opinion, what are the main challenges and hurdles that young start-up founders still have to overcome today?

Dietz: The main challenges for start-up founders today are access to capital, increasing competition due to globalization, constantly changing technology landscapes and navigating regulatory and bureaucratic hurdles. At the same time, it is crucial to scrutinize your business model and build the right team. Despite these obstacles, the entrepreneurial

journey is immensely rewarding if you stick with it with passion and perseverance. Since its founding in 1987, GFT has repeatedly reinvented itself and constantly reassessed its business model. The constant adaptation and change of the business model and the associated adaptation of the company are the basis for long-term success.

Dr. Echim, Professor Büskens: Entrepreneurship in itself is nothing new to you; you also have many years of experience in Steinbeis companies and share Mr. Dietz’s passion for digital technologies. In 2022, you then decided to found TOPAS Industriemathematik Innovation GmbH. What are the new challenges for you as a shareholder and managing partner?

Büskens: In my position as a partner at TOPAS, I face the challenge of wearing several hats on one – my – head. One key issue is the compatibility of my role at TOPAS with my work as a Professor at the University of Bremen. This defines a new responsibility for our employees, who are particularly important to me as they represent the heart of our company. With the state of Bremen as an investor, a new, very exciting, external per-



*Ulrich Dietz,
Chairman of the Administrative Board
GFT Technologies SE (Stuttgart)*

spective is being brought to us, which also needs to be paired with the specific requirements of my university work. The German Academic Working Hours Contract Act brings its own challenges for TOPAS and influences the way we work. And, of course, the founding of TOPAS has changed the focus of our work. This requires us to adapt and further develop our strategies. It is an exciting journey and I look forward to continuing it together with my team.

Echim: With the founding of TOPAS Industriemathematik, I took on an immense responsibility, especially for our employees. Risk management, especially for such concrete projects as autonomous shuttle buses on public roads, requires constant attention. There are decisions to be made every day, from large to small, that shape our company. A significant change for me was the transition from the University of Bremen to full-time entrepreneurship. This role increases



*Dr. Mitja Echim,
Managing Partner
TOPAS Industriemathematik
Innovation gGmbH (Bremen)*

expectations and the way you are perceived from the outside. It is an exciting and challenging time.

Duality plays an important role at Steinbeis – in your case in the interplay between the researchbased creation of knowledge and its commercially recognized application. Ferdinand von Steinbeis said that higher industry is “the craft wedded to science” and that knowledge and skill are equally important. Do you share this view when applied to the present day? Is TOPAS a result of this “marriage”?

Büskens: The duality as described by Ferdinand von Steinbeis is more relevant today than ever. When we think of industrial mathematics, the name alone illustrates the marriage of mathematics as a scientific discipline with industry as a practical application. This duality is made even clearer in relation to mathematics by the quote from a commission of inquiry of the American Academy of Sciences:

“Today’s high technology is essentially mathematical technology”. Today, however, we also see the need to extend this duality to the so-called quadruple helix, particularly in relation to mathematics, as society and politics also play a decisive role for us alongside science and industry. We are therefore expanding the partnership between knowledge and trade. TOPAS is a living example of a “marriage”, in which science and application go hand in hand.

Mr. Dietz, as an experienced entrepreneur who has always kept in touch with science, how do you rate the quote from Ferdinand von Steinbeis in its relevance today?

Dietz: This quote is still true today. The fusion of science and practical application is the key to innovation. Knowledge alone is not enough, ideas must be implemented in a practical way to create real value. Take the development of electromobility, for example. While science provides the basic research on battery technologies and energy transmission, it takes the craftsmanship of engineers and technicians to produce practical, safe and efficient electric cars for the mass market. Knowledge and skill are

essential and must go hand in hand.

When you, Mr. Dietz, founded GFT, PCs were still a long way from being mass products. Today, like Dr. Echim and Professor Büskens, you think in terms of digital twins, autonomous systems, artificial intelligence and clouds. In your expert opinion, what are the limits that are currently determining the development of digitalization and virtualization?

Dietz: When GFT was founded, the digital world was still in its infancy – especially compared to what surrounds us now. Today’s landscape, shaped by technologies such as AI and cloud computing, presents us with more complex challenges. Despite our progress, we are still a long way from fully exploiting these technologies. Growing volumes of data are increasing the pressure on data protection and security. At the same time, new technologies such as generative AI not only open up new avenues, but also raise new ethical questions that were previously unthinkable. Despite the rapid technological advances, some industries, not to mention our authorities, still lack a robust technological foundation. The increasing need for experts in new fields of technology is evident

across all industries. In addition, the continuous adaptation of regulations to the pace of technological innovation is a constant challenge.

Büskens: Digitalization and virtualization are certainly driving forces in various areas of today's technology. A frightening and at the same time significant limit that is currently slowing down digital development, is the largely insufficient, if not inadequate, knowledge in Germany about and in mathematics and in particular about its benefits. This is a problem that spans generations and is passed on within the family. There are significant gaps in mathematical education, which are transferred to all other STEM subjects in particular. This results in the blatant shortage of skilled workers that can be observed and, in particular, the fact that we will not develop an equivalent of Silicon Valley in Germany in the next 20 years. Many people are unaware of the enormous potential and benefits of mathematics, and this is holding back our progress in many areas. Take, for example, the fact that computer processors can no longer become significantly faster due to their clock speed, and combine this with complex, industry-

relevant simulations that require enormous computing times. As a result, it becomes clear that new, efficient mathematical methods and algorithms are indispensable. The ever-widening gap between an extremely wide range of digital, industrial mathematical applications on the one hand and our limited human resources to implement them on the other will lead to a growing shortage of skilled workers in the coming years.

I also see the tendency to massively underestimate digital complexity in the industry as a further limit—just think of the promises made by people like Elon Musk on autonomous driving since 2013. We must be careful that there is no growing demoralization between science and industry that prevents both areas from exploiting their full potential. TOPAS will not succeed in removing these boundaries, but it will certainly soften them a good deal further.

Echim: In the current phase of digitalization and virtualization, there are several limits that challenge us. First and foremost, the enormous energy consumption caused by digital technologies is

a key issue. This has not only economic but also ecological implications that we need to consider. More efficient algorithms are essential to reduce energy consumption and achieve optimal results. Another obstacle is the regulatory framework, especially in the EU compared to the USA or Asia. One concrete example is the difficulties that arise when setting up real laboratories or demonstrating autonomous systems. While there is often more flexibility in other regions, we are restricted by more extensive regulations in Europe. However, this regulatory approach also has advantages, particularly in terms of safety. This is particularly important in sensitive areas such as autonomous driving. Another issue is expertise in the field of digitalization. Many decisionmakers still need to catch up. You occasionally come across the attitude: "We've always done it this way." However, in the age of digitalization, it is important to be open to new things and to continue learning.

You guessed it: when we talk about boundaries, we are all the more interested in your visions and concrete plans for what you want to achieve in the coming years. Can you give us a glimpse into the topics of tomorrow in which your companies are working today?

Dietz: In the coming years, we see three main areas in which GFT will be active: artificial intelligence, blockchain technology and sustainable digital solutions. All based on cloud technologies that make applications available on virtually any end device.

The applications of AI go far beyond what we could have imagined a few years ago. A good example is the financial sector, where AI is used to optimize investment strategies, detect fraud activity in real time and improve customer service. Generative AI offers fascinating opportunities and challenges. It has the potential not only to analyze data, but also to create new content, be it in the form of art, music or – very exciting for us – programming code.

When it comes to blockchain, many people immediately think of cryptocurrencies. However,

we at GFT are convinced that the true value of this technology lies in other areas. In particular, we think of supply chain management, copyright management and secure, transparent transactions. The ability of blockchain to create transparent and unalterable records can fundamentally change the way business is done.

Finally, I would like to address the issue of sustainable digital solutions. We are required to look at technologies not only from an economic perspective, but also to recognize their social and ecological value. Our aim is to develop resource-saving solutions that minimize emissions and benefit society at the same time. Our GreenCoding initiative is a prime example of this.

Büskens: What we are working on at TOPAS perhaps best describes our major future project “#MOIN – Model Region for Industrial Mathematics”. With this project, we are pursuing a central vision: to significantly improve the image of mathematics in society, among young people, in politics and especially in industry. We want to emphasize the central role that mat-

hematians play in the modern, technology-driven world. The former German Minister of Education and Research, Johanna Wanka, has already stated this: “A digital society works only with mathematics”. Our own guiding principle “Universal knowledge for intelligent systems” reflects our conviction that industrial mathematics is the key to digital innovations. In our work, it is particularly important to us to make the concrete benefits of mathematics visible. In Germany, mathematics has been relegated to a shadowy existence for too long, even though it often acts as a hidden champion in many of our technological advances. In fact, we aim to recognize and harness the “low hanging fruits” for industry in addition to the complex, high-hanging fruits. By tapping into these immediate opportunities through TOPAS, we can often achieve success after a very short time and at the same time implement the longterm vision of our “Model Region for Industrial Mathematics”.

Echim: Our main focus at TOPAS Industriemathematik is on autonomous systems and the key topics of energy and the environment. There are numerous challenges and deci-



*Prof. Dr. Christof Büskens,
Partner TOPAS
Industriemathematik Innovation gGmbH (Bremen)*

sions in the development of fully autonomous systems. In doing so, we are taking specific turns in order to implement assistance systems in between. This step-by-step approach enables us to make continuous progress and provide practical solutions for our customers. Our goal is to become THE go-to partner for autonomous systems and intelligent algorithms – initially in the northwest of Germany and eventually throughout Europe. The industrial mathematics issues that arise in autonomous systems are both exciting and complex. With our expertise, we want to ensure that these systems function safely, efficiently and sustainably.

Mr. Dietz, you encourage and promote people to start their own business despite the increasing bureaucracy and ever greater restrictions on entrepreneurial freedom. What has driven you all these years that you can now pass on to Professor Büskens and Dr. Echim?

Dietz: I have always been driven by the conviction that true innovation comes from those who challenge the status quo. This requires a keen sense for trends and recognizing connections. Despite bureaucratic hurdles in Germany, it is essential

to realize your vision. My advice: Stay true to your vision and rely on your expertise to create innovative solutions. Take advantage of the infinite possibilities of a globalized market and the availability of decentralized know-how. A dedicated team and a willingness to learn from challenges are essential. And of course: do, do, do! The journey of entrepreneurship may not always be easy, but it is enriching and never boring.

Professor Büskens, Dr. Echim, how does Mr. Dietz's advice – actually his formula for success – affect you as entrepreneurial industrial mathematicians who have set out to actually challenge the status quo?

Büskens: It is a fascinating way to achieve innovation by challenging a familiar state of affairs. To do this, you often have to get your counterparts out of their comfort zone. That can be difficult, as for example in our charitable activities to improve awareness of the benefits of (industrial) mathematics. But it is also

extremely enriching – not to be understood in monetary terms, we are not that far yet – if we relate it to entrepreneurship. The beauty of our work is that by combining our universal knowledge, industrial mathematics, with that of our industrial partners, innovation is created, both for our partners and for us. We have a determined dream, which we are pursuing together with Steinbeis and which is intensively supported by a team with many “busy hands”. This defines excellent conditions for our development, equivalent to what Mr. Dietz said, and perhaps in a few years we will succeed in building a company that is as successful as GFT Technologies SE. →|



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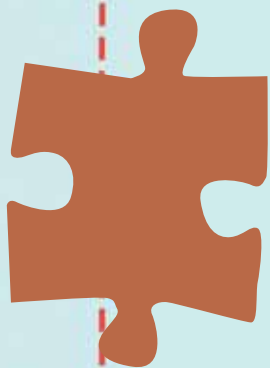
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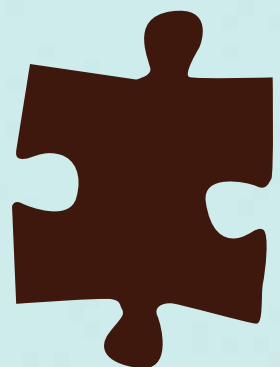


“Whoever wishes to devote himself to higher industry should never lose sight of the fact that it is a craft wedded to science and requires knowledge and skill at the same time; he must not be ashamed of manual labor, but neither must he remain a stranger in the sanctuary of science, but as far as the latter is concerned, he should preferably stick to what is necessary for his subject.”

Ferdinand von Steinbeis



WHEN ONE PLUS ONE
EQUALS MORE THAN TWO:
STEINBEIS DUALITY



“VIRTUAL COLLABORATION ENABLES A BROADER EXCHANGE OF IDEAS AND EXPERIENCES AND IMPROVES THE LEARNING EXPERIENCE, SUCH AS ALSO THE CONCRETE TRANSFER IN PROJECTS”

Digitalization and a shortage of skilled workers are a concern for companies and training providers alike. At Steinbeis University, Dr.-Ing. Walter Beck shows how both trends can be tackled successfully.

What Ferdinand von Steinbeis laid the foundation for in the 19th century still combines the best of both worlds in the German vocational training system today: Dual training combines theoretical learning at school with practical learning in the company. Steinbeis University has successfully developed this concept to an academic level and made a project-based practical approach an integral part of its Bachelor's and Master's programs. Dr.-Ing. Walter Beck was instrumental in founding the university in 1998 and has played a key role in the development of this concept ever since. Where does he see the challenges for companies today in order to be successful on the job market of the future?

Dr. Beck, the credo of our Chairman of the Board of Trustees, Professor Dr. Max Syrbe, who passed away in 2011, was "Human performance is proportional to the product of ability and motivation". From your point of view and with your many years of experience in educating people and companies, what is necessary for the product to actually become performance? And would you consider this result to be competence?

Beck: First of all, let me define what I mean by ability and motivation: abilities refer to the skills, knowledge and experience that a person has in a particular area. The higher a person's ability, the better they can fulfill a certain task. However, this alone is not enough to achieve high performance. Motivation, on the other hand, refers to a person's drive, energy and enthusiasm to complete a particular task. High motivation leads to a person working hard, overcoming obstacles and doing their best to achieve their goals.

Now to your question. Based on my experience in educating people and companies several factors are required to ensure that the product of ability and motivation actually results in performance. Firstly, these are clearly defined goals: It is important that both individuals and companies have clear, measurable goals to work towards. These goals should be challenging yet realistic and require a certain amount of motivation and effort.

The second factor I see as necessary is the continuous further development of both skills and motivation. This requires a conscious, ongoing learning process, be it through projectbased education, training or selfdirected learning, regardless of time and place.

Thirdly, feedback and reflection are needed: regular feedback, whether from superiors, colleagues or mentors, is crucial in order to improve one's own performance. It is also important to have time for reflection and selfassessment in order to identify strengths and weaknesses and take appropriate measures to improve. In my view, effective goal setting and self-management are extremely important. The ability to set goals and break them down into small, manageable milestones is crucial to drive performance. Effective selfmanagement and time management, for example using the Löhn method, is also necessary to identify and plan the necessary resources and priorities. Both ability and motivation must be combined with selfdiscipline and perseverance in order to continuously work towards the goals set, even when there are obstacles or setbacks. It requires commitment and the will not to be discouraged despite difficulties.

Do I regard this result as competence? I think it's more a combination of skills and characteristics that contribute to the development and I see it more as a combination of



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skills and attributes that contribute to developing and maintaining effective performance. It could be described as a kind of metalearning competence that forms the basis for other specific competencies.

Competencies can be differentiated according to their characteristics; technical, social and leadership competencies are just three examples. In your opinion, is there a competence that should be available as an indispensable basis in order to be able to successfully develop further competences based on it?

Beck: Yes, in my view, an important, absolutely essential basic competence is the willingness to learn. This competence includes the ability and desire to acquire new knowledge and new skills and to learn continuously. Without this foundation, it will be difficult to acquire other skills and develop further in different areas. A willingness to learn enables a person to react flexibly to changes and adapt to requirements.

It is also important to have a positive attitude towards learning and to be willing to learn from mistakes.

In the 19th century, Ferdinand von Steinbeis promoted the then revolutionary approach of dual training, centralized in schools and decentralized in companies. Today, duality seems to be a matter of course on several levels, with knowledge transfer taking place in parallel in the company and at school or university. In your opinion, how will digitalization change and further develop this duality?

Beck: Digitalization is rapidly changing various aspects of our lives, including education. Dual and vocationally integrated degree courses that combine academic learning with practical work experience, as well as training in companies, are not exempt from the effects of digitalization.

Digitalization enables dual study courses to be more accessible and flexible. Thanks to technological progress, students can now access educational resources and materials online and learn at their own pace and according to their needs. This flexibility enables students to better reconcile their academic work with their professional obligations.

In addition, digitization offers extended possibilities for distance learning, formerly related to a real university location, today to independence from space and time, as well as for virtual collaboration, i.e. for a kind

of “distance learning”. Both schools and universities can use digital platforms to bring students together with industry experts, mentors and fellow students at different locations. At Steinbeis University, for example, we offer the E-Campus for this purpose. Virtual collaboration enables a broader exchange of ideas and experiences and improves the learning experience as well as the concrete transfer into projects with guaranteed added value.

Digitalization also enables the integration of new technologies into “hybrid-dual” study and training courses. Students can gain practical experience with cutting edge technologies such as artificial intelligence, data analysis and virtual reality. This exposure to digital tools and technologies provides students with relevant skills that are in high demand on the job market.

However, digitalization also brings challenges for dual study and training programs. One concern is the potential displacement of certain professional roles by automation and AI advances. With the introduction of digital solutions in the industry, some traditional professions could become obsolete or require new qualifications – this also applies to schools and universities themselves. Universities must adapt their teaching methods and curricula and use their own digital and virtual expertise to equip students with digital skills so that

they can succeed in the evolving labor market.

Another challenge is to ensure that the practical component of dual study and training courses remains relevant in the digital age. As more and more tasks become automated or digitized, it is important that dual study and training courses offer meaningful work experience that aligns with industry requirements. This can include partnerships with companies that are committed to digital transformation and offer students the opportunity to participate in digitalization projects. In general, schools, universities and companies alike need to continuously develop their educational plans and partnerships to ensure that learners are well prepared for the future of work.

A lack of specialists and managers, as well as young entrepreneurs, is one of the main problems facing German companies, both quantitatively and increasingly qualitatively. Merely managing the shortage does not solve the actual problem, but the only thing that can be done is to qualify the available minds, which, as we know, are becoming fewer. In your opinion, how can the less become more? What do companies and universities need to do more of, or even fundamentally different, here?

Beck: In my view, companies and universities can take various proactive measures. Firstly, we need to strengthen partnerships: compa-

nies and universities can work closely together to develop programs that are tailored to the needs of the industry. This will ensure that the curricula are relevant and up-to-date and provide students with the skills and knowledge needed in the job market. The best example of this is undoubtedly Steinbeis University's project competence course with guaranteed added value.

Secondly, feedback and reflection are needed, for example through mentoring programs: when experts from industry and academia guide and support students, this can significantly improve their qualifications. Mentors can offer valuable insights, advice and networking opportunities that help students in their professional development. We do this, for example, through our project mentoring as part of the project competence course.

Thirdly, universities and companies must use digital learning and teaching platforms to improve accessibility and flexibility for students. Online courses, webinars and virtual workshops can complement traditional classroom education and enable students to acquire additional skills at their own pace.

Financial hurdles often prevent students from completing a university education. Therefore, another important aspect for me is the offer of scholarships and financial

support. For example, our students on the project competence course receive a salary from their partner companies to cover their living costs during their studies.

Creating an inclusive environment that promotes diversity is another essential prerequisite for qualifying more students. Companies and universities should actively promote diversity in their recruitment processes, scholarship programs and student support services to ensure equal opportunities for all. This also includes international cooperation to attract specialists and managers from abroad.

In addition, lifelong learning is essential, and topics such as upskilling will be strong drivers of education in the future.

And last but not least, cooperation with experts is necessary: Inviting guest lecturers or setting up advisory boards made up of experts can provide valuable insights into current industry trends and requirements. This collaboration helps universities to tailor their programs to the needs of the labor market.

By implementing these strategies, companies and universities can help to qualify more students and equip them with the necessary skills and knowledge for a successful start on the job market—so less can become more.

The global challenges we face can only be solved with interdisciplinary approaches that go far beyond the expertise of individual disciplines. The convergence of technologies with digitalization as an accelerator offers opportunities, but also brings challenges. What advice do you have for SMEs in particular to take advantage of these opportunities?

Beck: Due to the convergence of technologies and the constantly changing global economy, it is no longer enough to follow technological developments in one's own industry. Instead, technology trends must be considered across all industries in order to recognize opportunities and risks for one's own company. This is an enormous challenge, especially for medium-sized companies, as there is hardly any knowledge of other disciplines beyond their own industry expertise.

There is also a lack of staff and, in particular, skilled workers to take care of new technologies. There is then a great risk of not recognizing the potential benefits of new disruptive technologies until it is too late. Hidden champions in particular, who have built up a global leadership position in a specific technology or product field through specialization, run the risk of losing this position in the future due to a one-sided focus.

In order to recognize the opportunities and risks at an early stage,

I advise medium-sized companies to be open to new ideas and technologies and to question their own business model. This requires the development of appropriate skills within the company as well as the willingness of employees to embrace new ideas and continuously develop themselves further.

Regular employee training in digital skills and technologies can help to increase efficiency and open up new business opportunities. Through the aforementioned targeted upskilling in new technologies, experienced employees can be empowered to use their many years of experience in the core business to make targeted use of the opportunities offered by these new technologies for the company.

If possible, interdisciplinary teams should be formed from employees who cover different specialist areas, such as technologies and business administration. Collaboration between different disciplines brings together different perspectives and thus enables new, innovative solutions. Involving young talent in relevant projects is another key criterion for making the most of the opportunities offered by technological convergence: They help to open up perspectives and at the same time build up new technology skills within the company in a targeted manner. Here, we offer tailor-made approaches for small and medium-sized companies through our career-integrated project competence courses.

Partnerships and cooperations with industry-related universities and research institutions as well as start-ups and other companies with complementary skills can also be used to tap into new technologies and develop new business models.

The development of artificial intelligence is still in its infancy, but what is certain is that it has enormous potential. Do you dare to estimate what influence AI will have on the future competence development of people and companies?

Beck: Artificial intelligence undoubtedly has the potential to influence the skills development of people and companies in many ways. In all likelihood, it will fundamentally change the educational landscape by improving efficiency, personalization and access to education. Decisive changes are already foreseeable today. AI can help to improve educational content and methods and thus better adapt them to the individual needs and abilities of customers. By analyzing learning behavior, AI can create personalized curricula and make recommendations for additional resources or exercises. Based on individual interests, abilities and career goals, AI can also lead to appropriate educational pathways and programs.

AI can also be used to automate tasks in the education sector, such as the creation of learning content and the assessment of tests and examinations. This allows teachers

to devote more time to imparting practical knowledge and interactive, creative learning activities with learners – whether pupils, students or employees.

In the area of vocational training and retraining, AI can help to adapt the skills of employees to changing market requirements more quickly. With AI-driven online training and simulations, companies can prepare their employees for new tasks and technologies.

Through automated translation services, AI can improve access to knowledge and education worldwide. I am convinced that in the future we will be able to hear lectures held in foreign languages simultaneously translated into our mother tongue thanks to the use of AI. Despite all the euphoria about the opportunities and potential, ethical aspects must also be mentioned. Questions in this context include: What data on learning behavior is viewed and analyzed and by whom? How is it ensured that automatically generated learning content is nondiscriminatory? How does the AI arrive at a certain assessment or a recommendation for a learning content? As providers of educational offerings, we must address these questions and develop transparent solutions accordingly. →|

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**SCMT STEINBEIS CENTER
OF MANAGEMENT AND
TECHNOLOGY GMBH:
GENERATING AND APPLYING
KNOWLEDGE**

Demographic change and digitalization are increasing the pressure for transformation and are opportunities at the same time. The SCMT team has been supporting companies in recruiting young professionals and training employees for 25 years.

The SCMT cooperates closely with the Steinbeis School of Management and Technology (SMT), a business school of Steinbeis University. As part of the cooperation on project competence studies, the SCMT provides support for successful project work in the partner company, while the SMT is responsible for further training as part of the work-integrated study model. The range of further education opportunities includes a variety of certificate courses, Bachelor's and Master's programs.

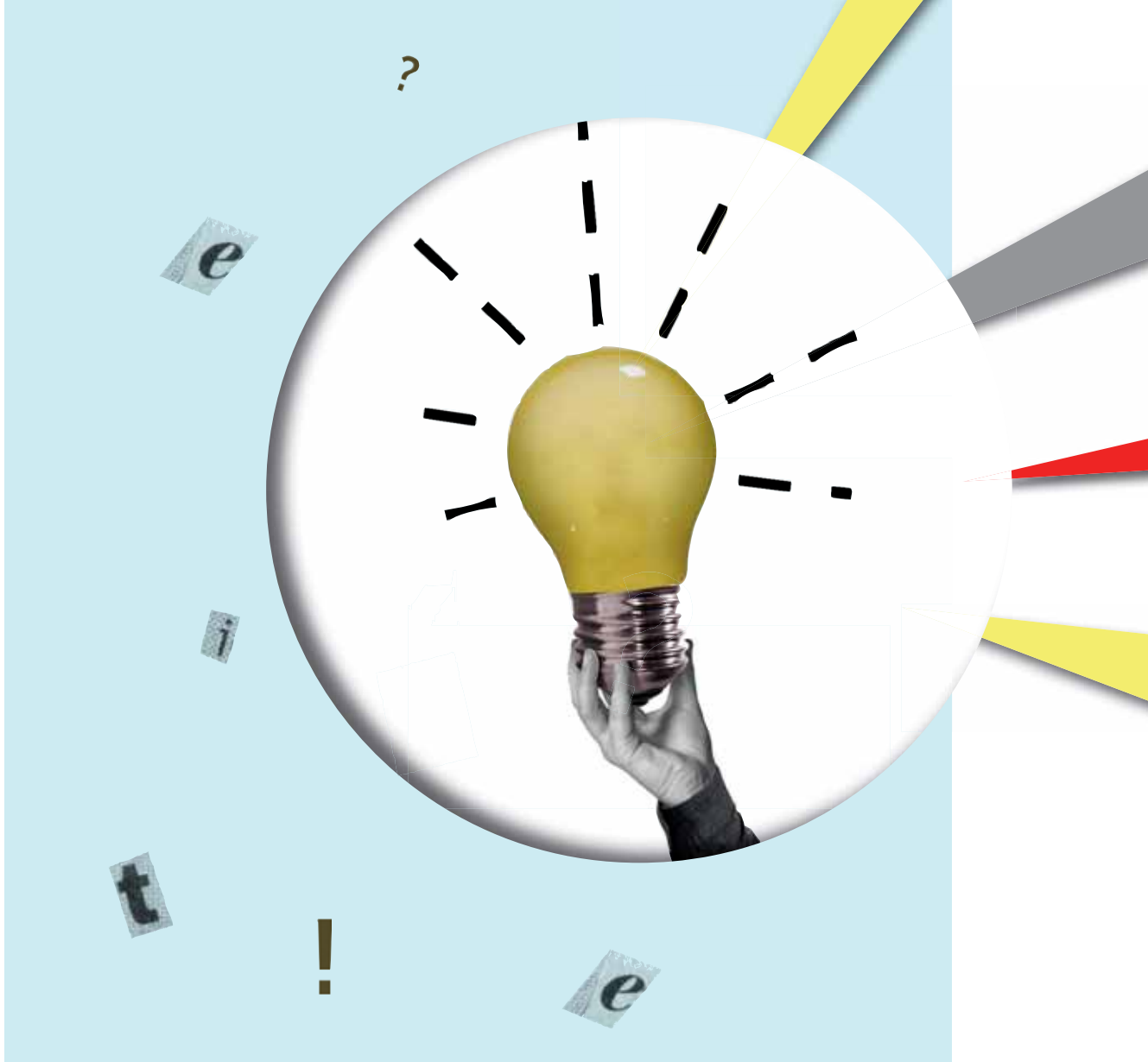
www.scmt.com



FROM YOUNG MINDS AND INNOVATIVE START-UP IDEAS

JUGEND GRÜNDET
has been inspiring young people
for entrepreneurship for 20 years.
How does the Steinbeis team do this?

“You must focus on innovation and people!” demanded Ferdinand von Steinbeis back in the 19th century and was way ahead of the zeitgeist of the time. The enterprising business promoter saw education as an essential cornerstone for the economic development of a country. He was concerned on the one hand with the transfer of theory into practice – with this seemingly self-evident approach, he described the then revolutionary concept of today’s dual education system – and on the other with value-oriented entrepreneurship. If Ferdinand von Steinbeis were to meet the team at the Steinbeis Transfer Center for Business Development at Pforzheim University and its nationwide student competition JUGEND GRÜNDET today, he would certainly have found best buddies. After all, the online business game is very much in the tradition of Ferdinand von Steinbeis: the aim of the competition is to introduce young people to the topics of innovation, start-ups and entrepreneurship at an early age. How does this work? Steinbeis entrepreneur Professor Dr. Barbara Burkhardt-Reich gives an insight.



