comma soft

Shaping and Navigating Technological Change

35 Years of Comma Soft
A journey through the history of IT

The Path to Becoming a Digital Champion
A roadmap for companies on the journey to effective digital transformation

Highlights and insights

Petersberger Gespräche 2024

On September 21, 2024, leaders from business, science, and technology gathered for the 16th Petersberg Talks at the Villa Hammerschmidt in Bonn. Under the theme **„Adaptability in the Era of Auto Sapiens,"** the event focused on future tech topics such as generative AI, neurochips, and the industrial metaverse.

Further information can be found at the end of this magazine.

Welcome back, curious minds!

„The best way to predict the future is to create it yourself."

– Alan Kay

Dear readers,
35 years of Comma Soft – a reason to celebrate! While writing this anniversary Travel Report, we were once again reminded how rapidly technological development is progressing. Who can say today what will happen in 35 years? Or even how our world will look in 35 months?

This is exactly why we at Comma Soft not only aim to advise, but also provide forward-thinking support in navigating the future. Whether it's calm seas (yes, they still exist) or stormy waters, we help companies stay on course, identify opportunities, and make smart decisions. One thing is certain: change cannot be stopped, but those who actively shape it will stay ahead.

In this issue, you'll find these three highlights, among others:

The changing workplace (page 9) – The history of Comma Soft is also the history of technology: a journey through progress, from the early days of networked work to the age of AI.

The path to becoming a digital champion (page 44) – Our blueprint for companies to implement digital transformation in a structured and successful way.

Stephan Huthmacher in conversation (page 72) – The founder of Comma Soft reflects on 35 years of innovation and shares his vision for the future.

As Galileo said: „Curiosity is always the first step towards solving a problem." We hope to spark your curiosity with a broad range of ideas. As always, we look forward to your feedback. Feel free to send it to us at: **redaktion@humboldt-gruppe.com.**

And now, enjoy reading!
Yours,

Benjamin Sch

Benjamin Schulte
CEO

Content

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44
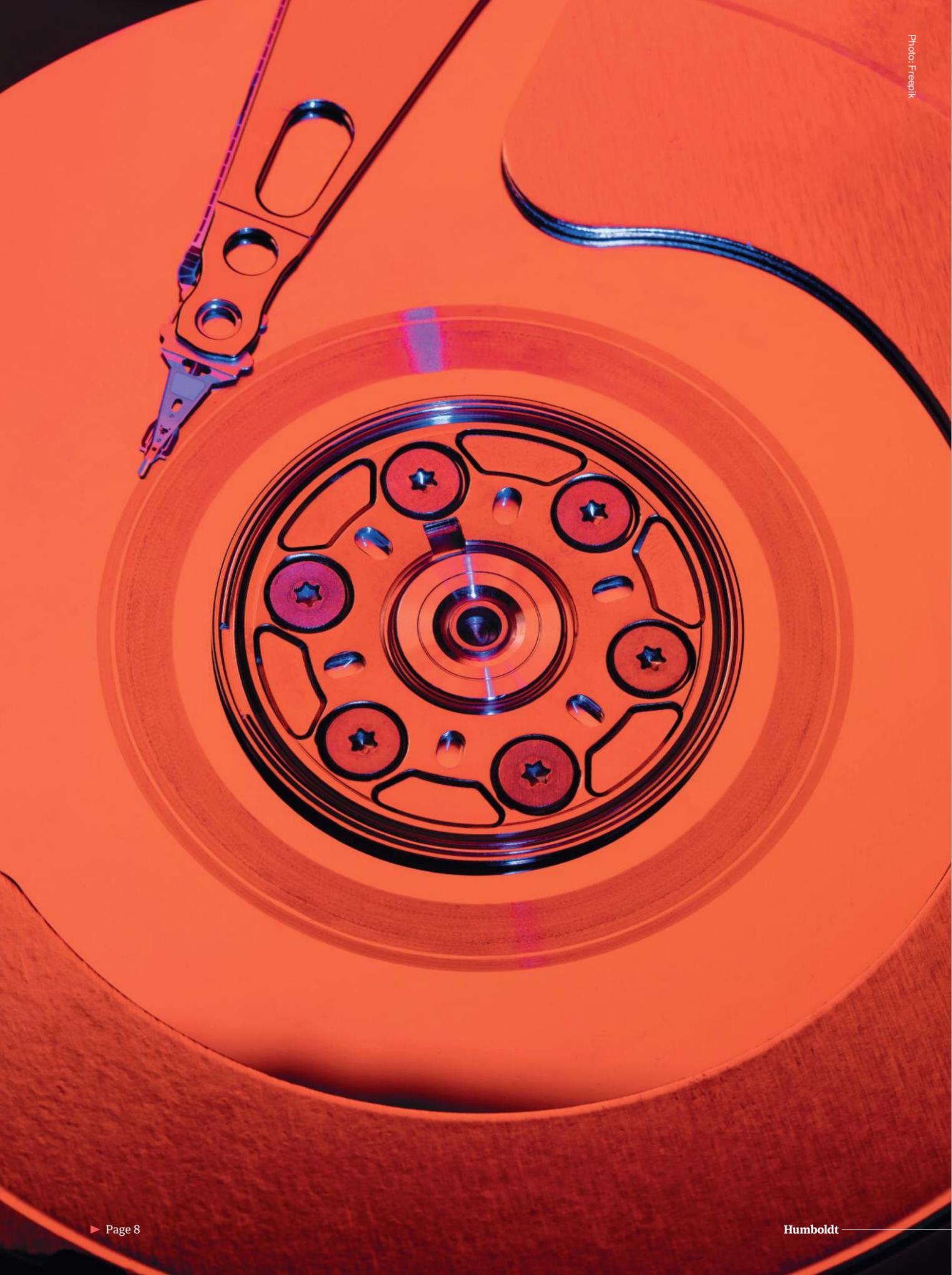
35 Years of Comma Soft

