

What's N3xt

Connecting People and
Technologies

FERCHAU



// Personal contacts rather than common prejudices

Europe's strength is its diversity – as long as you adapt to it

N° 08

// Smarter research with shrinking budgets

Interview with Professor Dr Katharina Hölzle from Fraunhofer IAO

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// Industry 5.0: Smells like team spirit

The future of human-robot collaboration

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// Like a team from a single mould

Why European companies must learn to think outside the box and pursue partnerships – even with competitors

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01-2024

08



Dear readers,

»We should not underestimate Europe«, urged Børge Brende in mid-January in the Handelsblatt newspaper. The President of the WEF, World Economic Forum, was referring to the continent's defence capability and economic development. An opinion that I happily endorse – despite the adverse conditions, we see the future of our Group more than ever in Europe.

Joining France, Spain, Austria and the UK, we opened two branches in Poland at the beginning of 2024: a new market, a strong team and a growth mindset. This forms a European all-star team that responds quickly and efficiently to all our customers' needs. It is about the benefits of diversity, connecting as equals and the scaling potential in the EU. Team spirit and innovation management, which we will be taking a closer look at in this issue, are two exciting facets of this. We also have specialist articles on relevant technical developments, including generative AI and Industry 5.0.

Fundamental to the European ideal is to see such changes as an opportunity. That's another reason why I joined the podcasters in 2024 with

»Straight talk economy«: STEM and SMEs need a voice and to be heard, not least in these disruptive times. Because the fact is that without engineers and developers, digitalskills and mega trends such as AI, no industry will succeed in making the transition. We will soon be launching the new FERCHAU Live Talks to make it easier to take action, featuring four renowned speakers, including Ranga Yogeshwar and Prof Dr Gunter Dueck.

Last but certainly not least, the European All-Star teams are gradually warming up for the European Football Championship. I would like nothing more than for that magical summer fairytale atmosphere we had in 2006 World Cup to be recreated. It was less a competition »against each other« and more an event »with each other«. For me, that is at the core of the European ideal.

With this in mind, I hope your summer 2024 will be packed with atmosphere!

Yours sincerely,

Solutions

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Artificial intelligence is both opportunity and challenge, especially for IT organisations

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Why it is important to strike a balance between automation and human skills

European All-Stars

The team mentality is THE star: forging a functioning team out of top players can be more of a challenge than it sounds, because everyone's priority tends to be to shine as much as possible for themselves on the pitch. It is becoming increasingly important in business to form new teams pragmatically, quickly and efficiently to be able to respond rapidly to changes. However, anyone clinging to their old ways is getting control wrested from their hands.



Nº 04

Co-opetition!

How All-Stars become a dream team: Europe's states and companies must build suitable alliances. Including, sometimes, with the competition. After all, it's not forever.

Nº 08

How stereotypes benefit and harm

We think in pigeonholes because that is more efficient. Sometimes, however, you need to approach others openly. To recognise that together you get further.

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Innovation projects in the EU

Figures, please - for example for cross-border EU research and innovation projects.

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Great, someone else is doing it!

1+1=3? This hope does not materialise when it comes to teams of people. How can performance still be elevated to a high level?

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»The prize must go to the team«

Professor Dr Katharina Hölzle from Fraunhofer IAO with a plea for a better research culture.

LEGAL NOTICE #8 | Issue 01-2024, Circulation: 55.500, 5th year of publication

PUBLISHER FERCHAU GmbH, Steinmüllerallee 2, 51643 Gummersbach, Phone +49 2261 3006-0, Fax +49 2261 3006-99, zeitung@ferchau.com, ferchau.com
EDITOR-IN-CHIEF (responsible in accordance with German press law) Martina Gebhardt — **EDITORIAL TEAM** Sven Angly, Harald Felten, Eugen Firla, Stefanie Freitag, Manuel Gieringer, Nina Heinze, Aras Savurur — **DESIGN** grafish GmbH, Phone +49 211 63559150, grafish.de — **EXTERNAL EDITORIAL TEAM** Bernd Seidel & Friends, Phone +49 170 1822633, seidelfriends.de — **PRINTING** Gronenberg GmbH & Co. KG, 51674 Wiehl, Phone +49 2261 9683-0 — **COPYRIGHT** The articles contained in this magazine are protected by copyright. Unless otherwise noted as an individual reference on the page: FERCHAU GmbH — Image sources: p. 4 - Illustration: dainz.net — p. 8 - Getty Images — p. 9 - KeSch Training — p. 10 - bottom: ESB Business School, Reutlingen — p. 12 - Getty Images — p. 13 - ZHAW — p. 14 - Ludmilla Parsyak — p. 16 - private — p. 17 - Uwe Annas — p. 18-19 - Exotec — p. 20 - top: Getty Images, bottom: private — p. 21 - both private — p. 23 - images-of-elements.com — p. 24 - Jan Meier, Leibniz Centre for Tropical Marine Research (ZMT) — p. 26 - Getty Images — p. 29 - bottom left: Astrid Eckert & Andreas Heddergott/TU Muenchen, bottom right: Sebastian Ulewicz

WIN-WIN: CO-OPERATION + COLLABORATION

HOW ALL-STARS BECOME A DREAM TEAM



DEVELOP AND PRODUCE EVERYTHING YOURSELF?

This is often uneconomical and time-consuming in complex supply chains. That means that entrepreneurs and researchers need to set up international All-Star teams that work together towards a common goal. But is this a model that can also succeed in Europe, given the diversity of countries and interests?

Sometimes it seems as if the Old World has been taking a nap since the turn of the millennium: The Chinese car manufacturer BYD will not only produce the most vehicles worldwide in 2023, it will also take over VW's mantle as the mobility partner of the European Football Championship in Germany. US companies are miles ahead when it comes to generative AI: The FAZ speculates that OpenAI could be worth 100 billion dollars. Mistral AI from France is worth around two billion euros, Contentsquare (also France) is valued at around 5.6 billion dollars. When it comes to energy and raw materials, there are still major dependencies on countries which in some cases do not share the same values as the EU. We source all our rare earths from China, 98 per cent of our boron requirements come from Turkey and 71 per cent of our platinum comes from South Africa.

Europe itself offers the best basic environment for things to get better: a continent where democracy and integration are fundamental virtues, with a mental and cultural diversity which complement each other. Europe is the home of great flashes of inspiration and inventions, with Italian grandeur, German precision, English style and French *élégance*. Add to that a common language and digital networking, and all the key ingredients for success are in place.


No wonder then that there are many positive examples of co-operation in Europe, such as the ADR treaty on dangerous goods – hardly what you'd call sexy, but important nevertheless. The road transport regulations covering packaging, load securing and labelling have been in force since 1968, with orange warning signs fitted to many trucks. International construction projects such as the Baltic Pipe, which opened a gas connection from Norway to Poland via Denmark in 2022, are also leading the way forward. Roads and railways, on the other hand, connect countries with each other in mammoth tunneling systems, for example under the Fehmarn Belt or Brennerpass. Meanwhile, Jülich

is coordinating research on a European »flagship« initiative, the »OpenSuperQPlus« quantum computer. And the Old World is on its way to becoming the first climate-neutral continent with the »Green Deal«.

CO-OPERATION AS A MEANS TO AN END

However, some countries and companies in Europe find it difficult to think outside the box. It is important in the digital economy to create internal and external networks of strong partners and to respond flexibly to new players and collaboration models. This calls for marketplaces for exchanging ideas and resources with trusted partners – and increasingly also for co-operation with competitors, known as »co-opetition«.

On the one hand this means »Co-operation & competition«: At BMW, for example, independent design teams in Munich, California and Shanghai compete against each other. Production sites have also always been fighting for the next vehicle series: while car manufacturers were still producing around 5.6 million cars and vans in Germany in 2012, this figure had shrunk to 3.6 million units in 2022, reported the Handelsblatt, citing the »MarkLines« information service. Those losing out in the internal competition must either invest more in training to improve the overall organisation's average – or leave the team.