Entrepreneurship education, this term describes the central future skills that we want to impart with the JUGEND GRÜNDET education portal. Young people are not only provided with tools for independent entrepreneurial action, but are also taught an attitude for developing and, in particular, implementing solutions – the basic idea of “transfer”. Because this is precisely what is becoming increasingly important in the current situation of “stacking crises”: more than ever, we need people who can shape the transfer of knowledge into concrete solutions to problems. This does not happen by itself. The same applies here: “You can’t teach an old dog new tricks”. That is why we must – in the spirit of our namesake Ferdinand von Steinbeis – sensitize our young people and make them fit to become active, creative problem solvers. Entrepreneurship education provides the necessary tools for this. Our Steinbeis team in Pforzheim has been teaching these tools for many years in various projects, particularly through the nationwide JUGEND GRÜNDET competition, but also through the Baden-Württemberg project “Start-up BW Young Talents”.

→ **CONVINCING YOUNG PEOPLE
OF ENTREPRENEURSHIP**

When we became involved in the development of JUGEND GRÜNDET over 20 years ago, we were fascinated by the idea of establishing a nationwide online competition to raise awareness among schoolchildren about the topics of start-ups (the term “start-up” was still a thing of the future) and innovation. At the beginning of the 2000s, JUGEND GRÜNDET was the first nationwide online competition with an online business plan assistant, an online simulation game and e-learning modules. We were convinced that we had to meet young people where they often were back then: on the PC! In addition, it was a central concern to anchor economic principles more firmly in schools – and the educational platform JUGEND GRÜNDET also stands for this.

Everything that is new and ahead of its time faces headwinds. Both economic education and an online offering were foreign to many schools at the time. The young people were enthusiastic about it, but it was also important to win over teachers for JUGEND GRÜNDET with the multiple duality associated with it in order to anchor this competition and the educational platform in schools in the long term. We have now succeeded in doing this very well, as shown by the steadily increasing number of participants. JUGEND GRÜNDET has now become a permanent fixture at many schools, and online offerings as well as economic education topics are part of everyday school life. Young people’s interest in start-ups has increased and so, year after year, schools succeed in attracting innovative young people interested in founding a company to the competition who participate without a teacher. Even during the corona pandemic and the associated school closures, JUGEND GRÜNDET was ahead of its time and one of the first competitions to implement the planned face-to-face events online.

WHAT DO THE ENTREPRENEURS OF TOMORROW NEED TO BRING TO THE TABLE?

A look at the past decades makes it clear how much the framework conditions have changed. We live in a world of stacked crises: Climate crisis, corona epidemic, the current war situation. At the same time, we are in the midst of a challenging transformation of our economy and, as a result, our society. In view of these crises and challenges, the question arises more than ever as to what we can pass on to the next generation in order to master these crises.



- One possible answer is to turn young people into active shapers of the future. And this is precisely an important goal of our entrepreneurship education projects and the core of our Steinbeis Transfer. Our aim is to create a framework so that the “world improvement potential” of this generation can unfold! This includes not only imparting knowledge and raising awareness of the topics of founding a company, entrepreneurship, start-ups and innovation. It is also essential to train and promote certain personality traits:

- - Creative qualities: ambitious, confident, unconventional, original, inventive, interested in many things
- Openness to new things: allowing and actively shaping change, changing perspectives
- Self-efficacy conviction: Confidence in one's own abilities and skills
- Proactive personality: independent, proactive
- Stamina
- Ability to think divergently: to deal with a topic openly, unsystematically and experimentally

In short: these are the classic entrepreneurship traits! With our "Start-up BW Young Talents" and JUGEND GRÜNDET projects in particular, we offer an environment to train these skills in pupils and trainees. The focus here is on research-based and projectoriented learning, rather than traditional sitting and stretching lessons. With both entrepreneurship education projects, we are following in the tradition of Ferdinand von Steinbeis. We offer young people in schools and vocational training an application-oriented environment to train these future skills, in the firm conviction that we can help young people with entrepreneurial education. We believe that our young people's ability to act and their innovative strength can provide an important piece of the mosaic for overcoming the current crises. We give our students the tools to actively shape the future from practical experience for practical application and want to contribute to ensuring that innovation and a wealth of ideas paired with an entrepreneurial spirit continue to shape Germany. →|

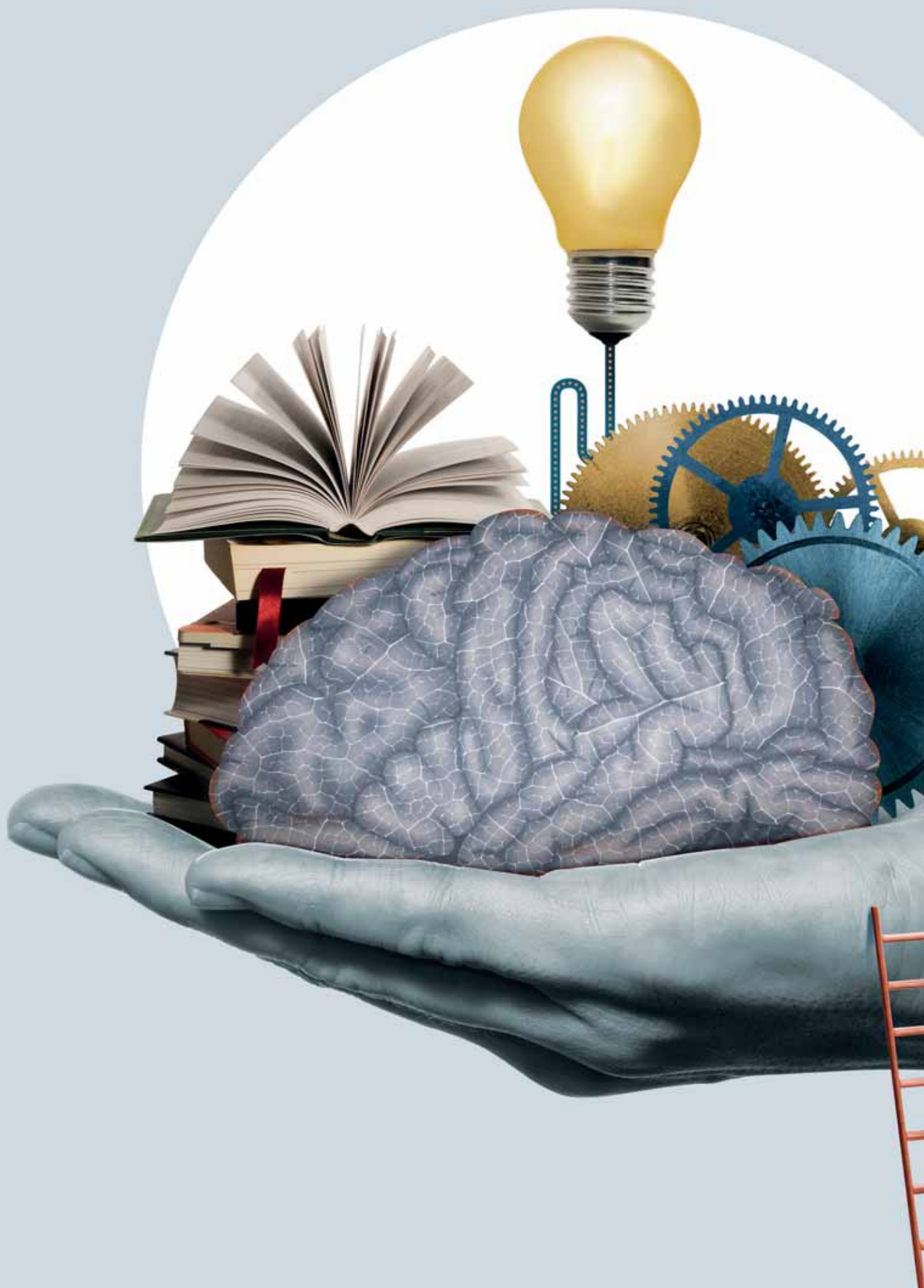


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FOUNDING SPIRIT **MEETS SCHOOL DESK**

As part of the Start-up BW Young Talents project sponsored by the Baden-Württemberg Ministry of Economic Affairs, Labor and Tourism, we offer innovation workshops to all public schools in Baden-Württemberg. Our team goes into the schools and works with the pupils for one school day. No preparation or prior knowledge is required; we give a brief introduction to the topics of innovation and start-ups and then use creativity techniques to guide the young people towards developing an innovative business idea. They present this in a simplified business model canvas and present it to a jury of experts in a three-minute pitch at the end of the day. Our experience: enthusiastic participants, incredibly exciting business ideas and creative pitches.

The online competition JUGEND GRÜNDET has been funded by the Federal Ministry of Education and Research since 2003 and is designed and run by our Steinbeis company. JUGEND GRÜNDET is a success story and is now established as a national competition and recognized by the Conference of Ministers of Education and Cultural Affairs. Here, too, the students develop an innovative business idea and draw up a comprehensive business plan, through which they are guided online with many help texts. Every year, our Steinbeis team evaluates around 600 business plans and is impressed by the innovative strength of the young people. Following the preparation of the business plan, the teams then experience the highs and lows of setting up a company in a business game. The best business plans are presented at several pitch events and the best teams then present their business ideas at a future ideas fair at the national finals. The main prize in the competition, donated by the Steinbeis Foundation, takes the winning team to Silicon Valley for an eventful week.



OF STEAM ENGINES,
ARTIFICIAL INTELLIGENCE
AND QUANTUM COMPUTING:
CURSE AND BLESSING
FROM INNOVATIONS



THE FUTURE NEEDS INNOVATION: RADICAL, DISRUPTIVE AND SUSTAINABLE

**Incremental innovations no longer
solve the challenges of our modern world.
We need completely new ideas.**

The steam engine is widely synonymous with the industrial revolution. It transformed the economy from the late 18th century onwards and led to the rapid growth of industry. The essential technologies associated with it convert fossil potential energy into kinetic energy at best and enable increasingly productive movement and manufacturing, both directly and indirectly via electricity. This in turn led to an enormous acceleration in the development of technology, productivity, education, science and innovation. For example, in the Kingdom of Württemberg, where in the 19th century Ferdinand von Steinbeis was successfully active as an economic promoter and entrepreneurs such as Gottlieb Daimler, Berta and Karl Benz or Robert Bosch as innovators. Even today, 200 years later, the resulting profound and lasting transformation of the so-called industrialized nations is still underway. Industrialization has had such a profound impact on humans and nature that a new geochronological epoch on Earth, the Anthropocene, has been defined. A key characteristic of this era is that humans, with the technologies they have created and used, have become one of the most important factors influencing the Earth's biological, geological and atmospheric processes. The consequences of this may be manageable in the future, provided that technologies with the same consequences can now be used sustainably. This will require innovators and suitable innovations as well as new technologies. Professor Dr. Werner G. Faix is certain that quantum computing is another phase of the industrial revolution that can make a significant contribution to this. As Managing Director of the Steinbeis School of International Business and Entrepreneurship (SIBE), he is intensively involved with the opportunities and challenges of this era for business and society.

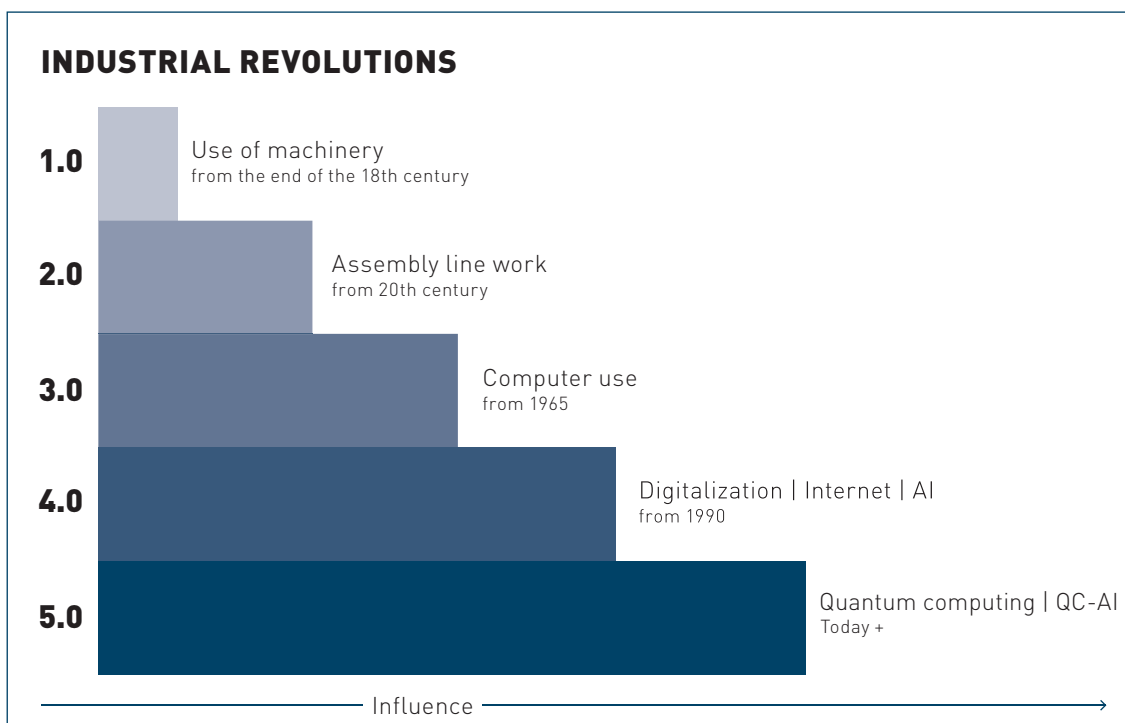
2023: WHERE WE STAND

The Anthropocene era is characterized by four so-called industrial revolutions, each with an increasing degree of complexity:

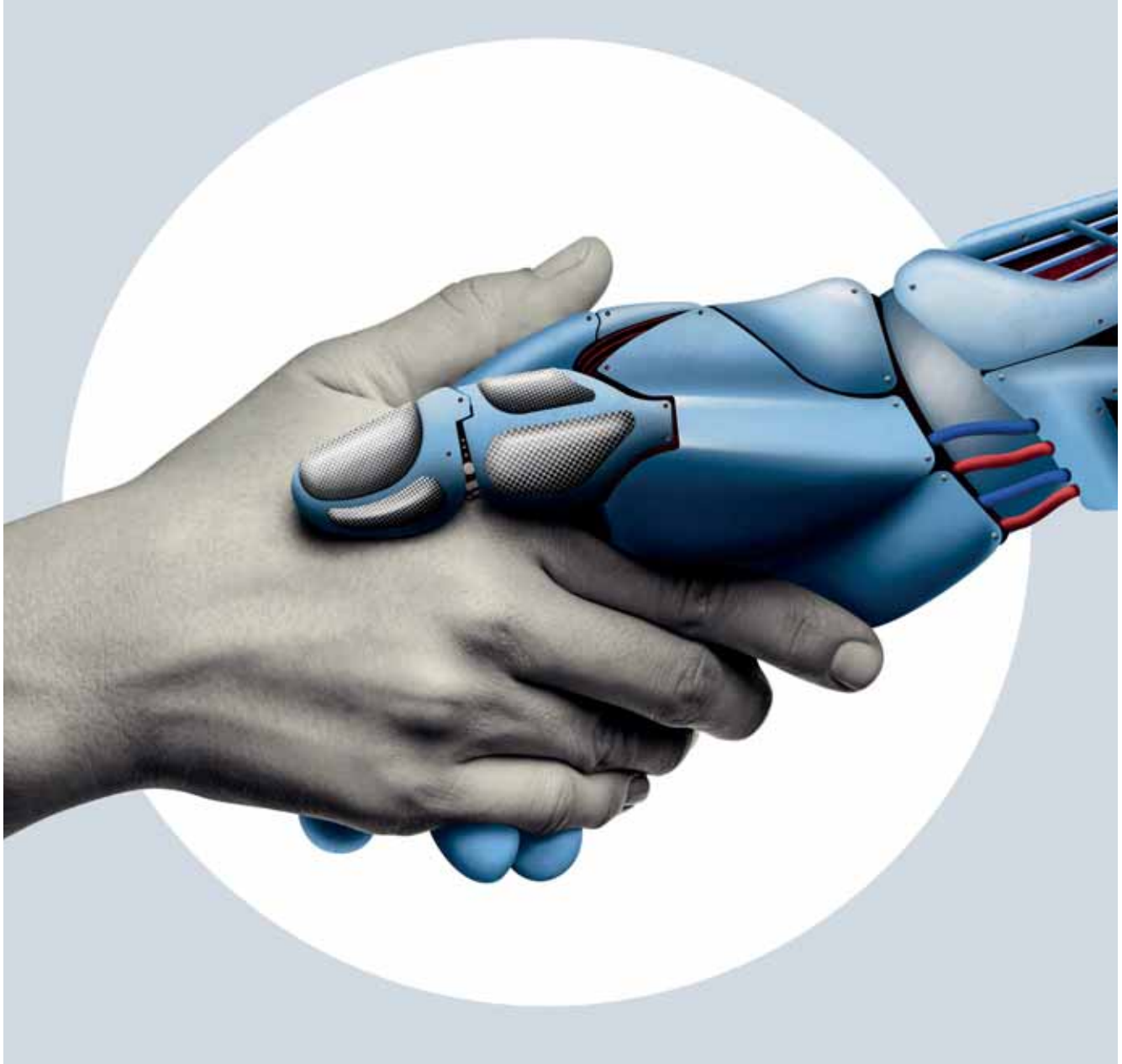
- 1.0 (from the end of the 18th century):
Introduction of mechanical production facilities using water and steam power
- 2.0 (from the beginning of the 20th century):
Introduction of mass production based on the division of labor using electrical energy
- 3.0 (from 1965):
Use of electronics and information technology (IT)
- 4.0 (from 1990):
Internet, digitalization, the use of cyber-physical systems and artificial intelligence (AI)

And I would like to add another one to the previous four:

- 5.0 (today): Quantum computing and the coupling of AI and quantum computing



The five industrial revolutions of the Anthropocene: Change gears speed in the Industrial age



- The chronological classification shows that not only the complexity, but also the speed of developments is increasing drastically – associated on the one hand with many opportunities and on the other hand with the insecurity of many people that they can no longer keep up, which can cause a longing for the glorified yesterday and the supposedly good old days. The Anthropocene is also characterized by several megatrends:
- The world's population has increased dramatically: Whereas in 1800 there were around one billion people, today there are around eight billion. By 2050, the earth's population is predicted to reach around nine billion.
 - People are living longer and longer – with quantum computer medicine, we are predicted to live to over 100. Poverty is decreasing.
 - At the same time, however, over one billion people still have no access to clean drinking water. The number of refugees is rising – partly due to conflicts, wars and famines caused by climate change.
 - Greenhouse gas emissions are still increasing and climate change is progressing almost unchecked. The causes are the increasing consumption of fossil fuels, the clearing and burning of forests and the resulting melting of the permafrost and polar ice caps.

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- Overfishing, global warming, acidification and salinity reduction in the world's oceans: all of this could lead to changes in ocean currents, such as the Gulf Stream—with dramatic consequences.
 - We are experiencing an ever faster destruction of natural ecosystems, the irreversible destruction of biodiversity with a dramatically increasing species extinction.
 - Fertile land is becoming scarce while demand for agricultural products is increasing.
 - People's education has risen sharply, combined with an increasing shift in values towards more co-determination, democracy, environmental awareness, sustainability and willingness to transform.
 - The proportion of people employed in industrial production is constantly decreasing, partly due to digitalization (Industry 4.0, etc.).

These megatrends illustrate positive developments for our quality of life, the proverbial blessing, but also the drastically worsening problems associated with them—the curse as a counterpart. These problems require a rethink towards sustainable, future-proof innovation.

INNOVATION IN GERMANY: THE STATUS QUO

One of the first “mass” productions of 2-Kbit computer chips called the “Riesling chip” took place in the 1970s at Internationale Büro Maschinen GmbH (IBM, formerly Deutsche Hollerith Gesellschaft) in Sindelfingen—the chip was developed in the IBM laboratory in Böblingen. Today, we have to motivate foreign chip manufacturers to produce medium-tech in Germany with enormous subsidies. Nevertheless, we think we are world champions in innovation. This may be true in the case of incremental innovations—but these are not a decisive competitive factor in international competition today. Joachim Dorfs, editor-in-chief of the *Stuttgarter Zeitung*, describes the state of Germany and the German economy as follows: “Security was outsourced to the USA, energy was bought very cheaply from Russia and the goods produced here were sold on the huge Chinese market.”

In the Steinbeis Innovation Study, we analyzed the current situation in Germany in collaboration with the Chair of General Psychology and Methodology at the Otto Friedrich University of Bamberg. The meta-study based on the world's most important innovation studies comes to these conclusions:

- The German economy is a pioneer in incremental innovations.
- The education system and science are good to very good—but not outstanding/excellent, such as universities and research institutions in the USA, Great Britain, Switzerland or China.
- The German economy still lives primarily from companies founded 100 or more years ago.
- A significant increase in transformation processes and radical and disruptive innovations is necessary to ensure the competitiveness and innovative capacity of the German economy.

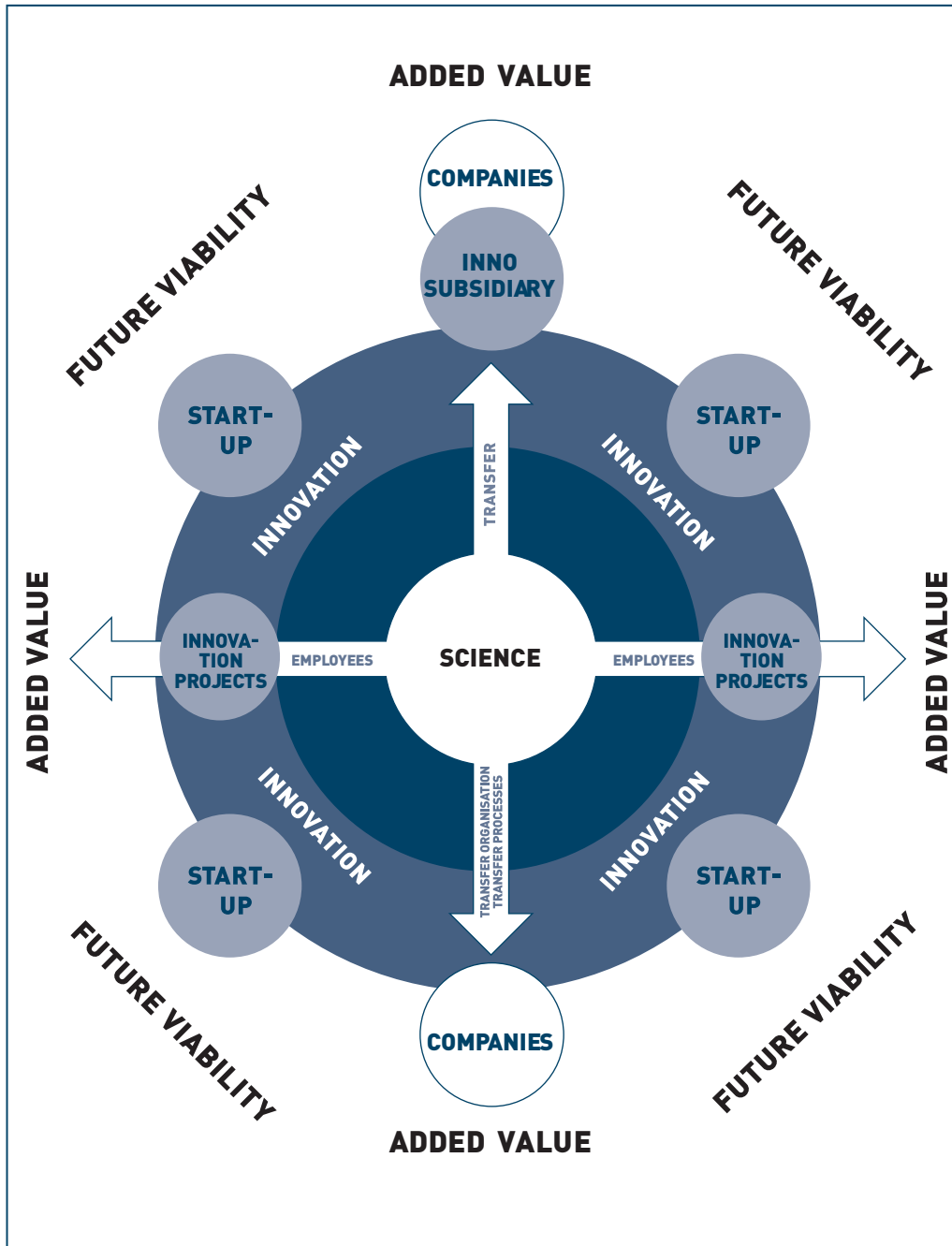
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- The realization of sustainability (climate-neutral energy, food, housing, mobility, etc.) also requires many radical and disruptive innovations and the design of corresponding transformation processes.
 - The transfer of knowledge and technology in Germany must be significantly improved with agile processes – science, companies and politics are all strongly challenged.
 - Value creation through radical and disruptive innovations and thus the value of German companies must be significantly increased and brought into line with the benchmark of US companies.
 - The founder and start-up scenario in economically relevant areas must be significantly increased in Germany (promotion of framework conditions, financing, reputation, risk minimization, etc.).
 - The formation of clusters in Germany and the establishment of (international) networks to increase innovation performance must be driven forward and actively shaped.
 - Entrepreneurial leadership responsibility for innovation must become a reality: The primary task of managers is innovation, management is responsible for ongoing operations! There must be an understanding that an innovation can only be described as such when a good, preferably radical or disruptive idea has become a value-creating reality, i.e. when there has been a significant increase in user numbers and consequently also in company profits and enterprise value.

SHAPING AN INNOVATIVE AND SUSTAINABLE FUTURE: RADICAL AND DISRUPTIVE

My credo: If you innovate in time, you can shape the future sustainably. If you only innovate in the future, you won't have time! The age of the Anthropocene is still characterized by the fact that the various innovations are both a blessing and a curse. A rethink has taken place, partly thanks to the Club of Rome, many other initiatives and movements as well as numerous scientific findings and the effects of climate change that many people are feeling. Unfortunately, however, the necessary changes in behavior are still at a very poor level in reality.

We must and we should work with full conviction and motivation towards a sustainable future that is good and worth living for people and nature. This requires a wide range of efforts and changes in all areas. And this requires a wide range of technologies and innovations – incremental, but above all radical and disruptive innovations. These technologies and innovations must be developed and implemented by us humans – people with education, people with leadership skills – with the support of AI systems and quantum computers where appropriate. To do this, we need innovation systems like the one shown in the diagram on the following page.

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Ideal innovation system: From science via transfer to innovation

- Whether incremental, radical or disruptive-innovations have different characteristics, which essentially differ in terms of their degree of novelty, the type of change and the extent of their impact. While incremental innovations aim to optimize and further develop existing products, services and processes, radical and disruptive innovations aim to develop entirely new technologies, systems or products, for example. These latter forms of innovation are therefore not geared towards performance requirements and standards of existing products, functions and modes of action. These radical and disruptive innovations are particularly necessary for shaping a sustainable and prosperous future. However, established organizations are not the ideal place to develop and implement high-quality radical and disruptive innovations. Living entrepreneurship is much better and more effective in innovation subsidiaries or start-ups.

We must formulate and implement an agenda for sustainability, innovation and education in all areas of society. This will lead to sustainable social and economic prosperity, competitiveness and future viability. Such an agenda also means an agenda for sustainable growth! In a free and democratic society, economic growth is based above all on the accumulation and dissemination of knowledge and thus on freedom of research and thought. The transfer of knowledge into practice for the development of innovation must be promoted through holistic educational processes (postgraduate and post-postgraduate) and appropriate framework conditions. The goal: to enable the transformation of scientific findings into innovations. In the figurative sense of Ferdinand von Steinbeis, the training of young leaders and innovators must take place within the framework of open-ended, real innovation projects in companies and not (only) in the lecture hall. Because then science and industry really do work hand in hand and enable young people to take on leadership responsibility.

INNOVATION NEEDS LEADERSHIP

According to Joseph Schumpeter, leadership means responsibility for innovation and not primarily the management of people. Accordingly, the development of employees should focus on innovation performance, sustainable value creation and leadership. Developing a good idea is one thing – turning a good idea into a value-creating and sustainable reality, on the other hand, requires leadership. This sums up our understanding of leadership at SIBE:



Leadership means leading oneself and human communities into a sustainable, innovative and creative future in open, complex and dynamic situations in a sensible, responsible and ethical manner, taking into account the framework conditions and collective rationality with personality.

(Faix, A.-V., Faix, W. G., Kisgen, S. und Mergenthaler, J., 2019)

→ By “leading” we mean being the cause of people actively wanting to achieve a common (new) goal. Reasonable, responsible and ethical means having good (structural) reasons to create sustainable positive development for the community and to achieve a foundation of value for one’s own community while preserving nature. This means fulfilling the humanistic ideal of education in one’s own individual possibilities and goals and should not be understood in an instrumentalistic way.