A journey through the history of IT

Since Comma Soft was founded over 35 years ago, technology has rapidly evolved, redefining our concept of work. The workplace is no longer a fixed location, but a state – mobile, connected, flexible. From the very beginning, we have contributed to this transformation as users, intermediaries, and developers. We have often been ahead of the curve, spotting developments early on and frequently pioneering new paths with our solutions.

Comma Soft was founded in 1989, at a pivotal technological turning point. At that time, traditional IT was evolving into modern IT, leading to the rise of networked information processing. In the decades that followed, the productivity of companies and public authorities became increasingly determined by how open they were to this development. As a result, consulting has often been not just about advice, but also about persuasion. Whether it's networked computers, infrastructure and knowledge management, cloud computing, data science, BI, or currently generative AI – the key question for leaders has barely changed: What real added value do these new technologies bring to our company?

For over 35 years, we have been working with our customers to find answers to this fundamental question, always tailored to the specific requirements of each case. In short: technology not as an end in itself, but as a catalyst for the evolution of the workplace and its associated processes. We would like to take you on a brief journey through the most significant advancements of the past few decades: What has changed, how, and what role have we as Comma Soft played in this?

Electronic storage media: The new level of data processing

From the mid-1960s to the early 1980s, punch cards were gradually replaced by electronic storage solutions like magnetic tape, which offered significantly better performance. In 1976, Wang Laboratories introduced the next step in digital storage with the 5.25-inch floppy disk drive – the classic floppy disk[2]. Just a few years later, Sony launched the first 3.5-inch floppy disk in a rigid casing, setting a standard that lasted well into the 1990s. These small, suddenly much more robust storage media elevated data processing to a new level. Instead of carrying around stacks of paper, employees could easily carry their data in their briefcases, read it on any compatible drive, and later edit it. Mobile computing was already on the horizon.

• 1980s

PC power to the people

The development of the typewriter gradually came to an end in the 1980s. Workplace computers with spreadsheets and word processing began to replace the now often electronic devices on desks. In particular, the IBM PC (1981) and its much cheaper compatible successors, as well as the Apple Macintosh (1984), revolutionized the world of work. While Apple was primarily used in the creative sector for its graphic capabilities, the IBM PC became the de facto standard in traditional business offices.

With the new digital tools, data could be processed and transferred quickly on desks. The computer mouse also fundamentally changed human-machine interaction. Starting in the middle of the decade, the first affordable laser printers gradually replaced the typewheel and dot matrix printers that had been commonly used until then, following a push by HP[3]. This shift not only improved document handling but also paved the way for desktop publishing.

The digital transformation was already being felt everywhere, challenging many of the familiar routines. It marked a crucial step toward the modern workplace we know today. As a result, attitudes toward computers began to shift. The new paradigm of office work: moving away from data centers, toward decentralized computing power and data processing with small, powerful, and graphics-capable desktop computers. The rise of workstations and PCs also changed user expectations. Users increasingly demanded the ability to independently process and analyze data at any time and print documents themselves. Despite initial skepticism, many managers came to the realization that by opening up their data and information, they could better manage their companies.

The computer was transformed from a simple data processing tool into a decision-making aid for critical business issues, capable of significantly enhancing a company's competitiveness. Its ability to greatly increase the strategic value of data and improve efficiency

[2] https://archive.computerhistory.org/resources/access/text/2013/05/102657925-05-01-acc.pdf

[3] https://www.hp.com/hpinfo/abouthp/histnfacts/museum/imagingprinting/0018/index.html

• 1890s to 1970s

High-tech punch cards

Today, it's hard to imagine, but up until the 1970s, paper-based methods and analog processes dominated everyday data processing. Hermann Hollerith, an American engineer and founder of the Tabulating Machine Company (which later became IBM), laid the foundations for this with his punch cards and tabulating machines at the end of the 19th century. Although extremely fragile and cumbersome by today's standards, the storage medium dominated the IT landscape well into the 20th century.[1] This not only made things laborious but also resulted in a high susceptibility to errors and a similarly significant amount of effort required to fix them. Just one incorrectly punched hole or a wrongly placed card could quickly bring the entire operation to a halt, making all scheduling and budget planning obsolete. It's no wonder that access to the mainframe computers processing these cards was strictly limited and reserved only for specialists at the time.

[1] https://www.hnf.de/dauerausstellung/ausstellungsbereiche/galerie-der-pioniere/herman-hollerith-1860-1929.html

made these new tools highly attractive to businesses. For example, they enabled comprehensive analysis of company data in areas like controlling and marketing, provided access to key business metrics and information, and offered deeper insights into customer needs, trends, and markets. This enabled companies to target products and services more specifically at customers – all factors with the potential to have a direct impact on operating results.