On the other hand co-operation between competing companies is also increasing. An example in the aviation industry is that airlines co-operate in terms of route planning, booking and customer service in the »Star Alliance«, while they continue to retain 

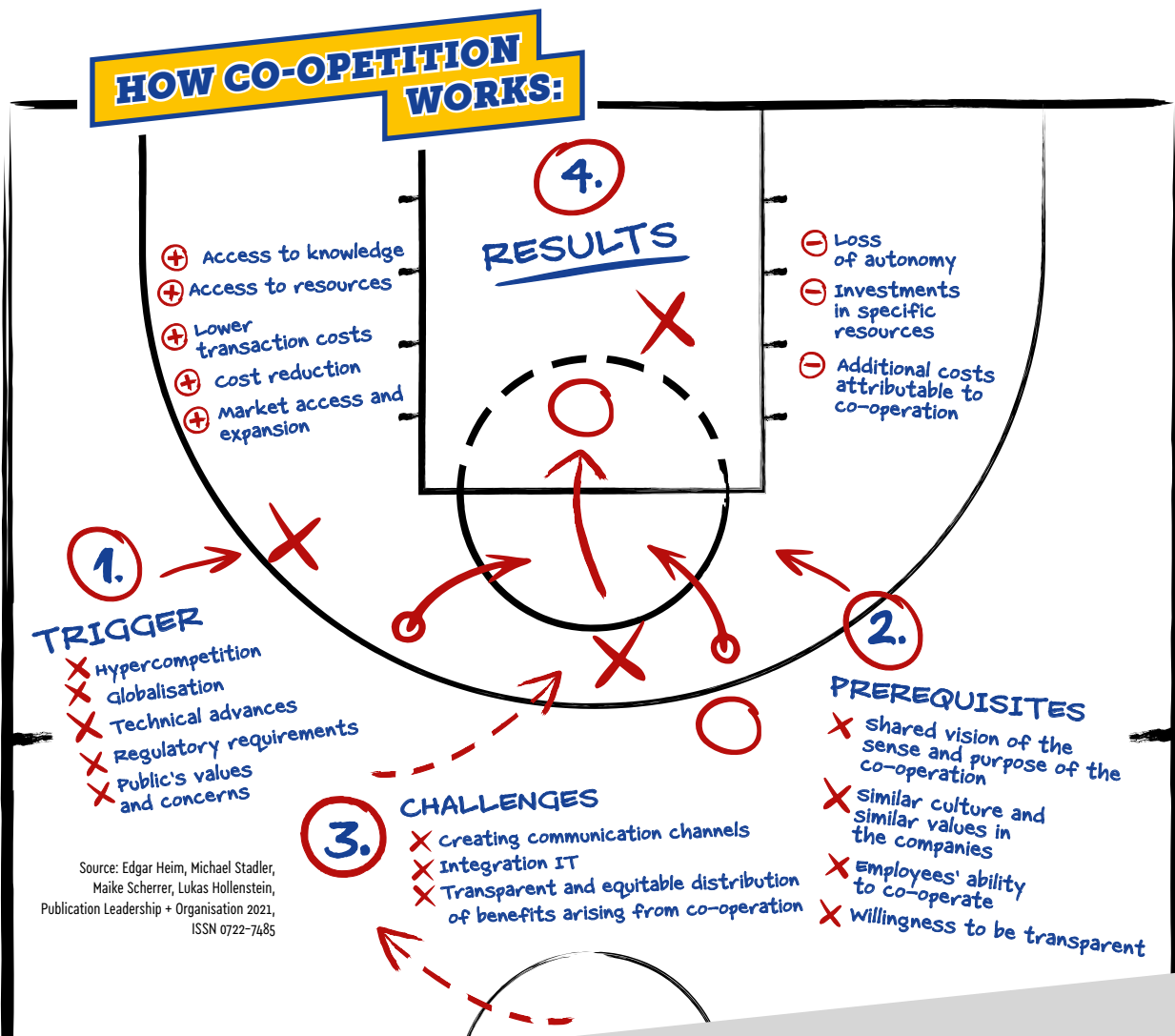
OPPORTUNITIES AND RISKS

their own identity through price and quality. The coronavirus crisis brought competing companies such as Pfizer and Biontech as well as Sanofi and GlaxoSmith-Kline to the table to develop vaccine doses at pace and distribute them internationally. European nations are working successfully together in aircraft construction at Airbus, while competing defence companies such as KNDS and Leonardo plan to develop tanks together.

The principle is not dissimilar to All-Star games in sport: anyone nominated or selected for an All-Star team is one of the most successful players of the year. Selection matches are now also organised in the Old World in sports such as basketball, ice hockey and handball. And the European Union in particular profitably exploit the All-Star mindset today – instead of the individual stars pushing their own qualities to the forefront, it is crucial that they all work towards a common cause.

The idea of co-operation competition was formulated by the mathematician John von Neumann and the economist Oskar Morgenstern and has its roots in game theory. Co-opetition is now seen as a solution to the effects of globalisation and digitalisation on markets and value chains: no organisation can be an island in the face of accelerated competition. Where a project is too big or too risky for a single company to undertake, co-operation could be the only viable option, writes manager magazin.

The potential goals of co-operation can be higher market shares, product development or development of new markets – with higher profitability. For example, Apple uses its Korean competitor Samsung's displays. Steve Jobs from Apple recognised it as early as 1997: »We have to get rid of the idea that Microsoft has to lose so that Apple can win.« Another example is the co-operation between Volkswagen (Sharan), Seat (Alhambra) and Ford (Galaxy). The boundaries of co-opetition lie in mutual cannibalisation, new goals or the power imbalance between partners.





REDUCE COSTS AND RISKS

If companies open their minds to new perspectives, they stand to see benefits in costs, risks and time-to-market. Co-operation between states deepens mutual trust, while at the same time reducing uncertainty and the risk of rapid escalation. Open ecosystems are in demand, and these continue to develop through their interaction with the environment – mapservices such as »Here«, in which Audi, BMW and Mercedes-Benz as well as the suppliers Continental and Bosch are involved, being one such example. The alternatives: develop the navigation maps on your own, or pay for licences from other providers.

SHARING DATA INSTEAD OF SITTING ON IT


Particularly in the age of data, its targeted sharing with other organisations is a lever for innovative business models, such as manufacturing as a service. Networked machines can be utilised here across organisations. Companies also need data that can be shared across company boundaries for training AI tools. The SmartFactory^{KL} research network, for example, is developing a method to minimise risks for such federated AI use cases. And Bosch, the Schwarz Group (Lidl) and the software group SAP »share« access to expertise at the German AI flagship start-up Aleph Alpha, which received half a billion euros funding from investors in autumn 2023.

HUMAN MEETS MACHINE

Digitalisation of work calls for **co-opetition between humans and machines** – sometimes humans are better, sometimes the strengths of AI and robotics come to the fore. It is about technologies such as **generative AI, extended reality or soft robotics** that make work easier in many areas and help to optimise output. »Zukunftsinstitut« a future research organisation, suggests that the future world of work is »a mixture of social and technological systems«. People can only massively increase and develop their own potential by merging. It is to be expected that people will remain irreplaceable as creative problem solvers and social actors in the working world of tomorrow. That is why the goal must be **to form productive alliances between human and machine** and thus solve the challenges of the future (see interview on Industry 5.0 on page 28).

PUTTING CO-OPERATION INTO PRACTICE

The co-opetition approach is similar to a classic All-Star team where players pull together on a project-related basis, at the same time putting themselves in the limelight. However, as well as the financing and design of such initiatives, there is also an organisational challenge: co-operation and collaboration must in all instances be comprehensively facilitated and accelerated for a networked economy in Europe; among states, companies, departments as well as internal and external employees. If this co-operation stutters, there is a risk of standstill.

Even global projects – major construction sites such as the Iter fusion reactor in southern France (Europe, Japan, Russia, USA, China, India, South Korea) and the ISS space station (Europe, USA, Russia, Canada, Japan) – can transcend all the political tensions to continue. But one thing is also abundantly clear: All-Star teams don't come for free. Bayer 04 Leverkusen's Werksself, for example, a dream team at the top of the Bundesliga table in the winter of 2023/24, has 27 players in its squad – plus 24 coaches and support staff all forming a unit. 

Personal contacts help to combat prejudices

European blunders



 **TEXT Christian Fries**

The EU countries are Germany's most important trading partners – and with major differences in negotiation cultures. **Stereotypical caricatures** can actually be helpful in the first step. But if you want to close a deal, you have to take in to account the **individuality of the person you are dealing with.**

Sometimes you a clear demarcation line is called for, sometimes you just need a bazaar mentality.

If you do business in a European country, you should consider Asterix's take on it in the series of books as essential reading. There you will learn that Spaniards are a proud people and respond to displays of machismo with a spirited »Olé«. The British, on the other hand, tend towards friendly understatement, find loud statements shocking and are prone to comment on them with »My goodness. It is, isn't it?«. In the

mid-1960s, the germanic Goths still had rather a bad press; militaristic and power-orientated, they wore spiked helmets, tended to be small-minded and were fastidiously clean.

»Such stereotypes function as a mental shortcut, lets us categorise people quickly. Quite efficient, but not necessarily correct«, says Hazel Grünewald. She has been teaching Intercultural Business Negotiations at ESB Business School in Reutlingen since 2009 and has been running training programmes for people in corporations and medium-sized companies for over 20 years. Ultimately, selling is about individual contact – and the better and closer you work together, the clearer the personality of each individual becomes, whatever their cultural background.

The shared history of nations can be very formative, says Hazel Grünewald. 20 years after the Second World War, many French people still had a strong dislike of their German neighbours, as »Asterix with the Goths« shows only too clearly. Over the past 60 years, the two countries have become close European and economic partners, despite fluctuating moods.

From strong hierarchies, climate protection and give-away bios

Scandinavia



If you want to sell products and services in Northern Europe, you should emphasise the **environmental and climate protection** aspects. These should also be demonstrated through procurement and production.

If you are offered a coffee from the kitchen, you should definitely accept, because part of the sales discussion takes place there in a more relaxed atmosphere in the »social room«.

A particular feature of Scandinavian countries is the strict working hours and a **clear separation of leisure and work**. You will rarely get any responses after 5 pm. In the same way, almost nothing happens in June and July, because that's when we're on our holidays and our mobile phones will definitely be switched off.