Leading into the future means shaping it creatively and, in a complex, dynamic world, requires having an idea of possible scenarios for the future and the goals derived from them, for which one feels responsible. In order for the future to be sustainable, innovative and creative, transformation processes must be developed with the aim of producing innovations—including radical and disruptive ones—and making them a reality in an agile manner. In our understanding, collective rationality is achieved when as many people as possible are involved in a cooperative manner. Ultimately, leadership takes place in many forms of human communities: These include, for example, organizations, companies, research groups, political parties and their sub-communities as well as networks.

INDUSTRY 5.0: IOT, AI AND QUANTUM COMPUTING

The Internet of Things (IoT) and AI are already causal drivers of innovation today. The industrial revolution 5.0 mentioned at the beginning is characterized by quantum computing (QC) and the combination of AI and QC. In the near future, they will be decisive tools for essential scientific findings and will become instruments for a variety of radical and disruptive innovations, new technologies and thus also new business models as well as the necessary contributions to sustainability and to mastering the consequences of climate change.

Some examples of developments that are already being worked on with QC and QC-AI illustrate the potential:

- Microsoft is working with QC on the development of low-energy catalytic nitrogenase versions (fertilizer). This would enable energy-efficient food production in the future and lead to a so-called second lead to a “green revolution”.

-
- Medicine urgently needs new antibiotics, as many germs have become resistant. Traditional development is very complex and time-consuming. With quantum computers, new antibiotics can be modeled and developed based on their mechanism of action. This requires an enormous amount of power, only promising substances are tested in the laboratory.
 - Many serious diseases, such as numerous forms of cancer, are genetic. A combination of gene therapy, quantum computers and CRISPR could become the successful therapy of the future.
 - To stop global and atmospheric warming and secure our energy supply, we need "clean" energy – namely solar energy. It can be harnessed in the form of solar cells, wind power, hydrogen generated from it and in the future with fusion reactors. The further development of fusion reactors will take place with the help of AI coupled with quantum computers and thus hopefully be successful in the near future.
 - ExxonMobil has leveraged the capabilities of the IBM Quantum Network to explore methods that map the global routing of commercial vessels on quantum computers.
 - Researchers from IBM and Boeing have collaborated on optimizing aircraft surfaces to study corrosion and all kinds of chemical reactions that take place on surfaces.

Numerous other applications are in the planning, development and implementation phase. The USA and China are leading the way in the entrepreneurial use of AI, IoT and quantum computing. And although a lot of research and development is taking place in Europe and Germany, the entrepreneurial implementation and application is unfortunately not at a corresponding level.

LOOKING AHEAD

We are in "a race for the future", is how physicist Michio Kaku sums it up. Europe and Germany should make an effort not to lose this race! Because we need to create many more innovations today and in the future in order to enable a sustainable future for humanity and nature. Sustainable innovations and technologies must become a blessing for people and nature! →|



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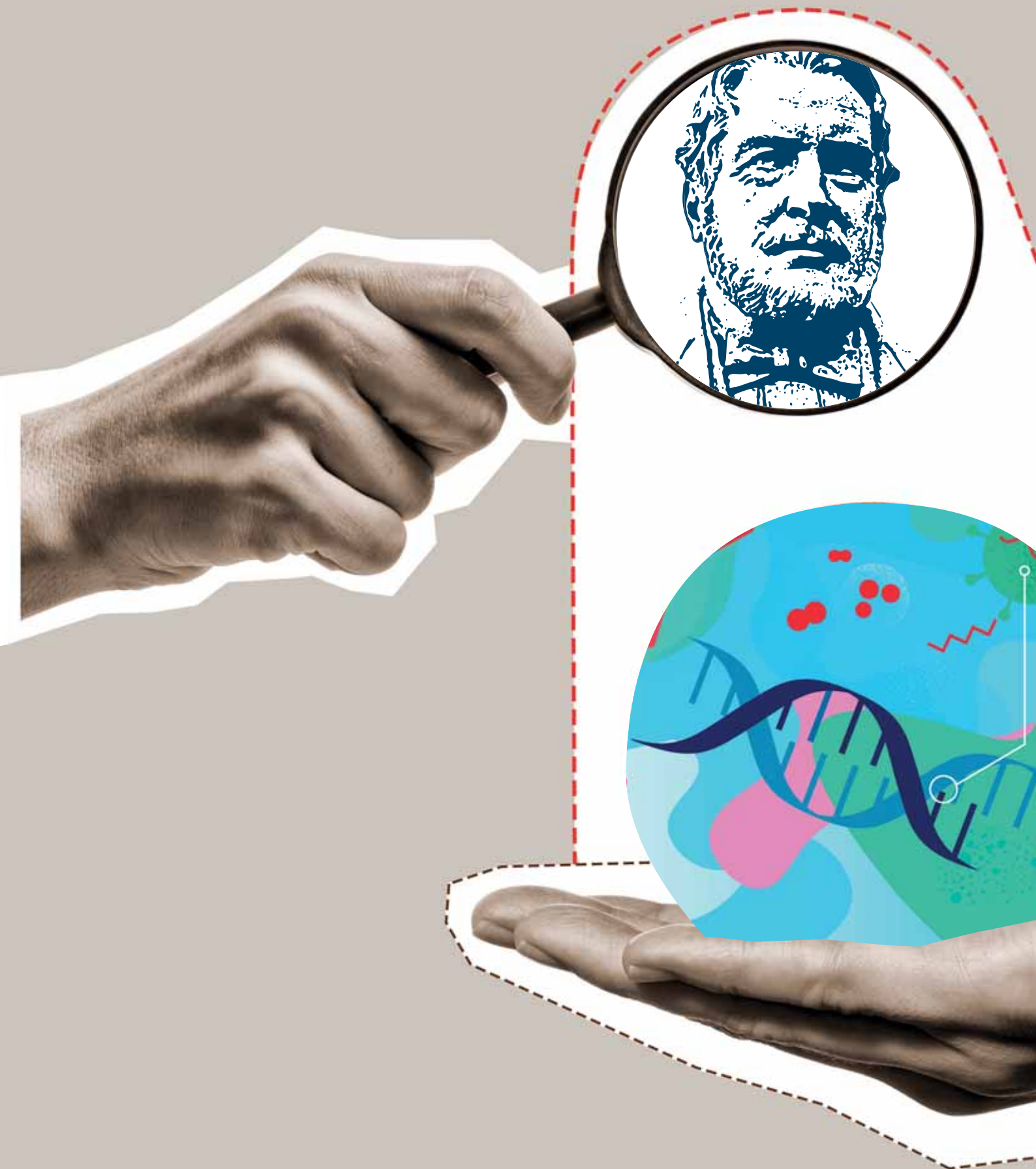
STEINBEIS SCHOOL OF INTERNATIONAL BUSINESS AND ENTREPRENEURSHIP (SIBE) POSITIONED FOR THE FUTURE: INNOVATION PROJECTS WITH SIBE

The Steinbeis School of International Business and Entrepreneurship (SIBE) supports companies and organizations in the development and implementation of innovation projects involving young, competent employees with a Bachelor's or Master's degree, who are intensively supervised by the SIBE team of experts as part of a project- and career-integrated Master's, diploma or doctoral programme. Among other things, SIBE offers an AI/Quantum Computing program in cooperation with IBM, the Alma Mater Europaea of the European Academy of Sciences and Arts and TUM International. The project team members are already employed by the company or are recruited according to the project requirements, including in international target markets. The project team is managed using an innovation project system developed and tested by SIBE. By deploying employees from the company, project expertise is created and remains within the company. Internationally specialized scientists are brought in for challenging projects.

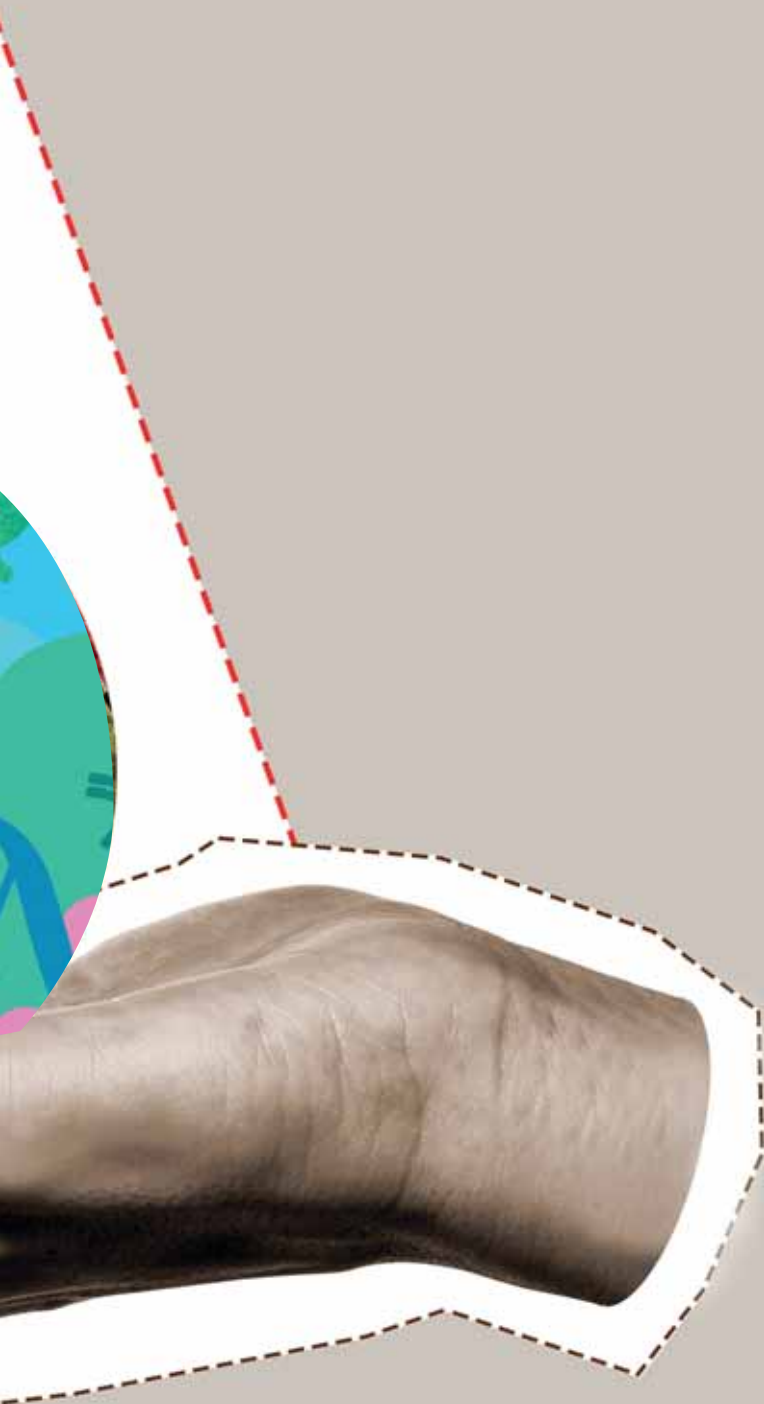
SIBE also supports companies in the development and identification of innovation fields and ideas as well as in the (spin-off) establishment of innovation subsidiaries.

Many of the incremental, radical and disruptive projects realized by SIBE have been published in the German publication series "Management von Innovation und Zukunftsgestaltung" and "Management von Wachstum und Globalisierung":

www.steinbeis-sibe.de/sibe/publikationen



STEINBEIS GENERATION: **ENTREPRENEURSHIP AS DNA**



ENTREPRENEURSHIP OBLIGES!?

**The descendants of Otto Steinbeis show
that family entrepreneurial roots can evolve
from obligation to solidarity.**

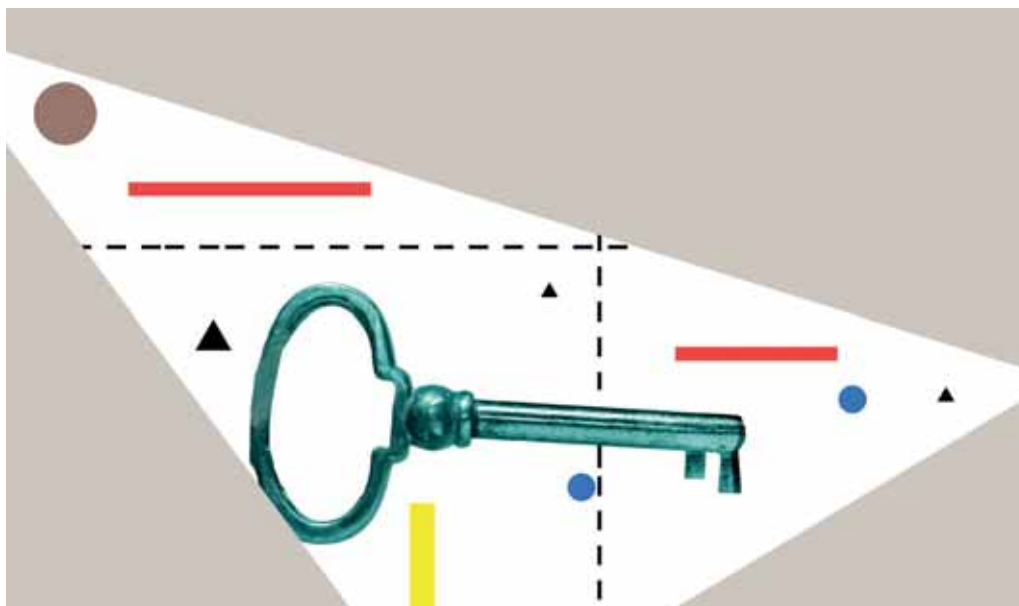
160 years ago, in 1863, Ferdinand von Steinbeis' son Otto set off from the former Kingdom of Württemberg to seek his entrepreneurial fortune in the Inn Valley. The three subsequent generations of his family have successfully and sustainably founded, formed and shaped a company. Today, Stephanie Ecker represents the fifth generation as Chairwoman of the Supervisory Board of Steinbeis Holding GmbH – and in this role, she helped drive the family's decision to retire from active entrepreneurship. In her essay, she looks at the entrepreneurial characteristics that shaped her family and, let's face it, still define them today.

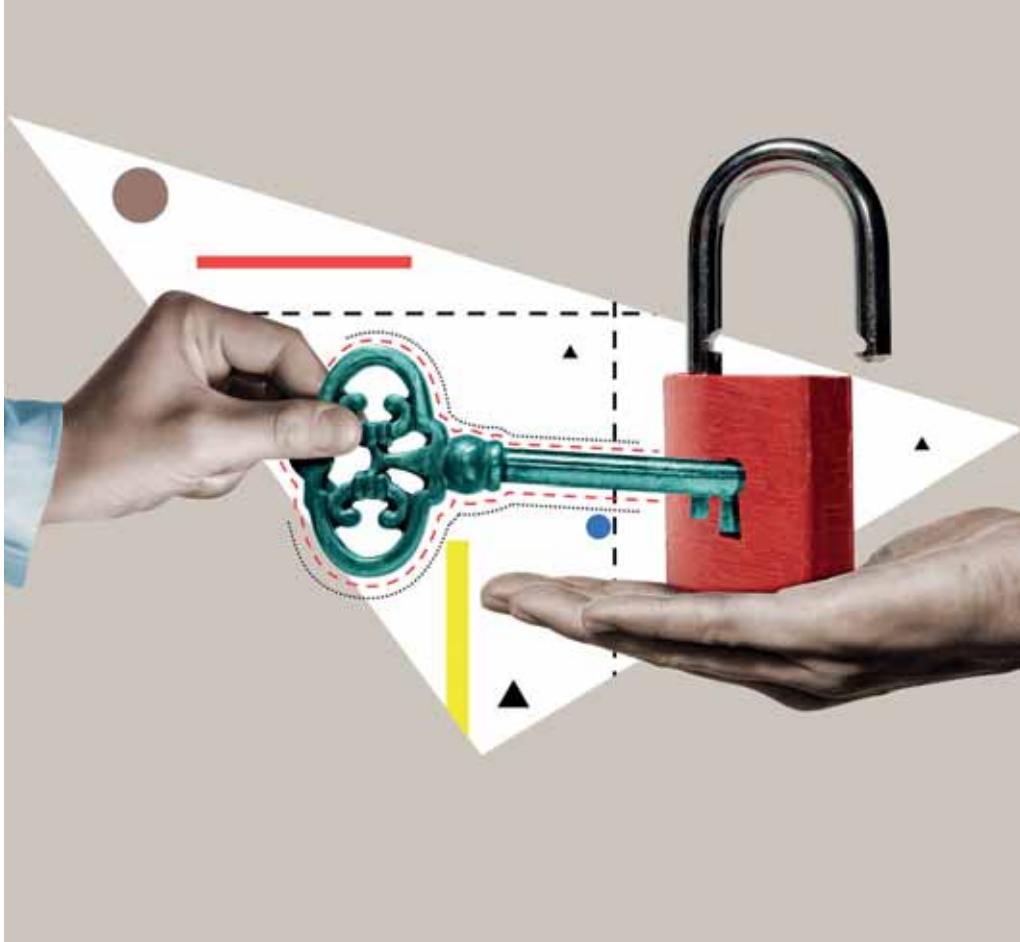
When I began to look into the question of entrepreneurial DNA, the genes that make up the classic entrepreneur, for this article, I was initially skeptical: in the true sense of the word, my family and I no longer see ourselves as entrepreneurs, is it my place and can I judge the qualities of my predecessors that we no longer bring with us or are no longer willing to contribute? What is an entrepreneur anyway and can entrepreneurship or the company be endowed with characteristics and inherited?

THE IDEAL ENTREPRENEUR: DETERMINED, CREATIVE AND CHARISMATIC

If the economist and Nobel Prize winner Friedrich August Hayek is to be believed, an entrepreneur is someone who enjoys overcoming obstacles. He is also an artist who not only creatively generates new ideas, but can also put them into practice and, even more importantly, convince those around him of their merits. Hayek, on the other hand, does not consider the necessary financial resources to be a mandatory requirement, but merely another obstacle to be overcome.

When our ancestor Otto Steinbeis founded the trading company Otto Steinbeis & Consorten in Upper Bavaria in 1863, he used the financial resources of a financial consortium, which he soon paid off. He certainly brought Hayek's entrepreneurial character traits with him. He was involved in many business areas related to forestry, cyanized railroad sleepers, bought a brewery and ran a construction company with partners. But what made him a true entrepreneur and pioneer, known far beyond the borders of Bavaria, was the construction of narrow-gauge railroads through rough terrain, for example in Bosnia-Herzegovina to exploit the forests or up the Wendelstein in his native Upper Bavaria. These were absolutely visionary projects that required not only creativity and persuasiveness, but above all stamina and technical and economic expertise.





→ **ACROSS GENERATIONS:
THE ENTREPRENEURIAL PASSION FOR PAPER**

A lot has happened since then, with three further generations of the Steinbeis family actively guiding the company's fortunes and setting the course for a constantly changing future with curiosity, wisdom and foresight. At no time was there a lack of obstacles and adversity. The former forestry operation was discontinued and paper production moved to the forefront. In the 1970s, the company moved away from specialty papers to become the first company to produce graphic papers based on waste paper. Another pioneering achievement, which enabled one of the first and most modern waste paper processing facilities at the company's headquarters in Glückstadt.

The search for an inexpensive raw material that could also be processed in a way that saved water and energy not only led to a new product, but also to a new focus in terms of content. The economic and ecological alternative to virgin fiber paper brought sustainability into focus for the first time. It is perhaps no coincidence that a family that had found its origins and its fortune in the management of forests found the idea of sustainable action to be an obligation, as it was precisely in forestry that the demand for a functioning cycle, i.e. a balance between deforestation and replanting of forests, was raised as early as the 18th century. The idea of the cycle fitted in well with the environmental awareness that emerged in the 1970s. It also enabled a medium-sized company like our family's to play a pioneering role in a niche that was not occupied by the major global players.

- The paper industry consumes a lot of electricity and water, so it is only logical that these two areas have also become the focus of the increasing debate on sustainability. My family optimized the water cycles in the company back in the 1970s and has been continuously improving them ever since. In the meantime, the coal-fired boilers have been replaced by a new substitute fuel power plant so that all the steam and half of the electricity can be generated at the site. A waste wood-fired power plant, biogas plants, windmills and solar plants are also operated. The aim is to cover the company's entire energy requirements in Germany itself. We are not quite there yet, but there is not much left to do.

Plastics recycling has been a new and logical field of activity of high political relevance for some years now. Based on our experience with waste paper and its sorting, as well as the processing of substitute fuels and their thermal utilization, our aim is to sort waste streams as efficiently as possible. Here, too, the focus is on sustainability and extending the life cycle of resources, at the end of which thermal utilization takes place. We want to become a pioneer in sorting technology and thus also a regional partner to the municipalities, similar to an urban mill. The joint use of heat is also being considered.

STEINBEIS ENTREPRENEURIAL GENES: THRIFT, RESOURCEFULNESS, SOLIDARITY

When I ask myself whether there is another "genetic imprint" in our company that points to the origins of Otto Steinbeis, the usual attributes of a medium-sized company come to mind in addition to the content orientation: thriftiness, because funds were usually too scarce to survive in the market and dependence on banks was shunned due to painful experiences, and consequently a necessary resourcefulness in sensing niches in which it was possible to make a living away from the big players. However, this also includes a close relationship with long-standing, medium-sized suppliers and customers and, conversely, a certain skepticism towards large corporations. A reluctance to engage in marketing and public appearances and a reliance on technicians and engineers led to a rather introverted self-image.

So what about the entrepreneurial character of the family? In Hayek's definition of the entrepreneur, it is noticeable that they are characterized by a rather unwavering spirit, independent of the opinions of others, assertive and visionary. These characteristics could also be described in another way, namely rather self-centered, not very team-oriented and unable to bend to rules set by others. In entrepreneurial families, people tend to look at their ancestors from a more positive perspective. In this way, the stories become adventure tales and failure becomes a necessary ingredient that maintains the suspense.

→ THE GENERATION CHANGE: FROM ACTOR TO COMPANION

But what happens when the company grows over time and the individuals involved are forced to take a back seat in order to make way for a more stable organization? The positive, traditional role models have no place in a fixed structure; in fact, they are disruptive. In our family, the classic entrepreneur has defined and shaped four generations, one generation longer than many, even international proverbs such as "From clogs to clogs in three generations" predict. The last entrepreneurial generation of my family had the foresight to equip the company with a clear compass, but to make it independent of strong family personalities. The search for external managers who would adopt the canon of values and the direction of the company, but otherwise act freely, proved to be extremely successful. Cooperation with the committees, which also include family members, is developing in a trusting and fruitful manner.

Our family has been well prepared for this new role. We feel comfortable in the given context and still identify strongly with the company and its goals. None of the family members aspire to the role of entrepreneur, but this is no longer envisaged. However, it is striking that there is a reluctance or even an unwillingness to give up their own independence within the shareholders. There is no one in our family who feels comfortable in a corporate group or other very rigid structures. I suspect that this is the case in many family businesses. The positive portrayal of independence and non-conformity is perhaps passed on after all. →|



*Stephanie Ecker
Chairwoman of the Supervisory
Board of the Steinbeis Holding
GmbH (Munich)
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STEINBEIS HOLDING GMBH

Sustainability is the industrial value of the future. Resource and energy efficiency secure the productivity of the economy and promote biodiversity. With its investment activities, Steinbeis Holding focuses on companies in the energy industry, ecological paper production, plastics recycling and the circular economy. An investment strategy shaped by the values of the Steinbeis family of entrepreneurs over generations. The company's more than 150-year history is characterized by the paper industry as well as timber and forestry. Other important chapters in the family chronicle include major engineering achievements such as the construction of the first cog railroad in Germany in 1912 and the production of graphic papers based on the secondary raw material of waste paper.



VISIONARIES
WITH FORESIGHT AND
A DOWN-TO-EARTH
APPROACH:
CHAIRMEN OF THE
BOARD OF TRUSTEES
OF THE
STEINBEIS FOUNDATION



“I THINK DECENTRALIZATION IS THE SECRET OF SUCCESSFUL COMPANIES”

Of the past 40 years, Dr. Leonhard Vilser has accompanied Steinbeis on the Board of Trustees for more than 20 years, ten of them as Chairman. Reason enough to meet him for an interview and look back and forward together.

In 1865, Jakob Eberspächer laid the foundations for one of the classic Swabian success stories: With a small workshop for roof glazing, he ventured into self-employment and thus began the history of the Eberspächer Group, which today operates as an automotive supplier. Dr.-Ing. Leonhard Vilser spent most of his professional life working for the company in various positions of responsibility and during this time joined the Steinbeis Foundation's Board of Trustees as a representative of the Landesverband der Baden-Württembergischen Industrie (LVI) e. V., now Unternehmer Baden-Württemberg e. V. (UBW). Anyone who meets the Bavarian-born engineer for a chat immediately realizes that two hearts beat in this thoroughbred engineer: passionate advocacy for more entrepreneurship meets enthusiasm for the natural sciences and engineering. Leonhard Vilser's grandmother was the main instigator of this enthusiasm. But from the beginning.

Dr. Vilser, for many years you headed several companies in the Eberspächer Group, whose origins go back to Jakob Eberspächer's founding of a craft business in Esslingen in 1865. We do not know whether he crossed paths with Ferdinand von Steinbeis, but it is certainly conceivable. In your opinion, what are the essential entrepreneurial genes that were key requirements for a founder then and now?

Vilser: I think that, on the one hand, there are basic requirements that an entrepreneur had and still has to meet, both then and now. And then there are adaptations to the respective times. The basic requirements are that an entrepreneur has a product or service with which he can survive on the market, that he takes care of and that he continues to promote with a certain degree of sustainability. Seriousness also plays an important role, as people then as now paid great attention to how they were treated. The pursuit of the then fast guilder or today's fast euro brought nothing back then and only brings trouble today: no company can afford to bring something onto the market prematurely that does not meet the requirements. In the broadest

sense, the product must be worth something to the customer, and it only has value when a very large percentage of the requirements have been met. Entrepreneurial genes mean that you work on your product or service with great intensity and perseverance, that you see it as your life's work. This is often not compatible with a 35- or 40-hour week, because you have to be there when the product or customer demands it.

Of course, an entrepreneur must also have a viable idea of how to run the company successfully. In Jakob Eberspächer's day, the whole family contributed to this. Every penny was saved and as little money as possible was spent on things that had nothing to do with the business. To this day, not much has changed in order to meet future challenges: After all, investments are only possible if the appropriate financial basis is created. An entrepreneur who thinks he can live without investment will certainly be shipwrecked.

An entrepreneur must also be tenacious and stick with things, even when there are problems, whether

with the product or financially – not giving up as long as there is still a glimmer of light on the horizon. This is a decisive character trait that was as crucial in 1865 as it is today. If you look back over the past decades, you can see which entrepreneurs and companies have survived wars and economic crises: Those were the ones who consistently stuck to their guns and, if possible, also had financial reserves in their nest egg. One of the now deceased owners of the Eberspächer Group once said to me in conversation: "Why do we still exist today? Because we had a crisis from time to time, and we learned how to get the company back on its feet."

Are you born an entrepreneur? I would say that certain genes are often there from the start. But of course there is still a certain amount of development. You can see this in family businesses where there are several children: Some have a certain entrepreneurial gene and others do not. However, there are also examples where these entrepreneurial genes have only developed over time and then the joy and fun of being an entrepreneur has developed.

This also leads me to the topic of work-life balance: I find this term inappropriate because it suggests that I don't live at work. In my opinion, it's more about a balance between private and working life.

You have accompanied the development of the Steinbeis Foundation for two decades as a member of the Board of Trustees, and you have chaired it since 2011. Looking back, what do you see as the milestones and key developments of these years that shape Steinbeis today?

Vilser: The most important step long before my time as Chairman of the Board of Trustees was certainly that Professor Lohn set up the Steinbeis Foundation as an independent organization in its early days. At the time, it was a political idea, and a very good one at that, to establish a link between science and business and to use the possibilities of science to transfer results to the economy. From the very beginning, it was crucial that this transfer was independent of political influence and that the idea of finding interested professors at the universities who wanted to transfer their research findings to industry in addition to their teaching activities was pursued intensively. Of course, the financial incentive

also plays a role here – those who work do so not only as an end in itself, but also in order to have economic opportunities and advantages.

In my view, the next milestone was to make the Steinbeis model known beyond Baden-Württemberg, both in other federal states and abroad. Like many other companies, Steinbeis is still a Swabian company in its origins, but like many Swabian companies, it operates worldwide. It was and is important to support small and medium-sized companies with advice and to accompany and encourage young people at universities in their start-up ideas. What is typical for us at Steinbeis is that this kind of support is temporary and only provided during the start-up phase. When we see that the company is starting to run independently, we gradually withdraw again, freeing up funds for new ideas. For me personally, it was also an important step that we have really centralized the Steinbeis headquarters with the new building here in Stuttgart-Hohenheim. My experience has always been that there is a lack of informal exchange, even if the other department is just around the corner. That's why I was very much in favor of bringing the headquarters

together here in Hohenheim at a common location.

