AMPERE

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Industrial Intelligence:

Preparing Europe's Future

ZVEI: Die Elektroindustrie

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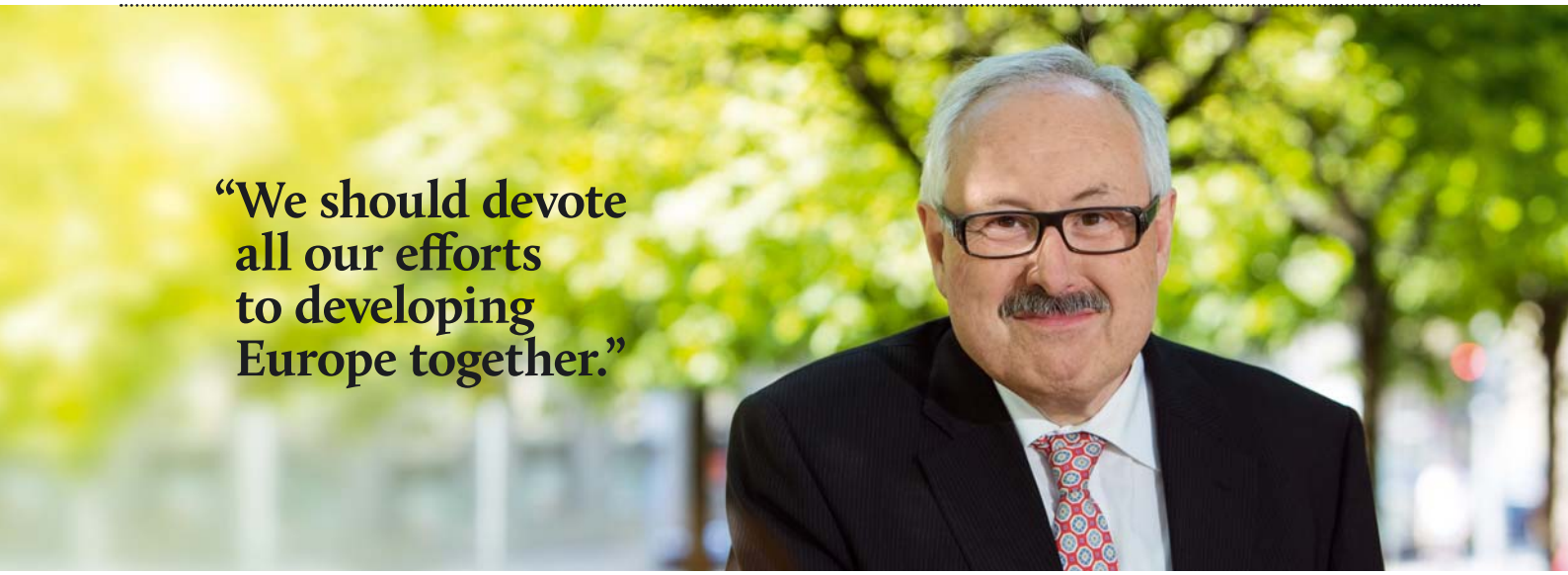


Dear reader,

I am sure I am not alone when I say that, for me the opening day of the Hannover Messe is always a happy day. Together we turn our gaze to the future of our industry which, modesty aside, is also crucial to the future of our country. But in 2019 the show kicks off on almost the same day as an historic event that greatly saddens me. From now on, the European Union will have to manage without our British friends, although we have worked closely and well together for many years.

At the time of going to press with this issue of AMPERE, neither the short-term arrangements nor the long-term consequences of Brexit can be foreseen. Nonetheless, it is clear that this step weakens the European position in the struggle to shape our world. By contrast, those political blocks in which the will of the people would never be allowed to be expressed in referendums are strengthened.

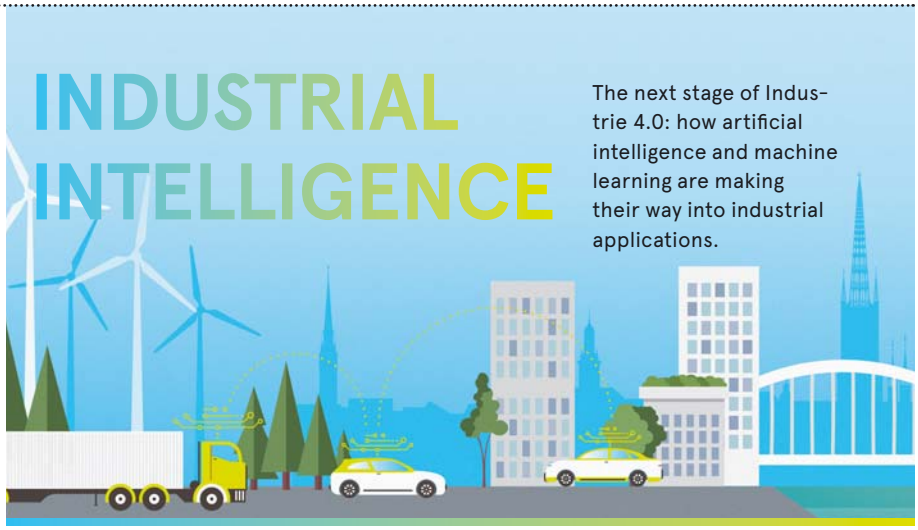
In many European Union member countries, forces are growing that increasingly see their salvation in self-serving nationalism. And yet it should be clear to every European that, if we want to secure our prosperity in a digital world against state-capitalist systems and unchecked Internet corporations, we can only do this together. We should devote all our efforts to developing Europe together. As citizens of the European Union, we have a voice that we can audibly raise in controversial discussions about our home continent and a ballot that we must cast at the elections in May.

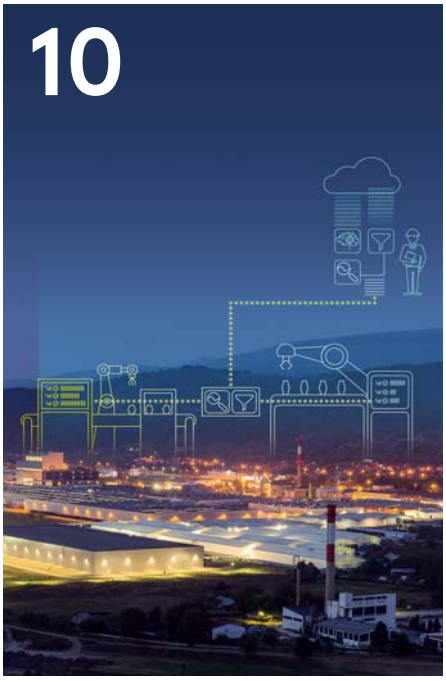
With this in mind, in this issue of AMPERE, we want to provide new impetus in two areas that we believe belong together: the increase in industrial intelligence and the European Digital Union.

Yours,

MICHAEL ZIESEMER
President of ZVEI

Photo: ZVEI | Title: ZVEI





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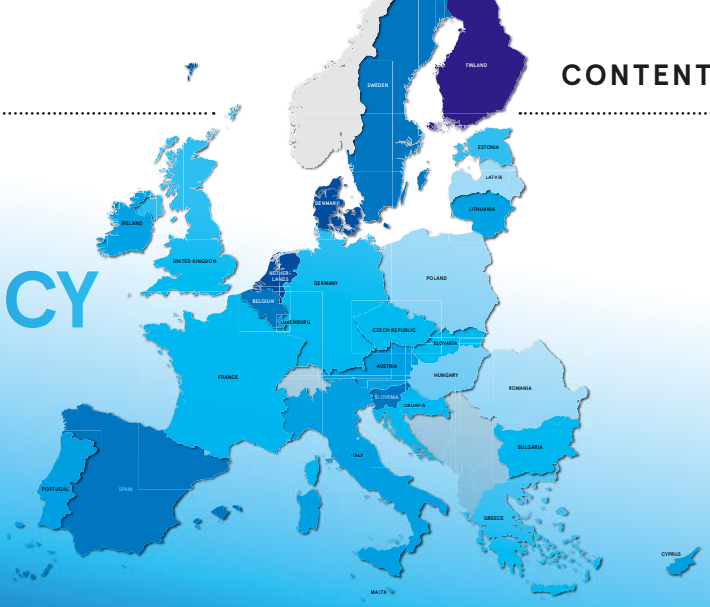
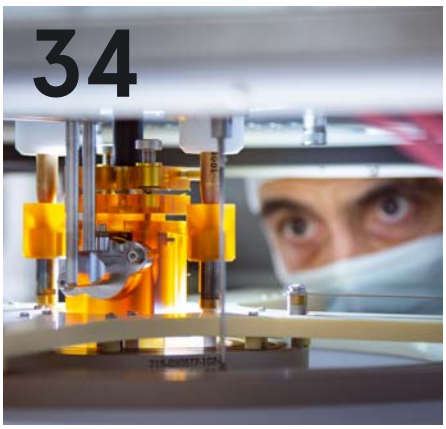
EUROPEAN INDUSTRIAL POLICY

What needs to be done to ensure that Europe also plays a leading role in the industrial world of tomorrow





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Translation: **Steffen Haase**

The view of the computer: the machine displays the essay on page 45 in the 8-bit binary code using eight zeros and ones per character in each case. Due to their simplicity, binary codes with "1/0" or "true/false" have become the basis for processing digital information.

New Partners

Text: **Johannes Winterhagen**

WOLFSBURG, GERMANY

Dr Wolfgang Hackenberg, manager of the Volkswagen Smart Production Lab (right), together with his colleague Johannes Teiwes, is conducting research to improve the way that robots interact with people. To achieve this, they need to develop robots that can correctly interpret people's movements in order to avoid collision. Their most important partner in this context is the German Research Center for Artificial Intelligence (DFKI). Although its name may suggest otherwise, DFKI is not a state institution, but rather a company with shareholders predominantly from industrial companies. In addition to Volkswagen, Microsoft and SAP, the companies involved include Airbus and BMW, not to mention many players from the electronics industry. ZVEI is currently cooperating with DFKI on several projects.

80

This is the number of startups that former members of DFKI have established to date. With more than 800 scientists from 60 nations, it is considered to be the largest research institute in the field of artificial intelligence.

Photo: Volkswagen AG

A Boost for Industrie 4.0

Artificial intelligence promises significant boosts to productivity. After years of research, specific applications in industry are now on the rise. However, medium-sized enterprises in particular are still hesitant. A new strategy programme from the German Federal Government aims to change this.

Text: **Johannes Winterhagen**

Faster throughput, shorter set-up time or predictive maintenance: it is claimed that the use of AI in production or larger infrastructure systems will increase productivity.

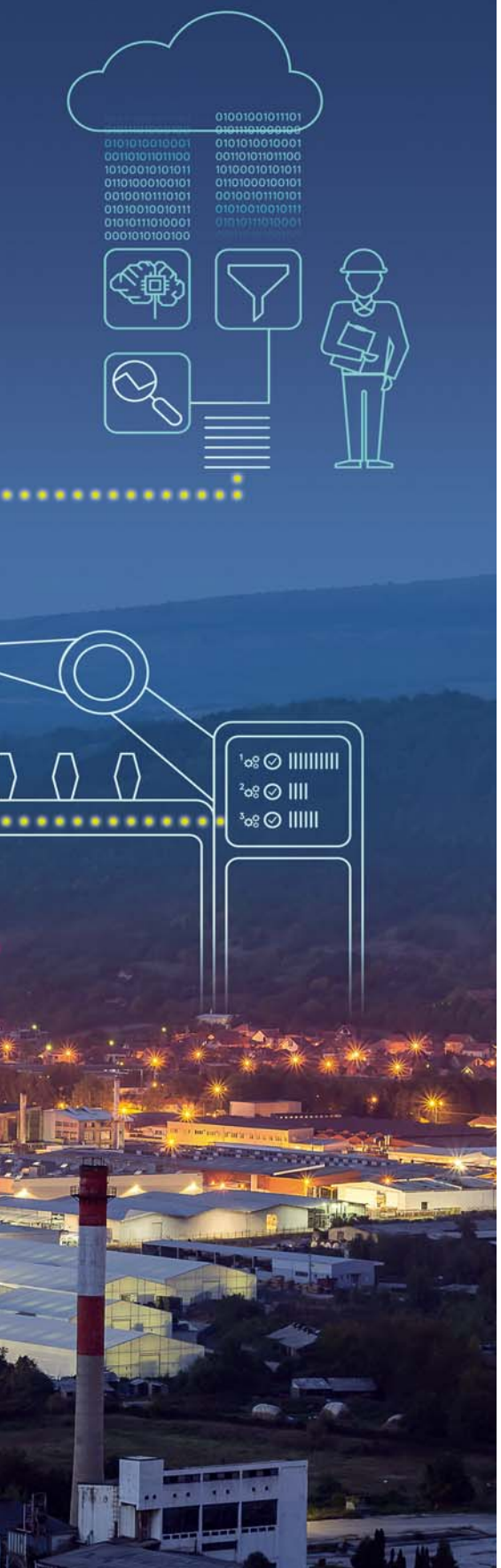


Photo: Johnny Photography/Alamy Stock Photo | Illustration: Barbara Geising

250 years ago, on 5 January 1769, Scotsman James Watt filed a patent that greatly accelerated the pace of industrial development in Europe. Although he did not invent the steam engine, he had dramatically improved its efficiency. The optimised use of fuel resulted in his machine being used not just in the mining industry, but also as an industrial drive system. The impact was considerable. Between 1850 and 1910 alone, the global economy grew by an additional 0.3 percent per year thanks to the use of steam engines. A similar effect was achieved in the 20th century with the introduction of industrial robots, which generated additional annual growth of 0.4 percent. Against this backdrop, a figure published last year by management consultancy McKinsey was very impressive. By 2030, it is estimated that the economic performance will be 1.2 percent greater per year as a result of artificial intelligence. In relation to the world economy, this would result in a cumulative effect of around 13 billion US dollars. However, it is difficult to estimate how realistic such figures actually are. One thing is certain though: individual high-tech companies aren't the only ones who are currently investigating applications for artificial intelligence, or AI for short. The entire automation industry is involved.