Left: IBM PC (1981), right: Apple Macintosh (1984)

The founding of Comma Soft

Once companies, authorities, and institutions recognize the value of decentralized data processing, the demand for seamless computer networking and electronic data exchange arises. The need for consulting services in the business world grows exponentially, while in-house expertise often still stems from the era of centrally organized IT.

Together, these developments created the foundation for the establishment of „COMMA, Kommunikation, Marketing & Medien GmbH" in October 1989 – now known as Comma Soft AG. The founding vision: to make the value of networked workstations not only recognizable but, above all, usable for customers. At the time, the client-server concept and Microsoft's backend system formed the basis for this. The goal of the still young COMMA was to provide solution-oriented consulting, deliver the latest software and hardware technology directly, and offer comprehensive support for implementation, training, and maintenance.

Software development was also a key part of the founding vision. On one hand, application software was developed to enhance customers' work processes; on the other, system software and add-ons were created to help companies retrofit missing features in Microsoft's back-office products of the time, enabling their use in larger organizations. In the early years, many companies could only meet all their IT infrastructure requirements by retrofitting these solutions. This provided the perfect backdrop for Comma Soft, still in its early stages, to fully engage with the new Microsoft technologies and corresponding backend products from the ground up.
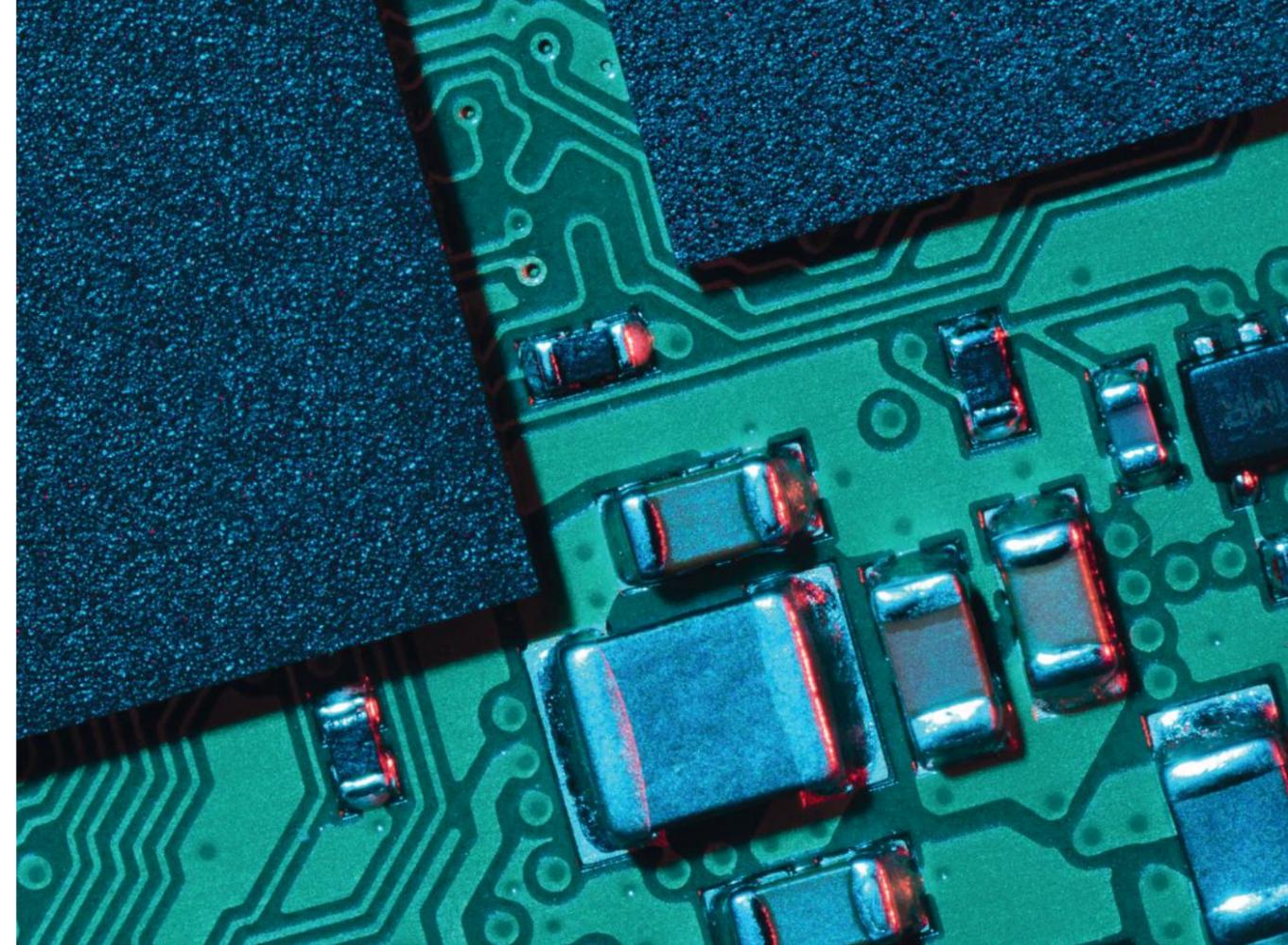
• 1990s

Full throttle for networking

I n the 1990s, workplaces were becoming increasingly digitized. Computers, monitors, and input devices became more common alongside the filing cabinets. Comma Soft had just twelve employees in 1990 and embodied the spirit of a modern start-up. The team was captivated by the latest technologies and the opportunities they presented – particularly in terms of their strategic business value for companies. This commitment remains a core part of Comma Soft's identity to this day.