The founding of Steinbeis University was of course also a milestone. International training is essential today. Just as you have to supply the instructions for using a machine, we also support training through Steinbeis University and thus implement Steinbeis in people's minds.

Start-up activities are being demanded and promoted more than ever, but at the same time entrepreneurship in Germany is steadily declining along with the willingness to take on responsibility and risk. Even in family businesses, it has never been as difficult as it is at the moment to find successors as entrepreneurs in one's own family. In your opinion, how can the generation starting out in working life today be convinced and supported to take the step into small and medium-sized entrepreneurship?

Vilser: I think it's a social problem that entrepreneurship no longer has the status it once had. It is portrayed as laborious and risky and the excessive bureaucracy makes it difficult to start and run a business: many regulations go into far too much detail, exert too much influence on companies and thus make

them more sluggish and, from an economic perspective, more cost-intensive – just take data protection laws, for example. This affects even the smallest units, right down to the individual self-employed person who has two or three employees and still has to ensure that they do not disregard any regulations. That is naturally a deterrent. It must become easier again to set up or continue a business, and bureaucratic hurdles must be removed.

In addition, the social status of an entrepreneur used to be more highly regarded, but that has changed. Today, entrepreneurs are considered less important for the economy and society and economic success is taken for granted. But entrepreneurial activities are always associated with risk. Those who take risks can also fail. Entrepreneurship must be given a higher status again today. Being able to decide for yourself what you do, how you do it and when you do it must once again be seen as something important, good and beautiful. That also gives you an inner satisfaction. Social recognition of entrepreneurship is enormously important – from small craft businesses and farmers to large companies, although the latter now often have

less scope for decisionmaking due to their dependence on corporate structures.

“You must focus on innovation and people!” This statement, attributed to Ferdinand von Steinbeis, has not lost its topicality and relevance to this day. Social upheavals, political and economic challenges and technological developments with enormous consequences make competent, reliable and visionary minds indispensable. What challenges do you think a decentralized association like Steinbeis will face in the coming years?

Vilser: Fortunately, Steinbeis has a very decentralized structure: In principle, the headquarters supports the many independent companies in the network with internal services so that they can concentrate fully on their products and customers. I believe that this decentralization based on many independent units is the secret of successful companies, and we at Steinbeis are already very well positioned in this respect. In my opinion, this decentralization must be further expanded and responsibility must be left where it lies in entrepreneurial terms. The headquarters should pursue ideas that relate to the further development of the entire network and deal with

current challenges, whether that is sustainability, changing lifestyles in the future or that we need to research and develop even more intensively. I see the approach of further decentralizing the network as a contrast to some political developments that are increasingly centralized. In contrast, I think the people on the ground know best what they have to do, where their customers are, what products are needed, how to develop them further and where to get the people who want to use their expertise to do so.

It is certainly also important that we continue internationalization with a sensible approach. Because despite all the problems that are seen today, internationalization and the division of labor will continue. I don't think we can solve the problems we face by bringing everything back to the domestic market.

You are what is rightly known as a thoroughbred engineer: Mechanical engineering has accompanied you throughout your entire professional career since your studies and doctorate. At the same time, the industry is increasingly looking for competent young professionals. Where do you see the causes of the current prob-



*Dr.-Ing. Leonhard Vilser
Chairman of the Board
of Trustees of the Steinbeis Foundation*

lems? In your opinion, how can young people be made more enthusiastic about a future career in engineering?

Vilser: I would like to answer with my personal development. I grew up between the city and the farm: I grew up in the city, but I spent all my free time and vacations on my grandmother's farm and saw how farming was done by hand in the 1950s and 1960s. Then came mechanization and even as a child I was fascinated by how it made work easier and how you could work more economically. Even at the age of ten or twelve, I wanted to go in this technical direction professionally and my big dream was to become an engineer. I helped to repair machines and at the same time experienced the spirit of optimism at the time: cars were getting bigger, better and faster. I watched the first men land on the moon on TV at night. I was fascinated by nuclear technology because you could now generate energy with nuclear power plants. I then did an apprenticeship first and saw how it worked, what happens when you

stand at the machine or at the vice every day. I then decided to study mechanical engineering. I think we need to show young people today that you can have fun developing and researching things and finding solutions to problems, just like the mechanization of agriculture did for me back then. Young people need to be inspired to have visions.

In my opinion, it is the task of those of us who are active in companies, but also of politicians and the media, to show that: Yes, we have problems, but mankind has always had problems and there have always been solutions. Take a look at where people's life expectancy is today and where it was decades ago – that shows what is possible. Of course we have to continue to improve, but to do so we have to keep researching and developing, and for that we need scientists and engineers. Today's problems will not be solved by burying our heads in the sand, but by engineers, scientists, doctors and economists leading the way. Politicians must place more trust in these minds. If this trust is there, I am firmly convinced that more young people who are interested in science and engineering will come back. This also includes more intensive training, right from

elementary school. Children need to get to know science and technology hands-on. There must be a theoretical basis, no question, but not everyone has to be able to solve an integral and differential equation.

Looking back, I can say that I would take the same path again today. I have helped to develop the future, and I would like to convey this image of engineering. If you are open to technology, it's a great job with lots of opportunities. In engineering, the same language is spoken all over the world, regardless of the national language. Physics in Germany is no different to physics in Japan, Argentina or anywhere else in the world. In this language, a bit is a bit everywhere, a volt is a volt, a bar is a bar! →|

DR.-ING. LEONHARD VILSER | STATIONS

Studied mechanical engineering at the FH Munich, mechanical engineering at the TU Kaiserslautern and doctorate (Dr.-Ing.) at the University of Stuttgart

1979 – 2014: Various positions of responsibility at the Eberspächer Group, including Managing Director and member of the Advisory Board

Since 2001: Member of the Board of Trustees of the Steinbeis Foundation

2006 to 2011: Deputy Chairman of the Board of Trustees of the Steinbeis Foundation

Since 2011: Chairman of the Board of Trustees of the Steinbeis Foundation

In addition to his voluntary work for Esslingen University of Applied Sciences, Leonhard Vilser was Chairman of the Working Committee for Research, Technology and Education at the Landesverband der Baden-Württembergischen Industrie e. V. (LVI).



Dr.-Ing. Leonhard Vilser

Chairman of the Board of Trustees of the Steinbeis Foundation

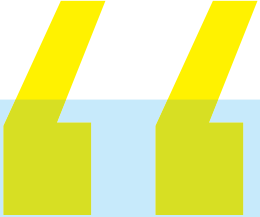
leonhard.vilser@steinbeis.de

AN ENGINEER, WHO THOUGHT OUTSIDE THE BOX

**Prof. Dr.-Ing. Hans Joachim Förster,
former Chairman of the Board of
Trustees of the Steinbeis Foundation**

Prof. Dr.-Ing. Hans Joachim Förster (1916 – 2012) chaired the Steinbeis Board of Trustees from 1982 to 1991 and supported the Foundation with his tireless efforts during its transition to the modern era and in the early years that followed. His constructively critical commitment, his pragmatism and his reliability in the phase of reorientation and establishment of the Steinbeis Foundation contributed significantly to the consolidation and independence of the Foundation and thus laid the foundation for today's Steinbeis network and its success.

Hans Joachim Förster was born in Breslau in 1916. He graduated from high school in 1935 and was then drafted into the air force. In 1938, he began studying mechanical engineering at the Technical University of Karlsruhe. He was called up to the air force again, but was able to continue his studies and graduate with honors in 1941. As early as 1942, he was employed by the then Daimler-Benz AG in Stuttgart; after returning from his time as a prisoner of war, Förster worked in Daimler's development department and took over responsibility for the development of automatic transmissions and power steering systems – a subject to which he was to dedicate his professional life. In 1967, Förster took over the management of the measuring center, and in 1969 the entire research department. In 1983, he retired from his position as Director.



“The engineer’s task is not already done with the artful development of his technical device, but his responsibility only ends when its users handle it sensibly in use.”

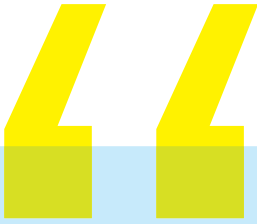
Hans Joachim Förster, from: Technik für Menschen

Parallel to his successful work in industry, Förster consistently pursued his scientific interests. In 1952, he completed his doctorate with a thesis on “Föttinger transmissions in power splits” at the Technical University of Karlsruhe, where he habilitated in 1965 with the study “Conversion range and stepping in vehicle transmissions”. From 1965, he lectured on the subject of power transmission and was appointed associate professor by the same university in 1970. Förster’s wide-ranging interests were also reflected in his numerous lectures and publications. Förster was a member of numerous committees. →|

A PHYSICIAN, WHO FOCUSED ON PEOPLE

Prof. Dr. rer. nat. Dr.-Ing. E. h. Max Syrbe, former Chairman of the Board of Trustees of the Steinbeis Foundation

Prof. Dr. rer. nat. Dr.-Ing. E. h. Max Syrbe (1929-2011) was a reliable and trustworthy contact since 1983 as a member of the Steinbeis Foundation's Board of Trustees, and from 1991 to 2011 as its Chairman, and supported the strategic development of the Steinbeis network. His warm-hearted, human nature, his comprehensive professional expertise and his tireless commitment were a valuable support in the expansion of the network.



“Human performance is proportional to the product of ability and motivation.” Max Syrbe

Max Syrbe was born in Leipzig in 1929 and studied physics in Frankfurt am Main. After gaining his doctorate in applied physics/control engineering in 1953, he worked for BBC in Mannheim for 14 years, initially as a development and project engineer and ultimately as Director and Head of the Electronics Division. In 1968, he took over the management of the Institute for Vibration Research (ISF), which was renamed the Karlsruhe Fraunhofer Institute IITB in 1970.

In 1966, Syrbe was appointed to the Senate of the Fraunhofer-Gesellschaft, of which he became President in 1983. He held this office until 1993. It is thanks to his initiative that the basic concept for the further development of the Fraunhofer-Gesellschaft was developed. Syrbe promoted performance-based contract research for industry and the public sector as the basis for Fraunhofer as the supporting organization for applied research in the Federal Republic of Germany. In 1975, the Faculty of Computer Science at the University of Karlsruhe appointed Syrbe as an honorary professor.

Syrbe's specialist work focused on the fields of automation and anthropotechnics, in particular human-machine systems, as well as research policy and research management. As a scientist and researcher, Max Syrbe was always concerned with producing scientific output not only for its own sake, but especially with synergy and in relation to its concrete application. Defending the necessary freedom of research in particular, he saw no contradiction between the guided creation of knowledge and research: Both are necessary in a networked way, one for the generation of solid foundations, the other as a basis for concrete application, which ultimately again enables the means for creating the foundations. Syrbe was the recipient of the Fraunhofer Sculpture, the highest award of the Fraunhofer-Gesellschaft. He was an honorary doctor of the Faculty of Engineering at the University of Duisburg-Essen and an honorary senator of the Albert-Ludwigs-Universität Freiburg. He was also awarded the Grand Cross of Merit of the Order of Merit of the Federal Republic of Germany and the Bavarian Order of Merit. In 2009, the jury of the Lohn Award honored Max Syrbe's outstanding personal commitment to knowledge and technology transfer as a long-standing member of the Board of Trustees and Chairman of the Board of Trustees of the Steinbeis Foundation with the Steinbeis Foundation's Transfer Award – The Lohn Award as a special award. →|





STEINBEIS:
OUR ROOTS ARE
OUR FUTURE

PULLING IN THE SAME DIRECTION: SO THAT INFORMATION BECOMES CONSOLIDATED KNOWLEDGE AND EDUCATION

Finding out how purely technological change can also result in relevant benefits for society and the economy is the mission of the Ferdinand Steinbeis Society of the Steinbeis Foundation.

Ferdinand von Steinbeis advocated dual training for industrial workers as early as the mid-19th century. In his words, he saw industry as a “craft wedded to science”. For him, the combination of science and practice, the basis of industrialization at the time, was the educational goal of the future. In this way, he established industrial training in Württemberg. While Ferdinand von Steinbeis worked primarily on bringing industry closer to technical science and vice versa on the basis of technology, some 150 years later we are discussing both a change in the orientation of society’s openness to new technologies and, in particular, the economic and scientific research activities that have increasingly accompanied technical sciences over time. Prof. Dr. Heiner Lasi and Prof. Dr.-Ing. Norbert Höptner are developing approaches at the Ferdinand Steinbeis Institute of the Ferdinand Steinbeis Society to promote these changes in science and society.

AN UNDERSTANDING OF SCIENCE SHAPED BY FERDINAND VON STEINBEIS

Although research achievements have become increasingly important for the reputation of entire institutions and the career prospects of individual academics, the quality of research activities is usually assessed exclusively according to purely scientific criteria and not equally according to their social and economic benefits. This one-sided focus has increasingly led to a decoupling of the real phenomena to be researched and the practicing scientists.

Against this background and taking into account the legacy of Ferdinand von Steinbeis, it seems urgently necessary to rediscover the ideal of “dual scientific research” (DSR) as a “marriage” of science and practice: The progress of scientific knowledge, which also demands benefits for the economy and society, is thus a guarantee for a progress-oriented future and thus becomes our legacy.

In the practical implementation of dual scientific research, this can be achieved via a two-polar target system:

1. Good scientific research produces high-caliber publications in international scientific journals – the DSR and the scientist must be measured by this without compromise, a high publication score is desirable.
2. DSR has a “Real World Impact” (RWI) [1] that can be measured directly using an indicator. On the one hand, this claim increases social acceptance and, on the other, serves the self-regulation of researchers. Science whose findings generate verifiable benefits also proves to be meaningful for all those involved. This not only facilitates the funding of research projects, but is currently an important attractor for outstanding researchers.

“Steinbeis research” is therefore characterized by the fact that all projects can document both the progress of knowledge for science and the benefits for practice. Among other things, this was and is the requirement for every dissertation carried out at Steinbeis University.

Based on experience to date, the RWI indicator in conjunction with the publication score represents a good opportunity for self-reflection and control. Institutions and researchers are thus able to self-critically evaluate research projects and allocate the use of resources and time. With regard to the publishability of DSR findings, experience has shown that the ability



- to publish increases due to the localization of research in “real life”, provided that high methodological standards and solid scientific work are adhered to. Experience has shown that “real cases” also convince scientific reviewers.

SOCIAL OPENNESS FOR TECHNOLOGICAL AND INDUSTRIAL ACHIEVEMENTS

In the approach postulated by Ferdinand von Steinbeis of marrying craftsmanship (practice) with science, a social openness is addressed in addition to the understanding of science:

- What craftsmen do and which tools they use are comprehensible to society.
- The benefits of the services provided by the skilled trades are not a cause for concern or skepticism, but a desirable step forward.

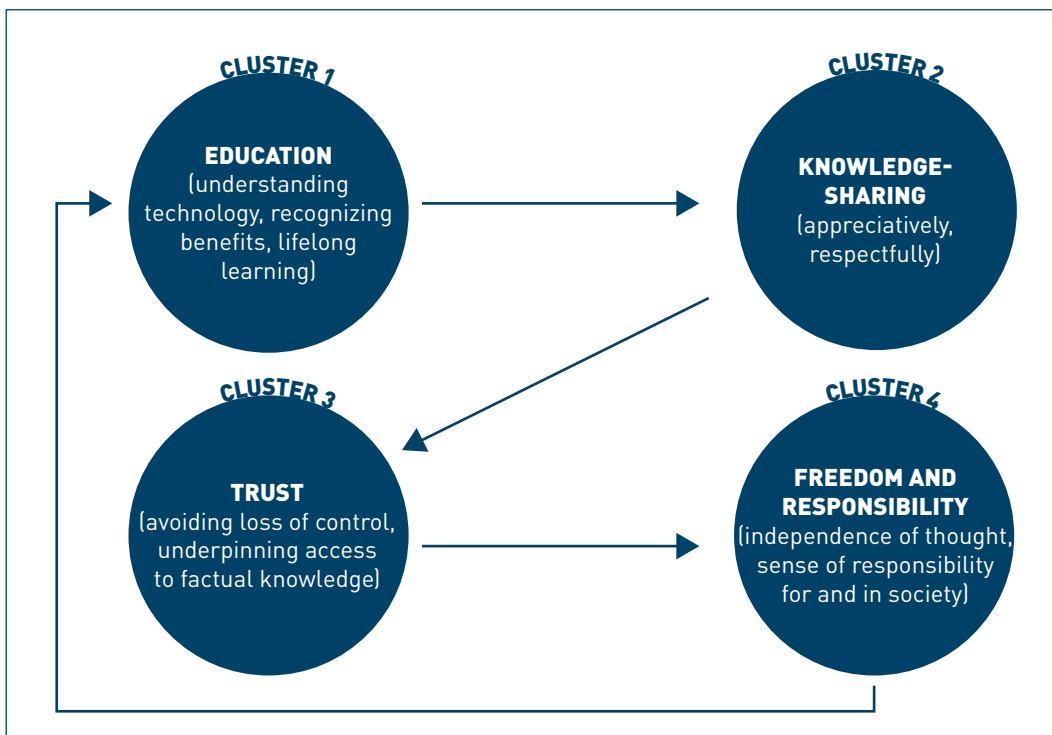
It may therefore come as a surprise that industrial processes and products (hardware, software and services) are met with great skepticism and even rejection, at least in parts of society today. Have we abandoned Ferdinand von Steinbeis' principle that processes and results should be “easy to understand” and “relevant” in terms of benefits, just like craftsmanship?

A quick retort with the argument that the world has become faster, more complicated and in parts more complex since the times of Ferdinand von Steinbeis may initially make sense as an explanation. However, based on our heritage, perhaps we should take up the challenge of focusing more on society and breaking down and explaining industrial achievements into comprehensible components of “craftsmanship” and “science”.

The Interactive Council (IAR) [2] of the Ferdinand Steinbeis Institute (FSI) has devoted itself to the question of how such a decomposition and broad social discussion can take place. The result is a value cycle model [3] consisting of four phases. Values play a central role as a link between a neutral understanding and individual evaluation – i.e. social acceptance.

The value cycle model suggests that we bring new technologies into contact with people as early as possible in an appreciative manner as a confidence-building measure – appreciative both with regard to the respective age and with a view to developmental maturity. Ultimately, this describes an education and research model in which new things are constantly being explored and learned with curiosity and joy, and in which the integrity of all partners involved is guaranteed.

- This is the real revolutionary idea: we are all pulling together in the same direction, namely to inform ourselves in the best possible way. That means effort. Because then it is not enough to look at one or two short social media statements on a topic. We are not calling for the abolition of social media channels, but on the contrary for responsible use of the wealth of information they contain. Humanity has never had such easy access to information as it does today. But we need to develop an intrinsic need for multiple and diverse sources in order to turn information into consolidated knowledge – in other words, education.



*Value cycle model of the
Interactive Council on
Ferdinand Steinbeis Institute*

→ In recent years, a gap has emerged between science and practice as well as society, which must be closed as a challenge for the future. In addition to the concern to interlink science and practice more closely, a modern understanding of Ferdinand von Steinbeis' ideas therefore includes the addition of the aspect of value-oriented social discourse. Ferdinand von Steinbeis showed society how to learn about and experience new industrial processes and products in an interesting way. This was his approach to using technology transfer to promote the economy. Today, the Steinbeis Association helps modern people to find their way in the technological universe in the spirit of the Ferdinand von Steinbeis legacy and thus sustainably supports the necessary transformation processes. This in turn promotes the economy, supplemented by the social level and thus contributes to strengthening the democratic way of life. As a team at the Ferdinand Steinbeis Institute, we are at the forefront of this. →|



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FURTHER INFORMATION

- [1] A Real World Impact (RWI) indicator was developed by the Steinbeis University research working group for reliable measurement and documentation. The RWI indicator can be used to measure and control research performance in the dimensions of "original scientific progress in knowledge" and "contribution to solving a 'real' economic, technical or social problem (transfer contribution)".
- [2] The FSTI's Interactive Council is an interdisciplinary group of personalities who support the Institute's social discourse on the basis of emerging technologies.
- [3] Detailed information on the value cycle model can be found in the Steinbeis Transfer Magazine issue 02/2023.

DUALITY AS A PULSE: THE FERDINAND STEINBEIS INSTITUTE

The challenges of digitalization are the driving force behind the research activities of the Ferdinand Steinbeis Institute (FSTI) of the Ferdinand Steinbeis Society for Transfer-Oriented Research of the Steinbeis Foundation. The team combines scientific expertise with the benefit-oriented implementation of its findings. It challenges previous ways of thinking in science in order to solve the problems posed by the digitalization of business and society.

As an interdisciplinary hub, the FSTI conducts transfer-oriented research and is also an affiliated institute of Steinbeis University. In addition to its location in Stuttgart-Hohenheim, the FSTI team has also been active on the educational campus in Heilbronn since 2019. There, the work of the FSTI is supported by the Dieter Schwarz Foundation.

The focus of all FSTI projects is on dual scientific research, according to which scientific standards go hand in hand with social and thus also economic effectiveness. The FSTI works together with a wide range of partners on interdisciplinary cooperative research projects. The FSTI is the sponsor of the German regional team of the Industrial Internet Consortium (IIC).

PART 2





CREATING VALUE





TWO CENTURIES,
ONE PASSION:
ENTREPRENEURIAL
KNOWLEDGE AND
TECHNOLOGY TRANSFER

CHARACTERIZED BY DUALITIES: THE STEINBEIS MODEL OF KNOWLEDGE AND TECHNOLOGY TRANSFER

**Steinbeis is a problem solver
in transformation, but at the same time
has itself been undergoing permanent
transformation for four decades.**

**What impact does this have
on the Steinbeis idea?**

Dualities are both a pool of innovation and a challenge, says our author Dr. Michael Ortiz. In the following article, he takes a look at the unique selling points of the Steinbeis network, which have changed over the decades. He focuses on the governance structures of knowledge and technology transfer with Steinbeis, places the resulting specific Steinbeis model in its systemic institutional context and discusses the challenges and opportunities for this model. Michael Ortiz is an economic and organizational sociologist and works at Steinbeis headquarters on topics such as corporate development, value-creating networks, comparative corporate competence analysis, transformation processes and technology acceptance. Since his dissertation “Varieties of Innovation Systems in Europe – The Governance of Knowledge Transfer in International Comparison”, he has been working on regional and national innovation systems as well as the theoretical foundations of Steinbeis and the contribution of practical implementation to knowledge and technology transfer systems.



STEINBEIS AND THE DUALITY OF GROWTH AND TRANSFORMATION

The multiple signs of crisis and transformation processes in the economy and society today once again raise the question of the competitiveness and resilience of national and regional economies, established economic areas and large parts of the corporate sector. Once again, the innovative strength and adaptability not only of companies, but above all of the institutional structures surrounding them are becoming the focus of interest (Rothgang 2022; Archibugi/lammarino 2010; Streeck 2004). Knowledge and technology transfer plays a central role in overcoming crises and transformation phenomena (Audretsch et al. 2022; Borrás/Edquist 2019; Edquist 2005). This transfer, as a recursive link between scientific research and entrepreneurial practice, is itself undergoing a significant transformation, as ongoing crises and transformations of the economic, technological and social framework conditions require an ever-accelerating, professionalizing and network-embedded transfer of knowledge and technology.

As a systemic player in knowledge and technology transfer, Steinbeis is also the subject of the processes described: With its unique selling points and the growth it has achieved since its foundation, it has both the claim and the responsibility to be a solution provider and shaper in an economy and society currently characterized by crises and transformations (Auer 2023). At the same time, it is itself exposed to considerable transformation processes resulting from the changed conditions of the present, but also from the development of the Steinbeis network itself in recent decades.

→ **FERDINAND VON STEINBEIS – DUALITY AND UNIQUENESS**

The roots of today's Steinbeis Foundation go back to its namesake Ferdinand von Steinbeis (1807-1893). He is primarily associated with the development of dual education, proactive trade promotion with a focus on the country, successful business start-ups and the first approaches to knowledge and technology transfer via competent experts. Duality characterizes the concepts of Ferdinand von Steinbeis: the combination of theoretical knowledge and practical experience, the targeted support of business and start-up activities with a simultaneous choice of entrepreneurial freedom, as well as the transfer of specialist and expert knowledge into value-creating economic application (Auer 2023; von Alberti 2016).

These dualities also characterize the unique selling points of today's Steinbeis Foundation: entrepreneurial and recursive knowledge and technology transfer of expert knowledge between science and business, dual scientific research and training and further education of specialists and managers, as well as systemic business development as one of the country's central start-up platforms (Auer 2023). The corporate network created under the umbrella of the Steinbeis Foundation is unique in terms of its structure, diversity and reach and continues to draw energy, creativity and innovation from its multiple dualities, but must also continuously adapt to the challenges of the dualities described in its work (Ortiz 2016).

From an analytical perspective, the governance approach is suitable for approaching complex organizations and organizational networks (Ortiz 2013). In this article, it is used to describe the unique system elements of the Steinbeis network based on its specific governance structure, to consider changes over time and the resulting opportunities and challenges.

THE STEINBEIS GOVERNANCE MODEL: DUALITY OF MARKET AND ORGANIZATION

Knowledge and technology transfer should be understood as systemic processes that are embedded in complex social innovation and production systems. Like many other socio-economic processes, knowledge and technology transfer systems are characterized by specific governance models to coordinate the transactions of their actors. The heuristic model on which this analysis is based conceptualizes knowledge and technology transfer systems as specific configurations of the six ideal types of social and economic governance: state, market, organization, network, association and community (Ortiz 2013; Hollingsworth et al. 1994; Voelzkow 2007). This model assumes that all structures, mechanisms and actors that constitute a knowledge and technology transfer system can be assigned to one of these ideal types, making it possible to analyze and compare these systems on the basis of their respective governance models. It also

- enables the reconstruction and analysis of transformation processes within these systems as changes in the configuration of their governance models (Ortiz 2013).

The Steinbeis model of knowledge and technology transfer can be described as decentralized, competitive and entrepreneurial (Auer 2007). It is based on entrepreneurial initiative and the bottom-up activities of actors at the knowledge and technology sources of universities of applied sciences and universities, research and development institutions as well as companies and experts outside institutional knowledge and technology sources. Steinbeis offers these players the structural, organizational and legal framework to implement transfer-oriented projects with economic added value in an entrepreneurial manner. The basic idea behind the Steinbeis transfer model is, as was already the case with Ferdinand von Steinbeis, "transfer via minds", i.e. via people, with their know-how, their commitment and their networks (Ortiz 2016).

In the heuristic model described above, Steinbeis is characterized by a market- and organization-based governance model. On the one hand, characteristics such as decentralized, entrepreneurial degrees of freedom, freelance transfer activities, market-based acquisition and pricing, as well as the value-added-oriented, atomistic competition of business models underline the market-like character of the Steinbeis model, in which knowledge, technologies and competencies are ultimately bought and sold at market prices. Central mechanisms of market-based transfer are consulting services, expert activities, further education and training, or the purchase and sale as well as the licensing of property rights, patents and licenses (Ortiz 2013).

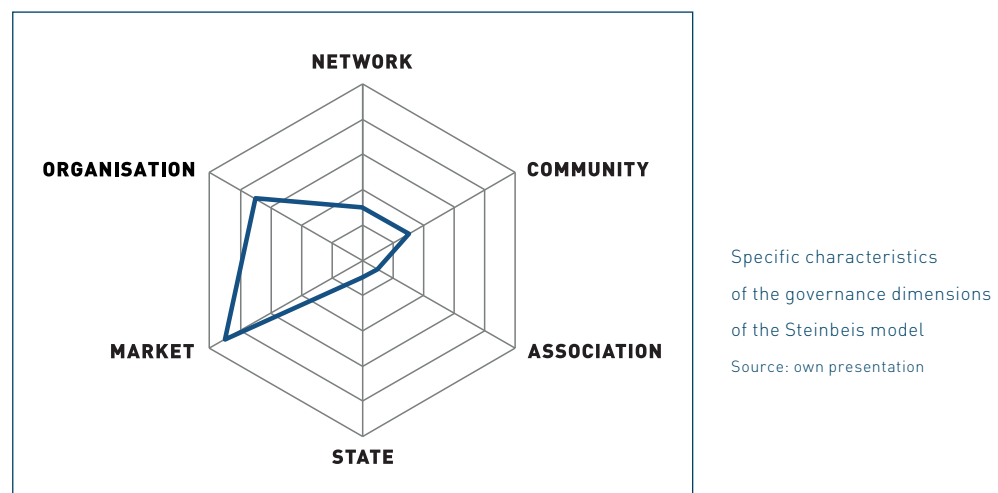
On the other hand, the Steinbeis network also shows elements of organization-based governance (Ortiz 2013). Its organizational structure, with the Steinbeis-Stiftung für Wirtschaftsförderung (Steinbeis Foundation) as the umbrella and Steinbeis GmbH & Co. KG für Technologietransfer underneath as the formal framework for the economic activities of the network, shows a form of "hierarchical" integration as well as a certain degree of coordination through specific formalized (including corporate and foundation law) and informal rights and obligations. In this context, the establishment of new Steinbeis enterprises can be seen as a vertical integration of expertise and technological knowledge into the network, comparable to a start-up or spin-off from science, which is primarily about connecting highly qualified technical and scientific experts to the network.