As always, there are pioneers who were already working on a technology years, or even decades, before it became mainstream. One such person is Dr Rudolf Felix. In 1991, he was working on his dissertation on fuzzy decisions. One early, initially theoretical, application was the optimisation of processes in semiconductor-based switches on microchips. Just one year later, he founded his own company, which developed fuzzy controllers and fuzzy systems. "Fuzzy" is the perfect adjective to describe the then new form of control technology. At its core, it is based on human decision-making processes, which are not aligned to specified thresholds but to "I'm too hot" or "it's time to shift to a higher gear". Simply put, mathematical values are not firmly assigned to specific volumes, but instead fuzzy logic simply names the possibilities that a value could be assigned to a certain value. Fuzzy rules became popular in the 1990s, and Felix received more and more orders. At some point, while looking at an arrangement of numerous electronic modules, he had a eureka moment: "The microstructures on the chip looked very similar to a factory viewed from above".

What was initially only developing in Felix's head quickly gained acceptance, particularly in the automobile industry where decisions constantly need to be made – for instance regarding which vehicles with which accessories should enter the assembly line in which order. Other applications arise outside of production, for instance in traffic management systems. To allow him to tackle such projects, Felix ultimately sold the majority of his company to PSI, but remained on-board as the Managing Director of a largely independently operating subsidiary. There, he fired up the next stage in artificial intelligence. ▷

By 2030, it is estimated that the economic performance will be

1.2

percent greater per year as a result of artificial intelligence.

"Artificial intelligence is an essential tool for Industrie 4.0. So every entrepreneur should start by gathering experience. You don't have to start off with a giant project."

DR RUDOLF FELIX,
MANAGING DIRECTOR OF PSI FLS FUZZY LOGIK & NEURO SYSTEME

The ZVEI position paper on human-centred artificial intelligence in industry provides ten recommendations for action.

For more information, see: zvei.org/ki-position

Although fuzzy rules can already make good decisions in complex situations, they still lack the ability to learn. Artificial neuronal networks provide this. Although research had also been carried out on these networks as far back as the 1950s, for a long time computers weren't fast enough to allow wider use. Since the turn of the millennium, this situation has changed, but now the problem is a different one: a neuronal network first needs to be trained, and this requires data. Not just any data, either – qualified data. "It is a frequent misunderstanding that more data is also more effective," says Felix. Instead, the data must be written in a suitable way. For instance, to recognise a cat as a cat with almost one hundred percent certainty, networks for image recognition have to be fed with thousands of cat photos in which a person has clearly identified the cat on every single image. This procedure is known as "labelling". "Conventional labelling is difficult to transfer to industrial data," says Felix, describing the challenge. "The data is constantly changing due to new orders, a different combination of model and accessories and through innovation". His solution: systems that automatically label data. "This is not an impossible task," says Felix, who is already testing appropriate algorithms in practice.

Faster throughput, shorter set-up time or predictive maintenance: it is claimed that the use of AI in production or larger infrastructure systems will increase productivity. But what is feasible? Felix speaks of 15 to 30 percent, depending on the starting position. He of all people, the pioneer, recommends proceeding in stages. "Artificial intelligence is an essential tool for Industrie 4.0. So every entrepreneur should start by gathering experience. You don't have to start off with a giant project." With the right approach, even small companies with fewer than 100 employees and just ten machines can benefit from AI applications.

The fact is that producing companies in Germany are hesitant when it comes to introducing AI technologies, as a study from last year by the Federal Ministry for Economic Affairs and Energy shows: 45 percent of all companies in this industry do not use any AI at all yet. Whether Germany becomes a leading location for industrial artificial intelligence could be decided in medium-sized enterprises rather than large corporations. In the 'artificial intelligence strategy' adopted in November 2018, the German Federal Government explicitly focuses on rapid distribution of scientific results to a wide audience. At the "Mittelstand 4.0" centres of excellence, AI trainers are expected to make at least 1,000 business contacts per year. In addition, the founding of new companies in this technology field is to be explicitly supported. In research, too, according to the government's strategy, the focus is moving away from just supporting individual top-class institutes such as the German Research Center for Artificial Intelligence (DFKI); instead the aim is to strengthen AI throughout the entire university landscape. A separate programme aims to create 100 new professorships. By 2025, the implementation of the AI strategy is to be financed with a total of three billion euros. This sounds like a lot, but is less than one fifth of the annual research budget of Google's parent company Alphabet. Like other Internet companies, Google is currently investing a large part of its development budget in AI technologies.

Nonetheless, Dr Klaus Mittelbach, Chief Executive Officer of the ZVEI Management Board, finds the signal sent by the Federal Government's strategy paper encouraging. "From the perspective of the electronics industry, it is important to start now," he says. "It will always be possible to increase spending later." In addition to the financial commitments, he is particularly pleased that "artificial intelligence made in Germany" is focusing on the social benefits of the new technology. "Technology is not an end in itself," warns Mittelbach, whose association published ten recommendations the middle of last year for action regarding the use of AI in industry. Many of the recommendations, for instance regarding research funding and support for smaller companies, can also be found in the government's strategy. However, when it comes to regulatory framework conditions, both Germany and Europe as a whole are still at the very beginning of an intensive discussion process. Here, the following is important to Mittelbach: "We need to distinguish between consumer and industrial applications as well as between personal and machine-related data." Attempting to regulate all AI applications using a standard policy is doomed to failure, he says. Moreover, it is necessary to view AI in the context of the entire digital ecosystem. Communication technologies such as 5G play just as great a role as data protection or competition law. Mittelbach is optimistic: "If we do everything right, AI is a building block for increasing the global competitiveness of European industry."

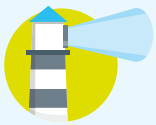
We will see how far artificial intelligence has already penetrated into industry at the 2019 Hannover Messe in April. Dr. Jochen Köckler, Chairman of the Managing Board of Deutsche Messe AG, explains the approach: "AI systems generate knowledge and, based on data and algorithms, can now continuously optimise operating conditions or confidently predict errors and faults – in production processes, in the power distribution network or in logistics. This is what the main theme Integrated Industry – Industrial Intelligence stands for." A mere vision? The exhibitors in Hannover wish to prove the contrary. □

MEASURES OF THE FEDERAL GOVERNMENT

With a view to implementing the "Artificial Intelligence Strategy" it passed in November 2018, the German Federal Government intends to take the following measures:

3 billion euros are to be spent on implementation up to 2025.

12 centres for AI research are to be set up.



50 lighthouse applications for using AI to protect the climate and the environment are to be supported.

100 new professorships are to be created.

1,000 medium-sized companies are to be advised by AI trainers each year.

Source: German Federal Government (publisher): Artificial Intelligence Strategy

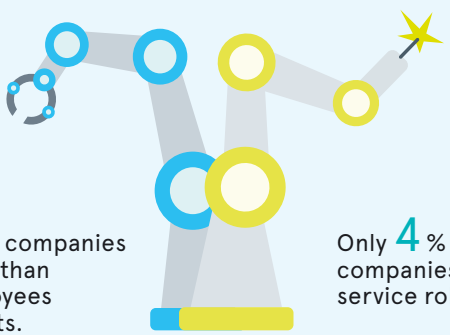
USE OF ROBOTS IN COMPANIES

With a share of **31** %, robotics is currently the largest area of application for artificial intelligence in the production industry.

If we look at all companies in the manufacturing industry, we see that automation by robots in small and medium-sized companies is still in the minority.

53 % of companies with more than 250 employees use robots.

24 % of companies with 50 to 249 employees use robots.



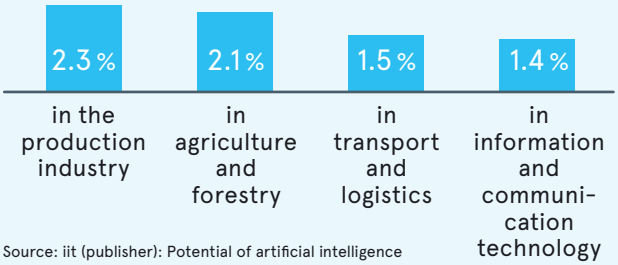
10 % of companies with less than 50 employees use robots.

Only **4** % of all companies use service robots.

Sources: Federal Ministry for Economic Affairs and Energy, Federal Statistical Office

AI-INDUCED GROWTH IN VARIOUS SECTORS

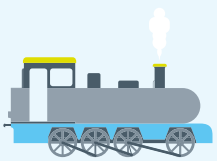
The following annual growth can be achieved by using artificial intelligence:



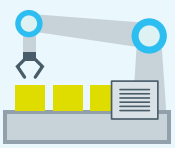
Source: iit (publisher): Potential of artificial intelligence in the production industry in Germany. Berlin, 2018

ANNUAL INCREASE IN PRODUCTIVITY

The use of new technologies has always increased productivity in industrial production:

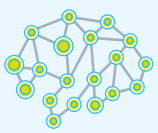


Steam engine as of 1850: **0.3** % p.a.



Industrial robot as of 1980: **0.4** % p.a.

Enterprise IT as of 1980: **0.6** % p.a.



Artificial intelligence as of today: **1.2** % p.a.

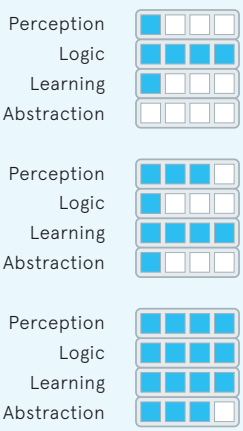
Source: McKinsey (publisher): Notes from the Frontier: Modeling the Impact of AI on the World Economy. 2018

PROGRESS IN ARTIFICIAL INTELLIGENCE

1st AI generation (since 1980)
Expert systems
Example. Cyc (everyday knowledge)

2nd AI generation (since 2006)
Learning systems
Example. IBM Watson (Jeopardy)
AlphaGo (Go)

3rd AI generation (future)
Incorporation of abstract knowledge, explainability, transfer of lessons learnt



Source: Fraunhofer IAIS

Illustration: Barbara Geising, Designcuts


SIEMENS

"That Pays Off Quickly"

Artificial intelligence alone is worthless. However, embedded in a digitalisation strategy, it can make factories significantly more productive. Even medium-sized companies can benefit from this, says Klaus Helmrich, Member of the Managing Board of Siemens.

Text: **Johannes Winterhagen** | Photography: **Ben van Skyhawk**

We got together at the beginning of 2013 to discuss Industrie 4.0 for the first issue of AMPERE. Now we want to talk about artificial intelligence. How are these two topics connected?
First, let us briefly define what artificial intelligence means. To begin with, this is nothing more than a computer program that uses machine learning to optimise itself without any human input and then makes decisions on this basis. AI software is capable of processing large data volumes, such as those generated in quality control during the production process. However, and this is a crucial point, artificial intelligence only works in areas that can be digitalised.

So artificial intelligence is just another building block in a digitalisation strategy?
Yes, artificial intelligence does provide another key lever for the digital transformation of industry. However, it only works in combination with other building blocks. This includes both a virtual simulation environment and the software that is used to control the processes in a factory. And, of course, suitable hardware is also needed, meaning the specific controllers for process control engineering and discrete production, which ultimately perform the processes. Further elements are then added to this foundation: communication technology, IT security, and platforms for data management and the data analysis for digital services.

But wouldn't all of that also be possible without artificial intelligence?
Artificial intelligence creates new possibilities for us to gain new insights from the correlation of large data volumes. An example: we use x-rays to analyse the electronic assemblies that we produce at the Amberg plant. This has resulted in a large data pool that assigns certain errors to certain causes. If this data is analysed with the aid of artificial intelligence, it is possible to determine exactly whether certain test processes are necessary for new circuit boards.

That also means quite a lot of computing effort though ...
... but we reduce the testing effort by 30 percent. This means we can get 30 percent more products through the process without procuring new testing machines. And that pays off quickly.

We can certainly believe that a technology corporation like Siemens makes profitable use of such methods. But what about the rest of German industry, which is dominated by medium-sized enterprises?
Every company, regardless of its size, needs to create a road map for digital transformation. This road map must be a component of the business strategy, and should go in two key directions. First: how can I transform my company and its processes? Second: what do I offer externally? Which digital solutions and services do I make available to my customers? ▷

Name:
Klaus Helmrich

Company:
Siemens AG

Role:
Member of the Managing Board

Date and place of birth:
24 May 1958 in Mitterteich, Germany

Initial training:
Electrical Engineering degree (Dipl.-Ing. FH)

This could, for instance, go as far as a machine no longer being purchased but paid for based on a "pay-per-use" model. For medium-sized companies, it is important to consider precisely where they pursue their own developments and where they work together with other companies in a single ecosystem. This is why we at Siemens provide open platforms for automation and for cloud technology. Developing platforms independently is extremely risky. A promising outcome is possible only if the operator can successfully attract a sufficient number of users.