The Northern European companies have a very strict approach to **compliance**: everything – even a freebie biro – is likely to have to be declared. It is better not to offer gifts, no matter how trivial, and save your counterpart a lot of bureaucratic effort.



Source:

Peter Kempf

Trainer and coach as well as Managing Director of KeSch Training International, which trains international corporations and SMEs worldwide in sales, purchasing and leadership.

Eastern Europe



There are **strong hierarchies**. What that actually means is that if management are in the meeting, then product and purchasing managers keep a low profile. This means that German sales people will first and foremost take the lead from their boss.

By the way, no matter how hot it is, **jacket and long-sleeved shirt** are customary. And only when the boss takes off their jacket is everyone else »allowed« to follow suit.

Wages and salary structures are significantly lower in the East – by around a third. You have to make a very precise case in order to achieve more attractive prices.

Alcohol consumption is declining overall at business lunches and meetings. This applies both to Eastern and Southern Europe. It's clearer with wine or spirits, but when it comes to vegetarian or vegan food – without wanting to make a big issue about health, etc – it's really not on the menu for the hosts.

Southern Europe



The French, Spanish and Italians communicate indirectly. Being so direct as to say »I need your decision by the end of the month« is counterproductive. This is seen as **impolite** and does not use the **subjunctive tense**. Much better to say: »When can we expect the next step from you?« Then you should allow three to four weeks to follow up if necessary.

In this region, it is quite common to take two months of **summer holidays**. Nothing used to ever happen during this entire period – now it typically only applies to August.

Nevertheless, different experiences can make negotiations and day-to-day work more difficult. Many French people – for all their «Égalité» – are distinctly elitist and the state is organised centrally. This partisan leaning is also reflected in the power structures of many companies. German negotiators would therefore be well advised to find out whether the other party actually has decision-making authority. Contracts can then be negotiated, but by no means signed.

But even when the ink is dry, the Germans and the French take different paths, says Harald Felten, Director Sales International at FERCHAU. While Germans furrow ahead with »implementation-as-agreed«, because from their point of view everything has been thought through, discussions often only start now for the French. Afterwards, different interpretations creep in: Where should which production line be? Wouldn't it be better to do it this way or the other? Felten admits that good arguments are then often brought to the table. And so the German »we are doing it like this« sometimes comes up against the French »perhaps there is a different way to do it«.

Hazel Grünewald has an image in mind of a goldfish jumping out of its bowl: **when you come into contact with a foreign world, you suddenly question what you take for granted – be it cultural values or ingrained patterns of behaviour.** And it quickly becomes clear what is important to you. Hardly any other nation communicates and



Hazel Grünewald

»Stereotypes function as a mental shortcut. Quite efficient, but not necessarily correct.«

negotiates as directly and efficiently as in Germany. The Indian-born expert in organisational behaviour, who was born in Malawi, grew up in England and now lives in her adopted home of Germany, thinks it important that her students are culturally aware and develop tolerance for these vagaries.

The historical perspective is also pertinent for business relationships with Poland. The country has been bounced back and forth over the centuries between its large neighbours Germany and Russia and even disappeared from the map completely for 123 years. That is why the Poles value independence and autonomy so highly. Polish business partners can react very sensitively to any hint of paternalism, superiority or criticism of current policies. However, if you strike the right note, in Felten's experience it creates a particularly positive atmosphere: »The young people in the cities speak excellent English, are very well educated and think ahead.« It's easy to get on first-name terms and have more personal conversations.

Accordingly, relationships between the business partners based on trust play a vital role, and the Polish side then finds quick and informal solutions to difficulties in professional cooperation that go beyond what has been contractually agreed. »If I have the feeling that the collaboration is volatile and not running smoothly, it is always a good idea to address this sensitively and switch to the relationship level«, says Grünewald, summarising her personal experience and knowledge gained from two years of working in Bulgaria.

As a rule of thumb, the further east or south Germans find business partners, the more flexible and willing to take risks they are likely to be. Plan for an increase of 10 per cent? »Of course we can do



Harald Felten

»Even when the ink is dry on the contract, things can be interpreted differently afterwards, depending on the culture.«

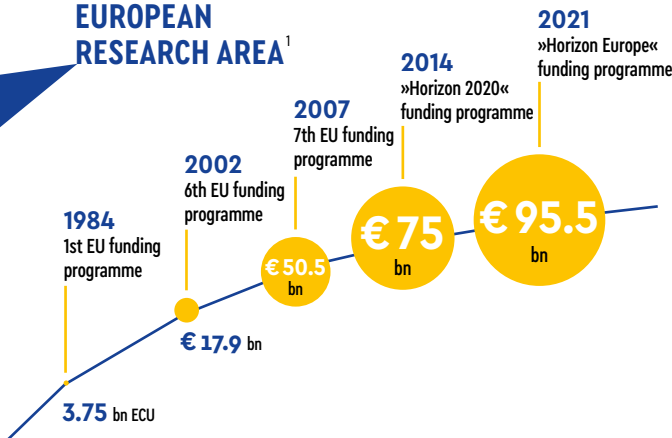
that«, Harald Felten hears his Spanish business partners say. No, this is not them being naive nor a little bit unreliable; more that the Iberians will give everything a go and take quite a flexible approach to timescales. »But there's something to this approach, because people are more willing to try things out and get to grips with new topics more quickly than in Germany«, says the Head of Sales.

The longer lunch break, on the other hand, is hard to criticise because the heat between 12 and 3 pm really is too much. On the other hand, it's completely normal to work until 7 or 8 pm. Spaniards like to talk things over with a meal, even a glass or two of wine. But preferably not about work. Also just as when you put Real Madrid and Catalonia's FC Barcelona fans together, Germans are likely to get somewhat over-excited when gossiping about the Spanish royal family. Initial conversations need to limit themselves to uncontentious and positive aspects of Spain, such as a holiday or the culture. And as always, when the personal relationship is right and the mood fits, banter about cultural differences and idiosyncrasies is more than welcome – but maybe no sooner than the closing banquet, where Cacofonix is once again conveniently nowhere to be found, but there is roast wild boar a-plenty. ■

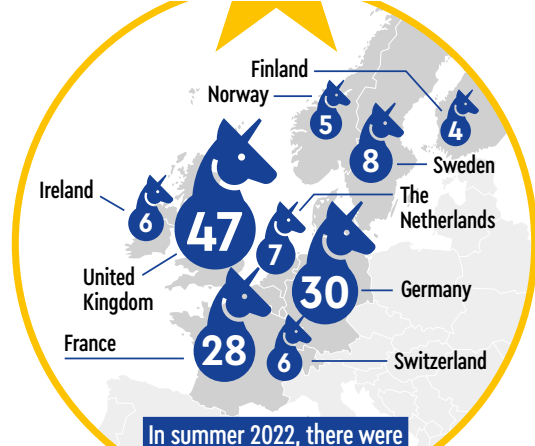
INNOVATIONS- PROJECTS FROM THE EU

Over the next years, the EU will be investing a good **€ 95 billion** in funding research. **»Horizon Europe«** is the largest joint funding programme for research and innovation in the world.

Development of the EUROPEAN RESEARCH AREA¹



UNICORN ALL-STARS



In summer 2022, there were **141 start-up companies** in Europe with a value of **over one billion dollars**³

BRIGHT PROSPECTS²

Spain scores highly with its many suppliers, expertise and attractive energy prices. This attracts the international automotive industry. On top of this, there is **€ 3 billion** in subsidies for the e-car and cheap loans from the country - from the European Recovery Fund.

SPACE STATION 2.0

The new Starlab space station is due to replace the ISS in 2028. Voyager Space, the US company, and the European aerospace group Airbus are involved in the development and construction. In general, space will receive around **€ 225 million** per year in funding under the »Horizon Europe« programme.

SPEEDY PARTICLES

The European Organisation for Nuclear Research (CERN) has **23** member states, around **3,500** employees and **14,000** guest scientists from **85** nations. The World Wide Web was developed at the world's largest research centre in the field of particle physics.

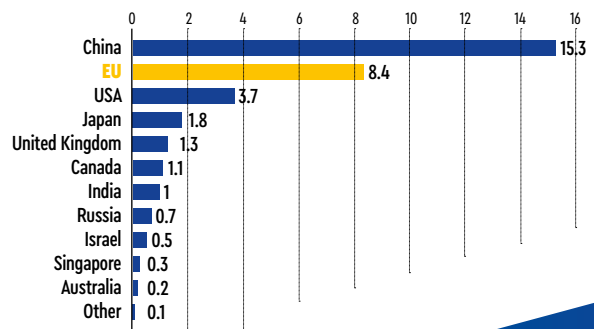
CHIP RESEARCH²

The Interuniversity Microelectronics Centre (Imec) is one of the largest research centres for nano- and microelectronics in Europe. The head office is in the Belgian city of Leuven. **5,500** experts from **96** countries work for Imec around the world.