Furthermore, network- and association-oriented governance elements are also recognizable in the Steinbeis network (Ortiz 2013). Vertical integration into the network is neither strict nor comprehensive, and the individual Steinbeis enterprises (SE) retain the entrepreneurial freedom to interact among themselves and with external partners without losing their independence. In addition, business transactions are subject to a network fee, which serves to provide the central organizational framework and network services for the entire network. The network thus exhibits certain characteristics of reciprocity and thus network-based governance, even if reciprocal interaction between individual SEs or collaborative R&D projects are rather

→ rare. Steinbeis can therefore only be considered a formalized network of collaborating and cooperating individual actors to a limited extent.

The situation is similar with the community-based governance dimension. Even though the Steinbeis network exerts a relevant and lasting attraction on its members and external stakeholders and can thus generate the desire to belong to the network (Ortiz 2013), not least due to its successful economic development, established brand and historical tradition, only a limited shared identity can be perceived among the members of the network. Nevertheless, there are network activities based on informal, voluntary and sometimes spontaneous solidarity and interaction between the players. The various platforms offered by the Steinbeis network also contribute to an informal transfer of knowledge and technology.

State governance elements only play a marginal role for the Steinbeis network. Even though the state of Baden-Württemberg made an important contribution to the reorganization of the Steinbeis Foundation in 1983, and even though Steinbeis is able to operate at the state's universities of applied sciences and universities on the basis of framework agreements, public sector mechanisms have so far only had a limited direct impact on the organization and structure of the Steinbeis model (Ortiz 2013).



DEVELOPMENT DYNAMICS: DUALITY OF OPPORTUNITIES AND CHALLENGES

Over the past 40 years, the Steinbeis network has undergone considerable development, characterized above all by quantitative growth and qualitative expansion. Starting with 16 technical consulting services in 1983 (Steinbeis 2006), more than 1,100 Steinbeis

→ enterprises will be active in 2023. These include offerings in almost all technological and scientific disciplines. There is also a wide range of services in the fields of management, organizational and strategy consulting as well as training and further education, the latter mainly under the umbrella of the Steinbeis University. In addition, there are numerous corporate investments in various forms as well as franchise companies abroad (Ortiz 2016). This positive development dynamic in terms of the breadth and depth of the Steinbeis portfolio as a result of the success and appeal of the model certainly brings with it new opportunities as well as challenges. Both will have an impact on the organization and governance structure of the Steinbeis network.

Clarity and findability of the service portfolio, quality assurance, the appropriate alignment of the network's own platform offerings and also the central network organization are becoming key challenges in a growing network. As a result, the network headquarters is also changing in terms of its design, breadth and depth of the services offered. The striking fragmentation of the network structure, but also the imbalance in the performance of the network companies, must be dealt with more intensively than before (Ortiz 2016). It will be more important than ever to follow the principle of Johann Löhn, who also introduced the dynamic synergy of poles as an organizational principle (Auer 2023), i.e. to draw productivity from the tension between opposites and differences. Today, the fragmentation of the network structure is increasingly being countered with coordination and facilitation of network activities, the imbalance in performance is countered primarily with targeted skills development and intensified portfolio management.

In addition to organizational and structural challenges, growth, size and heterogeneity also present opportunities. With its 1,100 affiliated companies, the network is a unique portfolio of atomistically structured expertise and transfer services (Steinbeis 2023). Customers can select precisely tailored and highly specialized services from the large number of small and micro units. However, in the current phase of profound transformation of the economy, society and technologies, it can be observed that it is not the fragmented technological development focused on specific disciplines that dominates, but above all the networked development at the interfaces of industries, disciplines and technological fields. As the central technological challenges of the present day in the key sectors of mobility, energy, ICT and health are strongly characterized by cross-disciplinary and cross-sectoral developments, it will be increasingly important to take into account that the service offerings of many individual network companies will find it increasingly difficult to meet the resulting changes in demand, both in terms of their scope and their size. This will also put pressure on the network to connect its competencies more strongly than before in strategically relevant and interdisciplinary subject areas in order to be able to acquire technology transfer projects that require a wider range of competencies and content expertise, but also a higher level of resources.

From a comparative perspective, the challenge of a fragmented network can also be seen as a competitive advantage that is not available to other providers of knowledge and technology transfer services in this form. Moreover, to the extent that it is possible not only to initiate, sta-



- bilize and coordinate micro-networks and collaborations between associated companies in strategically relevant fields, but also to combine and recombine these competencies in a flexible or modular manner in the context of dynamically changing technological demand, significant competitive advantages could arise.

The imbalance in performance with its Pareto distribution of value creation in the network (20 % of the network companies generate 80 % of the turnover) can also offer significant opportunities for development (Auer 2007). This distribution can serve as a valuable breeding ground for the incubation of successful and valuable ideas as well as business and service models for knowledge and technology transfer in the sense of a market laboratory (Ortiz 2016). If the costs of founding, developing and managing the

- network are also taken into account, the importance of the targeted and portfolio-oriented development of the services offered by the individual network units becomes clear. In addition, there is a general trend towards the increasing professionalization of players and approaches in knowledge and technology transfer, particularly with regard to the use of well-founded and validated strategy and technology concepts, mechanisms and instruments. This offers enormous potential for the network if it succeeds in maintaining and possibly even expanding the professionalism and quality of its service portfolio in comparison with competitors.

STEINBEIS AS A SYSTEM-DEFINING AND “NON-SYSTEM” ELEMENT

With its specific structure, unique selling points and service offerings, Steinbeis brings remarkable system elements to the German system context. While the German knowledge and technology transfer system is strongly characterized by activities and funding from the public sector (Abramson et al. 1997), Steinbeis is characterized more by an entrepreneurial and market-based model. Whereas other transfer actors in Germany have basic public funding and focus on large companies, Steinbeis is an economically selfsustaining transfer model that focuses on small and medium-sized enterprises.

Steinbeis thus contributes a model that deviates from the dominant patterns of the German and Baden-Württemberg innovation, knowledge and technology transfer system, which in turn is accompanied by dualities. On the one hand, this model represents an attractive alternative offer in the overall system for transfer-oriented experts as well as for companies and organizations inquiring and offers additional transfer options that might otherwise not be offered. On the other hand, there is also the perception of a model that is alien to the system as a whole, which places private-sector approaches and profit orientation on a science and research system that is essentially supported and financed by the public sector. This is an area of tension that also includes reservations on the part of individual universities of applied sciences, universities, research institutions and researchers.

Due to the breadth of its entrepreneurial transfer offerings, Steinbeis has become a systemic player in knowledge and technology transfer, at least in the federal state of Baden-Württemberg (Braczyk et al. 1998; Cooke et al. 2004; Krauss 2009; Heidenreich/Krauss 2004; Fuchs/Wassermann 2004; Heidenreich 2001). Steinbeis is shifting the orientation of Baden-Württemberg's regional knowledge and technology transfer system as a whole and in particular in a more entrepreneurial and market-oriented direction (Ortiz 2013). A significant proportion of the knowledge and technology-intensive corporate sector, as well as the transfer-oriented universities and research institutions in the state, benefit from this. Today, Steinbeis sees itself as a modern service provider and consciously accepts its (also systemic) role for transfer entrepreneurship in the state. As a player closely embedded in the state's innovation system, the association acts as a technological solution provider and facilitator of entrepreneurial ideas. Value retention and the creation of benefits for the economy and society are key guiding principles.

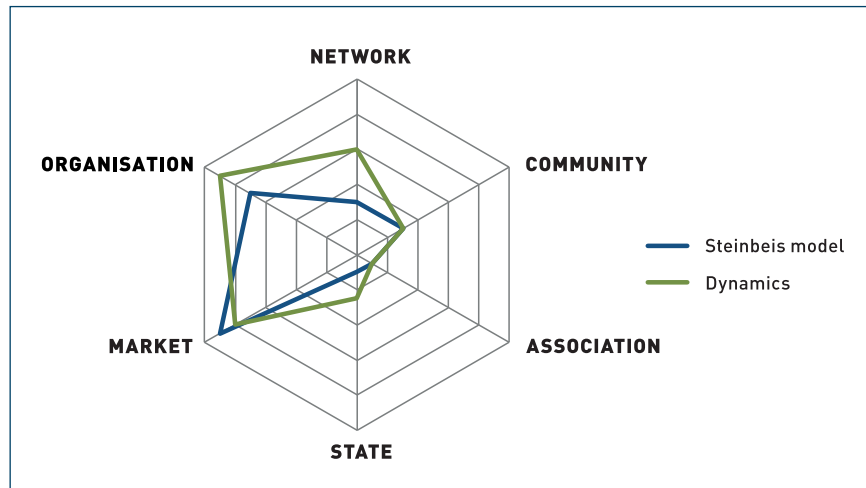
- It is therefore not initially contradictory that Steinbeis is involved as a partner in a variety of public funding contexts. In recent years, however, it has been observed that over-dominant public funding environments have been created for specific future topics with seemingly unlimited funds, leaving hardly any room for private sector transfer initiatives. Participation in these funding backdrops is therefore becoming a major challenge for the entrepreneurial transfer model, as is adapting to the possibility of these backdrops suddenly collapsing. In addition, there is an ever-increasing bureaucratic burden and an increasingly tightly woven canon of regulations, which make transfer entrepreneurial commitment more and more costly and in some cases undermine it. Decentralization, entrepreneurial freedom and lean organization as the basis and philosophy of the Steinbeis network are increasingly challenged by this (Auer 2007; Steinbeis 2009; Ortiz 2016).

Further significant challenges for the transfer entrepreneurial model are also evident in the decreasing freedom of researchers at universities of applied sciences, universities and research institutions, as well as the marked decline in student numbers in technical disciplines, which means that a further decline in qualified and transfer-oriented experts can be expected in the coming years, particularly in technology-oriented fields. The association is also responding to this with a stronger focus as a potent start-up platform and facilitator for solutions and entrepreneurial ideas from experts outside of science. However, the extent to which the further development of the political and legal framework conditions takes into account the facilitation of entrepreneurial knowledge and technology transfer and leaves room for transfer entrepreneurship or frees it up again or even creates new ones will also be of no small importance here.

Finally, the growth and breadth of the network also make it necessary to think more about the regionalization of the network structures. In many regions, there is already a significant concentration of groups of Steinbeis companies, be it in certain federal states outside Baden-Württemberg or around the locations of individual knowledge sources. Regional presence as well as the regional orientation and positioning of services offered by Steinbeis companies, but also regionalized services of the network headquarters will gain in importance. Regional partnerships will be entered into locally through the founding of regional companies, but also of university transfer companies together with the universities, and regional contacts will also be established locally. The management of a regionalizing network in this form is likely to be one of the main challenges of the immediate future.

→

Development dynamics
of the Steinbeis model
Source: own presentation



OUTLOOK: STABILITY AND CHANGE

Steinbeis is a unique governance model in terms of its structure, characteristics and mode of operation, which continues to be strongly influenced by the market and organizations. However, growth and diversity, as well as changing economic, social and political-legal conditions, are increasingly bringing elements of network-based governance and public-sector governance to the model. In addition, the need to coordinate network activities in a targeted manner will increase. This will have an impact on the established balance between centralized and decentralized network management. The targeted networking of Steinbeis companies with each other and with partners will become more important, as will the role and organization of the headquarters in initiating, facilitating and integrating strategically important network activities with the corresponding scope, volume and quality. 40 years of Steinbeis as a dynamically learning system make us optimistic that this transformation can continue to be successfully mastered and that the unique dualities of its origins at Ferdinand von Steinbeis can be continued in a beneficial way. →|



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STEINBEIS-TRANSFER:
NETWORK(ING)
WITH
ADDED VALUE



THE POTENTIAL OF THE FUTURE LIES IN NETWORKING

**Increasingly complex challenges
can only be solved
on a cross-company basis.**

**The bwcon team knows the challenges
and opportunities of value-adding networking
between different companies
and organizations.**

Alexandra Rudl and Dr.-Ing. Jürgen Jähnert are convinced that the value creation of tomorrow will take place in networks to which various players contribute their skills and technologies. As Managing Directors, they are both responsible for bwcon GmbH, a company in the Steinbeis network dedicated to digital transformation. It is backed by Baden-Württemberg: Connected e. V., a network of more than 700 members that brings together start-ups, industrial companies of all sizes, service providers, investors and local authorities. What sounds simple is becoming a challenge for companies and employees, particularly due to the dynamics, complexity and changing requirements for collaboration in the digital transformation. The bwcon team has set itself the task of supporting companies in meeting and overcoming these challenges. After all, networking offers added value that has no alternative in the digital transformation.

CHALLENGES OF DIGITAL TRANSFORMATION | Dr.-Ing. Jürgen Jähnert

Our economy is currently undergoing a transformation process that is largely characterized by digital technologies and the increasing use of data as assets, as resilient economic goods. This transformation process is interacting with two parallel trends: technological progress on the one hand and the pressure for resource and energy efficiency on the other.

Technological progress enables the implementation of new scenarios. Thus “digital” things and services are adaptive and smart, i.e. they adjust autonomously and selfregulating to changing environmental variables. Technologies such as artificial intelligence (AI) and machine learning accelerate this process, while simulation technology allows us to predict the future more accurately and exploit this accordingly in the respective control mechanisms. Distributed ledger technology, of which the cryptocurrency Bitcoin is probably the best-known representative, enables trust in the network and transaction security. In combination with the Internet of Things and Services, 3D printing processes, communication technologies (WLAN6, 6G) and cloud computing, further innovation potential is unleashed. Digital, autonomous organizations can emerge here, enabling new scenarios and collaboration structures as well as a higher level of trustworthy transactions between digital processes. In turn, these often lead to new data-based value creation networks that emerge dynamically and dissolve just as dynamically.

Parallel to this, a second trend is the now widespread realization in many areas of society that we have not been careful enough with planet Earth in the past. The resources available to us have not been used prudently enough. The consequences of energy use, for example the removal of environmental damage or waste, have been socialized too often. And the external pressure to use materials more efficiently was not great enough. To put it provocatively: energy was too cheap, the costs of waste disposal were tolerated by the state and in some cases even subsidized and passed on to the general public. This led to an economic system that was strongly oriented towards the paradigm of “extraction”: Soil resources were and are taken from the earth, in agriculture fruits were taken from plants, in production the raw materials (metal, wood building materials,...) were mainly produced by machining processes, the waste was partially disposed of and selectively fed into a recycling process. This entire production process generates too much waste and the economic system itself is incentivized to immediately replace the products that have just been purchased with new, more efficient ones. This leads to further waste, but also to wealth and prosperity, but not to an energetic optimization of the economic system.

→ ***A RETHINK IS NECESSARY AT MANY LEVELS***

In the meantime, society is thinking differently about this way of doing business. The financial industry is forcing companies to invest in ESG (short for environmental, social and governance), energy has become significantly more expensive and climate change is leading to ever-increasing costs.

The digital transformation could herald a paradigm shift in the economy. What this new system will look like cannot be definitively predicted at this point. What is certain is that the already complex interrelationships will become even more complex and that an individual or a small group of experts will not be able to quickly penetrate this complexity in its entirety.

Mastering the various technologies is already challenging, but now it has to be combined with change management, didactic training and the design of new value creation models. Last but not least, it must go hand in hand with the ever-increasing regulatory mania and the legal framework conditions must always be adhered to.

This change, especially the increasingly complex space, requires a completely different approach from business players than the previous one: Baden-Württemberg's economy was founded by ambitious inventors who often created companies with global visibility. They were ambitious, often competed with other inventors and quickly found their place on the global market in an economy that was predominantly focused on products.

The inventors were still able to master the complexity of the time on their own. The desire to be independent, combined with the necessary ambition, were certainly key success factors for the development of a company. And just like Ferdinand von Steinbeis, practical skills combined with theoretical knowledge focused on a few individuals were enough to successfully place groundbreaking innovations on the market.

***DYNAMISM, COMPLEXITY AND WILLINGNESS TO CHANGE
CHARACTERIZE THE FUTURE ECONOMY***

In the process of digital transformation, this approach, which was also a source of identity for many companies, will no longer be sufficient. The momentum with which new technologies are being introduced into a convergence process is constantly increasing. New forms of organization and communication must also be introduced, and

→ in addition to innovation driven by technologies, a transformation of value creation models is also taking place. For example, companies that previously focused on machining production processes are now confronted with topics from the field of machine learning. The methodological knowledge required for this must first be laboriously acquired. Once such methodological knowledge has been built up, the structured use and application of these methods and technologies can often lead to the “creative destruction” of established value creation models in Schumpeter’s sense. Such a path can be both painful and challenging for companies. It requires a change process that can fail on various levels: due to the methods and skills of employees, the willingness of management to change, the availability of qualified specialists, or simply the hope of employees that the transformation will bypass their own organization.

SMEs often do not have the financial resources to manage this process on their own. There is a lack of skilled workers and the associated impetus for change within the company would be too challenging. As a result, these small and medium-sized enterprises in particular are forced to contribute their own expertise to new value creation networks in which different companies work together to develop innovation potential through completely new forms of cooperation. In other words: If you cannot build up the competencies within your own company, they must increasingly be tied to your own company by means of cooperations and new forms of interaction. The greatest challenge here, in addition to the ability to self-reflect on one’s own lack of skills, is the ability to cooperate as a new elementary requirement of one’s own skills profile.

For companies, this can mean that the traditional separation between sales and purchasing no longer applies, as people have been socialized to think predominantly unidirectionally. The role of buyer must simultaneously sell and the role of seller must simultaneously buy. They must use this awareness to pursue business development together with the representatives of the complementary companies – in other words, to develop values in a value creation network. This type of cooperation must first be learned and is a complex and multi-layered challenge. A common, feasible overall technological vision, an overall vision at the customer-centric value level and an incentive mechanism that is acceptable to all stakeholders on an equal footing and serves all partners involved appropriately must be developed. People also interact with each other on another level: compatibility is required on the social level to ensure that the value creation networks function operationally.

Only if a common vision, a common understanding and a common set of interests prevail at all levels of the aforementioned multi-layered trends, i.e. technological progress and the pressure for resource and energy efficiency, can companies assert themselves on the global market.

- This leads to change for many companies. Familiar paradigms are being replaced by new ones, companies and their employees have to discard established knowledge and make room for new knowledge. The new challenges lead to much greater complexity, which unfortunately cannot be met with trivialization. The required knowledge is generally not fully available in an existing organization and the established communication relationships in the organizations have not yet contributed sufficiently to the systematization of this organizational knowledge. This is nothing new in itself, as this was already true of the transformation in the days of Ferdinand von Steinbeis (industrialization) or Johann Löhn ("electronization") – only today with a much higher degree of complexity and speed.

REQUIREMENTS FOR NETWORK MANAGEMENT IN DIGITAL TRANSFORMATION | Alexandra Rudl

In light of the challenges described above, value-adding networks will become increasingly important. They have the potential to act as a catalyst and moderator in the transformation process. However, this also makes the field of network management increasingly complex. This is because network managers need specific skills that encompass both specialist and methodological knowledge in order to support the value creation development process at all levels. This also requires learning at all levels on the part of network management.



→ **TASKS OF MODERN NETWORK MANAGEMENT**

While network managers in the early years of clusters and networks were primarily responsible for coordinating and organizing network meetings, today we see our role as moderators of value creation networks. We no longer simply bring people together, but accompany them with our specialist and methodological knowledge through the various innovation and transformation phases with the aim of creating new added value. We have divided these phases in the bwcon network as follows:

- Raising awareness, that means working towards a common understanding of the various aspects of digital transformation: technological progress, economic and environmental sustainability and willingness to change.
- Analysis: Where do our member companies currently stand and what are their needs in terms of digital transformation?
- Technology evaluation: Which challenges can be solved with which technologies?
- Business model innovation: In which value creation model does the technology create the best possible customer benefit and meet with market acceptance?
- Implementation: Can the vision be better implemented within the group of companies or are additional players helpful, such as specifically selected start-ups from the network that serve as technology solution providers for the established companies?

COMPETENCE REQUIREMENTS IN NETWORK MANAGEMENT

To enable our network managers to provide this comprehensive support in the transformation process, we have defined various overarching skills as "bwcon skills" in our HR development program. Our aim is for all colleagues to have at least a good level of user knowledge, ideally expert knowledge, in these competencies. This includes

- Moderation skills: Value can only be created in the network if people trust each other. This building of trust in the network requires professional moderation to guide people through the various innovation and transformation phases.
- Job-to-be-done competence, this means the competence to understand the essential customer needs together with our member companies and to develop a suitable (technical) solution on this basis. We guide all parties involved to adopt a "market-pull view" instead of a "technology-push strategy".
- Systems competence: By this we mean the ability to understand complex (organizational) systems and to recognize their mutual influences. Applied to network management, this means that the employees in network management are able to recognize synergies between member companies and establish cooperation.



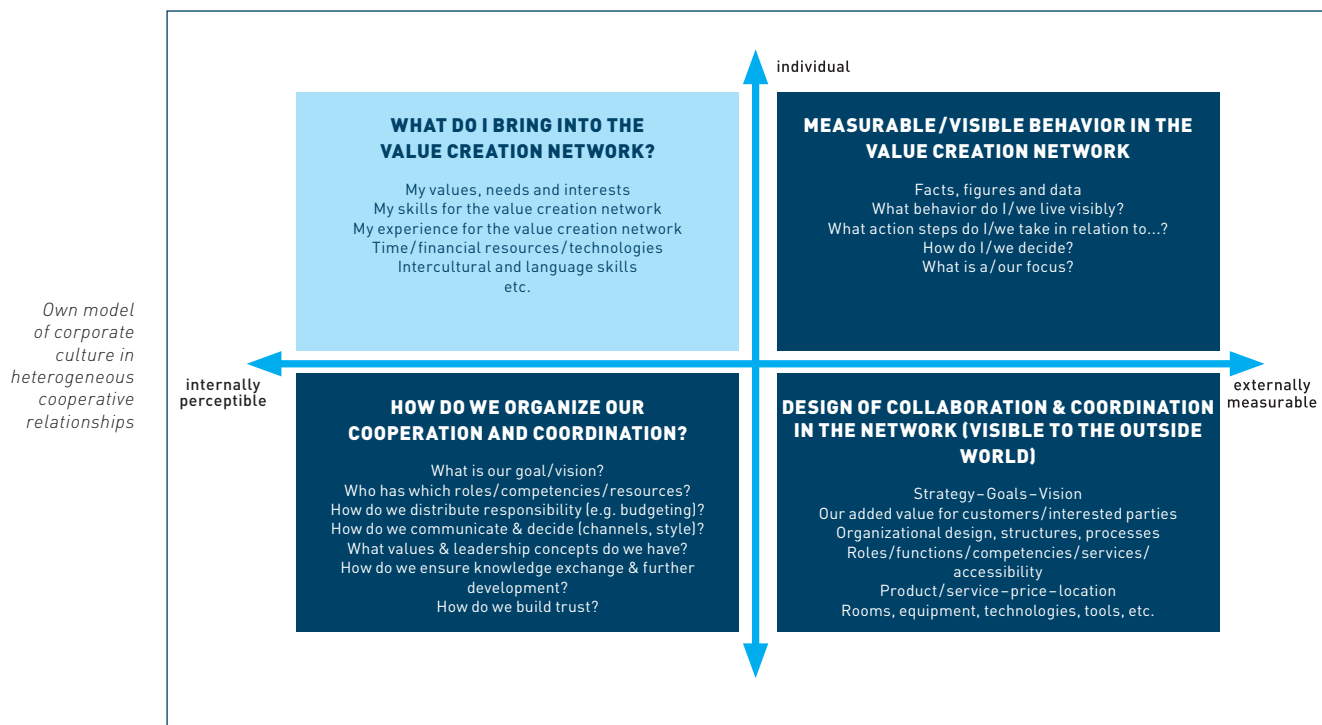
→ **HOW CAN THESE NEW SKILLS BE LEARNED?**

The development of these skills is not a matter of course. A traditional seminar in network management would not do it justice. For this reason, we took it upon ourselves in 2020 to further educate ourselves in these new skills. Together with the Ferdinand Steinbeis Institute of the Steinbeis Foundation (FSTI), the Baden-Württembergischer Handwerkstag e.V. and the Steinbeis Europa Zentrum in the research project “Agile project teams – success factors for cross-company and cross-industry cooperation” we asked ourselves the question: Why does the ability to network and cooperate in the digital age represent a key success factor for the medium to long-term competitiveness of SMEs more than ever before? The focus was on two sub-questions, among others:

- What organizational and qualification requirements must be met for interactive networking to be effective and efficient?
- What does a standardized moderation concept for initiating and establishing cooperations and cooperation projects look like?

For us, the models and the working instructions that were developed in the project represent the starting point for the further development of the role of network management at bwcon.

→ Among other things, the project partners have developed their own model of corporate culture in heterogeneous cooperative relationships. In this model, the aforementioned multi-layered challenges, namely a common overall technological vision, the customer-centric value creation model, an incentive mechanism that is acceptable to all stakeholders and the way in which the people involved work together, were transferred into two levels of consideration: Individual collective and internally perceptible/externally measurable. This results in four dimensions of corporate culture in value creation networks ("four quadrants"). The first dimension comprises the individual and internally perceptible contribution to a network, taking into account values, expectations and competencies, among other things. The second dimension represents the individual and externally measurable contribution to the network, i.e. it looks at the visible behavior of the network partners as well as figures, data and facts. The third dimension includes the collective and internal contribution to the network, i.e. aspects of the organization of cooperation and coordination. Finally, the fourth dimension looks at the collective and outwardly measurable contribution, i.e. the visible cooperation and coordination, especially from the customer's perspective [1].



- This model helps our network managers to understand all facets of network management and is an excellent illustration of the complexity of this task. Only once this has been understood can new moderation formats for supporting newly emerging value creation networks be implemented really well. The complete catalog of measures has been published and can be adopted by other networks.

The colleagues who worked on the project and who developed the models, the methodological knowledge and the formats with the consortium now have a leading role at bwcon in order to pass on this knowledge internally.

WHY NETWORK MANAGEMENT IS NOT THE ONLY THING THAT MATTERS

The success of a network depends not only on the network management, but also on the member companies in the network. Only if they take an active role in the network will they derive the maximum benefit from it. Then the network will come to life and cooperation will develop, which in turn will lead to new added value. This also requires the member companies to have the right attitude and skills to operate within the network:

- The ability to authentically share your own experiences in the network:
This also includes making mistakes that others can learn from. We operate in an innovation environment, which means an environment in which everyone is constantly learning new things and therefore every company operates under uncertainty. If the members of a network allow each other this, they have the greatest opportunity to learn from each other.
- Cooperation instead of sales attitude: The focus should not be on marketing yourself too obviously in the network. Instead, the ability to cooperate means approaching other members, understanding what their challenge is and then – if necessary with the network management – finding out how this challenge can be solved together.
- Willingness to share: wanting to share your own knowledge with other members, even if it is sometimes not clear at first how this will benefit your own company.
- Shaping instead of consuming: The network is only as good as the topics that its members bring to the table. Only if the network management deals with topics that affect the actual needs and challenges of the member companies can the work of the network management generate an impact. This means that the network members must constantly “feed” their network management with new topics.

This also shows that networks are always learning platforms. After all, operating in a network is not a matter of course and needs to be learned. Or as Prof. Jörg Menno Harms, Honorary Chairman of Baden-Württemberg: Connected e.V., put it in the anniversary edition of our 25th anniversary: “Connecting – it’s not an easy thing, because every company likes to work on its own, but it is precisely in this networking that there is a great deal of interesting potential for value creation”. This is particularly true within a network such as Steinbeis and its companies – as an opportunity and challenge for them, but also as an enabler for companies outside. →|



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LITERATURE [1] https://ferdinand-steinbeis-institut.de/wp-content/uploads/2020/11/Massnahmenkatalog_AgileTeams-1.pdf

STRONG TOGETHER: THE POTENTIAL OF INTERNATIONAL NETWORKS

Steinbeis Europa Zentrum has been doing pioneering work in cross-border innovation promotion for more than three decades: In the spirit of Ferdinand von Steinbeis, it brings companies together in networks across national borders.

Entrepreneurial success requires international competitiveness, as Ferdinand von Steinbeis was already convinced in the wake of the protective tariffs introduced by Bismarck. 150 years later, shaping Europe with the participation of innovative companies from Baden-Württemberg was the vision that provided the impetus for the establishment of Steinbeis Europa Zentrum under the umbrella of the Steinbeis Foundation in 1990. And so the vision and name became the program: European cooperation in research, development and innovation as well as networking and communication between the continent's innovation players. At the same time, this ensured the successful, competitive acquisition of funding from the European Union for Baden-Württemberg and its players in the innovation system. Cooperation with very different networks for companies, but also at political and regional level, was established. And the journey for pioneers from companies and research began. In keeping with Steinbeis Europa Zentrum's guiding principle: "Enabling innovators to grow". Dr. Petra Püchner, Commissioner for Europe of the Minister of Economic Affairs of Baden-Württemberg, and Dr. Jonathan Loeffler, who are jointly responsible for Steinbeis Europa Zentrum, provide an insight into the diverse international networks and their added value.