If medium-sized companies use existing platforms, how much artificial intelligence expertise do they actually need?
Our approach is to make AI applications as simple as possible. However, for applications that are predominantly geared to a specific machine, even medium-sized companies should learn the basics of artificial intelligence. Then again, this applies to all digitalisation topics, including 5G or handling simulation tools.

Simulation specialists are significantly easier to recruit from German universities than AI experts, though.
Which is why I am pleased that the German Federal Government's AI strategy focuses on bringing together scientists and users and strengthening education to cover artificial intelligence.

"Every company, regardless of its size, needs to create a road map for digital transformation."

KLAUS HELMRICH

As part of this AI strategy, the German Federal Government is planning an additional three billion euros of funding by 2022. Will this be sufficient to keep up with global competition?
I view it as positive that the Federal Government is making this topic more visible, both in companies and at universities. In our assessment, we should bear in mind that it is not individual technologies that are decisive for the success of the entire value chain, but rather an overall ecosystem that includes artificial intelligence alongside other topics such as 5G, IT security and the digital transformation as a whole. Simply making a start is good. In the face of constant technological advances, it would in any case be illusory to believe that reaching a goal means the process is complete.

If, in the future, products will be differentiated more strongly through skilful product data management and all companies worldwide will work on a few platforms, what opportunities for differentiation will even remain?
Software by itself is just one component in the manufacturing world. The added value comes from the interaction between the real machine and its digital twin, from which new business models can be established. In order for us to develop such business models and master the digital transformation here in Germany, the infrastructure needs to be right. Many medium-sized companies are headquartered in rural areas and rely on fast Internet access, such as that provided by 5G. Germany's industry is extremely reliant on exports, so we need to ensure global competitiveness in this area.

If we think AI through to the end, wouldn't it also be possible to manufacture products of a similarly good quality even on poorer machines, as relevant adjustments could be made in the event of deviations?
It is true that the quality of production can be increased with artificial intelligence. We are already seeing this today. But this also means that those who are already quality leaders can improve even further. Optimal interaction between the physical and digital world will continue to be crucial in the future. The decisive factor is the quality of the underlying data. This is why, with all due respect to other global technology corporations, I am not worried about German industry losing competitiveness.

Are you afraid that artificial intelligence may make human labour superfluous one day?
Every technology should improve the quality of human lives. Artificial intelligence does this by enabling us to analyse large data volumes. However, I am convinced that artificial intelligence will never be able to replace humankind. After all, feelings, intuition and sympathy cannot be digitalised. For this reason, people can respond to situations differently than a machine would. Even if the machine has artificial intelligence, it will always act in the way it has learned. I am therefore totally convinced that humans will continue to be at the centre of the action in the future.

Mr Helmrich, thank you for talking to us. □

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On the Safe Side

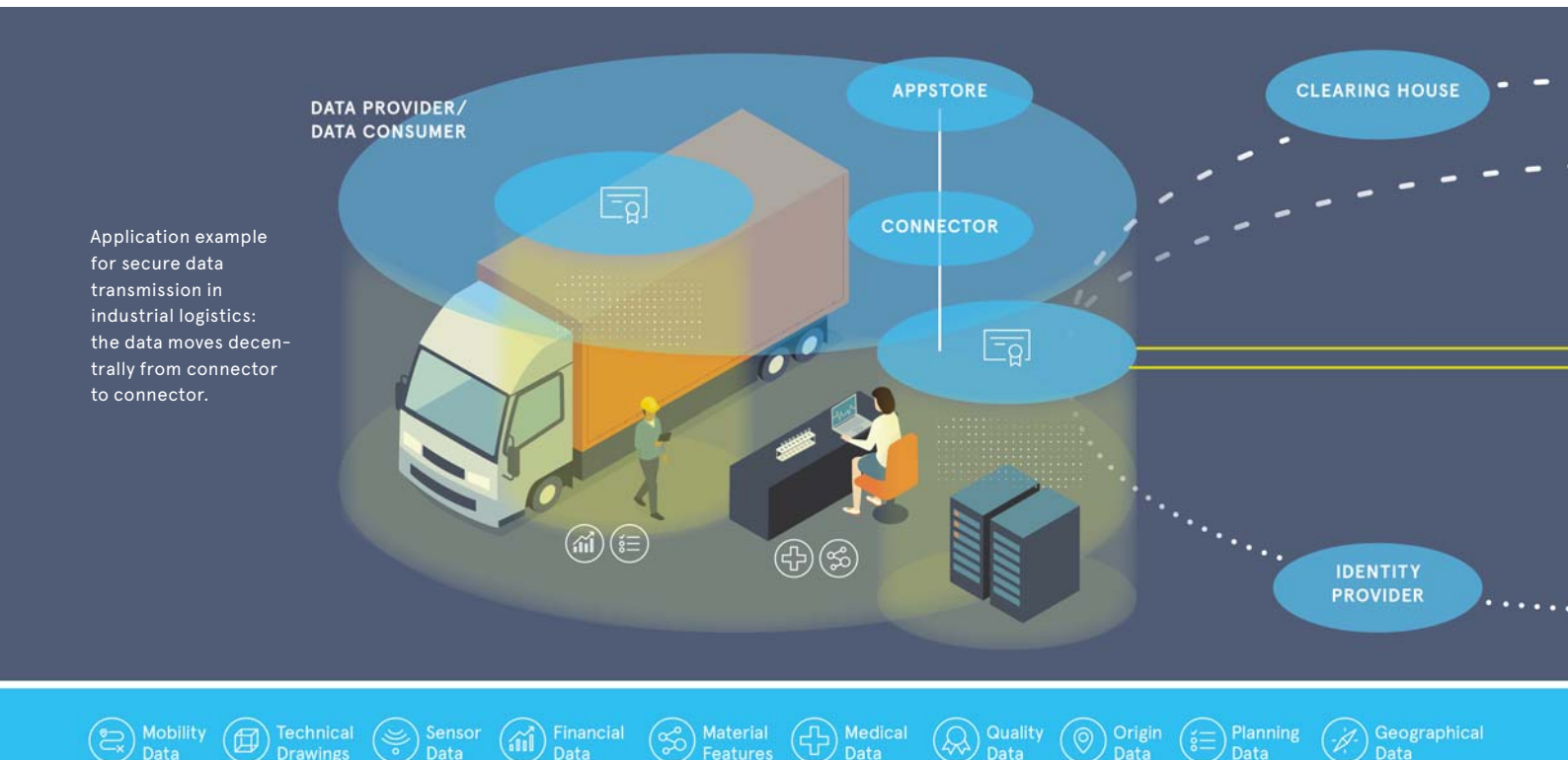
Amazon, Google and Facebook have been doing it for a long time. Now Industrie 4.0 intends to use data to establish new business models too. To make it work, an initiative of the Fraunhofer Society is developing secure data spaces, referred to as "International Data Spaces". Here, participants are all meant to determine for themselves what happens with their data.

Text: **Laurin Paschek**

According to the calculations of the US software company MerlinOne, the new data generated worldwide each day amounts to 2.5 quintillion bytes – that is, a one followed by 18 zeros multiplied by two and a half. This daily mass of data would fill around 36 million iPads. An ever greater proportion of these bits and bytes originates from industrial plants, the reason being that new algorithms make it possible to turn such data into cash – for instance to optimise maintenance intervals and avoid standstills in factories. Data can also be used to improve efficiency in industrial logistics. Thyssenkrupp, for example, is working on a system to optimise utilisation of the loading ramp, taking account of traffic data, meteorological data, and the driving and rest times of lorry drivers. Last but not least, data can provide a wealth of experience in product development and play a role in making targeted improvements to new developments.

"In industry, too, an increasing number of business models require cross-company data exchange, for example between manufacturers, suppliers and service providers," says Markus Spiekermann, head of the Fraunhofer Institute for Software and Systems Engineering (ISST). "However, when the data leaves a company, the company no longer has any control over what happens to it. There is a risk here of the original owner of the data losing valuable information such as business secrets," With the

Illustration: shutterstock/elenabsl



Application example for secure data transmission in industrial logistics: the data moves decentrally from connector to connector.

aim of resolving this conflict of interests, a total of twelve Fraunhofer institutes have since October 2015 been working on various research projects, sponsored by the Federal Ministry of Education and Research (BMBF), to develop a secure data space. The aim here is to enable companies of different sizes and from different sectors to exchange data in a sovereign manner, allowing the companies themselves to determine what happens to their data. A follow-on project, "Industrial Data Space Plus", has been under way since the end of 2017, with Spiekermann's department "Digitalisation in Service Industries" responsible for project management. The aim of the research project is to develop a reference architecture for industrial applications.

In contrast to traditional cloud solutions, where the data is stored in a central location, the research project is using a hybrid solution. The architecture basically consists of a decentralised peer-to-peer network between the participating companies. Using an access component called a "connector", users can enter the data space, make their own data available and access the data of other companies. The interfaces transfer not only the data itself, but also important additional attributes such as the author, the origin and the editor of the data. To provide an overview for participants, metadata is registered in a central directory and can be located using a search function. As a result of the decentralised architecture, or federal architecture as experts also call it, the data is always held by the companies themselves.

However, that is only one side of the story. "When it comes to security-relevant functions, it makes sense to make them available centrally," points out Spiekermann. "This includes, for example, the authentication of participants, an app store and also the Clearing House, which is to serve as settlement system and is currently part of our research." In addition, the ecosystem makes a specialised vocabulary available in a central location. This is attached to the data like a label and describes, amongst other things, the conditions of use. "Since we are working with a peer-to-peer connection, this makes it possible for data to be exchanged in a sovereign and self-determined manner," says Spiekermann. Data suppliers can utilise the conditions of use to stipulate individual rules for using their data, for instance laying down a maximum number of accesses or a geographical restriction. "It would also be conceivable for usage to be connected to a certain price or to allow data use as such while prohibiting the sale of the data to other parties," reports Spiekermann.

"Industrial Data Space e.V.", which has in the meantime been renamed the "International Data Spaces Association", was set up in 2016 to supplement the research-oriented development with real requirements from industry. "Our aim here is to make it clear that the issue of data sovereignty is relevant not only in the industrial context, but also in cross-sector domains such as logistics, health care, energy and mobility," explains Spiekermann. Originally founded by the Fraunhofer Society, 16 commercial enterprises and ZVEI, the organisation has now expanded to include around 100 companies from 18 different countries. "That is certainly a unique constellation," says Spiekermann. "In the association's working groups, industrial partners inform us of key requirements from the field and define standards that we can incorporate directly into the architecture."

One example here is the next central question that the research project will be striving to answer, namely how it would be possible to ensure that the conditions of use are always adhered to even outside of the secure data space. "We have already found an organisational approach in the form of our rules and standards. It would be better, though, if we could also establish a technical solution to ensure that the conditions of use are actually adhered to." The researchers are currently looking into three different approaches. Whatever the solution turns out to be, the utmost goal is most certainly to implement sovereign data exchange on a permanent basis from beginning to end. □

Not Afraid of the Robot

Swedish industry is undergoing a period of radical change. While the automotive and steel sectors are now dominated by international corporate groups, the electrical industry is going down a different route. It is hoped that artificial intelligence will allow domestic production to remain competitive over the long term. How can this be achieved?

Text: **Clemens Bomsdorf**

Transporting iron ore north of the Arctic Circle: alongside timber, this is a base commodity of Sweden's national economy.

To experience the backbone of Swedish industry, you can take the train from Malmö in the south of the country to Kiruna north of the Arctic Circle. On the 1,800 kilometre journey right through the country, the base commodities of Sweden's national economy roll past the train window. The country is shaped by vast expanses of nature with a lot of water, even more forest and finally the mountains. This landscape has produced plenty of wood and iron ore. It's therefore no wonder that the large traditional Swedish companies operate in the paper and forestry industry, mechanical engineering and the automotive industry. When car manufacturer Volvo coined the German advertising slogan "Sicherheit aus Schwedenstahl" (Swedish steel for safety) a few decades ago, it simultaneously positioned two products from Sweden's traditional industries on the global market.