1.43 MILLION bright minds conduct research in and for Europe.¹

Public funding for QUANTUM COMPUTING⁴

in selected countries worldwide until 2022 (in billion US dollars)



Sources: 1) BMBF, 2) Handelsblatt, 3) Statista, 4) McKinsey/Statista



SEARCHING FOR THE BEST

TEAM PERFORMANCE

Sports clubs, organisations and communities of states:
everyone is on the look out for the best possible interaction
without friction. Ideally high-performing!
But strong teams do not come about without
investing in the spirit.



TEXT **Alexander Freimark**

Anyone who works in a team will know these sayings only too well: »Great, someone else is doing it« or »If you want to go quick, then go it alone. If you want to go far, go with others.« After all, there are dynamic groups everywhere today, for example in the changing room, in agile environments or at a desk. And because teams are everywhere, it is essential that they function. The levers that are supposed to work: talk to each other more, hold better meetings, talk on a personal level, be authentic, really listen, praise sometimes, create psychological security and emphasise the (social) meaning of the work. And, of course, solidarity and harmony.

This feels like quite a steep learning curve for new team leaders in hybrid environments. Especially as there is something of a fundamental flaw: »Team performance is usually less than the sum of individual performances«, reports Dr Jan Rauch, a sports psychologist at

the ZHAW Zurich University of Applied Sciences who advises teams and organisations.

PEOPLE AND OXEN DO NOT SCALE WELL

The reason for the dilemma is called the »Ringelmann effect«. In the 19th century, the French agricultural economist tested the performance of oxen in the field and of humans in a tug-of-war. The efficiency of the teams is consistently less than the potential individual performance, reports the Swiss psychologist. This reveals two key points that cause friction losses – coordination and motivation. The best example: ten people spend time in the meeting to co-ordinate, five ask themselves the question of meaning or immerse themselves in their own comfort zone. Jan Rauch therefore sees team building first and foremost about curbing the effects of losses before tackling performance gains.

THE CHALLENGE

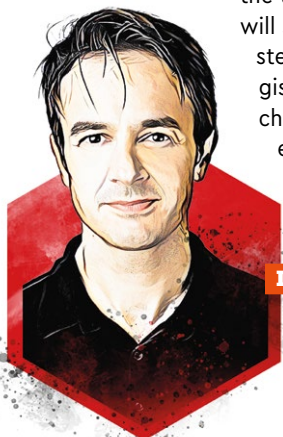
- There are no simple solutions, every organisation and every team is different.
- You need teams for some tasks, sometimes lone warriors are better.
- Is FC Bayern automatically high-performing, or is it FC Saarbrücken in the DFB Cup? Does performance equate to high sales revenue or a low error rate?
- Factors such as satisfaction and well-being cannot be measured precisely and therefore cannot be managed directly.
- Team building under orders – »beer after four« with table football – sends the motivation of some employees right into the cellar.

TEAM SPIRIT DOESN'T HAPPEN BY ACCIDENT

Good team spirit also comes at a cost. However, a little investment may well pay dividends: when members exchange ideas, their psychological security increases and they open up to others. They can admit mistakes and create understanding for their own situation. »When problems arise, team members are then more likely to stand up for each other and keep the overall performance high«, argues Rauch. It is not wise to rely on understanding and support in the shark tank.

TURNING THE WHEEL

It's different in football, though, where the coach is the first person to be affected by problems. Then »fire fighters« like Bruno Labbadia or Pal Dardai come in, who flip the switch in people's heads and provide a motivational boost. In this phase, social patterns are broken up and everyone in the team has to prove themselves anew. »Clubs hope that a change of coach will galvanise players and give the team a jolt – that players on the bench will sense their chance and everyone will step up a gear«, argues sports psychologist Rauch. »However, statistics show that changes of coach tend to have a short-term effect – if at all – and hardly have any lasting positive effects.« A small chance is often better than none, though.



Dr Jan Rauch

Sports psychologist at the Zurich University of Applied Sciences ZHAW

QUICK SHOTS DON'T HIT THE MARK

The EU institutions also provide a platform for exchanging ideas with politicians and lobbyists from other countries, looking beyond borders, making contacts and creating understanding. It is obvious that a European All-Star team also calls for investment. According to Rauch, financial commitment often wanes somewhat in difficult economic times. Whether from the CEO, club boss or sovereign: »More team spirit must be explicitly desired – in the hope that it will pay off without being able to measure it«.

One example of cross-border cooperation is »Team Europe«, which was put together in times of crisis as a joint response by the Commission and the Member States to the coronavirus pandemic. The motto: join forces and jointly organise emergency support for partner countries. This resulted in a comprehensive approach with potential for the future. It is intended to give the »Working Better Together« concept more clout by developing »Team Europe Initiatives« (TEI) – beacon approaches with great transformational potential that go beyond corona support in almost all partner countries, including across sector boundaries. »We can only overcome global challenges as Team Europe and show the world that the EU is more than the sum of its Member States« said Martin Jäger, then State Secretary at the Federal Ministry for Economic Cooperation and Development.

THE LEMON AND THE JUICE

And according to Swiss psychologist Rauch, much has changed for the better in recent years. »In the past, we were supposed to develop teams to squeeze even more juice out of the lemon. Today, it's more about well-being, mutual support and understanding.« If they are to perform at their best, members of a group must be given the chance to get to know each other and develop sympathy. »This can only happen if an organisation thinks long-term and supports the process.« Good teams also serve as a »social glue« that keeps people together and with the company, says Rauch. Then the bottom line will be more favourable: »Because poor team spirit with staff turnover, friction and absenteeism weigh heavily on the performance balance.«

 TEXT Alexander Freimark

Professor Dr Katharina Hölzle heads the Institute of Human Factors IAT at the University of Stuttgart and the Fraunhofer Institute for Industrial Engineering IAO. Since 2023, she has also been a technology commissioner for the Baden-Württemberg Minister of Economic Affairs. She researches in areas including technology and innovation management, digital transformation and socio-technical systems in start-ups and innovation. She was previously Professor of IT Entrepreneurship at the Hasso Plattner Institute (HPI) at the University of Potsdam.

Changing innovations

»With budgets shrinking, we inevitably have to take a smarter approach«

Professor Dr Hölzle, your research focuses on technology and innovation management as well as ergonomics. What is an innovation?

For me, innovations are things that make a difference. For decades, we as researchers have always said that ideas only become innovations when they are successful on the market. I think that's wrong. After all, innovations can also change societies, political systems or organisations.

Innovative strength and self-confidence currently appear to be weakening in Europe, especially when compared with the USA and China. How do you assess the status quo?

Basically, we are still very well positioned compared to other continents because we have invested a great deal in this area over the decades. This certainly applies to the western industrialised nations, but research also plays a very special role in the countries of Eastern Europe. We therefore have many very good scientists who love their work. It is no secret that Europe is envied for research from its state and entrepreneurs alike.

In which areas are we premier league players?

We are still the world market leader in mechanical engineering. An example from semiconductor production: many new chips can only be manufactured using machines from ASML, the global market leader from the Netherlands. And who supplies ASML? TRUMPF and ZEISS from Germany. The companies have toiled together for 20 years to jointly develop the EUV laser for ASML. That really impressed me: a classic example of open innovation with all the challenges it entails.

Such innovations are certainly desirable, but large-scale projects traditionally cause a stir, especially in global competition.

Of course, we also need beacon projects, and I know that it is currently difficult to invest a lot of money in one or two of these projects. But you can't get to grips with whole AI topic with € 10,000 or € 100,000. Companies therefore also need a strong commitment to the strategic foresight process so they can better predict what the next big thing will be.

What would a beacon project be on a European scale?

I think CERN, the European organisation for nuclear research, is a great example. The idea of joint research is exemplary, but unfortunately – apart from the WWW 35 years ago – too little innovation has emerged. This is mainly due to the fact that science is not properly incentivised.

So the pay is too low?

First and foremost, we have the wrong goals. As head of the Fraunhofer Institute, I am also measured by the number of publications I have had in prestigious media and the research funding I have acquired. Transfer is the top priority at Fraunhofer, but the traditional scientist in Europe only gets a higher salary and a new job if the publications are right. Collaboration, knowledge transfer and impact are dimensions that count less.

What are the consequences of this for research and development?

As an example, I see great potential for innovation in Europe by opening up R&D departments. Many companies in North America realise that they cannot solve complex tasks on their own. As a result, research ecosystems made up of large and small companies, including their competitors and customers, are much more widespread there. In Germany, on the other hand, researchers and teams in companies usually only look after their own interests. This is especially true within organisations. This is known as the classic »not invented here« syndrome – an aversion to external ideas and innovations. People would rather co-operate with other companies than with their colleagues from the department next door.

Why does this mindset come about?

Everyone wants to claim success for themselves. We have to change this attitude. It's something we can no longer afford. Because with budgets shrinking, we inevitably have to take a smarter approach. Biological ecosystems are a good metaphor – for example, ants know that they can only survive together. This makes them adaptable to external influences. We need to adopt this way of thinking and the flexible structures if we are to move forward.

What do you propose to achieve this?

We need joint interaction within and between companies and research organisations and their teams. We also need more freedom for people to develop. These are responsible researchers who want to move things forward and make a positive impact. But we will only enable cooperation and open innovation if we say goodbye to individual incentivisation. The prize must go to the team.