"From the very beginning, we've continually explored new frontiers in technology and IT strategy – and made them accessible to our clients. Throughout, we've stayed true to our vision: delivering the right information to the right place at the right time, instantly available at the touch of a button. That's been our guiding star for the past 35 years. Bill Gates captured it perfectly in just four words at the Comdex trade fair in early 1990: 'Information at your fingertips.' At the time, we didn't know where this path would lead us. But we were certain of one thing: this was the future, and we were standing at the beginning of something big."

Stephan Huthmacher, Founder of Comma Soft

Presenting the future – Comma Soft wins over major enterprise clients

The demand for modernizing work through networked PCs continued to grow in the 1990s. While new programs were constantly being introduced, text and data processing remained the primary applications for the time being. Microsoft responded to this demand with its own client-server architecture. Comma Soft recognized the advantages and future potential of this technology, becoming the first German Microsoft partner for back-office products. The spark that ignited the success of this collaboration was a presentation organized by the Comma Soft team in 1990 for around 100 professional users from major enterprise clients, held on the Venusberg in Bonn. At the heart of the demo: Comma Soft and Microsoft jointly presented Microsoft's new backend technology – including OS/2 LAN Manager and SQL Server – for the first time in Germany. Communication with mainframes via 3270 terminals was just as important at the time. The open system architecture also supports this through the communication server.

The live demo demonstrates how flexible and powerful the new architecture truly is by connecting to the mainframe computer of the "Gesellschaft für Mathematik und Datenverarbeitung" (Society for Mathematics and Data Processing) in Bonn-St. Augustin.