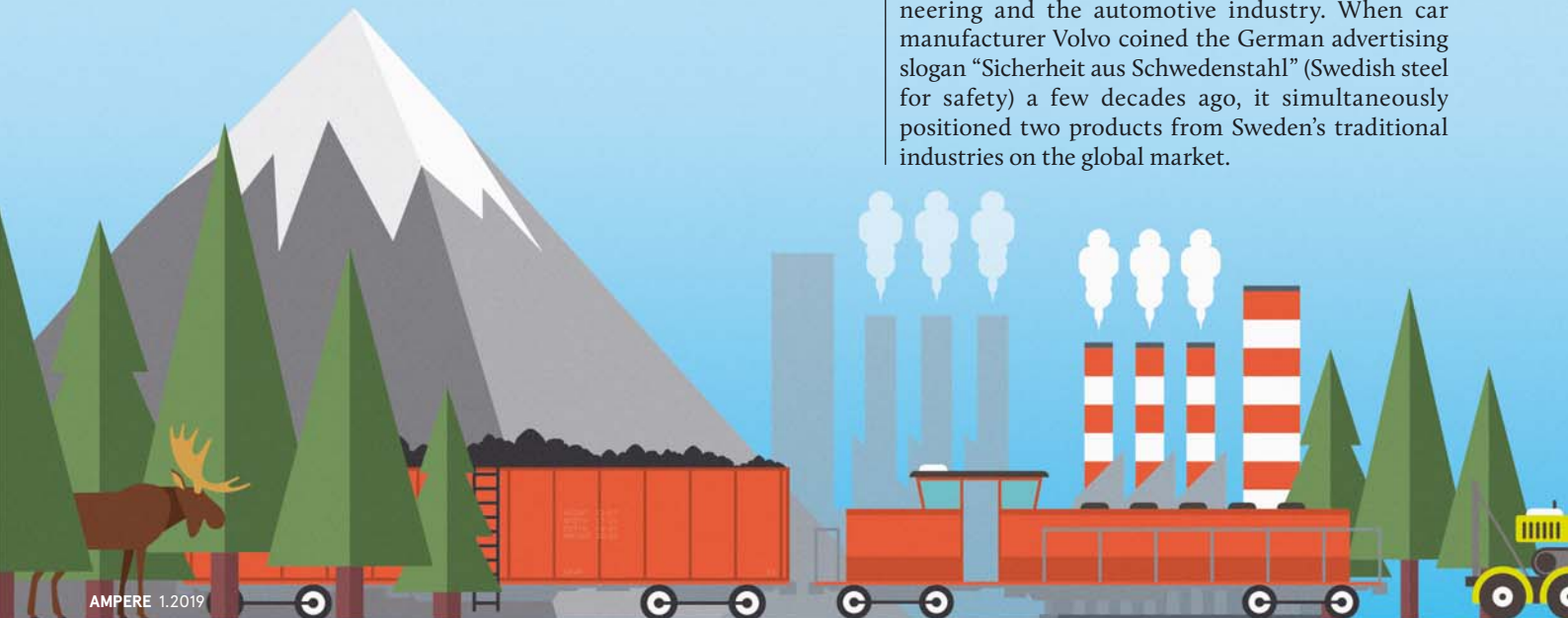


Photo: shutterstock/Tommy Alven, imageBROKER/Alamy Stock Photo | Illustration: gestalten/Alexander Tibelius, shutterstock/brichuas, Adobe Stock/elenabsl, Barbara Geising

But the times have changed. "A lot has happened in Sweden," says Klas Wåhlberg. He is chairman of the Teknikföretagen electrical industry association, equivalent to ZVEI in Germany. Wåhlberg did not just mean that two further heavyweights of the traditionally very open Swedish economy, Volvo Cars and Scania, are now in foreign hands (Volvo owned by the Chinese company Geely, Scania by German Volkswagen), but also that the competitive situation on the global market is now completely different. "To give a simple example: Previously, the Volvo 242 was made almost exclusively of components manufactured in Sweden. For the current models, there are now around 90 suppliers from just as many countries." Volvo produced the 240 series from the 1970s to the 1990s, a period in which globalisation was gaining momentum. Markets that had long been closed started to open up, and trade barriers fell. Suddenly, it made much more sense to ship products and raw materials from around the world back and forth. Overall productivity and wealth increased as a result.

Now, according to Wåhlberg, the process could gradually reverse, at least in some areas. This is no great secret. It's not new that production is being transferred back to industrialised countries because the quality is better there and production is becoming more cost-effective as a result of increasing automation. However, Wåhlberg goes one step further and points to the effect of artificial intelligence, which should bring new impetus to domestic production. This naturally includes driverless cars, but this is not the only area by a long way.

The most populous of the North European countries could take on a pioneering role because it is particularly open to innovation. After the Netherlands and Denmark, Sweden is the EU country in which people are least afraid that robots will take their jobs. In 17th place, Germany fares badly in the ranking commissioned by the EU Commission. While only 57 percent of Germans say they regard robots and artificial intelligence as positive, the value is 81 percent in Sweden. The "Artificial intelligence in Swedish business and society" report published in May 2018 by innovation agency Vinnova also puts the technology-friendly population at the top of the table with regard to the country's merits in matters of AI readiness.

Ricky Helgesson can only confirm this. "Inventiveness and an entrepreneurial spirit are widespread here," says the 42-year-old serial entrepreneur and CEO of Univrses. The AI startup has its headquarters at Medborgarplatsen, right in the middle of the hip Stockholm district of Södermalm, which is full of cafés and bars. Helgesson refers to a statistic that shows that, measured by population, Stockholm is surpassed only by Silicon Valley for the number of "unicorns" i.e. startups valued at more than one billion dollars. Univrses is not yet one of them, but has still managed to go from zero to an annual turnover of two million euros in two years. "Our work focuses on localising objects in space. ▷

Södermalm is a hip Stockholm district where numerous start-ups are located.

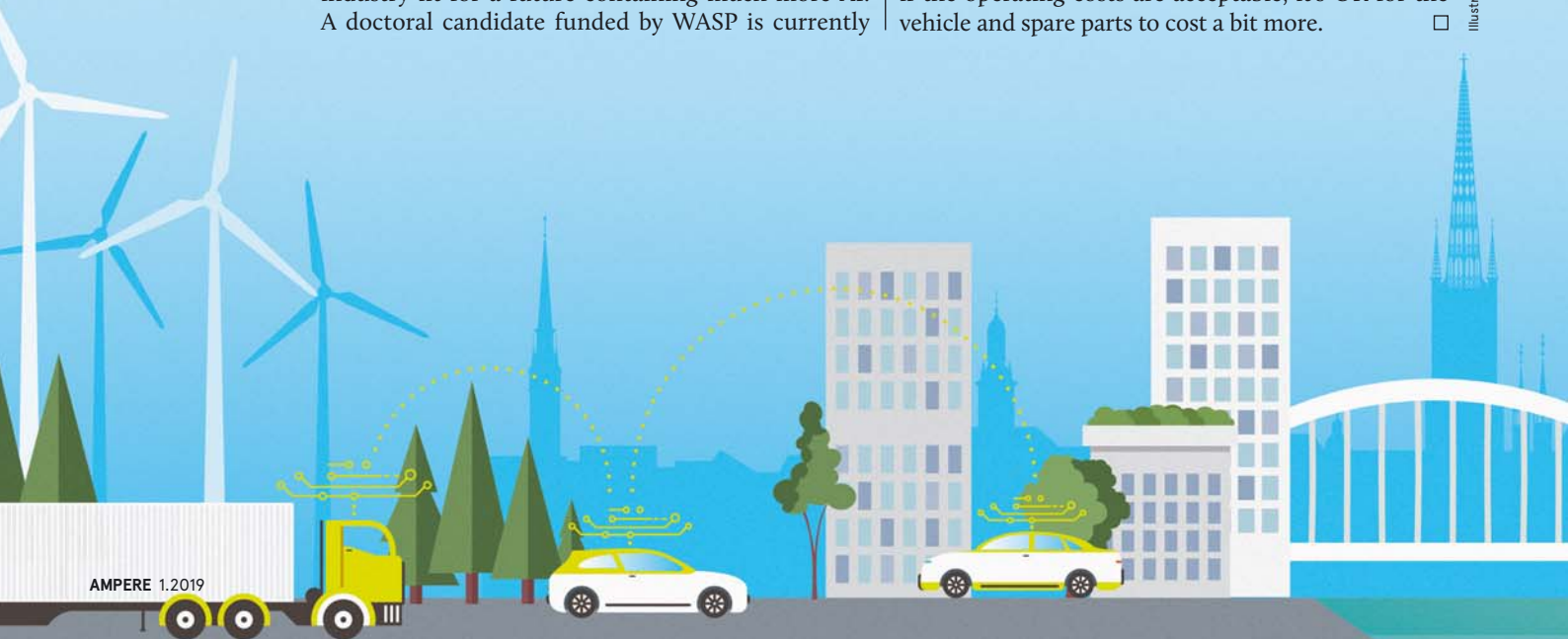
"For many, autonomous driving is surely the most interesting and accessible example of the use of AI, and we are of course active in this area."

JOHAN SVENNINGSTORP,
EMERGING TECHNOLOGY PROGRAM MANAGER BEI VOLVO

At the start, we were mainly concerned with VR and AR, for computer games among other things. But we quickly noticed that there was a more exciting customer group, namely industry," says Helgesson. Today, Univrses supplies software to, among others, car manufacturer Volvo, to enable its self-driving cars to navigate the roads and identify obstacles. It is necessary to learn how to identify patterns here, since like a small child a machine first needs to learn which objects could suddenly start to move. ABB is another customer. Here, it is the robots that need to learn their way in a factory.

Univrses AI solutions are highly complex, and Helgesson's employees are consequently very well qualified. "Many have a doctorate. The only one without an academic qualification is me," says Helgesson, who after graduating from high school founded one company after another – five in total. The good conditions his home provides for AI companies include technical universities in Goteborg, Stockholm, Lund and Linköping. In Sweden, a large amount of research is state-financed. The most well-known private sponsor is the Wallenberg industrial family, which holds shares in ABB and Ericsson, among others, and recently established "WASP". This stands for "Wallenberg AI, Autonomous Systems and Software Program" and provides research funds to help make Swedish industry fit for a future containing much more AI. A doctoral candidate funded by WASP is currently researching artificial intelligence at Univrses, for example. "We must ensure that Sweden remains a leader in research and development," says Helgesson.

Truck and agricultural machinery manufacturer Volvo Trucks – market-listed and independent of the car manufacturer of the same name – also works with WASP. "Sweden has the advantage of being technically very advanced, and invests diligently in this area. Compared to China, however, the amounts are naturally not huge," says Johan Svenningstorp, Emerging Technology Program Manager at Volvo. "For many, autonomous driving is surely the most interesting and accessible example of the use of AI, and we are of course active in this area," says Svenningstorp. "A lot more will happen here in the future. At the same time, it is important that we also solve much simpler tasks with AI as well," he adds. It is often the case that much can be achieved here quickly with relatively low financial input – for many classic industrial companies. For example, Volvo recently used AI to optimise its system for the provision of spare parts. Thanks to the electronics in the vehicles, Volvo now has much more information available to it than was the case just a few years ago. In addition, computing power is continuously improving. "Together with historical data, that helps us to predict the demand for spare parts relatively well," says Svenningstorp's colleague Christian Johansson, Head of Innovation & Concepts at Volvo Trucks. Where possible, Volvo analyses not only the mileage travelled by the trucks, but also other factors that affect wear and tear. As a result, spare parts can be made available where they are needed without much stock-keeping. The aim is to increase the operating time of the trucks. As a result, therefore, AI is ultimately helping to protect jobs in Sweden, because if the operating costs are acceptable, it's OK for the vehicle and spare parts to cost a bit more. □



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Important Trading Partners in the North

Even in Hanseatic times, i.e. from the 13th century to the 18th century, Germany and Sweden were important trading partners. Economic exchange brought wealth and development to both nations. Today, Germany is Sweden's most important trading partner. Around 20 percent of Sweden's imports come from Germany, and 10 percent of its exports end up there.

Info graphic text: **Laurin Paschek**

THE KINGDOM OF SWEDEN

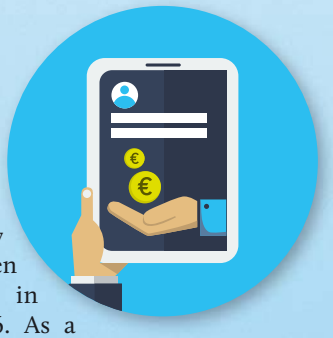
Area:	447,435	km²
Inhabitants:	10.1	mil.
GDP per head:	47,203	euros
Electric production 2017:	16.5	bil. euros (26th place worldwide)
Exports to Germany (total) 2017:	14.9	bil. euros
Electric exports to Germany 2017:	1.2	bil. euros
... of which information and communication technology 2017:	0.4	bil. euros
... of which automation 2017:	0.2	bil. euros
... of which home electronics 2017:	0.1	bil. euros

FEDERAL REPUBLIC OF GERMANY

Area:	357,385	km²
Inhabitants:	82.8	mil.
GDP per head:	39,649	euros
Electric production 2017:	144.7	bil. euros
Exports to Sweden (total) 2017:	26.7	bil. euros
Electric exports to Sweden 2017:	5.5	bil. euros
... of which information and communication technology 2017:	2.1	bil. euros
... of which automation 2017:	0.7	bil. euros
... of which traffic electronics 2017:	0.4	bil. euros

LOW BORDER TRAFFIC

Germany and Sweden do not share a border, but there are direct ferry connections from Malmö and Trelleborg to Lübeck, Rostock and Sassnitz on the island of Rügen, where there are large supermarkets that have adapted to cater to Swedish day shoppers – with large information signs in Swedish and a wide range of beers, wines, spirits and tobacco products. However, many ferry passengers also come to become acquainted with the other country, its people and regional cuisine. The journey from Sassnitz to Trelleborg takes about four hours.