Connecting Europe

FERCHAU Poland: New Kids on the Block

 TEXT Alexander Freimark

FERCHAU entered the Polish market at the end of 2023. As Country Manager, Szymon Karaś focuses on local shared service centres for global corporations such as Intel, ABB and Schaeffler, as well as nearshoring for the DACH region. In this interview, the car enthusiast, who codes ECUs as a hobby, explains how Western European companies can benefit from this.



What sums up the Polish market for engineering and IT services?

Recruitment services are well established here on a broad basis, and there is a huge supply of motivated developers and engineers thanks to the many universities. Its customers specialise in the automotive, aviation and marine sectors as well as financial services and pharmaceuticals. There are also service categories that are comparable to those in Germany, so SUPPORT, CONTRACT and COMPETENCE with work packages. We are targeting large shared service centres that global corporations have set up in Poland. And through our FERCHAU companies, we are talking about companies that often already use nearshoring services from Eastern Europe.

Which are your first priorities?

Now we've opened the branches in Warsaw and Wrocław, the focus is now on building up the teams, from branch managers to sales and human resources. In addition, we intend to fill at least 45 full-time technical expert positions in the current year. Almost all Polish engineers speak good English, they have a strong work ethic, and the cultural differences to Germany are hardly significant at all in the professional environment.

What skills need to be recruited for?

It always depends on the requirements. On the one hand, Java and .NET, web design, testing, UX/UI design and project management are most in demand in

business IT; on the other hand, embedded software is in demand in the mobility sectors with skills such as AUTOSAR, C and C++. With so many skilled employees, we can deliver exactly what the customer needs. We can even integrate specialists from FERCHAU's German branches into international project teams to optimise costs and expertise. Of course, we also have experienced electrical and mechanical engineers in Poland, because technical innovations are traditionally highly valued here.

What makes you optimistic in view of the many major competitors?

I agree with the old adage: »Success is not final, failure is not fatal. It is the courage to continue that counts.« We have the advantage that we can act like a start-up, where the structures of the parent company and its reference customers make it easier for us to get started. I have also been working in the IT and engineering services market myself for over 15 years, which means I can build a lean, flexible and efficient organisation. We pass these benefits on directly to our customers. We also offer temporary employment services, both within Poland and in Germany. The proximity counts – after all, Berlin is just as far away from Warsaw as it is from Munich. The difference is that prices are even lower here and expertise is available in abundance.



**FERCHAU relax – The Portal
for customers and suppliers**

Digital Plattform for all Personnel requirements

 **TEXT Bernd Seidel**

FERCHAU drives digitalisation forward and launches »FERCHAU relax – The portal for customers and suppliers«. When it comes to one-stop shopping, companies can use the platform to manage their personnel requirements – from procurement and commissioning to tracking all project-relevant information. Christoph Sedlmeir, CEO of prime-ing, a FERCHAU sister company responsible for the development of the portal, explains its function and benefits.

The customer portal »FERCHAU relax« has been live since the beginning of the year. What can customers expect?

Customers can use the portal to plan their personnel requirements precisely, submit enquiries and manage the entire recruitment process transparently and consistently: budget, costs, milestones, degree of completion, contract status and much more. Irrespective of whether teams are to be strengthened by FERCHAU experts by way of temporary employment, whether the customer wants to assign complete projects under a contract for work and labour or a service contract, or whether positions are to be filled on a permanent basis or with freelancers: all FERCHAU services and products are available digitally via the customer portal.

The does the customer set out their requirements in the portal and then automatically get suitable resource suggestions?

Not automatically. It is unrealistic to believe that in our complex environment, people, customers and projects can be brought together at the touch of a button and then fit together perfectly. The customer can use Guided Buying in the system to describe their needs and the required services in great detail. However, we do not expect our customers to search for profiles themselves in a large database. Therefore, on the same day, they receive a selection of people and profiles curated by FERCHAU specialists who best meet their requirements. Our experts in the background ensure that the customer only receives profiles that match the task, the customer and the mindset. The candidates' profiles can then be viewed and suggested dates for personal contact can be entered.

Why do you see the need for the customer portal?

The world is becoming more and more digital and our customers are asking for digital solutions to optimise recruitment. In 2025, 75 per cent of all employees will belong to the digital native generation. And 80 per cent of all B2B purchases and sales will be processed digitally, according to Gartner analysts. Today, our customers organise their working hours and locations flexibly at and also want to send enquiries at the weekend in the evening – online and not by phone or email. They can do this at any time via the portal, on any day and from any location and, unlike an email or a phone call, it can all be tracked transparently. If a resource is also no longer available, it is hidden and GDPR is therefore complied with at all times.

FERCHAU's expertise is people business. Where is the advice feature?

The customer always has the option of making personal contact and FERCHAU's sales team continues the dialogue to advise customers. But in many cases, this is not necessary and can be optimised for both sides using a universal tool. The customer portal helps us to become more focussed and improve quality, because customer requirements are explicit through the entries in the portal. This also means you can get straight to the right contact person.



Find out more or make your enquiry directly and without obligation:

ferchau.com/go/relax-portal



Christoph Sedlmeir

CEO of prime-ing

Exotec: fast order picking with warehouse robots

The intralogistics unicorn



TEXT Bernd Seidel

The logistics sector is regarded as the economy's nerve system. If the warehouses are empty, the conveyor belts stay still and the supermarket shelves remain empty. The logistics specialist Exotec develops and builds highly automated logistics centres with 98 per cent availability. Autonomous Skypod robots take over order picking. Engineers from FERCHAU monitor the performance.

If you've ever wanted to admire a unicorn, you will find it in Landshut an der Isar. Your search in Lower Bavaria for the horse-like creatures that are said to have healing qualities will probably be in vain. What you will certainly find, though, is the logistics company Exotec. Founded in 2015 in Lille, France, the start-up has a branch there and serves the Central European market from this location. In 2022, the company was given a market value of over €2 billion – making it one of the start-ups affectionately known as unicorns.

Exotec's logistics systems are somewhat less mystical, more like a symbiosis of hardware and software. At the heart of the solutions – alongside the company's own storage shelving systems and compatible standardised containers – are the intelligent Skypod robots, of which Exotec says it produces around 6,000 worldwide and uses in over 100 systems. These countries include France, the Netherlands, Belgium, the USA, Japan, Italy, Spain, Portugal, Denmark, Germany and

Switzerland. The whole thing is controlled and optimised using the in-house Deepsky software – the system's central brain.

Exotec systems are used wherever goods are picked; in the food and retail sectors, e-commerce, for pharmaceutical distributors and in production.

The French food group Carrefour and the sporting goods retailer Decathlon are among the well-known customers. In the language of logistics experts, the systems work by the »Goods to Person« principle. Put simply: A central control system always sends the Skypod robots to the shelves by the shortest route, where they remove a tray or storage boxes and take them to the picking station. And as a neat side effect, the workstations can often be designed more ergonomically. The systems work with chaotic or dynamic storage. Goods do not have a permanently assigned location; instead, products are stored in the best available storage location.

Christian Eberle

Director Maintenance at Exotec



»To keep availability high, the warehouse robots operate completely independently of each other«, says Christian Eberle, Director Maintenance at Exotec Landshut, explaining the strategy. Unlike conventional shelf operating devices, which regularly block an entire warehouse aisle in the event of a failure, the Skypod robots can continue to work if one or more robots fail. As well as high availability, the systems can also be used to easily cushion seasonal fluctuations, such as during the Christmas period. **»We can bring in robots and ramp up capacities within a few minutes«**, says graduate mechanical engineer Christian Eberle. You think of it like a flying change in handball, for example. Exotec offers a rental robot model to be able to react quickly to fluctuations in demand. »They are delivered from Lille within 48 hours and then put into operation on site.«



The flagship customer Carrefour uses Exotec to manage a warehouse that processes online orders for direct delivery to end customers. 230 Skypod warehouse robots swarm through the shelves and bring the boxes of products to the picking stations, where employees pack the individual customer orders into paper bags.



The warehouse robots work in a closed environment. This reduces the risks associated with pedestrian traffic in the warehouse. The vehicles travel at 4 km/h and have up to 30 kg carrying capacity. They move in three dimensions in the warehouse: they climb up to 12 metres up the shelves and then move freely on the floor like autonomous mobile robots (AMR). »This dual function of free navigation on the floor and vertical movement on the shelf means Skypod robots can take over both the storage and retrieval of small load carriers on the shelf and deliver these containers quickly to the picking zone, supporting the order processing employees«, says the Director of Maintenance Christian Eberle.

The flexibility and high 98 per cent availability of Exotec systems are top values in warehouse technology and require constant optimisation, Eberle explains. Where were there disruptions? Are the routes optimal, are more robots needed for capacity reasons or do more robots have a positive effect at all? This is where the

The Skypod storage robots move in three dimensions and climb shelves up to 12 metres high.

experts at FERCHAU come into play as part of FERCHAU Support. **As performance engineers, they analyse the data and faults from the warehouse systems centrally in the backend in Landshut, monitor troubleshooting, supporting the maintenance teams.**

»We always have Exotec specialists on site for larger systems to carry out targeted maintenance and rectify faults.« Device parameters are permanently monitored. In the event of a fault, the appliance automatically moves to the maintenance area, stops there and waits until the service technician has rectified the fault. Devices are also taken out of operation in advance if necessary, should parameters deviate from the desired standard. »Our FERCHAU people are also the point of contact for customers. On the one hand, for troubleshooting. Secondly, so that they can plan capacities with them in advance and run through possible deployment scenarios«, says Christian Eberle.