In 1990, Stephan Huthmacher and his team became the first company in Germany to showcase Microsoft backend technology to around 100 key account users.
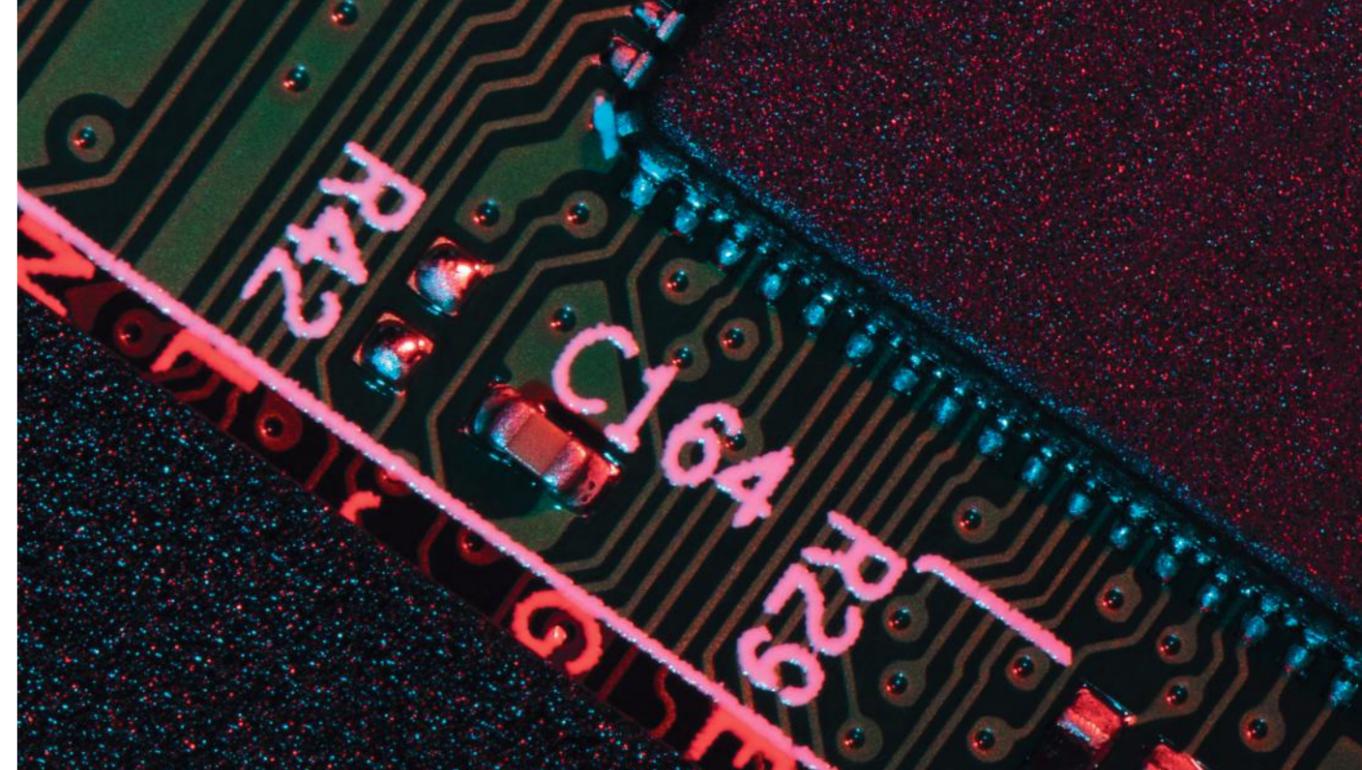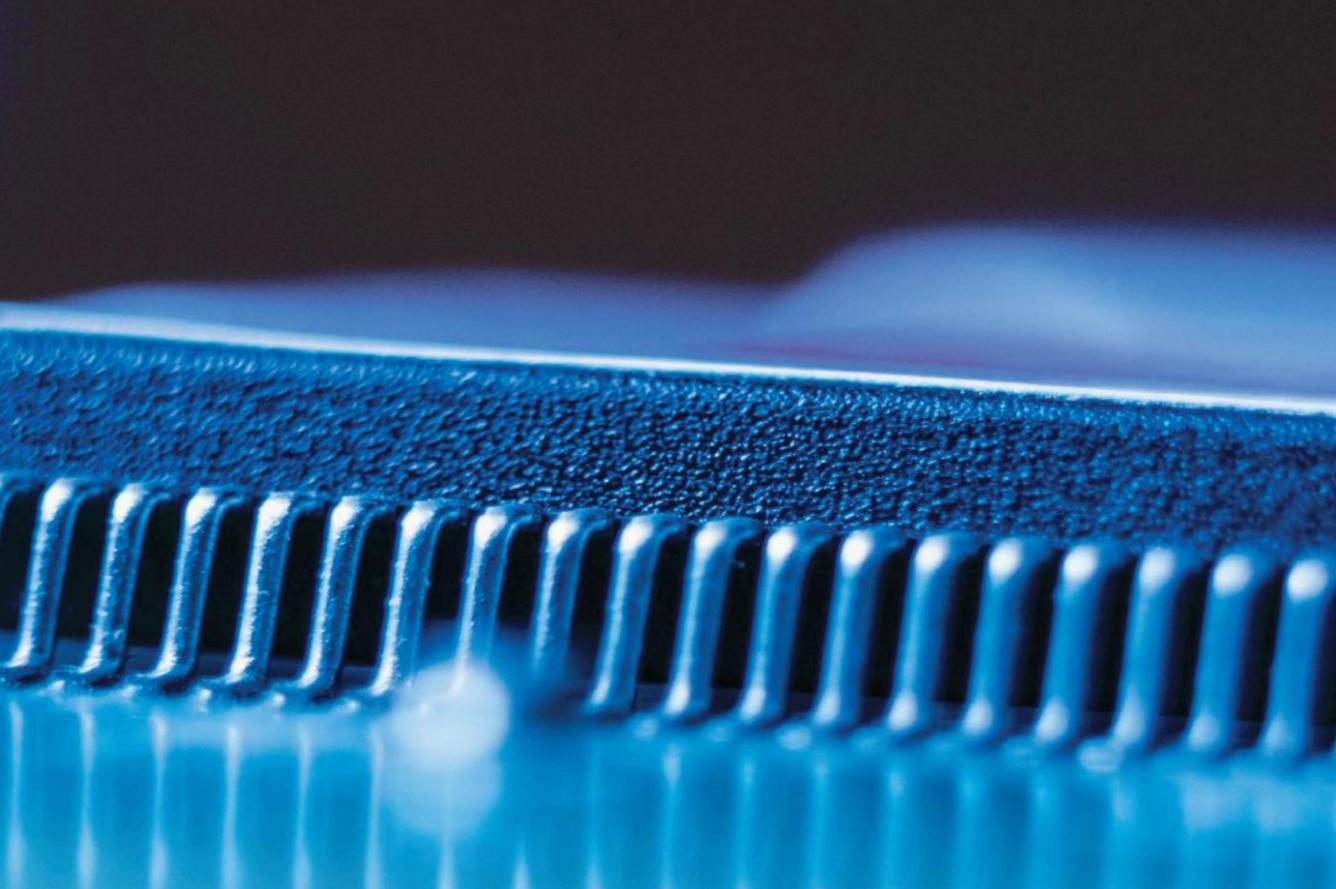
A town embraces decentralization

Comma Soft's first major consulting and implementation project came from a medium-sized town in North Rhine-Westphalia with 50,000 residents. At the time, the city administration stored its data on a mainframe at the municipal data processing center. Comma Soft was tasked with connecting the analog workstations to modernize and streamline workflows. This was a perfect match for the digital agenda of the young consulting firm. Our proposed solution: servers running OS/2, a new network and user management system, and networked Windows PCs, initially supporting Excel and Word. As part of the multi-year project, we also developed the "Council Information System" (RIS) for the town. The goal was to simplify and secure the day-to-day administrative tasks related to committee and town council meetings.