TOTAL TRANSPARENCY

The taxes that every citizen pays have been publicly accessible in Sweden since 1766. As a result, the Swedes know what each other earn. But it's not only the salary that is transparent: The tax office, the Skatteverket, assigns each person a personal identity number at birth. And whatever they do in later life – where they live, what they buy, the car they drive or whether they get married – this number is always registered. The Swedes do not have a problem with this, because the total transparency goes in both directions. From the Skatteverket, any Swede can find out a wide range of information about anyone.

Illustration: gestalten/Alexander Tibelius, shutterstock/brichuas, Barbara Geising

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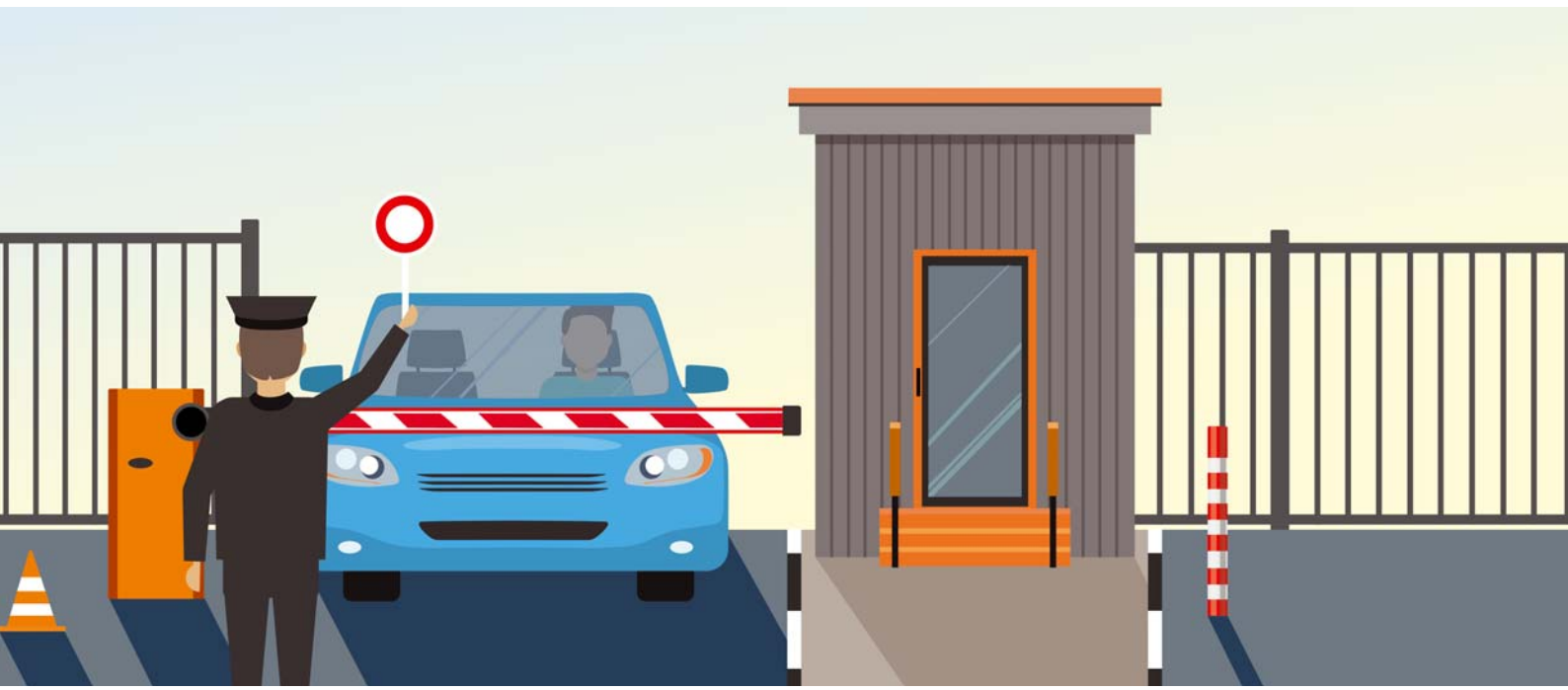
Where is Schengen, Anyway?

Text: **Laurin Paschek**

Just beyond Herleshausen, in the far east of Hesse, the car trip from Frankfurt am Main to Berlin abruptly ends for the time being with a traffic jam. Watchtowers and fences grimly announce what is to come. The road narrows to a single lane. On the left-hand side of the road, a conveyor belt is installed where passports are to be placed. This allows the passport control units of the GDR (which are under the control of The Ministry for State Security and located in barracks a few hundred metres further on) to examine the papers at their leisure. Having reached the checkpoint, the command comes to get out of the car and open the boot. The passport control unit staff, dressed in the uniforms of the GDR border troops, inspect the vehicle thoroughly. If they do not find any stowaways, undesirable books or similarly unwelcome items, you can finally be on your way again. Until the late 1980s, this was an everyday occurrence at the German/German border, part of the "iron curtain" that divided the whole of Europe from North to South into a western half and an eastern half. While the border controls were much more relaxed at the country borders within the "western block", barriers and customs officials dominated the scene here, too.



- *In **1990**, the mathematical GDP in today's 28 EU states (including Great Britain) was 10,360 billion US dollars. More than 30 bilateral country borders with countless checkpoints hindered the free movement of persons, goods and services.*

Today, anyone travelling from Munich to Salzburg, from Nice to Genoa or from Wroclaw to Prague at most has to stop to buy a road toll vignette. With the second Schengen Agreement – named after the small town of Schengen (population: 5,000) located precisely in the border triangle of Luxembourg, France and Germany – the border controls of persons and goods ended in many European countries on 26 March 1995. Not only almost all EU countries but also Switzerland, Liechtenstein, Norway and Iceland belong to the "Schengen area". The elimination of barriers not only makes holiday travel easier, but also helps cross-border regions grow together, such as the European region of "Pomerania", in which the towns and districts of the German federal states of Mecklenburg-Western Pomerania and Brandenburg have combined with three Polish Voivodeships and the town of Szczecin. And it also brings major economic benefits. According to a 2016 study by the Bertelsmann Foundation, the reintroduction of border controls would result in growth losses of 470 billion euros throughout the entire EU by 2025 – which equates to approximately the entire gross domestic product of Belgium.

After the Schengen Agreement came into force in 1995, other barriers also fell in Europe, for instance, when Euro coins and banknotes were launched on 1 January 2002. Today, people in 19 European states, from Portugal to Finland and from Ireland to Cyprus can reach into their wallets without having visited a bureau de change first. On 15 June 2017, an entirely virtual but no less significant border was torn down. With the elimination of roaming fees within the EU, borderless mobile communications and data use also became a reality. □

Illustrations: shutterstock/Medvedeva Irina, Barbara Geising

- *In **2017**, the GDP within the 28 EU states translated to around 18,478 billion US dollars. This means an increase compared with 1990 of more than 78 percent. Apart from just a few exceptions, border controls have been eliminated throughout the EU.*

Sources: UNCTAD, DESTATIS.
Note: The comparison was calculated in US dollars because the Euro did not exist as a means of payment in 1990.

Staying in the South

The Politecnico di Bari has an excellent reputation that extends across national borders. However, most graduates move to the north to find work. 25-year-old electrical engineer Vito Andrea Racanelli is not yet sure whether he will be able to stay in the south of Italy after completing his Master's degree either. In his daydreams, he looks forward to the year 2030 – when he believes a new entrepreneurial spirit will be the key to the development of the Mezzogiorno.

Text: **Recorded by Laurin Paschek**

Vito Andrea Racanelli is fascinated by the planned space port in Grottaglie near Taranto (Puglia).

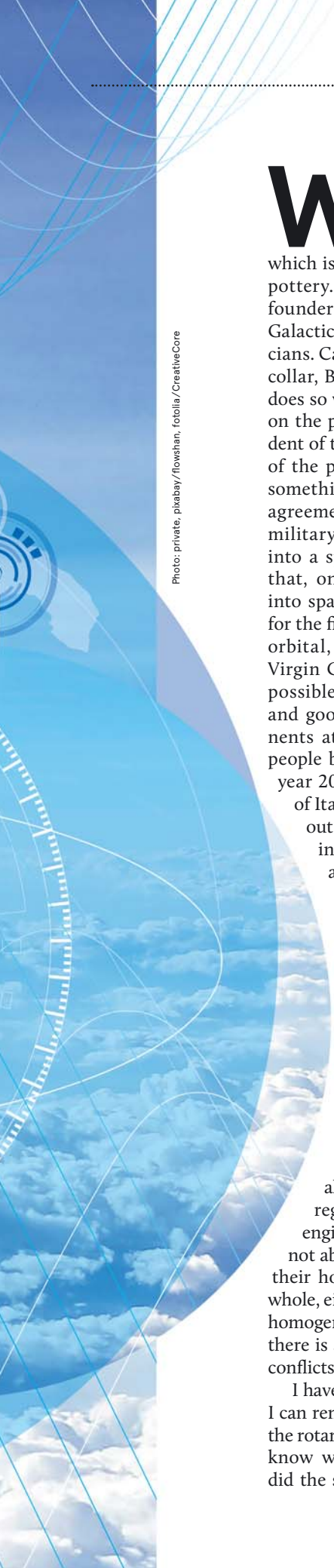


Photo: private, pixabay/flowshan, fotolia/CreativeCore

When I think of the future of southern Europe, a certain photo springs to mind. It was taken on 6 July 2018 in Grottaglie, a small village near Taranto, which is only really known for its typically Apulian pottery. The photo shows Richard Branson, the founder of the private aerospace company Virgin Galactic, surrounded by eight managers and politicians. Casually dressed in a white shirt with an open collar, Branson is holding up his right fist. And he does so with a big smile. That is because the people on the photo – including Michele Emiliano, President of the Apulia region, and Nicola Zaccheo, head of the private Apulian space agency Sitael – have something to celebrate. They have just signed an agreement to develop the old military airport of Grottaglie into a space port. The idea is that, one day, people will go into space from European soil for the first time here. The sub-orbital, parabolic flights of Virgin Galactic are to make it possible to transport people and goods between the continents at great speed. So, will people be able to travel in the year 2030 from the southeast of Italy, with its many worn-out roads, to Silicon Valley in just an hour? Will the locational disadvantage of the south then cease to play a role?

"A lot more would have to be done to promote small and medium-sized companies in southern Europe. In addition, action should be taken to foster an entrepreneurial spirit among young graduates and encourage them to build lives for themselves here."

At any rate, the reality today is somewhat different. My university, the Politecnico di Bari, may be highly renowned. Only a few years ago, our Politecnico took first place in a university ranking, overcoming the competition from Milan and Turin. However, the vast majority of students leave the Apulia region after completing their Bachelor's or Master's degree. My fellow students then seek their professional future in the north of Italy, especially in Milan and the surrounding region. Or they even go abroad: many to England, and some also to Germany. This is a catastrophe for the region. Although the highly qualified young engineers are trained here, they are subsequently not able to contribute towards the development of their homeland. This is not good for Europe as a whole, either, because it makes it impossible to ensure homogeneous development among all regions. Where there is a lack of equilibrium, there are bound to be conflicts sooner or later.

I have been interested in technology for as long as I can remember. As an eight-year-old, I disassembled the rotary-dial telephone at home because I wanted to know what it looked like inside. As a teenager I did the same with mopeds, namely the "Piaggio Si" scooters that are widespread here. I completed a Bachelor's degree in Electrical Engineering at the Politecnico di Bari and am now doing a Master's degree in Automation Technology. I am particularly fascinated by robotics. Working as an assistant to my professor, Saverio Mascolo, I am involved in a research project and program the control software for mobile robots to perform tasks such as transporting goods in warehouses. We are able to bridge the gap between theory and practice very well here, as a medium-sized company from the Abruzzo region is also involved in the project. One thing is clear, however: I have a passion for robotics, and if I am unable to follow this passion here after taking my final exams, then I too will leave the region.

It is hard to say what can be done to prevent this. I am neither an economic expert nor a politician. There is actually a very large number of small and medium-sized companies in southern Italy, also in the field of electrical engineering and information technology. However, they are much too dependent on a few major clients. This means that increased investment from outside, for instance by new research institutes and factories, would only be part of the solution, as is the space port planned by Virgin Galactic in Grottaglie. The small companies would also need to develop themselves further. This would mean doing a lot more to promote small and medium-sized companies here in the south. In addition, action should be taken to foster an entrepreneurial spirit among young graduates and encourage them to build lives for themselves here. This could give rise to a chain reaction in the positive sense. If one person forges ahead and sets a good example, then maybe others will follow. That reminds me of a great quote from Paulo Coelho, who said, translated into Italian: "Il mondo cambia con il tuo esempio, non con la tua opinione" ("The world is changed by your example, not by your opinion").

If this is achieved, then the south of Italy, which we affectionately also refer to as the "Mezzogiorno" – the middle of the day – could perhaps look completely different in the year 2030. Young talents would no longer be forced to move away, but instead would stay here and help promote economic growth. We may possibly even be in a position to welcome engineers from all over the world. After all, Bari and Apulia have more to offer than highly qualified labour. People from many other countries greatly appreciate our climate, our landscape and beaches, our cuisine and our relaxed way of life. I believe that southern Europe has something that cannot be found in the same way in the north, namely the combination of a calm attitude and a passion for whatever fascinates us. □

Digital Union

Günther Oettinger frequently incorporated the term “Digital Union” into his speeches when he was still European Commissioner for Digital Economy and Society. It can also occasionally be heard in the European Parliament’s Committee on Industry, Research and Energy. Now ZVEI is making the Digital Union the focus of its European policy agenda.