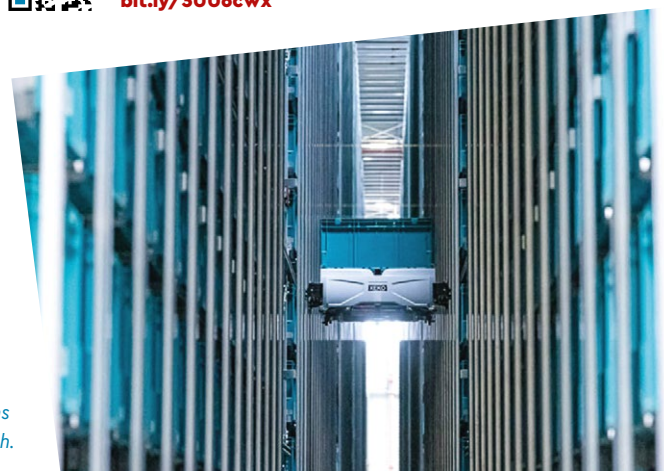
The market for warehouse automation using robotics offers enormous potential. An Exotec survey shows that 80 per cent of warehouses still work with manual order picking. »This is mainly because the cost and availability of labour has not been a major problem until recently«, comments Christian Eberle. That has changed. Various demographic and socio-economic changes have made it difficult to find employees for warehouses. According to the survey, 63 per cent of respondents are therefore planning to automate their warehouse in the next one to two years, with the remainder planning automation projects in the next two to three years. Fabulous times for the unicorn from Lower Bavaria.



**More information about
FERCHAU SUPPORT:**
ferchau.com/go/support



**See the Exotec »Skypod«
in action:**
bit.ly/3UU6cwx



Best Cost Country (BCC) approach:

Engineering and IT without borders

 TEXT Alexander Freimark

Low costs, flexibility and high speed – that's what matters when starting and implementing modern projects. Steffen Hauck puts together cross-FERCHAU competence packages with experts from Best Cost Countries (BCC) for engineering and IT.

Companies need to organise their development more efficiently and with better performance. However, because engineering and IT specialists are hard to come by, Steffen Hauck has built up an international network of resources over the past 15 years. **»I work with customers to find a solution for their tasks and integrate teams from other countries in order to ramp up projects quickly, cost-effectively and with legal certainty«**, reports the BCC manager from FERCHAU. **»Because it's pretty much impossible to make technical changes to 10,000 components economically in Germany today.«** The same applies to digitalisation, says Hauck: **»The rapid deployment of IT project teams from the BCC landscape at lower costs is increasingly becoming the focus for companies.«**



Steffen Hauck

BCC Manager at FERCHAU

The BCC network now covers eight countries, from North Africa to Eastern Europe and India. FERCHAU has its own locations with experts in Poland and Spain, while the model is implemented in the other countries via co-operations: **»This allows us to supplement our expertise and capacities in project groups and technical offices in a targeted way.«**

Flexible even during ongoing projects

BCC's core competences in engineering include the areas of mechanics, analysis & simulation, electrics and system engineering. In IT, the focus is on business solutions, systems integration, embedded systems, application development and industrial solutions. As a result, customers now come from many sectors, above all the automotive industry and mechanical and plant engineering – both in large companies and in technically orientated SMEs.

»One advantage is that various processing models can flexibly adjust

the shoring proportion during the project«, explains BCC manager Hauck. Orders are processed via works or service contracts with defined performance and delivery units based on time and effort or fixed price, and there is also the option of a services catalogue in the works contract. The FERCHAU branch office on site remains the contractor, delivery centre and first point of contact for customers; the customer has a dedicated interface coordinator to communicate requirements and changes directly to the BCC team.

»The aim is to make it as easy as possible for customers to reduce costs and get the necessary experts up and running quickly«, reports Hauck. And all

to German quality standards. The focus in nearshoring and offshoring is gradually shifting from pure cost considerations to other benefits:

»If the ramp-up is to be quick and flexible, the available expertise and capacities are becoming increasingly important.«

Borja Cerero

Business Development
Manager at FERCHAU Bilbao



David Moreno

Expert in structural analyses
at FERCHAU Bilbao



FERCHAU Bilbao

A clear view of the world

TEXT Alexander Freimark

»New Space«, the main term for the commercialisation of space travel, is a real game changer. A sign of the times: Instead of putting a few large satellites into orbit as in the past, satellites are becoming smaller and smaller and there are more and more of them. The Starlink constellation had around 5,270 satellites in Earth orbit at the end of 2023.

One renowned manufacturer is the company Satlantis from the Basque Country in Spain, which specialises in developing high-resolution vertical cameras for small satellites – known as »Integrated Standard Imager for Microsatellites« (iSIM). They enable a resolution in the sub-metre range for several spectral ranges – from a height of 500 kilometres. The cameras have many applications, says Borja Cerero, Business Development Manager at FERCHAU Bilbao, such as security, forestry, shipping and detecting gases in the atmosphere.

Growing demand for specialists

The company is growing rapidly and is looking for experienced experts. This is where FERCHAU COMPETENCE comes into play: »We adapt the mechanical structures of the cameras individually to the size of the respective satellites and the respective projects«, explains David Moreno, aerospace expert at FERCHAU specialising in mechanics and structural analysis. He works in the Satlantis team and optimises

the structures to reduce the amount of material used and thus the overall weight of the camera.

The work takes from several months to over a year per model and order – which is still quick when compared to classic space projects. The Solidworks CAD tool is used to design the physical models and the pre-/post-processor Femap with NX Nastran as FEM system for simulations and calculations of the designs.

Success Stories

Project reports in a nutshell

FERCHAU experts have taken a wide variety of customer projects in numerous industries to the next level.



Short and sweet – find out more about the sweet side in our success stories:

ferchau.com/go/success-stories



More information about
FERCHAU COMPETENCE:
ferchau.com/go/competence

Europe in a raw material frenzy

The EU member states want to become more independent when it comes to raw materials. The political goals are ambitious. New claims have already been staked out in Europe and Africa. However, recycling rates are still lagging behind.

Rare earths are without doubt the gold of the 21st century. But the new European sites for the 17 metals and oxides are unlikely to trigger an era-defining Klondike-like gold rush like the one 130 years ago. At that time, over 100,000 adventurers and fortune-seekers roamed the North American wilderness in search of the coveted gold nuggets, during the course of which the border between Alaska and Canada was established.

Unlike gold, rare earths have no direct psychological effect on people. It is more about their areas of application. Rare earths are found in chips, smartphones and even artificial joints. Around three quarters of extraction and production are controlled by the three major powers: China, the USA and Russia. The governments of the EU member states want to free themselves from these monopolistic commodity constraints.

A joint set of regulations – the Critical Raw Materials Act – is now to fundamentally change by 2030 what has been neglected for decades. Extraction of »critical raw materials« within the EU will then cover at least ten per cent of demand, which is a mandatory discovery quota for the mining industry. The processing capacities in the EU for these raw materials would be at least 40 per cent. This means that 25 per cent of raw materials are to be recycled throughout the EU. The usual 15 years allowed for the authorisation process from discovery to extraction will be curtailed to only 27 months in future. This period will be 15 months in future for recycling and processing plants. The member states are also to maintain reserves of some critical raw materials.

New claims

The Swedish state-owned mining company Luossavaara-Kiirunavaara Aktiebolag (LKAB) has already announced in January 2023 the discovery of a large deposit of rare earths in the Swedish soil under Kiruna. The treasure trove of more than one million tonnes of oxides is the largest known deposit in Europe to date, reported LKAB boss Jan Moström. However, their exact chemical composition has yet to be clarified. In his opinion, constructing refineries to separate the rare earths from the carrier ore is likely to be if anything an even greater challenge. Moström estimates that it will take another 10 to 15 years before significant quantities can be extracted from the ground. But the new EU agreement could now speed up the authorisation process here too.

Norway wants to dive even deeper. An investigation by the Norwegian Petroleum Directorate claims to have discovered a treasure lying dormant in the seabed deep beneath the waves along the Norwegian coast. And that is also economically viable to recover. Estimates put the figure at up to 80 million tonnes of copper and zinc. In addition, almost two million tonnes of valuable cerium – a rare earth element that among other things is used in aluminium processing – are suspected to be there. Deep-sea mining is not yet being carried out commercially anywhere in the world, but the Norwegians could soon be the trailblazers.

Rare in Germany

Sites in Germany are indeed rare. Some substances from the promising list of those 17 rare earths were discovered by chance in the 1970s in the Saxon town of Storkwitz, 30 kilometres north-west of Leipzig. After further test drilling in 2012, it was estimated that there is around 20,000 tonnes of ore present.