"What we built back then using distributed computer architecture to enable collaboration within the city administration was truly groundbreaking. We had to dive deep into the technology and develop new solutions that simply didn't exist on the market yet. Our success proved that persistence and creativity lead to results. That mindset is still part of our DNA today: when something doesn't work, we don't wait for the manufacturers – we find our own solution."
Dr. Wolfgang Dussa, Comma Soft

"We were awarded the contract because we promised to provide support at every location in Germany within eight hours. At the time, that seemed almost impossible, as technicians would typically have to travel to each site. The breakthrough: we were able to manage and maintain the systems remotely from Bonn, thanks to a remote maintenance solution we had already developed specifically for that purpose.**"**

Stephan Huthmacher, founder of Comma Soft

Ten times more affordable – without compromising on security

In 1992, a large federal ministry took a bold step into the future with a modern, standardized network. At the time, the prevailing expert opinion was that only Unix or Novell NetWare were suitable for professional environments, so the Microsoft LAN Manager wasn't initially considered. However, with a demo installation, Comma Soft quickly demonstrated that the ministry's goals could be fully achieved on this platform – and at a fraction of the typical cost. The clever part: the open interfaces of the Microsoft LAN Manager allowed us to implement software development tools that were precisely tailored to the ministry's high security requirements. With this combination of Microsoft LAN Manager and our own development, we were able to convincingly meet the very strict access and failure security standards. The result: significant efficiency gains, with operational management costs reduced by a factor of ten.

With this, Comma Soft successfully tackled a sensitive challenge. The project became a key reference, earning the trust of companies and institutions in data-sensitive industries. This is further demonstrated by new clients from the insurance and financial sectors, including a major health insurance association, individual insurance funds, and several large private banks.

In 1993 , another federal ministry also took a major step toward digitization: Comma Soft was tasked with supporting the implementation of a new information system for public administration. At the heart of the project was the migration of all office communications from Unix to Windows NT. In addition, the ministry required a robust communication architecture and a modern messaging infrastructure. Within this framework, Comma Soft designed and developed the technological foundation for future advancements. This flagship project in creating a "lean administration" received widespread recognition and became a gateway for Comma Soft to collaborate with numerous other ministries and companies.

Wide Area Networking for Germany's Trade Unions

The demonstration on the Venusberg also opened the door to the future for a major German trade union federation, which was determined to make real change in 1991. With a comprehensive test installation, Comma Soft successfully won the tender, despite competition from the industry's top players. The pitch: a nationwide, cost-effective office communications network based on Microsoft, designed to enhance efficiency. The task: equipping around 2,000 employees with PCs and networks across 200 offices in Germany. Soon, no workplace within the trade union federation would look the same: computers would replace typewriters, and no one would need to run to the printer to start a task – everything would be accessed directly through the network. With a new administrative support solution from Comma Soft, the federation could also eliminate the need for its own IT department. The result: savings of approximately 25 million euros, along with increased productivity and efficiency in the years that followed.

1993: Laying the foundation for software development at Comma Soft

From the very beginning, Comma Soft's core principle was the combination of consulting and product – a forward-thinking approach in light of the rapidly growing complexity of IT landscapes. Our first self-developed software solution, helpLINE®, clearly shows how consulting and custom solutions for enterprise clients can work hand in hand. This cross-industry, integrated solution for help desk management enables users to fully control the administration of the entire help desk process. This allows support teams to respond more quickly to incoming inquiries. At the same time, call tracking ensures transparency, and repeatable processes stored in a knowledge base make it possible to leverage the organization's collective experience over the long term. The approach paid off: just one year after its launch, Comma Soft had captured a 7 percent market share. This positioned the company as the leading provider in Germany and secured it fourth place on the international stage.

From WAN to web: Unlocking business intelligence with INFONEA®

The more client-server computing and the exchange between workstations became the standard, the more crucial consistent networking became. The emergence of the internet fueled this development exponentially.

From the mid-1990s, companies became increasingly aware that their accumulated knowledge was an indispensable asset for becoming more innovative, faster, and therefore more competitive. However, for this resource to truly create value, it became clear that effective knowledge management was essential – a principle that remains true to this day. After all, knowledge must be available exactly when it is needed.

"In 1998, the company generated a revenue of around 25 million marks with 113 employees. (…) Huthma-cher and his team of scientists, computer scientists, and economists are passionate about information and knowledge management: ‚Our vision is to make knowledge available at the touch of a button. Many companies often have no idea what they actually know. This is both an organizational and technological issue."
Computerwoche 01/1999