Text: **Markus Grabitz**

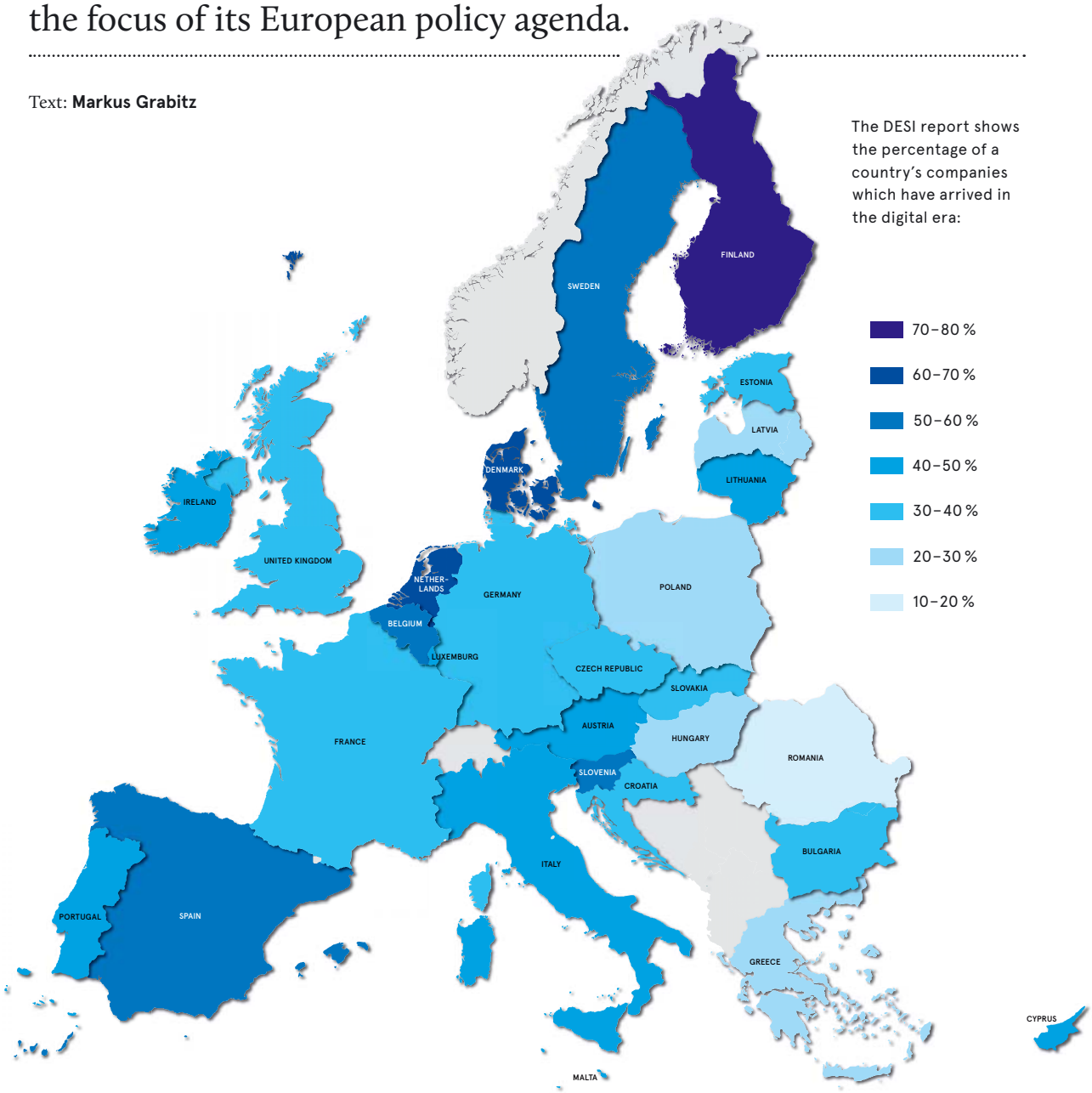


Illustration: Barbara Geising

For a long time, the greatest European project of all time – the EU – stood for the free movement of persons, goods, services and capital. With digitalisation, a fifth fundamental freedom has now arrived: the free flow of data, the raw material of digitalisation, from Portugal to Estonia and from the Irish Sea to the Greek islands. "The Digital Union is at the heart of an industrial policy strategy with a global claim to leadership," says Dr Oliver Blank, head of ZVEI's European Office. "Digitalisation is not a fate that is descending on us. On the contrary, digital transformation is a design task for business and society." You could also put it another way: the former trade union now needs to become a Digital Union.

However, the EU is still worlds away from the new era. According to the DESI report, which the EU Commission uses to summarise the status of digitalisation in the member states, only 40 percent of companies have arrived in the digital era. And the contrasts are enormous: in the leading country, Finland, 75 percent of companies are considered to have digitised, in Denmark the figure is 65 percent, in the Netherlands 60 percent. At 35 percent, Germany is in the bottom third, then a few places behind them Poland, Hungary and Romania bring up the rear. It is thus clear that there is still a lot to be done, given that the digital union promises more jobs and greater growth. With an efficient digital single market, the EU Commission estimates that the economic performance of the EU would increase by 415 billion euros per year. Companies that use digital technologies such as Big Data, blockchain and artificial intelligence produce higher quality goods and create more value.

When Günther Oettinger became the digital commissioner in 2014, he developed the "Digitalising European Industry" strategy. The EU is providing five billion euros for this between 2016 and 2020. Overall, the strategy aims to initiate investments of 50 billion euros, because member states, regions and the industry are integrated and expected to mobilise their own funds. One pillar of the programme consists of more than 200 "hubs" for digital innovation, primarily targeting medium-sized companies. In Germany, for instance, there were 23 functioning hubs at the end of last year, with a further 25 under construction. At these hubs, entrepreneurs can spend time testing key technologies and receive support for the financing of investments. Digital experts create feasibility studies and business plans. The hubs are also used for employee training courses and network events.

The second pillar is a law that takes into account the specific features of digital business. Since 2014, the EU Commission has developed around 30 proposals. In 2018, 23 of them were completed, meaning the Council and the Parliament endorsed them. In essence, the purpose is to create a digital infrastructure, for instance by establishing the 5G mobile communications network throughout Europe. Another aspect is protecting companies better against cyber criminality. For this purpose, the intention is to create a certification system to identify secure products and services.

However, by the time a proposal from the EU Commission becomes part of European law, up to four years may have passed. The legislation system is slow, which poses particular challenges for regulation in a rapidly changing, digital world. This means the EU legislator can only provide a framework, because any regulation that went into too much detail would already be outdated by the time it came into force. Furthermore, the EU is not operating in a vacuum. The Commission has to find solutions that will also work for enterprises across the globe.

Digital standards and ethical rules are a further aspect of the Digital Union. This is the starting condition in the race to establish digital platforms for industrial companies, where businesses will soon exchange data with one another, request technical support and carry out pre-competitive research. Although the US and China are currently far ahead in the B2C field thanks to Google, Uber and Facebook, the jury is still out when it comes to B2B. From 2018 until 2020, the EU is providing 300 million euros for establishing the next generation of platforms. And after all, the man who now occupies the position where all the threads of digitalisation come together in the EU Commission is satisfied with what has been achieved thus far. Vice President Andrus Ansip says: "The Juncker Commission has delivered. At the outset of the mandate in 2014, it was not yet possible to speak of a digital single market. Now it is taking shape, and unnecessary barriers are being dismantled one by one."

One challenge for the Commission here is that digitalisation is a cross-cutting task. Three commissioners – for Industry and Entrepreneurship, for Justice, Consumers and Gender Equality, and for Digital Economy and Society – are involved and specify the political guidelines. At the next level down, expertise is divided across several Directorate-Generals (DGs). The officials from "DG Grow" and "DG Connect", in particular, are required to work together. Of course, efficiency losses and infighting over responsibilities also occur here.

The single market expert among the CDU delegates in the European Parliament, Andreas Schwab, also argues that the next EU Commission must have in mind an overall strategy for industrial policy in Europe in 2030 and deliver a coherent policy: "We need genuine harmonisation. That means a single EU regulation and not 27 national laws. Only in this way can we drive the digital single market forward." He adds that this requires precisely coordinated proposals for legislation, and argues that it is crucial for the Commission to recognise this and adjust its structures accordingly. □

The economic performance of the EU would increase by

415

billion euros per year if the digital single market was efficient.

Technology Mediators

The discussion about curved cucumbers is emblematic of a heavily criticised Brussels bureaucracy. In fact, though, the EU officials in the individual departments create the underlying framework needed for future technologies and digitalisation. You're not convinced? Then take a look behind three office doors.

Text: **Markus Grabitz**

SCOUT FOR FUTURE TECHNOLOGY

NICHOLAS DELIYANAKIS, BRITISH AND GREEK NATIONAL, ACTING HEAD OF THE STRATEGY DEPARTMENT IN THE INDUSTRY DIRECTORATE OF THE RESEARCH AND DEVELOPMENT DIRECTORATE-GENERAL OF THE EUROPEAN COMMISSION

What are the key technologies of the future? This is the question Commission official Nicholas Deliyanakis repeatedly faces. The physicist has been working for the Commission since 1999 and with his 17-person department, has a view of the big picture: "We help industry to apply the technologies it needs to remain competitive on the global market while at the same time ensuring sustainability." Lately, the technologies concerned have related to the field of advanced material and production sciences, industrial biotechnology and nanotechnology. They aim to provide responses to the major challenges of our times, for example in connection with environmental protection and climate change, health services, transport and the closed-loop economy. His contacts outside the Commission are evenly split between industry and academia. On the one hand, Deliyanakis decides on the use of research funds allocated by the EU. On the other, his role is to influence fundamental decisions made by the EU Commission in connection with future technologies. To this end, he and his colleagues must consult with colleagues from many other Directorate-Generals, for example in the industrial and digital sector. This legislation-forming work has become increasingly important for him and the other strategists in his team. "The Directorate-General is currently developing from an entity that awards research funds into one that actively shapes policy content." The task of deciding on funding is increasingly being transferred to other offices within the EU. Deliyanakis explains why it makes sense for the focus of his work to shift towards involvement in the drafting of laws: "Research funds alone change nothing. Funding needs to be aligned with the political priorities." He believes that only the combination of the right regulatory environment and private and public research funds can create a climate that is ultimately beneficial for enterprises with top-level research.

Illustration: iStock/JDawnInk | Photos: private

PILOTS OF DIGITALISATION

IORDANA ELEFTHERIADOU, GREEK NATIONAL, GROUP LEADER FOR FUTURE TECHNOLOGIES IN THE INTERNAL MARKET AND INDUSTRY DIRECTORATE-GENERAL

Shortly before Christmas 2018, the Commission presented its strategy for artificial intelligence (AI). This relates to how the EU member states can, in collaboration with the Commission, develop and apply artificial intelligence as a future technology. Iordana Eleftheriadou, computer sciences graduate with a masters in business administration, and her seven-person team were involved for a year in drafting the strategy. "Whatever the Commission proposes, it is our job to pay very close attention to ensure that the industrial dimension is upheld." Artificial intelligence is expected to provide stimuli that will fundamentally change all industrial sectors – from the automotive to the pharmaceutical industry, from food to energy production. "My approach was to find out which central AI applications are the most promising for the EU." Her work also focused on preparing industry for this process of transformation. However, the official, who has worked at the Commission for 24 years, does not just operate in the spheres of the EU in Brussels. With her team, she also supports a Commission initiative – the Digital Cities Challenge – that is helping 41 cities in the EU to develop a digitalisation strategy. The project began at the start of 2018 and will run until mid 2019. It supports not only metropolises but also medium-sized cities, such as – in Germany – Nuremberg, Heidelberg and Gelsenkirchen. "We advise municipalities on how they, together with competent partners, can create an ecosystem for the digital transformation." Representatives from industry, SMEs, research and development and city administration come together to achieve this. One element of the concept is to hold regular seminars, known as "City Academies" where participants from all 41 cities can meet to discuss progress and exchange ideas.

MISTER 5G

PETER STUCKMANN, HEAD OF DEPARTMENT, DIRECTORATE-GENERAL FOR COMMUNICATIONS NETWORKS, CONTENT AND TECHNOLOGIES

5G, the next mobile generation, is expected to open up completely new application possibilities, for example communication between machines and applications with minimum latency. Peter Stuckmann, a qualified engineer, used to work in the private sector, founded his own start-up, and has been working for the EU Commission since 2004. With his team of 20 from the "Connect" Directorate-General, he is working on enabling industrial companies in the whole of the internal market to fully exploit the opportunities of the new technology as soon as possible. One focus of his work is the implementation of the Commission's 5G action plan. "Our aim is for 5G services to have started in all member states by 2020." Between 2020 and 2025, comprehensive coverage should be ensured, so that the key technology is available in all cities and on all important transport routes by 2025. 5G will not only provide faster mobile services than the current networks, it will also allow the professional applications needed for the comprehensive digitalisation of industry. "The Commission's task is to have a uniform digital internal market. We must therefore ensure, for example, that the licence conditions for frequencies do not differ too greatly for companies in the individual member states, and must instead seek to harmonise these." Stuckmann is also involved in 5G-PPP, a public-private partnership between the EU Commission and industry receiving funding of 700 million euros. The 5G Infrastructure PPP has been under way since 2013. Relevant European companies such as Nokia, Ericsson, the network operators and many medium-sized companies are involved. In a first phase, this cooperation developed the 5G technology within a framework of pre-competitive research. In a second phase, providers and industrial users are now testing initial cooperation models. Commercial services are scheduled for launch in 2020. □

100 Billion for Top-level Research

The EU wants to spend a record sum between 2021 and 2027 to promote innovations. For this, the research programme "Horizon Europe" predominantly focuses on pre-competitive, cooperative industrial research in close collaboration with the scientific community. This concept has been successful in Germany for many years.