The 17 rare earths

Rare earths have very special chemical properties without which our technology – smartphones, notebooks, LED lights, electric motors and countless other products – would not work. They are called earths because they used to be extracted as oxides from certain minerals.

LANTHAN (La)



For example in:
Nickel-metal hydride batteries (for electric cars and laptops)
catalytic converters, soot particle filters, fuel cells

CER (Ce)



For example in:
Car catalytic converters, soot particle filters, UV protection glass, polishing agents

NEODYM (Nd)



For example in:
Permanent magnets (for electric motors, wind turbines, nuclear magnetic resonance tomographs, hard discs), lasers, CD players

PRASEODYM (Pr)



For example in:
Permanent magnets, aircraft engines, electric motors, glass and enamel colouring

DYSPROSIUM (Dy)



For example in:
Permanent magnets for wind turbines, phosphors, lasers, nuclear reactors

SAMARIUM (Sm)



For example in:
Permanent magnets (for dictation machines, headphones, hard disc drives), Space travel

YTTRIUM (Y)



For example in:
Fluorescent tubes
LCD and plasma screens, fuel cells, LEDs

PROMETHIUM (Pm)



For example in:
Luminous digits, heat sources in space probes and satellites (radioactive element)

SCANDIUM (Sc)



For example in:
Stadium lighting, fuel cells, racing bikes, X-ray technology, lasers

EUROPIUM (Eu)



For example in:
LEDs, fluorescent lamps, plasma TVs

GADOLINIUM (Gd)



For example in:
Contrast media (magnetic resonance imaging), radar screens

TERBIUM (Tb)



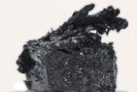
For example in:
Phosphors, permanent magnets

HOLMIUM (Ho)



For example in:
High-performance magnets, medical technology, lasers, nuclear reactors

THULIUM (Tm)



For example in:
Fluorescent lamps, X-ray technology, TVs

ERBIUM (Er)



For example in:
Laser (medicine), fibre optic cables

YTTERIUM (Yb)



For example in:
Infrared laser, chemical reducing agents

LUTETIUM (Lu)



For example in:
Positron emission tomographs



**There is no way around more recycling:
»The course of the circular economy is
more sustainable than constantly
developing new mining areas.«**

*Prof Dr Raimund Bleischwitz
from the Leibniz Centre for
Marine Tropical Research (ZMT) in Bremen*

However, the rare earth content of less than half a per cent was not viable to consider for mining. Three years later, the mining licence was surrendered. Local rivers could be another source of valuable precious metals such as lithium. To date, around 80 per cent of the lightest metal comes from South America and Australia. As the portal EFAHRER.com reports, the German company Vulcan Energy Resources wants to develop underground lithium-containing thermal water. According to the company, Europe's largest lithium deposit is located in the Upper Rhine Rift Valley between Basel and Karlsruhe. The plan: Vulcan Energy will bring the thermal water to the surface, use it for heating and at the same time extract the rare metal from the water.

The British company Pensana also wants to exploit the boom in rare earths and has therefore already put out feelers to Africa. There are plans to commission a mine in Angola with a view to reducing Europe's dependence on China for rare earths. The mining project is called Longonjo which, according to the company, is said to have around 166,000 tonnes of neodymium-praseodymium oxide, the material from which permanent magnets are also made.

The young company also plans to set up a rare earths processing centre in the port city of Hull on the north-east coast of England. The plant will refine

12,500 tonnes of earth oxides per year. However, this has only been speculation so far, as Pensana reported an annual loss of a good € 5 million in June 2023. It could therefore be that mining activities and refining processes will be delayed if investors start to get nervous.

Low recycling rate

»Our observations, which were published in ›Nature‹ journal, show that refining one tonne of rare earth oxide can not only produce 1.4 tonnes of radioactive waste, but also 2,000 tonnes of waste material and 1,000 tonnes of wastewater containing heavy metals«, reports Prof Dr Raimund Bleischwitz, an expert in recycling management at the Leibniz Centre for Tropical Marine Research (ZMT) in Bremen. The entire rare earth industry needs to be rethought if it is to satisfy the growing demand without damaging the environment.

However, only around 1 per cent of rare earth metals are currently recycled, as there are no strategies or programmes for recycling rare earths from products anywhere in the world. »I currently see a rather sombre mood in large parts of the recycling industry«, states Bleischwitz. The EU regulations could provide a push in this respect. The expert also questions whether the current ›spirit of optimism‹ in mining exploration will continue when it comes to environmental impact assessments and involving the local population. Ultimately, the circular economy is more sustainable than constantly opening up new mining areas. ■

Rare earths are a group of 17 metals



In fact, some of the rare earth metals (such as cerium, yttrium and neodymium) are more abundant in the earth's crust than lead, copper or arsenic. However, the metals are called rare because they rarely occur in high enough concentrations to make their exploitation economically viable. Experts estimate the concentration at just under 0.2 per cent per tonne of ore at the deposit in Kiruna, Sweden. Less than two kilograms of rare earths could be extracted from one tonne of ore.

Bots as testers take the strain off IT and the specialist department

First: test, second: test, third: test – this is the mantra from experienced developers for quality assurance in software development. Robotic Process Automation (RPA) means companies can follow this recommendation even when time and specialist personnel are at a premium. As in: always.

 **TEXT Uwe Küll**

Software tests are essential for effective quality assurance in times of digitalised processes and products. After all, the consequences of installing a faulty merchandise management update or a security vulnerability being exploited by hackers in insufficiently tested customer apps is in the headlines almost every day: nothing works any more, customers are annoyed, companies suffer financial loss and reputational damage. The German Federal Office for Information Security (BSI) has not defined software tests and approvals as building blocks of its IT baseline protection approach for nothing. But how can throughtesting and the shortest possible time-to-market of products be reconciled? With automation.

Specialised tools or RPA?

It makes sense for companies that already automate business processes using robotic process automation to use RPA bots for software testing as well. A study by PwC reveals that more than half of all companies do this. Various software manufacturers offer specialised testing tools. However, using them incurs licence and training costs, especially for key users from the specialist departments. The result is extra time pressure. What's more: when interacting with several applications involved in a process and their data formats, weaknesses in pure testing tools are sometimes exposed. The RPA bots access the graphical user interfaces in the same way as the »human interface«, making them perfectly suited for such complex scenarios.

This is how it works:

write once, test again and again

Testers or specialist users write the process to be tested on the screen as usual using the mouse and keyboard. For example in a B2B logistics process such as spare parts dispatch this includes:

- **Take over the order number** from a retailer's online shop,
- **Assign the consignment number** in the forwarding agent's logistics portal,

- **Check availability and compare** against item numbers with digital catalogues from different suppliers,
- **Track the status messages** along the supply chain or
- **File** the confirmation of receipt.

Depending on the scenario, the person creating the test uses drag-and-drop to add different variables and assign additional data sources, for example for manufacturer or official test certificates. The RPA bot then repeats the test procedure independently. Developers and business users have time to devote to other things.

What advantages have you been able to achieve by using RPA?

Basis: companies that use RPA solutions
Multiple answers were possible



Source: based on the »RPA in the DACH region« study/PwC

The new era
of automation

Generative AI makes people more productive

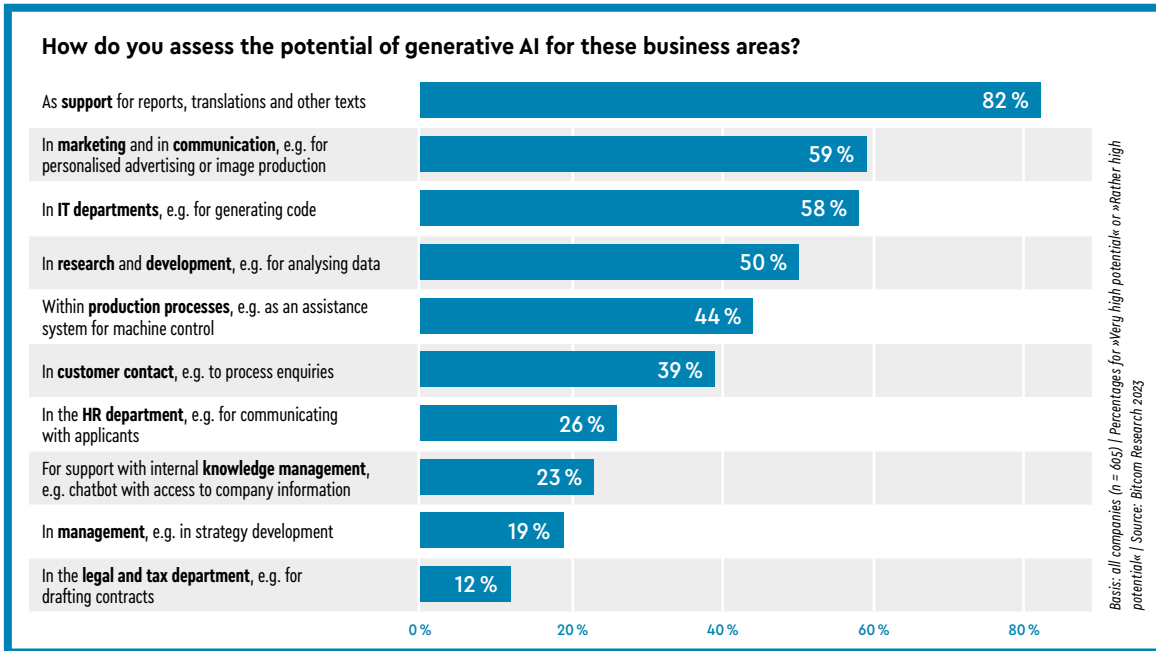
TEXT Uwe Küll

From rising star to fixed star: generative AI is becoming an integral part of work processes in many areas. Especially in IT. This will enable companies to automate increasingly complex processes faster and faster in the future.