When the European single market was launched in 1993, the European Commission also created the first major international business network, the Value Relay Centers. Steinbeis Europa Zentrum was part of this network from the very beginning and has grown from two employees at the beginning to around 100 today for the benefit of companies and research institutions in Baden-Württemberg.

PIONEERS FROM BADEN-WÜRTTEMBERG BENEFIT FROM INTERNATIONAL COOPERATION

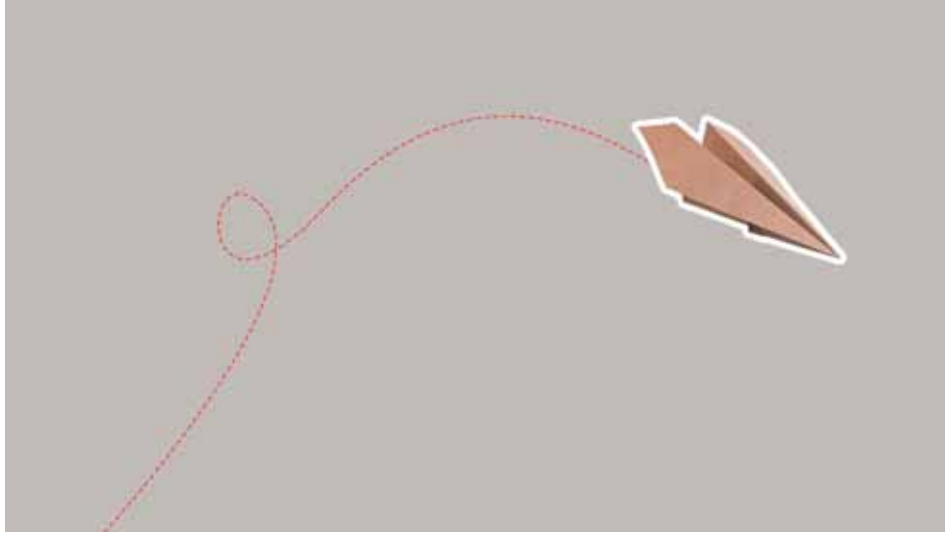
Steinbeis Europa Zentrum's offers and services are primarily aimed at pioneers in research and innovation, at entrepreneurs who are prepared to take on a pioneering role and want to explore new paths with the courage to take risks. We cover all topics that are also prioritized in the European Commission's research and innovation programmes. This means we are always at the cutting edge of developments – and can arrange suitable financing for our customers and position them as important players in future markets with their project plans and business ideas. In 2022, we helped to acquire 130 million euros in EU funding for international consortia. We were involved as a partner in 80 projects with over 600 partners from 52 countries.

From the very beginning, we have made use of all opportunities that allow us to provide initial advice and follow-up support to SMEs, be it with financial assistance from EU programs or state and federal measures. This makes it easier for young companies in particular to get started. The right networks, international contacts and cooperation partners are extremely important for this.

ALWAYS IN FOCUS: COMPANIES

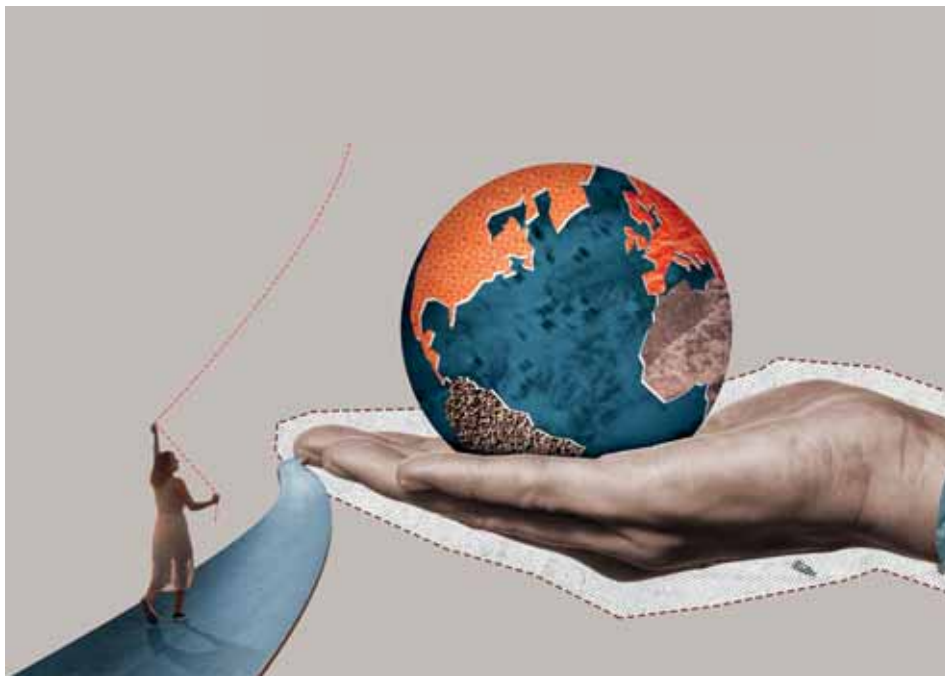
In its first ten years, Steinbeis Europa Zentrum has already been able to bring numerous innovative companies into EU projects. In 2022, we advised over 200 pioneers from companies. They received information on financing, funding programs and opportunities for international cooperation. Participation in the Enterprise Europe Network – at that time still the Innovation Relay Center Network – was essential for successful applications. The target group was innovative small and medium-sized enterprises, such as Hydrotox GmbH from Freiburg, which focused on textile finishing. Financed by EU research funds and with our support, Hydrotox succeeded in developing an environmentally friendly, cost-effective method for the dyeing process by eliminating or replacing mutagenic textile dyes.

We have supported the Mühleisen organ building company in Leonberg and the Fraunhofer Institute for Building Physics in six EU projects. The results of this research into the sound design of organ pipes and their adaptation to the room acoustics still have an impact today in several European churches, including the collegiate church in Stuttgart. In 2013, we were awarded the Steinbeis Foundation's Transfer Award – the Lohn Award for our project work.



→ Another successful company is Harms & Wende GmbH & Co. KG, based in Hamburg and Karlsruhe. The medium-sized company carries out research and development in the field of welding systems and supplies customer-specific solutions. Steinbeis Europa Zentrum has been supporting it since 1998 with applications, project, knowledge and innovation management as well as with the exploitation of project results. Together we can look back on seven successful projects. The RECLAIM project, which has just come to an end, has succeeded in developing a completely new generation of friction welding machines that are very well suited to the future requirements of the Industrial Internet of Things.

For several years, Steinbeis Europa Zentrum has been advising MANN+HUMMEL GmbH on the acquisition of European funding for its innovation and transformation projects. This collaboration led to the approval of three innovation projects in 2022, for which MANN+HUMMEL will receive a total of around two million euros in EU funding over the course of the project. As coordinator of the EU project AeroSolfd, the Stuttgart-based company can bring its technologies for the filtration of brake dust and for improving air quality in subway stations from pilot status to market maturity. Participation in two other EU projects enables MANN+HUMMEL to expand its filtration technologies indoors and thus contribute to improving air quality.



→ **ACCELERATOR AND INVESTOR NETWORKS AS SCALE-UP FINANCING FOR START-UPS**

In the last ten years, the focus has increasingly shifted to start-ups in high-tech and deeptech areas. Pioneering work is particularly visible here, as it usually involves new yet rapid developments that are needed in the economy and society and drive the transformation forward. The main focus here is on the necessary scale-up – i.e. the actual implementation of the inventions. The EU provides access to a large network via the European Innovation Council (EIC), which also includes the European Institutes of Technology and the regional ecosystems.

Three collaborations represent our successful support and assistance for start-ups from Baden-Württemberg. INERATEC GmbH from Karlsruhe offers modular chemical plants for power-to-X and gas-to-liquid applications and supplies sustainable fuels and products. Hydrogen can be converted with greenhouse gases such as CO₂ into e-kerosene, CO₂-neutral petrol, clean diesel or synthetic waxes, methanol or synthetic natural gas (SNG). A complete production plant fits into a container and enables decentralized use. In December 2020, INERATEC received funding of almost 2.5 million euros from the EIC to start scalable series production.

With SciMo – Elektrische Hochleistungsantriebe GmbH from Karlsruhe, Steinbeis Europa Zentrum carried out an innovation potential analysis and looked for suitable funding. The consultation led to a successful EU application and SciMo received 1.9 million euros in EU funding in the EIC Accelerator program in 2022. The start-up has developed a new motor winding technology that makes it possible to increase the power density of electric traction motors to up to 10 kW/kg and thus save up to 75% motor weight and thus also 75% of resources such as copper, steel and rare earths.

Robotextile GmbH, a start-up from the Swabian town of Dormettingen, successfully took part in a tender by Steinbeis Europa Zentrum in 2022 and was awarded 100,000 euros for its application project in the field of textile production to reliably handle textile blanks with the help of sensor technology.

→ **NETWORKING OF SCIENCE AND APPLICATION**

Scientists at universities and universities of applied sciences as well as at applied research institutes are also pioneers. In 2022, we advised 130 of these pioneers, primarily researchers at universities of applied sciences and the Baden-Württemberg Cooperative State University.

Research gives rise to new ideas and possibilities, which are then tested and finally implemented. We act as an enabler for each stage of research and can thus accelerate the processes. This includes bringing scientists together with the best in Europe and forging partnerships that benefit everyone involved. Research and development are accelerated by strong partners. And the pioneers can focus on what they do best. This often results in new companies that turn these findings into products and business models.

In 2014, Steinbeis Europa Zentrum drew the attention of the Baden-Württemberg company Curevac to the European Vaccine Prize competition. Curevac applied and was awarded the prize. Receiving this award increased the international visibility of the early Tübingen spin-off and initiated new collaborations with the pharmaceutical industry.

Numerous pioneers are active in the university sector, such as Prof. Dr. Carlo Burkhardt at Pforzheim University. He is passionately dedicated to the recycling of rare earth magnets for the circular economy. Steinbeis Europa Zentrum has been supporting him for over ten years: what began with an EU research project in 2010 has now led to the establishment of a Europe-wide value chain for a circular economy of permanent magnets based on rare earths; an area that is of great importance for our industry and our everyday lives – from consumer electronics to medical technology, mobility, sensor technology and renewable energies. The European project work made it possible to found HyProMag GmbH with branches in the UK and Pforzheim. The start-up is responsible for setting up a production facility for recycled rare earths in Europe. The example of this client journey shows how effective years of support can be with the help of EU networks such as the Enterprise Europe Network, access to EU funding and to the European institutions.

We have also been supporting the European Institute for Energy Research (EIFER) in Karlsruhe for many years. Here, David Colomar and Rami Chahrouri are working on new ground-breaking solutions in the field of hydrogen technologies. Since the start of

- the first project in 2017, the compression technology has made significant progress in design and performance and will soon be tested at a real hydrogen refueling station in the Touraine Vallée de l'Indre region in France. The existing fleet of fuel cell electric vehicles and a waste truck will be used to demonstrate the commercial viability of the compression solution.

INTERREGIONAL SUCCESS: THE NETWORK OF DANUBE TRANSFER CENTERS

Regions are also pioneering new networks, as demonstrated by the activities in the Danube region, which were largely driven by the federal state of Baden-Württemberg. The state government campaigned for the development of a European strategy for the Danube region, which was finally adopted by the EU in 2011. In order to bring this strategy to life, Steinbeis Europa Zentrum set out and launched the idea of Danube Transfer Centers in 2012, based on the Steinbeis transfer model.

We began in 2012 with the establishment of three Danube Transfer Centers. Today, the network has 15 entry points with more than 60 partners in ten countries, including Karlsruhe (Germany), Villach (Austria), Nitra (Slovakia), Győr (Hungary), Maribor (Slovenia), Vukovar, Zagreb (both Croatia), Novi Sad (Serbia), Cluj-Napoca, Craiova, Bucharest, Iași (all Romania), Ruse (Bulgaria), Kiev and Odessa (both Ukraine). As part of the joint projects, activities in technology transfer and innovation management were accelerated and advanced with a wide range of partners. This benefits companies, universities, clusters and regional innovation agencies.

Over a period of ten years, 31.8 million euros in funding was acquired. Funded by the research framework programs and Interreg B, the network partners are now involved with us in projects in the fields of sustainable timber management, agriculture and nutrition, renaturation, social innovation, the creative industries and neurosciences.

→ **EXPANDING THE INTERNATIONAL NETWORK WITH PARTNERSHIPS OUTSIDE THE EU**

Steinbeis Europa Zentrum took its first steps into Africa together with Prof. Dr. Jan Hoinkis from Karlsruhe University of Applied Sciences. Since 2005, we have been successfully supporting the expert in drinking water treatment and wastewater recycling with applications for four EU projects. Initially, his membrane filtration technologies were used for the innovative treatment of drinking and industrial water in China and Bangladesh, then a new class of membranes was developed for use in bioreactors for wastewater treatment in North Africa. In the following project, the efficient and robust system was used for wastewater treatment in fish farming on Lake Victoria in Africa. Since October 2018, a demonstration plant has been in operation in the city of Kisumu in Kenya, which is being used to build local expertise.

Another current project focuses on the transformation to organic farming for small farmers in East Africa. Jan Hoinkis wants to prove that organic farming is both sustainable and financially viable. The 16-strong consortium will receive EU funding of seven million euros for three and a half years. We have supported the Karlsruhe professor in all of these ventures, particularly in project and innovation management, in the exploitation of research results and in communication and training measures.

We took our next big steps into Africa as coordinator of ENRICH in Africa. With the founding of the ENRICH in Africa Center in Cape Town in 2022, the European-African innovation community has experienced a significant boost. In 2022 alone, over 300 start-ups from Africa were supported with needs assessments, participation in soft landing and start-up programs as well as investor pitch events. Over 50 accelerators and incubators from Europe and Africa are involved as members and around 385 members have joined the community.

CITIES NETWORK ON THE "EUROPEAN MARKETPLACE"

In view of the challenges facing society, cities play a key role as pioneers of the green transformation. They can contribute to meeting the EU's goal of becoming climate neutral by 2050. The Green Deal master plan poses major challenges for cities in particular, as they are responsible for over 70% of global greenhouse gas emissions. For many years, we have been supporting pilot measures in so-called lighthouse cities that play a pioneering role.

- The focus is on energy generation and efficiency, mobility, energy management and digitalization. For example, we have supported the cities of Hamburg, Nantes and Helsinki and promoted the market launch for selected results. To this end, we carried out twelve patent analyses, drew up a roadmap and a business plan for business opportunities and initial business models.

As a communication partner in the EU Smart Cities Marketplace, we bring interested cities together with European lighthouse cities and facilitate business relationships and access to best practices. The marketplace brings together 359 partner cities with over 1,000 members from cities and industry. Steinbeis Europa Zentrum is responsible for the platform's communication activities on behalf of the European Commission and is therefore well connected with urban innovation stakeholders.

A LOOK INTO THE FUTURE

With around 80 ongoing projects each year and more than 600 international partners from over 50 countries, we at Steinbeis Europa Zentrum are continuing on the successful path we began in the 1990s. Our target groups have expanded. In addition to companies, research institutions, clusters, networks and policy stakeholders and the European regions, we also offer our expertise to cities and municipalities.

In 2023, our employees launched a sustainability initiative within the company, and in November 2023 we received the ClimateFit Company award. A sustainability check has been added as a new service for companies and a guide to the Green Deal is already available as a web platform. Enabling innovators and pioneers to grow – in line with the right forward-looking green measures. →|



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NETWORKS WITH POTENTIAL:
REGIONAL, THEMATIC, INNOVATIVE

DANUBE TRANSFER CENTERS

The network of Danube Transfer Centers comprises over 60 partners in ten countries. Initiated by Baden-Württemberg, its aim is to strengthen transnational technology transfer in the Danube region and to bring new products and services to market more quickly.

THE VANGUARD INITIATIVE

Interregional cooperation is at the heart of the 40 or so regions of the Vanguard Initiative, which sees itself as a community of pioneers to strengthen industrial growth in the EU. The Commissioner for Europe of the Minister for Economic Affairs, Labor and Tourism is the contact point in Baden-Württemberg together with Steinbeis Europa Zentrum.

ENRICH IN AFRICA

As coordinator, Steinbeis Europa Zentrum brings together representatives of the African and European innovation ecosystems. A network of incubators and accelerators provides services according to the principle "from the community for the community" in order to strengthen international cooperation in the field of innovation.

ENRICH IN CHINA

In order to network China's research and innovation activities more closely with the EU, Steinbeis Europa Zentrum was involved in several projects between 2010 and 2021 and ultimately committed to the establishment of the ENRICH center in China. So-called "ENRICH in China soft landing zones" were set up in Beijing and Chengdu.

SMART CITIES MARKETPLACE

With the EU's Smart Cities Marketplace, over 350 partner cities with more than 1,000 members from cities and industry are driving market transformation through the development and replication of successful measures on a large scale. Steinbeis Europa Zentrum is responsible for the communication activities of the platform on behalf of the European Commission.

CLEAN ISLANDS NETWORK

In the "Clean energy for EU islands secretariat", Steinbeis Europa Zentrum supports a community of 78 islands as a partner for communication. It implements public relations measures, including podcasts, videos, publications, seminars and conferences.

DISTRICTS OF CREATIVITY

The Districts of Creativity consist of eleven creative, innovative regions from the USA to China and from Scotland to India. The network stimulates creativity and innovation in business, culture and education and promotes the exchange of experiences and best practices. Steinbeis Europa Zentrum and the Commissioner for Europe of the Baden-Württemberg Minister of Economic Affairs, Labor and Tourism are the single point of contact for Baden-Württemberg on behalf of the Ministry.

EUROPEAN DIGITAL INNOVATION HUBS

The European Digital Innovation Hubs (EDIH) initiative offers contact points that support SMEs in the use of digitalization, AI and related technologies. Steinbeis Europa Zentrum coordinates the exchange of all contact points and is a partner of the "European Digital Innovation Hub Artificial Intelligence & Cybersecurity" in Karlsruhe. The hub enables companies to use existing "testbeds", improve the acquisition of AI skills and initiate joint projects.



“TRUST IS THE BASIC PREREQUISITE FOR FUNCTIONING NETWORKS”

In conversation with Steinbeis original Peter Wittmann

Four decades of Steinbeis are also four decades of people who have shaped the network: with their ideas, their entrepreneurial activities and their commitment. Peter Wittmann has accompanied the development of the Lohn Steinbeis model from the very beginning. He has been active in the network since 1983, initially at the Steinbeis headquarters and over the years in numerous positions of responsibility within the network. Today, he is an Associate Partner of the Ferdinand Steinbeis Institute, which supports companies in the areas of innovation, digitalization and ecosystems. What has remained constant for him, despite all the transformation and technical development, is the importance of personal networks at eye level.

Mr. Wittmann, “For me, digitalization is the greatest technological and social challenge of this century”, you once said in an interview with the Ferdinand Steinbeis Institute. As a graduate computer scientist, you were the first employee of the “Löhn era” to start at Steinbeis headquarters in 1983. Please take a look back for us: what were the technological and economic challenges at the time?

Wittmann: Back then, we were in a similar situation to today: Transformation meant “structural change through key technologies”. The key technologies were microelectronics, new manufacturing technologies, biotechnology, new materials and communications technology. It was very difficult for companies to dissolve the boundaries between technologies and to change their thinking from product to system. Entire industries have disappeared during this transformation, such as the watch industry, hi-fi and TV, to name just a few examples. Most companies failed to recognize the opportunities and benefits of key technologies. We were too late to abandon the engineering mindset – only when we have the 100% solution will we go to market – and this still applies to many areas today.

In your impressively long time at Steinbeis, networking has formed the basis for your very successful work. Today, the market for technical tools to support networking is almost unmanageable; in the virtual world, actual distances no longer play a role. But is that enough? In your view, are we working together more closely, more networked, more agile and more efficiently today than in the last four decades?

Wittmann: Yes, we do. Many processes in the companies are organized in such a way that no matter where the employees are based, collaboration works well. This has also become apparent during the pandemic. But many of the creative processes suffer from a lack of face-to-face meetings. Sharing ideas at the coffee machine or discussing them on a flipchart or whiteboard are necessary for the innovation process.

The basis for both networks and networking is trust and spaces of trust. Critics argue that digital collaboration and virtuality stand in the way of this trust and anonymity as well as a loss of trust. What is your experience?

Wittmann: Trust is the basic prerequisite for functioning networks. If you don’t know and appreciate each other personally, it



Peter Wittmann
Associate Partner of the
Ferdinand Steinbeis Institute
(Stuttgart/Heilbronn)

remains superficial and not very sustainable. In my experience, digital collaboration also works if this personal basis exists.

Networking is like teamwork: success depends on the people involved. What are your experiences of how the give and take in a network does not run the risk of being side-tracked and some people benefit more than they contribute while others are involved far more than the average?

Wittmann: You always have to weigh that up. My aim has always been to see the benefits for everyone involved. If you’re constantly calculating whether it’s always fair, you won’t be successful. However, if you discover that a network partner is exploiting the network, you take them out of the game.

You are exemplary for the variety of activities that are possible with and at Steinbeis: As an employee from the very beginning at Steinbeis head-

quarters, Steinbeis entrepreneur, managing director of a Steinbeis subsidiary, you were and still are active as an expert at the Ferdinand Steinbeis Institute. What was the unifying factor, the unique selling point, that still defines the work in the Steinbeis network for you today?

Wittmann: The high degree of freedom! I don't know of any other organization like Steinbeis where you can be self-determined and self-organized and do what brings you personally forward and fulfills you.

As one of the people who helped shape Steinbeis and who has lived through transformation and structural change: What advice would you give

the current generation of Steinbeisers for the challenges they face in a time of fundamental transformation, increasing bureaucracy and tougher competition for the knowledge sources and companies that are important to Steinbeis?

Wittmann: There hasn't been a decade in my professional career without new challenges, crises or upheavals – just think of the mechanical engineering crisis in the 1980s, the collapse of the new market or the banking crisis. My motto was and remains: Don't spend time lamenting and mourning the seemingly good old days, but look to the

future and recognize the upcoming problems as opportunities. →|



Peter Wittmann

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NETWORKING WITH SUCCESS

In his many years of experience in networking, Peter Wittmann has established one thing above all: It doesn't work without discipline and a few, all the more essential rules.

These are his principles:

- # 1: Build trust – a network does not work without mutual trust
- # 2: Relationship at eye level: function, position, title, etc. do not play a role
- # 3: Listen! Question! Understand!
- # 4: Creating benefit without counter calculation
- # 5: Mindfulness. Being there even in difficult situations and when things are not going well.
- # 6: Maintain relationships among network partners for as long as it is wanted
- # 7: Quit when networking no longer makes sense

PETER WITTMANN STATIONS

Apprenticeship as an electromechanic in Villingen-Schwenningen

Studied computer engineering at Furtwangen University of Applied Sciences

Project manager at the Fraunhofer Institute for Manufacturing Engineering and Automation (IPA)

Peter Wittmann has been active and successful at Steinbeis in numerous functions since 1983:

Assistant to the Chairman of the Steinbeis Foundation

Head of the Steinbeis Transfer Center for Technology Management and Innovation

Managing Partner of Steinbeis Beteiligungsberatung GmbH

Managing Partner of Saphir-Kompetenz GmbH

Associate Partner of the Ferdinand Steinbeis Institute

Peter Wittmann held several advisory and supervisory board mandates until 2013.

Since 2008, he has headed the Schmalenbach Society's Corporate Management Working Group, which initiates and coordinates the dialog between business management research, teaching and practice.





ENTREPRENEURSHIP
NEEDS COURAGE.
A PERSONAL REVIEW OF
40 YEARS OF STEINBEIS





CHANGE IS THE NORMAL ONE. WHY PROGRESS BEGINS IN THE MIND

**What makes Steinbeis what it is today
is inextricably linked to Johann Löhn.
His strategic approaches and his model met
with both approval and rejection in 1983 –
but they were and still are the basis
for the success of the Steinbeis Network.**

The year is 1982 and Johann Löhn from the north meets Lothar Späth from Swabia. The former had previously been Rector of the then Furtwangen University of Applied Sciences and had already attracted attention in the ministries because he was too busy and unconventional. The other was the Minister President of Baden-Württemberg, who woke the state from its slumber and made it a leader in technology policy. A combination that can't work? Quite the opposite. Both free spirits in their respective roles, they quickly become allies. Together, against much resistance, they laid the foundations for today's Steinbeis network of around 1,100 companies. In Baden-Württemberg and beyond, they are the pioneers of successful entrepreneurship and today's corporate world. And who better to look back on these 40 years of Steinbeis than Johann Löhn in his inimitable way?

In 2023, I will personally be looking back on 40 years of Steinbeis experience. In my view, however, looking back only makes sense if it provides insights for the future.

I would like to send two messages below: Firstly, the key strategic decisions I made during my time at Steinbeis, without which Steinbeis would no longer exist today or would exist in a completely different form. Secondly, general guidelines derived from these decisions. I call these guidelines “impulses”, as in the problem-solving method I developed.

How do you make strategic decisions and how do they come about? Initially, they are triggered by facts, such as technological or social changes. But why is one successful and the other not, even though both had the same starting position? My theory is that decisions can only be made on the basis of a value structure. And these are different. You either have values or you don't, you can't blame anything but your parents. Values are adapted or confirmed through life experiences.

When deriving an impulse, one must be careful and always question whether a singular experience is suitable for generalization. Professors are particularly at risk here because they like to apply their detailed findings to everything else. At this point, I will therefore mention selected impulses that I have verified through concrete action at Steinbeis.

01 IMPULSE:

WHAT BENEFIT DOES MY ACTION BRING, FOR WHOM AND FOR HOW LONG?

The then Minister President of Baden-Württemberg, Lothar Späth, offered me the position of Government Commissioner for Technology Transfer in the early 1980s. Before that, we had also considered whether I should become State Secretary for Technology in the State Ministry. I was allowed to define the title and the list of tasks myself – where else is that possible? That would have been mainly cooperation and coordination. Späth was right: it would have been associated with a high reputation, which in turn would have opened almost all doors. If vanity wins out, then it would be a great job until you are recalled – there are numerous examples of this. But what good would that have done for companies and science?

So I decided that I needed a company to implement my ideas. Späth's offer was a limited company in the Landeskreditbank environment. He immediately phoned Rolf Schoeck (President of the Landeskreditbank) and told him that “Löhn is sitting here and needs a small GmbH”. Schoeck's answer: “No problem”. But that was too close to the state for me. So I suggested that the (then small) Steinbeis Foundation could be used. I would change the articles of association to suit my project. No sooner said than done. Although the foundation under civil law is subject to state supervision, it ultimately belongs to itself.

This fulfilled the aforementioned impulse and avoided the first crucial mistake. I had the framework to create sustainable benefits for companies and science.

→ **02 IMPULSE:**

A DECISION AT THE TOP IS USELESS IF IT ARRIVES AT THE BOTTOM TURNED AROUND 180 DEGREES.

Now even the opponents could no longer prevent the decision in principle. And there were many opponents: In the Ministry of Economic Affairs, in the organizations and in the opposition in the Baden-Württemberg state parliament. Chamber presidents were equipped with speech slips requesting appointments with the Minister President to tell him how superfluous this position was. Motions for my dismissal were tabled in the state parliament. And these opponents were also on the Steinbeis Board of Trustees at the time. The aim was to prevent the Steinbeis experiment from succeeding by imposing all kinds of "conditions".

However, there were also isolated exceptions: At the University of Stuttgart (Rector Prof. Dr. Hartmut Zwicker, Chancellor Dr. Jürgen Blum), at the Stuttgart Region Chamber of Crafts (Managing Director Werner Lutz) and occasionally at the Ministry of Economic Affairs (Head of Department Josef-Rudolf Wennrich). Such people are usually more important in these situations than they realize.

My advantage was that I was able to follow the general decision from the very top to the last measure myself. So I was my own minister and at the same time the person in charge.

First of all, Späth and I worked to convince some ministers in the "Cabinet" at the Schlossgarten Hotel in Stuttgart – a small room where many discussions were held and decisions made outside the protocol.

Prof. Dr. Helmut Engler, the Minister of Science at the time, was the most positive about the idea. I didn't provide him with the concept he asked for. But I convinced him that if I could get 500 people to walk in the same direction, that wouldn't be a bad thing. He was enthusiastic about the project and didn't feel restricted in any way. I found him to be an outstanding personality.

I was able to convince the then Finance Minister Gerhard Meyer-Vorfelder of my ideas at a post-cabinet meeting. He came up to me and said "Lothar has raved so much about you, now I want to get to know this wonder boy." It was remarkable how awake and focused he still was at 3 o'clock in the morning.