Text: **Markus Grabitz**

The EU wants to invest around 100 billion euros between 2021 and 2027 for the promotion of top-level research – that's more than three times the German federal budget for traffic and the digital infrastructure. With the "Horizon Europe" project, Günther Oettinger (EU Commissioner for the Budget) suggests around one fifth more funding than in the multi-year financing framework of the predecessor programme Horizon 2020 is to be made available for developing pioneering innovations. One new feature is that a European Innovation Council is to be set up. This will be the EU's central point of contact when it comes to identifying technology that has great potential but also requires large investments and financing this from the laboratory through to market maturity.

In the future, there will be a separate budget for research relating to digitalisation and artificial intelligence. Around 15 billion euros are earmarked for this in the "digital and industry" cluster. In this way, the EU intends to ensure that Europe retains its independence when it comes to key technologies for digitalisation and production. Preferred research areas are production technologies, digital technologies, materials for the future, artificial intelligence and robotics. There will likely also be points of contact with other research programmes within Horizon Europe, such as the health, climate, energy and mobility clusters.

As well as the actual research budget for "Horizon", the Commission is also providing 9.2 billion euros in the "Digital Europe" programme, for instance for researching supercomputers and for AI research. The "Connecting Europe" programme adds an additional 3.2 billion euros to this sum for the promotion of basic abilities that are applied in all European projects and aim to facilitate digital public services beyond member-state borders.

A sum in the billions will also flow to the "Airbus for chip production" between 2021 and 2027. ECSEL, a joint venture between the EU Commission and industry has been earmarked to fund pre-competitive research. Companies and research institutions from the EU, Switzerland and Israel are active there. Businesses that frequently compete with one another on the market work together on basic research, and the member states are also involved. Around half of the financing is provided by the participating companies while 25 percent each comes from the EU and the

Photo: Bosch

In the future, there will be a separate budget for research relating to digitalisation and artificial intelligence.

member states. On its founding, the "Chip Airbus" was commissioned with halting the exodus of chip production out of Europe. This is considered to have been successful in that ECSEL succeeded in defending the market leadership for micro- and nano-electronic components, sensor technology, and in the low-power electronics field. From 2014 until 2018, ECSEL provided EU research funding of around 310 million euros per year. Incidentally, the main beneficiary until now has been Germany, followed by France, the Netherlands, Belgium, Italy, Austria and Spain.

The joint research projects are very popular at companies in Germany, with a new project being tendered every six months. For instance, Bosch and Infineon report that they have had positive experiences with ECSEL for many years. Currently, researchers from these two companies are working on a project that aims to improve chip manufacturing and design more efficient assembly lines. The high degree of automation in production is to be advanced further with the aim of achieving higher chip quality while simultaneously producing more cost-effectively.

"ECSEL is unique due to the high level of transparency," says Ina Sebastian, responsible for politics on research and innovation at Infineon. "Member states and companies have a good overview of which projects are being supported, anyone can optimally compare their roadmap for research and weigh in with their own research project and expertise at precisely the right point. Ultimately, everybody benefits from this." Peter van Staa from Bosch points out: "ECSEL has stimulated numerous pre-competitive collaborations with partners from industry and research, thereby making a key contribution to strengthening our innovative capability."

However, it is currently unclear whether the 100 billion will actually be available on time. Although Oettinger's proposal for the next multi-year financing framework has been on the table since May 2018, the state and government leaders have only recently joined the negotiations. However, the money can only be spent once the Council and Parliament have agreed. The Commission is picking up the pace. "Delays would only force our brightest people to look for options elsewhere. This would mean the loss of thousands of positions in the research field and negatively impact Europe's competitiveness," a spokeswoman of the commission claims. □

Free Exchange

Since joining the EU, Romania has become one of the fastest-growing national economies in Europe. The factories of German companies are playing a key role here. In turn, this also safeguards jobs in Germany. A visit to the Romanian plant of Weidmüller illustrated this.

Text & Photography: **Johannes Winterhagen**

Maria casts her expert eye over the cable and then, with a swift movement, attaches the label to it. The concentrated young woman is one of almost 1,000 employees working at the Romanian plant of Weidmüller. Her employer, a well-known German manufacturer of automation and connection technology, opened the factory near Baia Mara in north-western Romania in 2005. Having started out with 30 employees and entirely manual assembly, the plant has now come to be one of the company's most important international locations. More than 40 million finished parts leave the plant each year – products such as the terminal strips with which the newly founded company made a name for itself after the Second World War. By now, the Weidmüller plant in Romania does much more than just assemble components that are produced elsewhere. It has actually become a competence centre, especially with regard to plastic injection moulding.

Angela Sandor (47) knows every nook and cranny of the factory. Having studied business administration, she has been working here for eleven years, first as a production manager and since the end of 2017 as plant manager. Our tour begins in a warehouse where the intermediate products are delivered. "With the exception of the plastic granulate, the cables and the cardboard boxes for packaging, everything comes from Detmold," explains Sandor. There are truck loads arriving from East Westphalia every day. The journey from Germany across Austria and Hungary to Romania takes two and a half days. What would happen if one of these countries were to leave the EU? It might then be necessary to pay customs duties if it is not a pure transit that is involved. "In any case, the supply chain would not be as reliable as it is today because customs formalities always take time," says the plant manager. The finished products are then transported again by the same lorries – largely to Dortmund, where Weidmüller operates a logistics centre for its Central European customers. The Romanian site plays a fixed role in the company's logistics chain.

When it comes to occupational safety and environmental protection, Weidmüller sets the same standards in Romania as in Germany. This can be seen in the company's plastic production. A total of 27 injection moulding machines are located in a light and clean hall, producing casings and other components around the clock. The product range comprises a total of 500 different tool shapes. Both the tools and the products manufactured on them were developed in Detmold. The jobs in Romania therefore come hand in hand with employment for German engineers. Would it not be possible then for the production to take place in Germany? "We predominantly manufacture products in Germany when very high quantities are involved," states Sandor. However, in cases where the quantities are smaller, it does not pay off to automate the assembly that follows injection moulding. What remains is manual labour. The considerably lower wage costs have a great impact here. In 2017, the average labour cost in Romania was 6.30 euros per hour. "We actually pay employees more than the statutory minimum wage," says Sandor. "And even that has risen in Romania by 15 percent in recent years."

Nevertheless, the conditions for employers are favourable. Many German companies have for this reason established production facilities in the country, especially electronics companies such as Bosch or Continental. As a result, the Romanian economy is one of the fastest-growing economies in Europe. The country's gross domestic product increased by 6.9 percent in 2017 and by more than four percent last year. "The European Union brings us numerous advantages," says Sandor, naming visa-free travel as one example. This benefits both Romanian employees when the company sends them to its main plant for training seminars and the German experts who set up and maintain the machines at the Romanian plant. Does the expansion in Romania come at the expense of Germany? Alongside the development in Romania, the number of employees has clearly increased in recent years in Germany, too. In fact, the total number of employees in Detmold rose by nearly 500 between 2005 and 2018 to reach a figure of 1,800 employees. It is at least questionable whether this development would have been possible if Weidmüller had not become more competitive through partial relocation to Romania.

"We have many advantages as a result of the EU. The supply chain, for example, would not be as reliable without it because customs formalities always take time."

ANGELA SANDOR,
PLANT MANAGER OF WEIDMÜLLER IN ROMANIA

However, constant further development can also be seen in Romania. The unemployment rate in the north-west of the country, at around three percent, is extremely low, while living standards are improving. Moreover, there is an increasing shortage of qualified workers. Sandor has already taken action and automated initial assembly steps. To take one example, for a terminal strip produced in medium quantities, a small robot now performs the task of inserting the intricate metal parts. This has not led to a loss in jobs. There are still 21 women working here, the only difference being that there are now two shifts rather than just one. □

Deputy Leader of the FDP parliamentary group, Michael Theurer (right), and Dr Oliver Blank, Director for European and China Affairs at ZVEI, on the relationship between Europe and China.

"We Don't Need to Hide"

By means of its "Made in China 2025" programme, the People's Republic aims to progress from its extended workbench role to becoming the leading nation in terms of technology. What does this mean for Europe and how can the continent draw benefits from this transformation? This matter is discussed by Michael Theurer, Deputy Leader of the FDP parliamentary group, and Dr Oliver Blank, Director for European and China Affairs at ZVEI.

Text: **Laurin Paschek** | Photography: **Claus Morgenstern**

For Europe, is China an important trading partner or more of a fierce competitor in the global economy?

THEURER: It is actually both. To see why, let's take a look across the Atlantic. The US and China are practically on an equal footing when it comes to their volume of trade with Germany. For Europe, and in particular for an export nation such as Germany, it would be very damaging to become sandwiched between the US and China. After all, the danger of a trade war erupting has still not been averted. At the same time, China is constantly progressing along the road from an extended workbench to a serious technological competitor. This draws attention to issues such as protecting intellectual property, establishing the rule of law and ensuring conditions of fair competition.

BLANK: In our view, too, China is at the same time a partner and a competitor. As digitalisation advances, however, the boundaries between the two roles are set to become increasingly blurred. It is already difficult today to divide the world into German, European or Chinese industry. In China, alongside state-owned enterprises, there is an increasing number of start-ups with which European companies frequently work in very close collaboration. Many companies in the electrotechnical and electronics industry have operations in China, and are at the same time partners and competitors of Chinese suppliers. With the digital transformation and further development of the platform economy, international partnerships involving numerous players remain on the increase. This gives rise to both opportunities and risks. We at ZVEI have a very pragmatic approach to China: namely seizing the opportunities, accepting the challenges and minimising the risks.

China may at present be the largest electrotechnical and electronics market in the world by far and the leading purchaser of German electronics. However, the sector is reporting increasing losses in its trade with China.

BLANK: Although this is true, our economists take a relatively relaxed view of the situation. After all, on a global scale, the German electrotechnical and electronics industry is recording a trade surplus. In our view, the greater problem – alongside protecting intellectual property and establishing balanced framework conditions in mutual competition – comes from the economic slowdown in China. If this trend continues, it will have a major negative effect on our industry, which has direct investments of more than twelve billion euros. ▷

Dr. Oliver Blank, born 1968, as Director for European and China Affairs, manages the ZVEI European office in Brussels.

Michael Theurer, born 1967, is a member of the German Bundestag (parliament) and Deputy Leader of the FDP parliamentary group.

THEURER: Up to now, this deficit has not been so dramatic from our point of view, as long as products for the mass market come from China and the German manufacturers from the electrotechnical and electronics industry or mechanical engineering offer high-end solutions. Our analysis shows, however, that we are now at a crossroads in the relationship between Europe and China. The interesting question will be whether Germany, in particular, can establish the necessary conditions to remain in fourth place worldwide in terms of the strength of its economy. We are in danger of falling behind in certain areas. Let's look, for example, at the digital economy. In this area, we have major suppliers such as Google, Apple, Amazon and Facebook in Silicon Valley, as well as giants such as Baidoo, Tencent and Alibaba in China. There are no European companies, though, that come anywhere near to operating on a par with these enterprises.

When will this become a problem?

THEURER: Very quickly – especially if a state-capitalistic country such as China establishes special economic zones, thereby uses the market forces to catch up in terms of technology, and in the process becomes highly dynamic. Germany and Europe as traditional industrial locations with a low growth momentum will then fall behind. As Free Democrats, we therefore call for the introduction of digital freedom zones to relieve the over-regulated German economy of bureaucratic obstacles. For example, we could have fields of experimentation within which innovative start-up companies are not subject to any rigid official regulations, and also benefit from tax relief or tax incentives for research.

Should the "Made in China 2025" strategy be viewed as a challenge to Germany?

BLANK: Firstly, I think that we should acknowledge "Made in China 2025" with respect. A lot of work has been invested in this industrial policy programme and it also offers numerous good ideas. Moreover, we in Europe can use it as a point of reference, establishing what we have in common and where the differences lie. Neither in Germany nor in Europe as a whole do we need to hide from this programme. On the contrary, in the electrotechnical and electronics industry especially we also supply equipment for factories and plants – from electric drives to sensor technology. When it comes to automation, we are the global market leader. The programme therefore also provides us with many opportunities in China. Nevertheless, we in Germany and Europe need to do our homework

> **"In the first instance, we should acknowledge 'Made in China 2025' with respect. Moreover, we in Europe can use it as a point of reference."**
> DR. OLIVER BLANK

and we need to develop our own vision for Europe 2030. Following the European elections, we really need to make progress here, turning what used to be the European Coal and Steel Community into the Digital Union in the future.