Writing emails, compiling reports, creating documentation – in future, engineers will be able to delegate all or at least some of these tasks to generative AI. This is made possible by large language models such as ChatGPT, the technology behind Microsoft Azure OpenAI Services. Mercedes-Benz have been working with this »Direct Chat«, as the car manufacturer calls the application, since the end of 2023. Pilot applications with ChatGPT in the cockpit of Mercedes models are already running in the USA and in production. Experts agree: 2024 will be remembered for transformation through generative AI. ChatGPT and all the others obtain information, organise appointments, design graphics and images, structure projects and write program code in response to written or verbal requests expressed in natural language. They are changing everyday working life in the engineering professions, and particularly quickly and significantly so in software development.

Generative AI assists in software engineering

Well over half of those surveyed in a Bitkom study cite IT and generating code as tasks in which generative AI can provide great or very great benefit (see figure on the right). Gartner predicts that by 2025, more than half of all job descriptions for managers in software engineering will require the use of generative AI. Developers already have a wide range of AI applications at their disposal that can automatically provide and execute tests of individual functions, known as unit tests. But that's not all: a study by researchers at Johannes Gutenberg University Mainz and University College London found, »that ChatGPT's bug fixing performance can compete with the standard deep learning approaches CoCoNut and Codex and is significantly better than the results reported for the standard program repair approaches.« However: ChatGPT fixed more than three quarters of the errors, but by no means all of them.



The potential of generative AI is still estimated very conservatively.

Faster programming – everyone wins

Generative AI provides particularly noticeable relief by automatically adding code as it is written. This speeds up the programming process. Practitioners report time savings of 50 to 80 per cent – depending on the problem and typing speed. They can then use the resources this frees up to roll out AI applications in other specialist areas. This could solve the permanent shortage of skilled labour.

Relieve specialists from routine tasks

Users in public administration and corporate management benefit above all from generative AI's ability to summarise and process content. This makes it easier to write strategy papers and instructions as well as to prepare and follow up effective meetings and negotiations. Generative AI also offers professionals in the pharmaceutical and medical technology sectors the prospect of reduced workloads in research and documentation. This leaves more time to design and carry out tests.

There is still plenty to do

Fears that artificial intelligence will over coding and engineering in its entirety are misplaced, however, as Iris Lorscheid explains. She is Professor of Digital Business and Data Science at the University of Europe for Applied Sciences (UE): »The greatest potential of generative AI lies in the collaboration between humans and AI, in hybrid intelligence (see interview in What's N3xt 2023/02). Today, we see that AI delivers the best results in dialogue with people. And for the time being, only humans are able to describe problems in their context in such a way that generative AI provides useful answers.« Plus: AI is not just AI.

»Selecting the most suitable tools for a specific task, evaluating the results, testing their feasibility and creatively developing them further – all of these tasks will pose major challenges for engineers from all disciplines in the future.«

AI creates more added value: € 330 billion

According to a study by IW Consult, generative AI could contribute € 330 billion to gross value added in Germany. The assumes that more than 50 per cent of companies use AI. According to the study, this figure was around 17 per cent in mid-2023. And the trend is on the rise – 46 per cent of the more than 2,000 companies surveyed intend to invest in AI over the next five years. The employees in the study were also remarkably positive: three out of four believe that generative AI tools make their work more productive. The use of generative AI could save around 100 hours per person per year. And what happens to the labour capacity that is freed up? Two thirds of companies plan for their employees to carry out tasks with higher added value during this time. And another piece of good news: the workforce is expanding in almost 20 per cent of companies using AI. Only 6 per cent of the companies that do not yet use AI report this.



Industry 5.0:
new human-machine interface

The perfect workarounder



 TEXT **Bernd Seidel**

The Industry 5.0 concept aims to re-establish a balance between automation and human skills. The automation and ergonomics professors Birgit Vogel-Heuser and Klaus Bengler from the Technical University of Munich explain why this is necessary, and how industry in Germany will become more flexible and resilient as a result.

After Industry 4.0 – the networking of production – you are now propagating Industry 5.0. What are the features of your concept?

Birgit Vogel-Heuser: In a nutshell, we are concerned with human-centred production and resource efficiency at the same time. How can people and machines work together in harmony in the future? Our projects on Industry 5.0 and our research are turning the prevailing approach around and asking: How can robotics learn from humans? Not: how can I take all the work away from people, automate processes – and then make people fit into this networked working world?

Human-machine interaction and cooperation, whether with IT systems, robots in the warehouse or assembly, works very successfully.

Klaus Bengler: So far... Today's systems are designed and planned from an automation perspective. Processes always run in the same way as far as possible and humans fill the gaps left by robots because they cannot carry out this work economically, at the right speed or flexibly enough. This results in very fragmented, small-scale work processes, which leads to a permanent handover, as we say. In some circumstances, it would be more efficient if the human was not just a stopgap, but in the flow better with one or two more work steps. We receive many requests from leading mechanical engineering manufacturers and industrial companies to analyse exactly this interface problem and develop solutions.

Vogel-Heuser: If a box is jammed, a workpiece is wedged or the conveyor belt is at a standstill, the

alarms go off and the operator or maintenance employee springs into action. Humans are virtually the »last line of defence«. This has been the case up to now, but it is no longer sustainable like this in the future. The buzz phrases: shortage of skilled labour. We no longer have the people with this expertise. However, humans are unbeatable here and automation must learn from this.

Bengler: What is needed are systems that people can quickly customise without having to be robot or system programmers; the workstation could be clicked together to suit individual body size, physical strength and speed, and at the same time the transfer points to the machine could be determined more freely, for example if someone has to step in due to illness or is being retrained.

Aren't people more of a disruptive factor in production?

Bengler: Only if it were an error-free fully automated production process. Who has this?

What makes you optimistic that the handover problem will continue to be solved by people and not by technical solutions, smartened up by AI?

Vogel-Heuser: That it's simply not viable because customised automation for special interfaces is often so expensive. The trend is for an increasing number of variants and continuously optimised products. It would be far too time-consuming to reorganise production every time. Companies want to be adaptable, at reasonable procurement costs, yes, but more

importantly in operation. And of course there will continue to be standard cases and processes that are easily automated. In future, though, intelligent interaction and agility will be required in production: for special cases, for smaller quantities, for products in special and plant engineering, where no two machines are the same, where there are deviations.

Bengler: Adaptable production facilities are therefore required; flexible systems and processes and intelligent, ergonomic human-machine cooperation. On the one hand, robotics can learn and adapt based on AI and, on the other hand, humans come more into play, who can then adapt the process – according to their needs and in terms of the overall optimum level. This makes processes more resilient, in other words, less susceptible to disruptions. These are precisely the strengths and unique selling points of local machine and plant manufacturers, which they can further expand with Industry 5.0.

What prerequisites do companies need if they are to implement Industry 5.0?

Vogel-Heuser: Point one is the mindset, which means wanting to think about the human-machine interface and openly examining the question: where and when is the machine better placed and where and when is the human better? Point two is to have good models. These are integrated models; not machine here and human there, but co-operative. Today's concepts are singular, depicting individual components but not the big picture.

Bengler: Companies need to develop a feel for what data they need from production. Today, they collect information to check and understand if something has gone wrong or to intervene preventively. In my experience, this is only part of the truth and is not sufficient as training data. Many valuable insights can be derived from situations in which the machines and processes have run well. Only when we look at both together can we analyse how much leeway the process has before it really stops working.

Where will humans be stronger than machines in the coming years?

Vogel-Heuser: People are more critical and creative in the design phase, requirements analysis, verification, service and troubleshooting. When parts or materials are missing, people are unrivalled in finding viable solutions.

Bengler: Humans make decisions based on fuzzy information and create responsible workarounds. As they say: »Looks like it could work. Shall we do it – or not?«. It's about gut feeling and intuition. This doesn't always have to be right, but people reach their goal creatively and take responsibility for it. Who really wants to leave that to the machine or AI alone?



Automation meets ergonomics

Prof Dr Phil Klaus Bengler researches in the field of »micro ergonomics« on issues of human-machine interaction, in particular driver assistance, software ergonomics and cooperation between humans and robots.

Prof Dr-Ing Birgit Vogel-Heuser's focal points are in the field of system and software engineering as well as in modelling distributed and reliable embedded systems. Hybrid processes and heterogeneously distributed, intelligent systems involving human-machine interaction also form part of their research.