The most difficult three-way meeting was of course the one with the then Minister of Economic Affairs, Dr. Rudolf Eberle. It was only later that I learned that Späth's dissatisfaction with the Ministry's technology policy had also contributed to my appointment as technology commissioner. There were several meetings with Eberle. He came to the first meeting with the responsible official at his side (Dietrich Munz, Head of the Technology Department), whom Späth immediately sent away again. Eberle was then repeatedly briefed by his office to prevent the idea of my Steinbeis. This only ended

→ when Späth put his foot down with Eberle: "... every comma is agreed with Löhn and I no longer accept explanations, only resignations". Resistance also continued at a lower level and in the Ministry of Science.

I went with Munz to his counterpart at the Ministry of Science. On the way there, Munz told me that he had heard that I was planning three transfer centers. However, it had been decided with the Ministry of Science that for each Steinbeis center, a mirror institute would first have to be founded in the area of the Ministry of Science. A joke, Steinbeis would have died before it could start. In the following meeting, I then said that I had already founded five centers and that more would follow next week. That wasn't quite true, but the issue was resolved. Incidentally, today the Steinbeis network consists of more than 1,100 companies.

Another of the many obstacles in my way: the Ministry of Economic Affairs (Ministerial Director Peter Kistner) stipulated that the local Chamber of Industry and Commerce had to be consulted before any Steinbeis center was established. Thankfully, Prof. Dr.-Ing. Hans Joachim Förster intervened immediately in his role as Chairman of the Foundation's Board of Trustees and clearly represented our position: "We are our own company and we make our own decisions". Förster was already Chairman before my time and he remained so. He was head of development at Daimler, a gnarly guy. We got on very well very quickly. If he was convinced of something, his position never wavered. Steinbeis and I have a lot to thank him for.

Many other obstacles were placed in my way, but I think the ones listed here are sufficient to explain the impulse.

Things then changed over time. Over the years, the officials in the ministries who were opposed to Steinbeis and me realized that I could be more helpful to them. On several occasions, senior civil servants asked me for support when their ideas were not getting through in their own ministries. If I was convinced of their plans, I used my direct contact with Späth and later also with his successor in the office of Minister President (Erwin Teufel). An "instruction" soon came from the Ministry of State to the relevant ministry. A phone call from the official followed with the single statement "Thank you". There were never any records of this.

**03 IMPULSE:
IF THERE IS NO OPPOSITION TO A MEASURE FROM ANY SIDE,
THEN YOU CAN LEAVE IT ALONE.**

I would also like to illustrate this impulse with an example. Thanks to Späth, Baden-Württemberg was already a pioneer in technology policy in the 1980s, which attracted worldwide attention. This was also characterized by a question from a Chinese politician during a visit by Späth and myself, who asked: "Tell me, Mr. Minister President, in which part of Baden-Württemberg is Germany located?"

- A copy of my role as government representative for technology transfer was also created in Lower Saxony due to our success in Baden-Württemberg. I met with my colleague there at the Hannover Messe, who presented me with a wide range of initiatives. I then asked him whether anyone had been against his appointment. His answer was that everyone, including all the ministries, had agreed. I replied that I then assumed that his function would soon no longer exist. That's what happened. He didn't disturb anyone's circles.

04 IMPULSE:

THERE MUST ALWAYS BE A GOOD BALANCE BETWEEN CENTRALIZED AND DECENTRALIZED.

Systems can only survive in the long term if the individual can develop within the system. This begins in politics. Unfortunately, in many cases centralization prevails in the long term.

But let's stay concrete. In a ministry, but also in companies and organizations, there are departments, units and so on. If someone at the bottom of the hierarchy has an idea, then by the time it reaches the top of the hierarchy it is so polished that it is no longer recognizable.

To get around this, I used the Steinbeis Transfer Centers (STC) or today Steinbeis Enterprises (SE) to make every manager the head (today Steinbeis Entrepreneur, SEN) of his (legally dependent) company. But that is easier said than done. It requires constant adjustment.

At the annual meetings with the SENs, I always emphasized: "It's your company, there are only regulations from the headquarters if absolutely necessary". The Steinbeis headquarters has certainly accepted risks, for example it is ultimately liable externally for all results of all legally dependent SEs. Millions have been lost over the years, but far more millions have been earned. We have succeeded in attracting innovative minds who have only stayed because of our system. In a central office, however, you always have to warn against trying to educate the "decentralized" employees and maltreating them with queries and bureaucracy. We once had a very successful SEN that didn't have an office. He sorted his receipts in a cab and then sent them to the headquarters in a shoebox – something like that must also be possible. A headquarters must not treat the decentralized employees like third parties, starting with the letter style. At Steinbeis, the decentralized SEs are an integral part of the network.

My message behind this is: help and don't criticize. That's a huge competitive advantage, and don't give me the compliance pretext. Of course regulations are observed. But compliance in a bad sense is a pretext for an erotic relationship with forms.

→ **05 IMPULSE:**
GOOD IS A SELF-RENEWING SYSTEM.

There is no need for innovation working groups at Steinbeis. Change and innovation happen in the SEs themselves.

The balance between centralized and decentralized also means that the SEN, apart from a sales-related network fee to the headquarters, keeps the result of his SE for himself. Conversely, this also means that if there are permanently no more orders, the SE will be closed. So the SEN has to come up with something. This means that innovation is automatically organized.

06 IMPULSE:
ABSOLUTE CONCENTRATION ON CORE COMPETENCE DOES NOT ALWAYS HAVE TO BE RIGHT.

I don't want to have a dogmatic discussion here about the extent to which you should focus exclusively on one core competence. However, I tend to follow the motto of looking at what is also good for the cause.

And so I have always invested in real estate at Steinbeis, for example. This occasionally led to the Board of Trustees asking whether we were now a real estate company. My answer: "You'll see". The largest investment at the time, in the Steinbeis building in Berlin-Friedrichshain, required a decision by the Board of Trustees. The representative of the Ministry of Economic Affairs on the board of trustees was against the investment. What should I do? I took action and said that I found the project so attractive that I would realize it privately if necessary. That must have made some members think. The result: Steinbeis realized the project lucratively.

During my time in office, the real estate projects have generated considerable real estate assets of more than 60 million euros, which were recently used to construct prestigious new Steinbeis buildings in Hohenheim and Berlin. That's quite something.

07 IMPULSE:
IN THE END, SOMEONE ALWAYS HAS TO DECIDE.

This is a very important stimulus for employee motivation.

There is often a saying in companies that "the" board has decided – the same applies to managing directors. A board member can hide behind this destructive statement without having to explain himself. But it is at least as bad when it is used to stabilize hierarchies. You can use this statement to consolidate your position at various levels. In a hierarchy, you don't have to be able to do anything, you just have to be in charge. Then you shouldn't be surprised if your employees are permanently preoccupied with inner resignation.

→ I made an agreement with Späth at the beginning of my work as a government representative at his suggestion: I could reach him at any time via his "red telephone". You wouldn't believe how important that is for day-to-day work. How often do you hear employees complaining that they can't get past the anteroom? Incidentally, because everything went so smoothly, I never had to use the "red phone". But knowing that it existed helped a lot.

At every recruitment or start-up meeting, and that was a high three-digit number, I said: "You can call or get an appointment at any time. Just say it's private". That way, everyone could clarify whether what was being communicated was actually true and concentrate on their work again. I never played games, but always stood by my decisions openly.

A SEN – also a professor – had committed a tax offense in his private life. So far so bad. The Ministry of Science, the Ministry of Economic Affairs and his own university relieved him of his duties. One of the ministries involved expected Steinbeis to do the same. My response was that I wouldn't do that, the SEN had not defrauded Steinbeis and would continue to work for us.

Important personalities wrote to me, for example, "commitment, reliability and on a handshake" or "one wage, one word". That is what I wanted to achieve.

08 IMPULSE: PEOPLE GREATER ORGANIZATION.

When someone applies to a company, they are presented with an organization chart with boxes. However, their profile often does not fit into the box provided. So what do you do? The applicant is bent until they fit into the box. As a result, they will not be able to contribute their full range of skills to the benefit of the company.

My approach was always to bend the boxes so far that the employee's profile fitted in. This increased motivation and efficiency.



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- In all conversations – whether with applicants, employees, customers or visitors – I have always imagined and tried to find out what this person does when they are not sitting here. How do they live, what are their goals, what are their worries, what do they do in their spare time? Then you can understand much better why he argues this way and not differently and pick him up from there. This also includes assigning the performance to the person who provided it. I won't name any individual SENs, that would fill pages, and I could also name many employees from the headquarters.

So it is always people and not regulations that are important. I have always relied on promises, and of course I have always kept my own promises. With a few exceptions, it always worked out. In these exceptions, I just switched to "automatic" and said to myself: the world is big enough, I don't have to be able to deal with everyone.

09 IMPULSE:

IT'S NOT ALWAYS GOOD WHEN THE BOSS BRINGS THE MOST INNOVATIONS.

My first job on a supervisory board was at Sick in 1979. Erwin Sick was an enthusiastic inventor and a manager with his own values. I spent many conversations and walks with him. Today, Sick is a globally successful sensor company. Would it be the same if Erwin Sick was still the boss? In my opinion, the employees would not be motivated to innovate because Erwin Sick's management style would no longer be as successful today. But it is also clear that this company would not exist without Erwin Sick's inventions. His family knows this, his successors know this and honor the founder.

At Steinbeis, innovations are created in the SE. As a physicist, I understood them as well as I could. I would never have come up with the idea of having to set up a kind of steering committee to define the guidelines for the development of the network's content.

My approach was always "Let's do it!" and that led to success. Internal problems were never brought to the outside; they never left the respective system circle, even within Steinbeis. That was good for the climate, I sealed the outer skin, so to speak.

Steinbeiser wrote to me when I left that I was an "enabler". The thousands of innovative ideas didn't have to come from me, I saw it as my job to clear the way so that these ideas could be realized.

10 IMPULSE:

MANAGEMENT FROM OUTSIDE ONLY WITH A GOOD REASON.

I am referring to both the top and second management levels. You often hear the argument that a breath of fresh air and an outside perspective are needed. However, there are many, if not most, examples where the "star" from outside first needs time to get to know the company. Productive time passes because everyone is waiting to see what will happen. He then implements the concept that he has learned, regardless of whether it

- suits the company. The disaster is perfect if this person is also unqualified, i.e. a lark. It is a different matter if a very specific profile is required for certain tasks.

For my immediate successor as CEO, there was a great desire for an external appointment. Of course, this was also because Steinbeis now had a respectable value. I had to pull out all possible (legal) stops to force an internal Steinbeis appointment. Details would be interesting, but I prefer to keep them to myself. Prof. Dr. Max Syrbe, Chairman of the Board of Trustees at the time, shared my view. I'm sure Steinbeis would be a completely different company today if we hadn't succeeded in convincing people back then.

The discussion of external candidates also arose with regard to the following succession. However, this was nipped in the bud as, unlike before, there were already full-time Board members alongside the Chairman. In addition, the now acting Chairman of the Board of Trustees, Dr.-Ing. Leonhard Vilser, acted as a confident moderator.

11 IMPULSE: DYNAMIC SYNERGY OF POLES (DSP).

This is a central element of my self-management and problem-solving method, the Löhn method. In DSP, there are two poles that are in principle mutually exclusive. However, these are considered together infinitesimally (dynamically) – both poles should be “heard” equally when making decisions.

Examples of such poles are tradition versus progress, systematic versus simple, goals versus doing, professional versus private or centralized versus decentralized.

This dynamic synergy between poles has always been a criterion in my daily work when making decisions. Basically, Steinbeis is built on this.

12 IMPULSE: GOALS VERSUS DOING.

I would like to explain an example of a polar pair in the DSP in more detail: there are people who define goals all day long, and whenever things get concrete, they set themselves a new goal. And then there are people who work from morning to night and are unsuccessful – true to the motto “We have lost sight of our goals, but have redoubled our efforts”.

There was and is a lot to do at Steinbeis. But despite everything, you have to sit back now and again and ask yourself whether the strategy is still right.

One example: After the long-standing Chairman of our Board of Trustees, Prof. Dr.-Ing. Hans Joachim Förster, wanted to step down, discussions about a successor began. Prof. Dr. Max Syrbe, former President of the Fraunhofer-Gesellschaft, was already a member

→ of the Board of Trustees and “independent”. He was my candidate for the succession and the ideal candidate for Steinbeis, but not the candidate of groups on the Board of Trustees who wanted greater external influence. I was not involved in the election, but I had a goal and knew what to do: I had to convince the sovereign decision-makers with arguments to say “yes” to Syrbe. And so it happened.

I continued this process with the current Chairman, Dr.-Ing. Leonhard Vilser. He was also a member of the Board of Trustees before his time as Chairman. Several years before his election as Chairman, I asked him whether he would be ready for this position one day. And he was.

13 IMPULSE: GOOD PREPARATION IS HALF THE BATTLE.

In the Lohn method there is the impulse: prepare/follow up/finish.

An example of good preparation: We had a delegation visit from the Australian Minister of Economic Affairs to the Steinbeis headquarters. I made the presentation myself. Beforehand, I asked my “spy” in Australia how the Minister of Economic Affairs was described in the press and whether there were any political problems. I knew that he wanted to close an institute, but that there was resistance. I had also obtained the budget plans. So I didn’t start my presentation with “You’re visiting Steinbeis, the most successful transfer company” as you might expect, but with Australia and said that I would also close the institute and discussed the Australian institute structure on the basis of the budget plans. The Minister of Economic Affairs was so enthusiastic that he spontaneously invited me to Australia for two weeks at his country’s expense. I was there too, but for a shorter period.

An anecdote in passing: I learned from my hosts that Späth would also be visiting Australia two weeks later. I took a piece of paper and wrote “Lohn was already there” on it, put it in an envelope and asked my hosts to give it to Späth. We had to have a bit of fun, and we had plenty of it.

14 IMPULSE: ONLY EVER TALK ABOUT OTHERS AS IF THEY WERE THERE.

You probably know when the whisperers come and say “Have you heard that...” I usually responded with “Really, we’ll call him right away.” This saved me a lot of time afterwards because these types of conversations became rare. I communicated the message that I don’t get upset until I’ve heard all sides.

This impulse also helps if you find yourself violating it.

In any case, it is a good impulse for the climate in the house.

→ **15 IMPULS:**

THERE IS NO DISADVANTAGE SO GREAT THAT THERE IS NOT ALSO AN ADVANTAGE.

An example from Steinbeis' tax department: The tax audit "made us happy" at Steinbeis for years. We had several million euros in provisions for our SEs. Taxation by every single legally dependent company was imminent and would have been a disaster in every respect. In the discussions, I made my view clear that the tax office only wanted the taxes, ultimately no matter from whom. The response confirmed this. The next day, I reinvented the Steinbeis financial system. The parent company pays the taxes and the results become taxed reserves in the legally dependent SEs and, when dissolved, become expenses of the parent company.

Without the pressure of the audit (disadvantage), I probably wouldn't have come up with the innovative system (advantage).

16 IMPULSE:

JUST GET STARTED.

I once met an entrepreneur on a flight from Berlin to Stuttgart the day before Christmas. When we landed in Stuttgart, we had founded a company at Steinbeis. The first account transactions were made before New Year's Eve.

80 to 20, Pareto sends his regards. You can always make adjustments. Columbus never arrived in India either, but he did discover America.

17 IMPULSE:

HE WHO PAYS, CREATES.

The question is quite simple: who pays for my service? The answer in relation to the transfer also is, when the client and contractor are clearly named.

In so-called pre-competitive transfer, the state is the client, so the result belongs to it and therefore to the general public. This is typical for science, a type of institutional funding. The problem is that the state also intervenes in the organization of the institution.

I wanted to prevent that at all costs and therefore consistently rejected institutional funding for Steinbeis, although we could certainly have received several million. The foundation's share capital was the only state investment.

The attempts by the Ministry of Economic Affairs to gain influence through the back door with small, unclaimed subsidies and, for example, to adjust the freely negotiable salaries of a self-financing company to the fixed, capped public tariffs were interesting. I transferred the amounts back and paid the salaries as was commercially necessary.

→ At Steinbeis, the customer pays – which can of course also be the state when it comes to specific projects.

If I had made a different decision here, we would be on the state's drip, if we still existed at all.

**18 IMPULSE:
INCOME MUST BE HIGHER THAN EXPENDITURE.**

I have heard many lectures on strategic investments. If everything I heard there had been successful, you wouldn't be able to walk because of your strength.

It is clear that there must also be risky innovations with associated risky investments. Otherwise there will be no progress.

But I have always chosen the bottom-up approach to innovation. And I've always flirted with the fact that I'm only a physicist and therefore live by the motto of spending less than you earn.

If you look at Steinbeis, you can see that: Impulse fulfilled.

**19 IMPULSE:
CHANGE IS THE NORMAL ONE.**

As a rule, people prefer a familiar way of living and working. Changes are often associated with anxiety, or at least with effort.

It all starts in your head: once the change has been made, this is the new normal. Consciously take a different route on your way to work or don't always sit on the same chair in the garden. You will experience a different perspective.

Three commissions were set up by the state government and presented their findings in 1982: "Baden-Württemberg Research Commission", "Promotion of New Communication Technologies (EKOM)" and "Baden-Württemberg Export Promotion (EFK)". In the EKOM, the vision emerged that there could be a kind of "people's telephone" in the future. What do we have today? Even children have their own cell phones. That is the new normal.

If I am correctly informed, in 1835 there were investigations into whether the speed of 30 km/h was not harmful to the eyes on the rail journey from Nuremberg to Fürth.

At the beginning of the 1980s, there was a structural change, mainly due to microelectronics. If you take a look at all the comments, you might well come to the conclusion that the end of our prosperity was sealed back then. Things turned out differently. If you replace the term microelectronics from back then with AI today, there are certainly parallels.

→ It is true that, from the current perspective, changes require considerable qualitative “changes in the mind”. But structural change has always brought progress in the end.

That’s why I’ve always advocated not panicking every time there’s a change. The end of the world has not yet come.

20 IMPULS:

HOW CAN YOU AVOID BUREAUCRACY?

I take a somewhat differentiated view of the much-maligned bureaucracy. First of all, you can always see that citizens complain when something happens that is not regulated. So the civil servants “inevitably” fill the gaps in the regulations because otherwise they would get into trouble. This is how the flood of regulations builds up.

During our tax audit, I had many discussions about the VAT Act with our contacts at the authorities. We all agreed that the law is a “monster”. But we also agreed that it had become one because people kept finding loopholes and improvements had to be made. In this respect, those who are complaining at the top of their voices should probably take a good look at themselves.

Another point is that bureaucracy also offers security. Let’s take the work of a notary or the land registry. Here I am glad that I live in Germany.

I have always done well with two comments:

1. Bureaucracy is anything that does not serve to solve the problem.
2. Problem description yes, but what does the solution look like?

Against this backdrop, I have had many fruitful, solution-oriented discussions. The relationship with the Court of Audit, the financial administration and even the public prosecutor’s office was always relaxed. →I

→ **SO I SAY "GOOD LUCK"
TO STEINBEIS
FOR THE NEXT 40 YEARS!**



*Prof. Dr. Dr. h. c. mult. Johann Löhn
Honorary Trustee of the
Steinbeis Foundation
johann.loehn@steinbeis.de*

**PROF. DR. DR. H. C. MULT.
JOHANN LÖHN
STATIONS**

01.01.1983: Appointment as Government Commissioner for Technology Transfer of the State of Baden-Württemberg. A position that was created for Johann Löhn who reported directly to the Minister President. After several extensions, Johann Löhn ended this position at his own request after almost 25 years at the end of the 2006 legislative period.

01.04.1983: Elected Chairman of the Board of the Steinbeis Foundation

31.03.2004: After more than 20 years, Johann Löhn's chairmanship ends. The Board of Trustees of the Steinbeis Foundation amends the statutes on the occasion of his retirement as Chairman of the Board and appoints him Honorary Trustee.

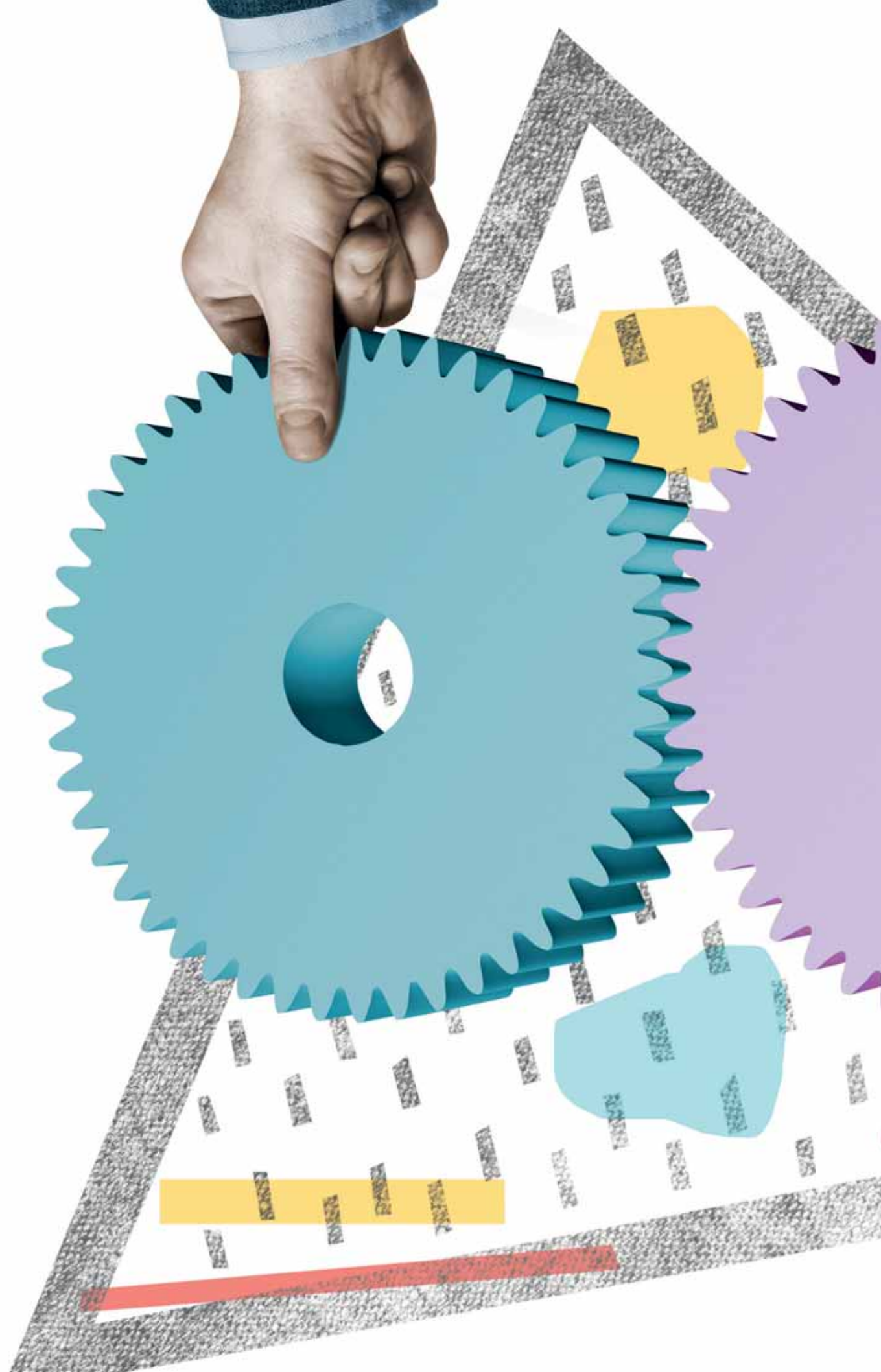
Johann Löhn built the Steinbeis Foundation into a globally active knowledge and technology transfer group on the basis of the Löhn method (L°°) he developed and his model of so-called transfer centers with the associated transfer entrepreneurship.

Born near Hamburg in 1936, he completed his studies in physics with a doctorate at the University of Hamburg (1969). In 1977, he became Rector of the Furtwangen University of Applied Sciences (former FHF) and in this function also headed the Technology Transfer Working Group of the Baden-Württemberg Research Commission in 1982. Based on this activity and his experience in managing a so-called Technical Advisory Service at the FHF, Johann Löhn developed the then unique, integrative model of entrepreneurial technology transfer as an independent, private-sector task. Against this background, the then Minister President of Baden-Württemberg, Lothar Späth, appointed him Government Commissioner for Technology Transfer in Baden-Württemberg on January 1, 1983.

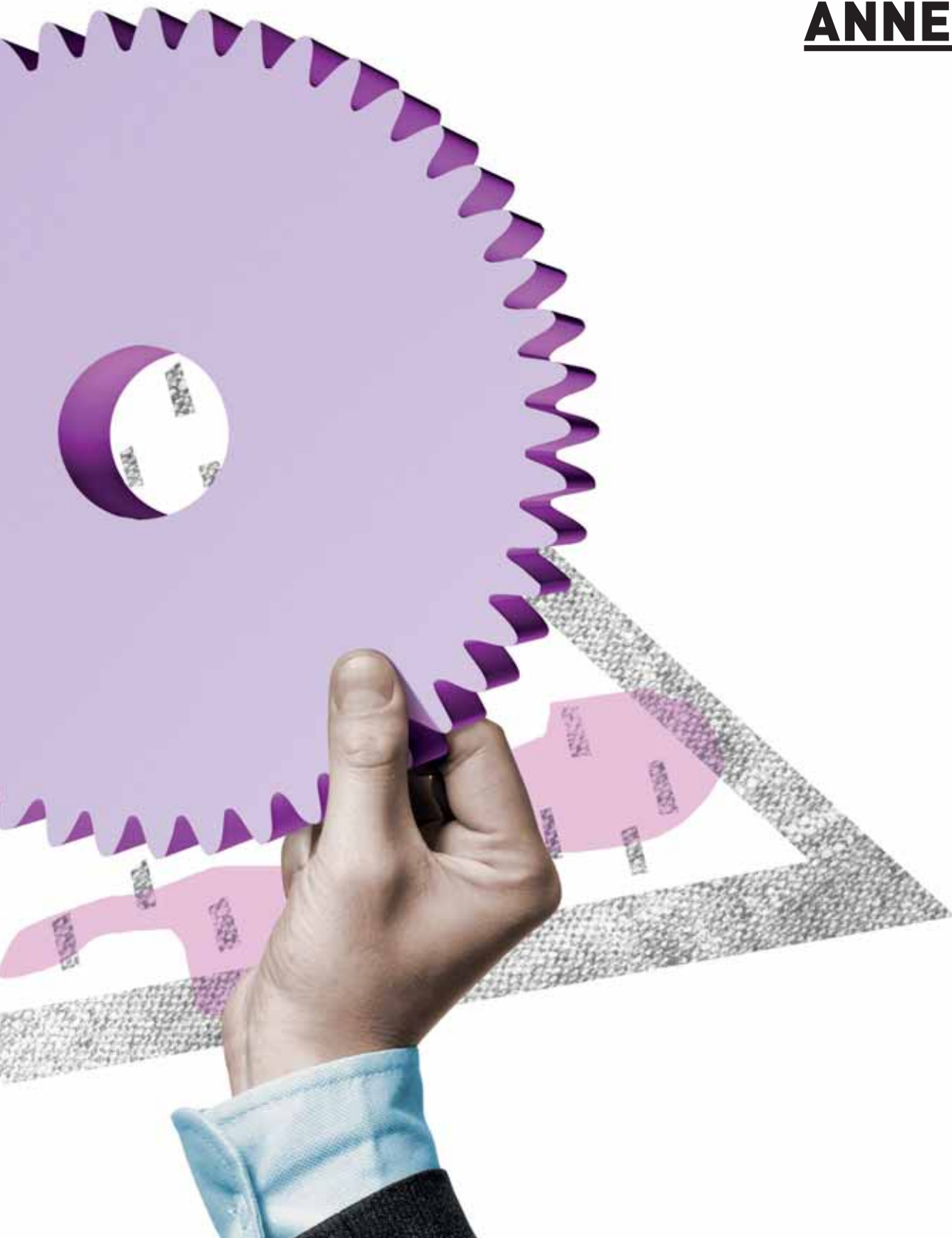
From April 1, 1983, Johann Löhn was the first Chairman of the Board of the new Steinbeis Foundation, using the existing foundation under civil law, which until its reorganization had a founding capital of DM 67,000 at the time and had as one of its main tasks the support of the 16 Technical Advisory Services (TBD) at the universities of applied sciences in Baden-Württemberg. To enable the realization of his concept, the foundation capital was increased in 1983 with funds from the Landeskreditbank Baden-Württemberg. Trusting in his concept of self-supporting technology transfer, Johann Löhn in return consistently dispensed with the institutional funding from the Baden-Württemberg Ministry of Economic Affairs that had been customary up to that point.

Johann Löhn led the Steinbeis Foundation and, from 1998, Steinbeis GmbH & Co. KG für Technologietransfer with great success until 2004. He was President of Steinbeis University from its foundation in 1998 until September 2018. In recognition of his commitment, the Steinbeis Foundation has awarded the Steinbeis Foundation's Transfer Award – the Löhn Award for outstanding technology transfer projects every year since 2004. In 2018, Johann Löhn received the Steinbeis Award for outstanding services to Steinbeis.