THEURER: Quite a central issue in the European elections will be whether the European Union isolates itself politically and economically. That would be fatal, as it is free trade that we have to thank for our prosperity. I am convinced that the European Union needs to remain the strong voice of free trade. However, this must be achieved subject to fair conditions – and this brings us back to the asymmetry, in other words unbalanced competitive conditions between China and Europe, emerging as a result of governmental intervention in China's state-capitalistic system. We need fair competition, though. On top of this, we have digitalisation and the platform economy, with the associated tendency towards monopolistic structures. Europe needs to find an answer here, particularly with a view to the medium-sized companies that form the backbone of our economy.

What might be a suitable answer?

THEURER: Medium-sized companies need to achieve the prerequisites to be successful on a global scale. The most important aspect here is infrastructure. I have for many years also been advertising a product that I refer to as the digital airbus. Just as Europe overcame the US dominance in civil aviation, the continent now needs to join forces in the area of digitalisation. In terms of the framework conditions, we call for a really comprehensive provision with fibre optic cable and the 5G mobile network, as well as secure cloud solutions and effective measures to achieve cyber security, for instance through a genuinely European Galileo Plus satellite network. A system of this kind would ensure cyber security in space while at the same time making citizens aware of one way in which Europe gives them added value – after all, individual states cannot afford this.

BLANK: In Europe we need a more global perspective on competition. We have up to now concentrated particularly on achieving a well-functioning internal market. However, the challenges that we need to face are global and come, for example, from China as well as other regions of the world. We also need to allow European champions and a better cooperation of European players around strategic value chains. Our competition rules, which have served well for the functioning of the internal market, now need to be adapted to increase our global competitiveness.

Also with regard to the acquisition of German and European technology companies by Chinese investors?

THEURER: First of all, the EU investment protection agreement with China needs to be finalised as quickly as possible. In addition to this, we in the FDP consider it to be absolutely essential to establish effective EU legislation regarding investments from third countries. We demand clear and objectively comprehensible criteria with regard to the conditions under which such investments can be prohibited. Having said that, this should be limited to the absolutely necessary, security-relevant or system-relevant cases. What is also important is systematic monitoring, so that it is actually known where in the European Union foreign investors are attempting to obtain technological expertise by taking over companies. However, this must not lead to isolation. We should remain open to foreign investments and at the same time – this is by far the better route to take – make the framework conditions more attractive for domestic investors.

> **"A central issue in the European elections will be whether the European Union isolates itself politically and economically. That would be fatal, as it is free trade that we have to thank for our prosperity."**
> MICHAEL THEURER

BLANK: Monitoring is also a very important point in our opinion, but requires corresponding tact and sensitivity. We are not at all interested in restricting market access and taking measures that could be interpreted as protectionism, and we do not need a "Lex China". "Investment screening", as it is called by the EU Commission, therefore needs to be defined in such a neutral manner that it applies to all investors from non-EU countries. It also needs to follow a clear set of rules in order to avoid becoming arbitrary and discriminating. All member states of the European Union must agree on this issue. In these circumstances, monitoring may actually make sense, especially with regard to critical infrastructures such as those in the energy sector. What is most important, though, is a global, multilateral economic system that, with rule-based free trade, brings prosperity to all involved.

Gentlemen, thank you for this discussion. □

Mind the Gap

If we are to use the mechanisms of the free market for a successful energy transition, all energy carriers must make an equal contribution to climate protection, Møller-Jensen insists.

Global energy demand will have risen significantly by 2040. At the same time, an appreciable decline in CO_2 emissions is needed if climate targets are to be achieved. However, for Ole Møller-Jensen, Managing Director of Danfoss, an immediate fossil-fuel phase-out is not a miracle solution. Instead, market mechanisms should be used to bring about a successful energy transition with a fair price for CO_2 emissions.

Text: **Laurin Paschek** | Photography: **Markus Hintzen**

Each winter, the sky over Katowice, a city of 300,000 in the heart of the Polish coal-mining region, is clouded with a veil of pungent smog. No other city in Poland symbolises coal and the mining industry like Katowice – right down to the residents' private households, many of which are still heated with completely outdated coal-burning stoves. Yet, at the same time, Katowice is also a place of new beginnings. For instance, engineers and scientists at the Euro-Centrum Science and Technology Park south-west of the city centre, are working on the use of renewable energy sources and advising local companies on how they can invest in energy efficiency when constructing new buildings (see AMPERE 3/2015). And Katowice was also the scene of the World Climate Conference COP 24, at which almost 200 states met in December 2018 to agree on a set of regulations for implementing the Paris climate goals. A more symbolic location could not have been chosen. The city is a place where the old and new energy worlds converge, – revealing the challenges that need to be resolved during the transition.

Current reports from the International Energy Agency (IEA) and the Intergovernmental Panel on Climate Change (IPCC) illustrate the dilemma. According to the IEA's "World Energy Outlook 2018", the global energy requirement will have risen by 25 percent by 2040. However, according to the IPCC special report published in advance of COP 24, global CO_2 emissions need to fall by 45 percent between 2010 and 2030 in order to prevent global warming from exceeding 1.5 degrees Celsius. There are no simple solutions here. "In the energy system, everything is connected, from generation to transport to consumption," emphasises Ole Møller-Jensen, Managing Director of Danfoss in Germany. "Renewable electricity is set to become the energy source of the future. But to successfully shape the transformation, we need a comprehensive approach that encompasses all sectors – from electricity generation and heating supply right through to the transport sector."

In Møller-Jensen's view, the coal phase-out demanded by the IPCC is just one measure that should be placed in a larger context. He points out that "for the time being, in many countries coal ensures a reliable supply of electricity at economic prices". "The question is whether a politically driven, faster withdrawal from coal can actually significantly accelerate a development that is happening anyway or whether it will simply make this more expensive." After all, the expansion of renewable energies is making progress, and not just in Germany. "Renewable energy sources will automatically squeeze out coal and other fossil fuels from the energy mix," says Møller-Jensen. However, these energy sources cannot fill the gap left by an accelerated coal withdrawal overnight. He points out that if this gap has to be bridged with electricity from coal power stations in neighbouring countries, for example, then nothing will have been gained.

Møller-Jensen ascribes a key steering effect not to subsidies, but to fair and widespread use of European CO_2 emissions trading. "The costs for CO_2 emissions have risen significantly in the electricity sector, most recently to around 20 euros per tonne. As a result, coal is becoming increasingly unprofitable anyway," calculates Møller-Jensen. On the other hand, however, he believes the system is unfair. In contrast to other energy carriers, electricity contributes to climate protection through both European emissions trading and the Renewable Energies Act levy. As a result, people who heat their homes using an electrically driven heat pump, for instance, are at a disadvantage. In fact, he claims heat pumps face a double burden due to the price of electricity. Even if heat-pump operators have a solar installation on the roof, they pay for climate protection once through CO_2 emissions trading and then again via the Renewable Energies Act levy. "If we are to use the mechanisms of the free market for a successful energy transition, all energy carriers must make an equal contribution to climate protection," Møller-Jensen insists.

Møller-Jensen believes there are many other parameters that can be addressed in the energy system. For instance, further increasing energy efficiency, which is becoming increasingly important against the backdrop of significant global increases in energy demand. "Energy efficiency is a precondition for the energy transition and transparent consumption is a first step on the way." Digitalisation is the way to achieve this. However, Møller-Jensen is convinced that precisely this is one of the challenges of the energy transition. "Digitalisation exacerbates the problem of the lack of skilled labour because it requires additional skills," he says, highlighting the situation among tradespeople. The energy transition will not succeed if we do not have experts who can implement it. Education policy must therefore focus more strongly on motivating young people to learn a trade or enter a technical occupation. "And we also need to skilfully train long-term employees in digitalisation and the energy transition," says Møller-Jensen.

In Møller-Jensen's view, the energy transition is a major societal endeavour that demands much broader understanding and discussion. Only when everyone is clear about the goal can the steps to reach it be meaningfully defined. Withdrawing from coal is one of these steps, but it is far from the only one. □

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Breaking Out of the Stone Age!

Caution proved to be the best policy in prehistoric times. However, in an age of upheaval, it is not a good survival strategy. An argument for being willing to change.

Text: **Johannes Winterhagen**

In the far north of Denmark, where the world seems to end, there is a red and white wooden cottage where we spend our summer holidays every year. We almost always set off so late that by the time we arrive everything is in darkness. The next morning, I start by sitting on the veranda for a while, enjoying the wind, the sun and the sounds of the sea. Last summer, my usual enjoyment was spoiled. Three large birch trees had been felled on the neighbouring piece of land. I failed to notice the benefit of the increased sun on our terrace because all my thoughts were focused on what was no longer the same as in all the years before.

In psychology, this form of distorted perception is known as "loss aversion". The concept has been greatly shaped by Nobel laureate Daniel Kahnemann, who showed that people perceive loss more strongly than the equivalent gain. According to this theory, a gambler would have to win approximately 200 euros to compensate for the emotions of having previously lost 100 euros. Author Rolf Dobelli believes this behaviour is a result of the hazards we faced as prehistoric humans. "One stupid mistake and you would be dead." Over the generations, only those who were careful lived to pass on their genes.

However, in a time of great upheaval, Stone Age thinking is no longer helpful. Today, we cannot stop many of the changes facing humanity; at best, we can mould them. As an example, let us assume that economic growth remains coupled to the consumption of fossil fuels. In this scenario, a large portion of the world will sink either into the rising oceans or into bitter poverty. In the fight against climate change, too, the realisation is growing that the simple answers found in the past – such as the Renewable Energies Act levy – cannot solve anywhere near all the problems we face. Constant adjustment in line with technological advances will most likely be the only route to an emissions-free world.

Mastering the digital transformation is a similarly complex task. Technologies that are collectively referred to as "artificial intelligence" are now providing a turbocharged push that could radically alter the way we live and work in just a few decades. No citizen, no state and no institution will be able to halt this trend. In 2018, the German government responded with a national AI strategy, which is a good sign. But here, too, only continuous rethinking of the action we are taking will allow us to remain a leading industrial nation.

Constant adjustment to changing circumstances is becoming a survival strategy in the 21st century. This does not mean that change in itself represents a value. Particularly in times of upheaval, there must be values that remain constant. Peace, democracy and freedom must not be compromised, even if it emerges that authoritarian systems can supposedly deal more efficiently with transformation. This is not at all clear in any case – Europe is very well placed in the race for the future. □

Just Getting On With It

Electrical Engineering is seen as a highly theoretical course of study. However, even for a people-oriented man of action like Ulrich Leidecker, it laid the foundations for his career.

Text: **Johannes Winterhagen**

Ulrich Leidecker, born in 1967, manages the industrial management and automation business area of Phoenix Contact. He is also the Chairman of the ZVEI Regional Office in North Rhine-Westphalia.

When you first encounter electricity, you do not forget it in a hurry. At the age of ten or eleven, Ulrich Leidecker unscrews his father's eight-millimetre film projector. He is already an experienced tinkerer and first removes the plug. However, his curiosity then gets the better of him and he wants to understand how the circulation mirror works. To find out, he reconnects the device to the power supply – and shortly afterwards gets an electric shock that silences him for a few minutes. "That really taught me what 230 volts are," says Mr Leidecker, laughing. The incident does not put him off the passion for tinkering that he has had since his childhood. His father, a self-employed heating and cooling system installer, lets his sons drill holes in metal sheets in his workshop on Saturdays while he himself takes care of the invoices. Only when the boys set their room on fire while using a chemistry set do their parents actually step in. From then on, Ulrich tries out his tinkering predominantly on his own bicycle. At the same time, he reads Jules Verne and wonders how he could possibly build a time machine.

Despite this, it is not immediately clear that Mr Leidecker will study Electrical Engineering. After completing school, he first considers studying Medicine – until a friend of the family who is a doctor dissuades him. A short talk with a career advisor quickly leads to the conclusion that, as he enjoys Maths and Physics, he should go for Electrical Engineering. Although the advice initially seems too simplistic to him, he enrols at Paderborn University. Mr Leidecker struggles through the highly theoretical foundation course, specialises in automation and control technology, and is even able to establish a connection to Medicine in a student research project. He namely designs a computer program that uses blood analysis values to determine the training condition of top athletes. If you ask Mr Leidecker today what he would recommend to those finishing school, he sounds rather like his former career advisor: "If you enjoy Maths and Physics, you should seriously think about doing Electrical Engineering." The course not only trains students in abstract thinking, but also teaches them to keep considering cause and effect.

Before actually completing his diploma, Mr Leidecker discovers a poster on the noticeboard advertising the career of sales engineer. "All of a sudden, I realised that I don't have to spend my whole life in the laboratory." Although Mr Leidecker really enjoys tinkering, he also needs constant interaction with other people. Indeed, he actually starts working in sales and distribution at Phoenix Contact, a family-run business, shortly after he finishes studying. Quickly climbing the career ladder, he is made responsible for the newly established German sales company in 2010. Today, Mr Leidecker heads the industrial automation business area at Phoenix Contact and is responsible for several thousand employees. Nevertheless, he still spends his weekends pursuing his technical hobbies. His most recent project was revising the operating unit for the home automation that he had installed and programmed himself. And if neighbours complain about the fill level of their cistern, it may well happen that Mr Leidecker will call round and install an ultrasonic sensor that sends data to an app every ten minutes. □

Photos: private, ZVEI

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