However, the perfect technical foundation to transform simple knowledge management into genuine business intelligence did not yet exist at the time. For this reason, Comma Soft developed its own new in-memory technology in the mid-1990s. This technology later became an integral part of the knowle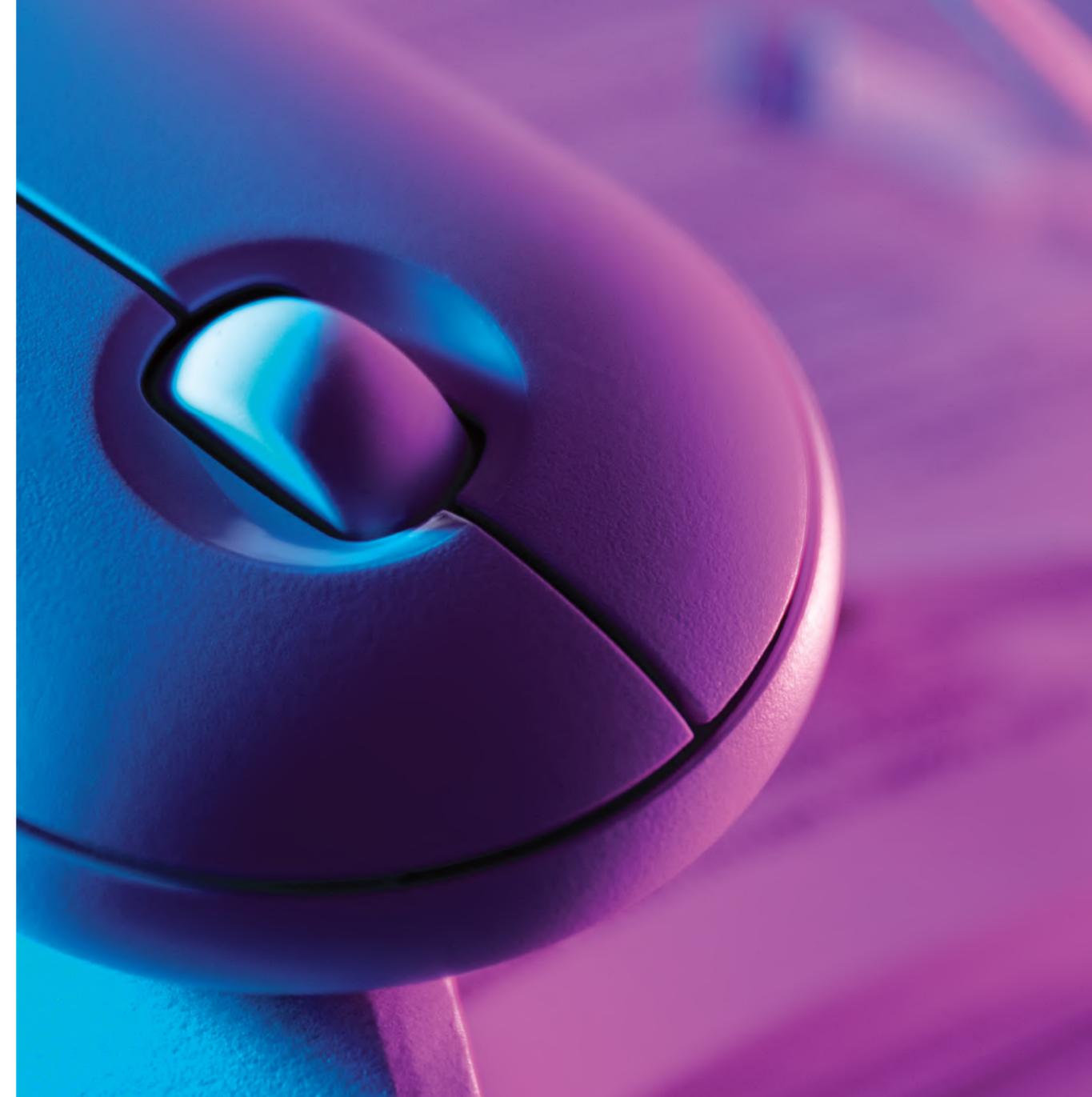dge management and BI solution INFONEA®, which was launched in 1995. The outstanding feature of the software was and still is the breathtaking speed at which it creates links between data and information. This enables companies to uncover previously hidden connections and insights. To increase speed in this way, Comma Soft developed an entirely new technical core. This allows direct access to data from the main memory – hence „in-memory." Together with a new mathematical model, this innovation provides structured, linked information that is condensed into knowledge almost in real time across the company. By quickly recognizing correlations, INFONEA® also answers questions that have not yet been asked. The result: access to all data storage, databases, and data silos, directly from your own workstation. The INFONEA® architecture is also well-suited for company-wide intranet solutions – a topic that gained significant momentum with the rise of web-based technologies in the second half of the 1990s.
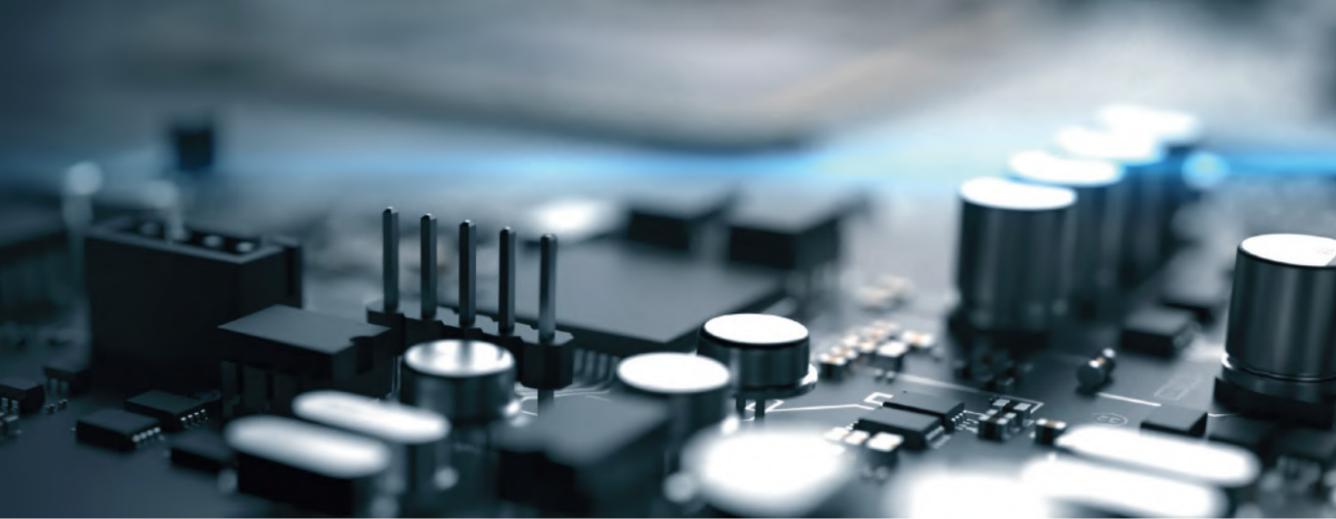
• The 2000s