Johann Löhn also received numerous external honors for his work, including the Federal Cross of Merit 1st Class, several honorary doctorates, the Order of Merit of the State of Baden-Württemberg, the Golden Badge of Honor of the Baden-Württemberg Chamber of Crafts and the Rudolf Diesel Medal in the category "Best Innovation Promotion" for the establishment and expansion of today's Steinbeis Foundation.



ANNEX



IN THE TIME LAPSE: KNOWLEDGE AND TECHNOLOGY TRANSFER WITH STEINBEIS

1969

At five engineering schools in Baden-Württemberg (now universities of applied sciences), professors found the first “Technical Advisory Services” (TBD) as a contact point for small and medium-sized enterprises (SMEs). Their goal: to provide SMEs in the state with the consulting expertise of the lecturers there in an unbureaucratic and consciously organized manner outside the university structures. By 1982, 16 TBDs had become reliable partners for the economy in Baden-Württemberg.

1971

Ten associations, research institutions and individuals establish the Steinbeis Foundation as founders to promote the entire economy in Baden-Württemberg. As a foundation under civil law, it becomes the umbrella organization for the Technical Advisory Services. The founders and their contributions are:

- Working Group of the Chambers of Industry and Commerce in Baden-Württemberg, Stuttgart | DM 10,000
- Baden-Württembergischer Handwerkstag e.V., Stuttgart | DM 3,000
- Forschungsinstitut für Pigmente und Lacke e.V., Stuttgart | DM 10,000
- Landesverband der Baden-Württembergischen Industrie e.V., Stuttgart | DM 5,000
- Prof. Dr.-Ing. G. Stute | DM 2,000
- Verband der Baden-Württembergischen Textilindustrie e.V., Stuttgart | DM 8,000
- Verband der Deutschen Uhrenindustrie e.V., Schwenningen | DM 10,000
- Verein für das Forschungsinstitut für Edelmetalle und Metallchemie e.V., Schwäbisch Gmünd | DM 10,000
- Verein der Förderer der Deutschen Forschungsinstitute für Textilindustrie Reutlingen-Stuttgart e.V. | DM 8,000
- Wirtschaftsverband Steine und Erden Baden-Württemberg e.V., Stuttgart | DM 2,000

1983

The Steinbeis Foundation is establishing technology transfer as a key element of Baden-Württemberg's economic policy. But how can the state's economy be better supported in coping with structural change? A research commission on behalf of the then Minister President of Baden-Württemberg, Lothar Späth, formulates recommendations. One key recommendation is to appoint a government representative for technology transfer in the state of Baden-Württemberg. Prof. Dr. Dr. h.c. mult. Johann Löhn, until then Rector

→ of Furtwangen University of Applied Sciences, takes on this task in personal union with the chairmanship of the Steinbeis Foundation. He begins to build up the Steinbeis network and to expand it in the following years. In addition to the TBD, further independent, subject-oriented transfer centers are established at the universities of applied sciences. While the TBDs primarily provide advice and refer companies to competent specialist contacts, the new transfer centers focus on actual problem solving and project implementation.

1986

The Steinbeis Foundation is given its headquarters in the Baden-Württemberg Trade and Industry Office, from 1990 the Haus der Wirtschaft in Stuttgart.

The Coordination Office for New Communication Technologies (KKT) established in Baden-Württemberg is affiliated to Steinbeis and advises companies on how to deal with the changing communication system. From 1986 to 1994, the KKT develops and publishes information on possible applications and services in the field of new information and communication technologies. The new technologies are presented to companies at events and seminars and, if required, contacts to problem solvers are arranged.

1989

In the year of the fall of the Berlin Wall, Steinbeis founds the 100th transfer center in the network. In the same year, the first issue of the Steinbeis Transfer-Zeitung (forerunner of today's Transfer Magazine) is entitled: "Textile: Inkjet for cutting" and describes an innovative project of the Technical Advisory Service in Sigmaringen, in which the pattern is printed onto the fabric using CAD/CAM technology instead of being drawn by hand.

1990

Steinbeis activities in the new German federal states begin. After intensive discussions on site, transfer centers are quickly established, especially at the technical universities in Saxony, Thuringia and Saxony-Anhalt.

Cooperation at European level also comes into focus: the European representative of the Baden-Württemberg Minister of Economic Affairs is appointed to the Steinbeis Foundation. At the same time, he takes over the management of the newly founded Steinbeis Transfer Center for European Technology Transfer, today's Steinbeis Europa Zentrum. It supports SMEs in their search for cooperation partners abroad and technology funding programs of the then European Community.

→ **1991**

In addition to centers in technology areas, “management centers” are now also being set up to offer management consulting and support with business management issues. The first Steinbeis Transfer Center outside Germany is established in Austria.

Prof. Dr.-Ing. Hans Joachim Förster, who has served as Chairman of the Board of Trustees of the Steinbeis Foundation since 1982, hands over the baton to the new Chairman Prof. Dr. rer. nat. Dr.-Ing. E. h. Max Syrbe, President of the Fraunhofer-Gesellschaft, for reasons of age.

1995

While the Steinbeis Transfer Center model in Baden-Württemberg was previously limited to founders at universities of applied sciences, transfer centers are now also being established at universities and universities of cooperative education. In addition, so-called “independent” centers are being established, which are run by experts outside of universities and research institutions.

1998

The Steinbeis network has grown steadily over the past 15 years, making it necessary to adapt the corporate structure: Steinbeis GmbH & Co. KG für Technologietransfer is founded as an operational unit for the extended economic activities and all transfer services. The non-profit Steinbeis Foundation remains the umbrella organization of the network.

At the newly founded private, state-recognized Steinbeis University Berlin, students can now complete Bachelor’s and Master’s degree courses integrated into their careers according to the “Project Competence Concept”. In addition to certificate courses and degree programs, the educational offerings have also included a doctoral program since 2003. The university’s first president is Johann Löhn, who holds the position until 2018.

2000

Steinbeis invests in start-ups to support the transfer of knowledge and technology. These investments are held and managed by Steinbeis Beteiligungs-Holding. It also supports spin-offs from and of Steinbeis companies, the establishment of legally independent Steinbeis companies and investments in companies outside the network.

2003

Providing the country’s economy with scientific knowledge is the central mission of the Steinbeis Foundation. Steinbeis is now also fulfilling this mission with the Steinbeis-Edition: Steinbeis’ own publishing house publishes specialist publications from the network.

→ **2004**

After more than 20 years of development and expansion, Johann Löhn steps down as Chairman of the Executive Board. The new, now fully full-time Executive Board with Prof. Dr. Heinz Trasch, Prof. Dr.-Ing. Sylvia Rohr and Prof. Dr. Michael Auer also takes over the management of the Steinbeis Foundation as well as Steinbeis GmbH & Co. KG für Technologietransfer.

In recognition of Johann Löhn's extraordinary achievements, Steinbeis is awarding the Steinbeis Foundation's Transfer Award – the Löhn Award for outstanding transfer projects in competitive knowledge and technology transfer for the first time.

2005

The Steinbeis Foundation provides small and medium-sized companies with access to technology and knowledge sources through a free brief consultation. Since the start of the consulting program, around 4,000 short consultations have been carried out to date.

2008

The close cooperation between Steinbeis and the universities results in the first two joint transfer companies as cooperation enterprises: they are established at the Karlsruhe University of Applied Sciences – Technology and Economics and, in the following year, at the Ulm University of Applied Sciences – Technology, Informatics & Media. Steinbeis thus becomes an institutional transfer partner of the two universities. Today, cooperation companies exist with seven universities in Baden-Württemberg and Hesse.

The Ferdinand Steinbeis Institute for the coordination and implementation of studies is founded.

2011

Steinbeis mourns the loss of Max Syrbe, a long-time companion of the Steinbeis Foundation as a member and Chairman of the Board of Trustees. His successor will be Dr.-Ing. Leonhard Vilser, who has been a member of the Steinbeis Foundation's Board of Trustees since 2001 and still chairs the Board today.

2012

Following an age-related change in the Steinbeis Executive Board, Prof. Dr. Michael Auer and Manfred Mattulat are taking over responsibility for the further development of the Steinbeis network.

Steinbeis is organizing the first Max Syrbe Symposium with a focus on the prerequisites for successful science and research management. After all, Max Syrbe's credo was one of conviction: "Human performance is proportional to the product of ability and motivation".

→ **2014**

From 2014 to 2016, the Steinbeis Arena series will focus on a key objective of transfer, namely economically recognized success as a prerequisite for innovation, and one of the challenges of innovation, namely its financing. The arenas bring experts and stakeholders together in an interactive way and enable a new, agile and mediaaccompanied form of interaction.

2015

The term "Industry 4.0" stands for the comprehensive digitalization and competitive design of industrial production. Steinbeis is taking this key focus area into account and realigning the Ferdinand Steinbeis Institute of the Steinbeis Foundation (FSTI): Under the leadership of Prof. Dr. Heiner Lasi, the FSTI will become the central competence center for digital transformation and technology convergence. As an interdisciplinary hub, the institute conducts transfer-oriented research and is also an affiliated institute of Steinbeis University.

The long-standing partnership between Steinbeis and Karlsruhe University of Applied Sciences is being further intensified with the construction of the Steinbeis-Haus Karlsruhe on the university campus. With more than 5,000 m² of usable space, the building offers room for researchers at the university as well as for SMEs and start-ups.

Successful knowledge and technology transfer thrives on the enthusiasm and passion of the people behind the transfer. Steinbeis picks up on this emotional aspect of transfer with the short film "Early Birds".

2016

45 years after the Steinbeis Foundation was established, the 2,000th Steinbeis company is founded.

2017

Technology-driven change calls for new organizational cultures with a variety of skills and approaches. In the event and the accompanying publication "A different perspective on innovation. Women in technology transfer" in 2017, the female actors in technology transfer will have their say and show their approaches, success factors and barriers in transfer processes.

→ **2018**

Under the motto #techourfuture, the FSTI is advocating more openness towards future technological developments from 2018 to 2020 as part of the Technologie*Begreifen project funded by the Baden-Württemberg Ministry of Economic Affairs. The FSTI team does not want to convince the general public through low-threshold events and online formats. Instead, it is essential for the FSTI to encourage people to engage with new technologies and not to reject them prematurely.

2019

Foundation of the Ferdinand-Steinbeis-Gesellschaft für transferorientierte Forschung gGmbH of the Steinbeis Foundation (FSG) as an umbrella organization for Ferdinand Steinbeis Institutes. As a non-profit subsidiary, FSG promotes cooperative and interdisciplinary research. In addition to Stuttgart, FSG is building the Ferdinand Steinbeis Institute Heilbronn on the Bildungscampus Heilbronn with the support of the Dieter Schwarz Foundation.

2021

Germany's oldest innovation prize, the Rudolf Diesel Medal, honors Johann Löhn and the Steinbeis Foundation, which he established and expanded, in the category "Best Innovation Promotion".

After four decades in the Haus der Wirtschaft in Stuttgart, the Steinbeis headquarters is moving to a new building on the Steinbeis Campus in Stuttgart-Hohenheim. The campus is to become a central hub for the Steinbeis network.

2022

Steinbeis University moves its headquarters from Berlin to Magdeburg. A modern higher education law in Saxony-Anhalt provides positive framework conditions for further development as a private university.

2023

To date, around 2,500 Steinbeis companies have been founded within the Steinbeis network. Around 1,100 of these companies will be active in 2023. As characteristic as ever: The Steinbeis transfer is consistently customer and market-oriented as an entrepreneurial process.

EXCELLENT! AWARD WINNERS OF THE STEINBEIS FOUNDATION'S TRANSFER AWARD - LÖHN AWARD

The Steinbeis Foundation's Transfer Award–Löhn Award was initiated and awarded for the first time in 2004 in recognition of the unique achievements of Prof. Dr. Dr. h. c. mult. Johann Löhn and awarded for the first time. The award recognizes exceptionally successful projects in competitive knowledge and technology transfer. Project success is measured by two central criteria: the quality of the transfer process and the recognizable transfer potential. This success is reflected in the economic benefit for the project partners involved. In addition to the transfer projects, special prizes can be awarded for projects, achievements and merits that deserve special recognition. The winners are awarded a two-part sculpture and prize money, which they can use for future transfer-oriented projects. We also present the award-winning projects in video clips on www.loehn-preis.de.

2023

3X3 NINE – TEST RIG DEVELOPMENT FOR THE NEXT GENERATION OF BICYCLE HUB GEARS

Project partners: Steinbeis Transfer Center Innovative Drive Engineering and Waste Heat Recovery (IAA)/Aalen (Prof. Dr.-Ing. Markus Kley) | H+B Hightech GmbH

2021

CLIMATE-NEUTRAL DISTRICT – NEUE WESTSTADT ESSLINGEN

Project partners: Steinbeis Innovation Center energieplus/Stuttgart (Prof. Dr.-Ing. Manfred Norbert Fisch, Dr. Christian Kley, Dr.-Ing. Boris Mahler, Dr.-Ing. Stefan Plesser, Dipl.-Kfm. David Sauss, Thomas Wilken) | Berlin Institute for Social Research (BIS) | Green Hydrogen Esslingen (GHE) | Esslingen University of Applied Sciences with the Institute for Sustainable Energy Technology and Mobility | HyEnTec | mondayVision | Polarstern | Esslingen Municipal Transport (SVE) | City of Esslingen | TU Braunschweig with the Institute for Building Climatology and Energy of Architecture | Baden-Wuerttemberg Center for Solar Energy and Hydrogen Research (ZSW)

→ **2019**

**A NEW GENERATION OF ELECTRICAL CONTACTS – OPTIMUM PERFORMANCE
TANKS TO HIGH-SPEED LASER STRUCTURING**

Project partners: Steinbeis Research Center Material Engineering Center Saarland (MECS)/Saarbrücken (Prof. Dr.-Ing. Frank Mücklich, Dr.-Ing. Dominik Britz) | TE Connectivity Germany GmbH

KYANA – PREDICTIVE MAINTENANCE USING DIGITAL TWINS

Project partners: Steinbeis Research Center Design and Systems/Würzburg (Prof. Erich Schöls, Prof. Ulrich Braun, Sebastian Gläser) | Koenig & Bauer Coding GmbH

**BETOLAMINA®-CAST – THE NEW FIBERGLASS-REINFORCED BUILDING
CONCRETE FOR COMPLEX CREATIVE FACADES**

Project partners: Steinbeis Innovation Center FiberCrete/Chemnitz (Dr.-Ing. Sandra Gelbrich) | Fiber-Tech Products GmbH | Medicke Metallbau GmbH

**AN INNOVATIVE PRODUCTION SYSTEM FOR MANUFACTURING HIGHLY COMPLEX
COMPONENTS WITH VULNERABLE SURFACES**

Project partners: Steinbeis Transfer Center Production and Organization/Pforzheim (Prof. Dr.-Ing. Herbert Emmerich) | Optik-Elektro Huber GmbH

2018

**DIAGNOSTICS PLATFORM FOR COMMUNICATION SYSTEMS USED
IN AUTOMATION TECHNOLOGY**

Project partners: Steinbeis Embedded Systems Technologies GmbH/Esslingen (Christian Hayer, Manuel Jacob) | Steinbeis Transfer Center Systems Engineering/Esslingen (Prof. Reinhard Keller) | Bosch Rexroth AG | Festo AG & Co. KG | Sercos International e.V.

**REAL-TIME CONTROL OF CAR DRIVE CHAIN TEST BEDS
FOR REALISTIC VEHICLE TESTING**

Project partners: Steinbeis Transfer Center Traffic Engineering.Simulation.Software/Niederstotzingen (Jakob Häckh, Prof. Dr.-Ing. Günter Willmerding) | Daimler AG

→ **2017**

**OPTIMIZING PRODUCTION TECHNOLOGY FOR WIEGAND WIRES USED
AS AN ENERGY SOURCE**

Project partners: Steinbeis Transfer Center Material Development and Testing (WEP)/Wiernsheim (Prof. Dr.-Ing. Norbert Jost, Prof. Dr.-Ing. Gerhard Frey) | SEW-Eurodrive GmbH & Co. KG

**COMPLEX AUTOMATION REPLACES MANUAL SYSTEMS IN THE PRODUCTION
OF CIRCULAR KNITTING NEEDLES**

Project partners: Steinbeis Research Center Automation in Lightweight Construction Processes (ALP)/Chemnitz (Mirko Spieler, Prof. Dr.-Ing. Wolfgang Nendel) | Prym Consumer Europe GmbH

2016

OUTSTANDING ACHIEVEMENTS IN TECHNOLOGY TRANSFER

Special award winner Prof. Dipl.-Ing. Karl Schekulin

2015

**INNOVATIVE TEST ENVIRONMENT AND SOFTWARE TOOLS
FOR MODERN DRIVER ASSISTANCE SYSTEMS**

Project partners: Steinbeis Interagierende Systeme GmbH/Esslingen (Dr. Oliver Bühler, Dr. Daniel Ulmer) | Daimler AG

**RAW DATA ANALYSIS AND PRECISE EFFICIENCY MEASUREMENTS
FOR ELECTRIC DRIVES**

Project partners: Steinbeis Transfer Center Energy-efficient Power Electronics for Electrical Drives and Power Storage Systems/Aschaffenburg (Prof. Dr.-Ing. Johannes Teigelkötter) | Hottinger Baldwin Messtechnik GmbH

**LUVIS – STANDARDIZED CONDITIONS
FOR CONTRAST SENSITIVITY TESTING**

Project partners: Steinbeis Transfer Center eyetrial at the Center of Ophthalmology/Tübingen (Prof. Dr. med. Barbara Wilhelm, Dr. med. Tobias Peters) | VISUS GmbH

**A MODEL FOR LIVED VALUES IN SCIENCE,
TRANSFER AND SOCIETY**

Special award winner Prof. Dr. habil. Hans Jobst Pleitner

→ **2014**

ADAPTIVE CONTROL OF WELDING PROCESSES

Project partners: Steinbeis Transfer Center Applied Production and Joining Technology/ ARGOS Systemtechnik/Oldenburg (Prof. Dr.-Ing. Dieter Liebenow, Harald Musa) | Volkswagen AG

LASER HARDENING OF CAMTRONIC CAMSHAFTS

Project partners: Steinbeis Transfer Center Laser Processing and Innovative Manufacturing Technology/Pforzheim (Prof. Dr.-Ing. Roland Wahl) | Daimler AG

COMMITTED PROFESSOR AND SUCCESSFUL ENTREPRENEUR

Special award winner Prof. Dr. Joachim Goll

2013

INNOVATIVE METHOD REDUCES TESTING TIME FOR ZINC COATING SYSTEMS

Project partners: Steinbeis Transfer Center Corrosion and Corrosion Prevention/ Friedrichshafen (Prof. Dr.-Ing. Reinhold Holbein) | Daimler AG | Holder GmbH Oberflächentechnik | Ingenieurbüro Peter Schrems (IPS)

PIONEERING MEASURING SYSTEM FOR CHARACTERIZING THERMAL INTERFACE MATERIALS

Project partners: Steinbeis Transfer Center for Heat Management in Electronics/ Walddorfhäslach (Prof. Dr.-Ing. Andreas Griesinger) | Behr GmbH & Co. KG

TRADITIONAL ORGAN BUILDING MEETS MODERN SCIENCE

Project partners: Steinbeis-Europa-Zentrum/Karlsruhe (Prof. Dr.-Ing. Norbert Höptner, Dr. Jonathan Loeffler) | Steinbeis Transfer Center Applied Acoustics/Stuttgart (Prof. Dr. András Miklós) | Fraunhofer-Institut für Bauphysik IBP | Werkstatt für Orgelbau Mühleisen GmbH

ENTREPRENEURIAL VISIONARY AND PIONEER OF STEINBEIS

Special award winner Prof. Dr. h. c. Lothar Späth

→ **2012**

WIRELESS SENSOR LINKAGE FOR DIDACTICAL MEASUREMENT TECHNOLOGY

Project partners: Steinbeis Transfer Center Embedded Design and Networking/Heitersheim (Prof. Dr.-Ing. Axel Sikora) | PHYWE Systeme GmbH & Co. KG

**CONTROLLED SELF-HEALING PROCESS FOR ELECTRICAL,
EXTREMELY STRESSED GALVANIC SYSTEMS
FOR HIGH-END CIRCUIT BOARD PRODUCTION**

Project partners: Steinbeis Research Center Material Engineering Center Saarland (MECS)/Saarbrücken (Prof. Dr.-Ing. Frank Mücklich, Christian Selzner) | Atotech Deutschland GmbH

**BIOLOX®-APP AND BIOLOX® MOTIONS: CONSULTING AND
TRAINING OF SURGEONS WITH INTERACTIVE MEDIA FOR THE
HANDLING OF CERAMIC HIP JOINTS**

Project partners: Steinbeis Transfer Center Technical Communication – Paracam/Salach (Prof. Dr. Michael Bauer) | CeramTec GmbH

STEINBEIS QUALITY IN THE JAPANESE MARKET

Special award winner Sachihiko Kobori

MACHINES ARE HIS PASSION

Special award winner Prof. Dr.-Ing. habil. Eberhard Köhler

2011

**HIGH DYNAMIC VARIOTHERM TECHNOLOGY FOR THE PRODUCTION
OF MICROFLUIDIC COMPONENTS**

Project partners: Steinbeis Transfer Center Plastics Center/Bretzfeld (Prof. Dr.-Ing. August Burr) | Sony DADC Austria AG | Watlow Plasmatech GmbH

**DATA2LINE® – AUTOMATED PROCESS FOR THE DETECTION OF UNEXPLODED
BOMBS AS PART OF THE EXPLOSIVE ORDNANCE DISPOSAL**

Project partners: STASA Steinbeis Angewandte Systemanalyse GmbH/Stuttgart (Prof. Dr. Günter Haag) | Institut Dr. Foerster GmbH & Co. KG

→ **INTUITIVE SOFTWARE FOR A NEW OPTICAL TOOL PRESETTER**

Project partners: Steinbeis Transfer Center Quality Assurance and Image Processing / Ilmenau (Prof. Dr.-Ing. habil. Gerhard Linß, Steffen Lübbecke, Dr.-Ing. Peter Brückner) | NT TOOL CORPORATION

PIONEER IN AIRCRAFT AND LIGHTWEIGHT CONSTRUCTION

Special award winner Prof. Rudolf Voit-Nitschmann

PASSIONATE INNOVATOR

Special award winner Prof. Dr. Werner Bornholdt

2010

**CLINICAL DIAGNOSIS OF LYSOSOMAL STORAGE DISEASES
IN CENTRAL AND EASTERN EUROPE**

Project partners: Steinbeis Transfer Center Biopolymer Analysis, Protein Chemistry and Proteomics at the University of Constance (Prof. Dr. Dr. h. c. Michael Przybylski) | Genzyme CEE GmbH

**NEW LASER WELDING TECHNIQUE FOR
ROTATIONALLY SYMMETRIC COMPONENTS**

Project partners: Steinbeis Transfer Center Production and Organization Pforzheim (Prof. Dr.-Ing. Herbert Emmerich) | Stadtmüller GmbH

**INNOVATIVE BENDING MACHINE FOR INDUCTION CONDUCTORS
USED IN LARGE-SCALE GENERATORS**

Project partners: Steinbeis Transfer Center Drive and Handling Technology in Mechanical Engineering / Chemnitz (Prof. Dr.-Ing. habil. Eberhard Köhler) | Siemens AG Generatorenwerk Erfurt

ENTHUSIASTIC PROBLEM SOLVER

Special award winner Prof. Dr.-Ing. Klaus Boelke

CONSUMMATE ENGINEER BY CONVICTION

Special award winner Prof. Dr.-Ing. Hermann Kull

→ **2009**

**MINI IMPLANT SENSOR FOR NON-INVASIVE TESTING
OF BLOOD SUGAR IN DIABETES**

Project partners: Steinbeis Research Center International Vision Correction Research Center (IVCVC)/Heidelberg (Prof. Dr. med. Gerd Auffarth) | EyeSense GmbH

**LOCAL DEVELOPMENT CONCEPT FOR THE MUNICIPALITY
OF BAD PETERSTAL-GRIESBACH**

Project partners: Steinbeis Consulting Center Regional and Communal Development/Kaiserslautern (Prof. Dr. habil. Gabi Troeger-Weiß, Dr.-Ing. Hans-Jörg Domhardt) | Municipality of Bad Peterstal-Griesbach

**IMPROVED SUCCESS IN COMMUNICATION
AT PSD BANK BERLIN-BRANDENBURG EG**

Project partners: School of Management and Innovation (SMI) at Steinbeis University Berlin/Berlin (Carsten Rasner, Prof. Dr. Dr. Helmut Schneider) | PSD Bank Berlin-Brandenburg eG

**INNOVATIVE COMPUTER NETWORKS IN THE
DEVELOPMENT AND PRODUCTION FIELD**

Special award winner Prof. Dr.-Ing. Nikolaus Kappen

TRAILBLAZING RESEARCH MANAGEMENT

Special award winner Prof. Dr. rer. nat. Dr.-Ing. E. h. Max Syrbe

2008

MATHEMATICAL OPTIMIZATION OF THE RESOURCE PLANNING OF SATELLITES

Project partners: Steinbeis Research Center for Optimization, Control and Regulation/Grasberg (Prof. Dr. Christof Büskens) | OHB System AG

GRAPHITE-MODIFIED GYPSUM PLASTERBOARD

Project partners: Steinbeis Transfer Center Plastics and Composites Technology/Naila (Prof. Dr.-Ing. Christian Kipfelsberger) | SGL Technologies GmbH | Saint-Gobain Rigips GmbH

→ **LEAVE NO MORE FEATHERS**

Project partners: Steinbeis Transfer Center Quality Assurance and Image Processing/
Ilmenau (Prof. Dr.-Ing. habil. Gerhard Linß, Dr.-Ing. Peter Brückner) | WAFIOS AG

A BRIDGE BUILDER FROM THE VERY BEGINNING

Special award winner Prof. Dr.-Ing. habil. Prof. h. c. Eberhard Kallenbach

2007

RECOGNITION OF PERSONAL COMMITMENT TO STEINBEIS

Special award winner Senator E.h. Dr.-Ing. Wilhelm Schmitt

INNOVATIVE PROJECT WORK PROMOTES SUSTAINABLE PRACTICAL RELEVANCE

Special award winner Prof. Dr.-Ing. Jürgen van der List with the Steinbeis Transfer
Center Microelectronics/Göppingen

2006

**MINIATURIZED FLUORESCENCE MEASUREMENT MODULE
FOR MEDICAL DIAGNOSTICS**

Project partners: Steinbeis Transfer Center Medical Biophysics/Heidelberg (Prof. Dr.
Rainer H. A. Fink, Dr. Martin Vogel) | Sensovation AG

PIONEERING SERVICES IN THE TECHNICAL ADVISORY SERVICE (TBD)

Special award winner Prof. Dr.-Ing. Eberhard Birkel

2005

**THE ROSTOCK CORNEA MODULE RCM: CONFOCAL LASER SCANNING
MICROSCOPY OF THE ANTERIOR SEGMENT OF THE EYE**

Project partners: Steinbeis Transfer Center Biomedical Engineering and Applied
Pharmacology in Ophthalmology/Rostock (Prof. Dr. med. Rudolf F. Guthoff) | Heidelberg
Engineering GmbH

COMPLEX RATIONALIZATION IN FACTORY OPERATIONS

Project partners: Steinbeis Transfer Center Production Technology and Waste Disposal
Logistics/Dresden (Prof. Dr.-Ing. Ulrich Günther) | Koenig & Bauer AG

→ **2004**

“VISCAN”: PRECISE MEASURING METHOD WITH LIGHT

Project partners: Steinbeis Transfer Center Quality Assurance & Image Processing/ Ilmenau (Prof. Dr.-Ing. habil. Gerhard Linß, Dr.-Ing. Peter Brückner) | Carl Zeiss Industrielle Messtechnik GmbH

IN VITRO PYROGEN TEST REPLACES ANIMAL TESTING

Project partners: Steinbeis Transfer Center In-Vitro Pharmacology and Toxicology/ Constance (Prof. Dr. Albrecht Wendel) | Charles River GmbH

DM-DROGERIE MARKT GOES ONLINE TO THE SALES SHELF

Project partners: Steinbeis Transfer Center Innovation > Development > Application (IDA)/ Karlsruhe (Prof. Klaus Gremminger) | dm-drogerie markt GmbH & Co. KG

**AIR CYCLE VALVES INCREASE ENGINE PERFORMANCE
AND ENVIRONMENTAL FRIENDLINESS**

Project partners: Steinbeis Transfer Center Mechatronics/ Ilmenau (Prof. Dr.-Ing. habil. Prof. h. c. Eberhard Kallenbach) | Mahle International GmbH

THE INTELLIGENT SIMULATION OF LINE BUS TRANSMISSIONS

Project partners: Steinbeis Transfer Center New Technologies in Transport Engineering/ Ulm (Prof. Dr.-Ing. Günter Willmerding) | Voith Turbo GmbH & Co. KG

RECOGNITION FOR PIONEERING WORK IN TECHNOLOGY TRANSFER

Special award winner Prof. Dr.-Ing. Walter Kuntz



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