Standing at the threshold of the information age

Der CIO als Business Enabler

With the advent of departmental computers and the first commercial software solutions in the 1980s, data processing became increasingly decentralized. More and more, business units began identifying their own needs and proposing innovations, while IT leaders found themselves serving a dual role – responsible for both data processing and overall organizational management. In the early days of IT, the typical agenda of an IT organizer was 80 percent technology, 20 percent business. But with the introduction of departmental computers – and later, the first PCs in operational departments – IT teams increasingly had to relinquish control over areas that were once firmly within their domain. Client-server computing marked a turning point, transforming the IT

department from a purely technical unit into a key strategic stakeholder in information technology – one that began to think more and more in terms of business use cases across departments. This marked the emergence of the Chief Information Officer (CIO), who increasingly served as a bridge between technology and business. By the late 1990s, it had become clear that IT wasn't just a cost center – it could be a critical driver of business success. With the rise of the internet as a new challenge, CIOs took on a central role: either developing new digital business models themselves or supporting business units with innovative concepts and cutting-edge technologies.

Complexity drives demand for consulting

By the end of the decade, these early CIOs and IT-savvy executives had become the driving forces behind digital transformation within their companies and across the broader economy. Every day, they faced not only an increasingly complex business environment but also a steady stream of emerging technologies – whose economic relevance they were often forced to evaluate under intense pressure. As the new millennium approached, one thing became clear: external partners capa-

ble of managing complexity with cutting-edge technology would be vital. Experts who can turn technological advancements into tailored solutions would be equally indispensable. At this time, Comma Soft was already delivering both: deep experience and a strong spirit of innovation. With a team of around 115 employees, the company had become one of Germany's leading innovators – winning over CIOs, senior executives, and family-owned businesses alike.

As the world approached the 21st century, public debate was also being shaped by IT – most notably by the Y2K or "Millennium Bug." The pressing question at the time: would computer systems and software be able to handle the transition to the year 2000 correctly? From today's perspective, it may seem almost quaint, but in 1999, there were serious concerns that many systems might crash or produce faulty data at the stroke of midnight – with potentially severe consequences for finance, healthcare, transportation, and energy infrastructure. System crashes, economic crises, and infrastructure failures were among the most hotly debated scenarios. In response, companies, institutions, and organizations took precautions – investing an estimated $300 to $600 billion to safeguard their IT systems and, by extension, protect the economy and society from the feared digital meltdown.[4]

Comma Soft was also part of the nationwide emergency plan on New Year's Eve, supporting the ministry's internal Y2K readiness efforts. A team of network and email infrastructure specialists joined the official Y2K emergency task force at a federal ministry, serving as the central point of contact with Microsoft to ensure preparedness for any possible scenario. There was a wave of relief when Microsoft customers in Australia – who rang in the New Year several hours earlier – reported no issues. The crisis team didn't get to enjoy a lavish

holiday meal that night, but they did manage to grab a hearty serving from the field kitchen's goulash pot – a welcome boost after a night of high tension.

But just as the world began to breathe a sigh of relief, the dotcom bubble burst on the stock exchanges in New York, Tokyo, Frankfurt, and London in March 2000. Trillions of investments in new technology markets like Nasdaq and Neuer Markt evaporated in an instant. Internet-based business models of many start-ups and technology companies were hit especially hard. The new economy faced its first wave of insolvencies. Meanwhile, the old guard had learned a valuable lesson: no longer paralyzed by the optimism surrounding agile start-ups, large companies and corporations were increasingly recognizing that there was no way around the foundational technologies of the internet, cross-location networking, and modern software and infrastructure.

Just two months later, on May 4, 2000, computers and systems around the world were hit by an uninvited and devastating guest. The email worm known as "Loveletter" – named after its subject line, "I love you" – spread rapidly across global networks. The result: an estimated $10 billion in damages to Windows systems alone. Even organizations that escaped unscathed became acutely aware of the emerging threats – and of the urgent need to secure their IT infrastructure. By this point, cybersecurity had become a permanent fixture in every IT department.

[4] https://www1.wdr.de/stichtag/stichtag-die-jahreswende-100.html

> **"**We were able to answer questions in five minutes that were previously impossible to solve.**"**

From 20 million data points to instant insight: INFONEA® at Deutsche Postbank

In the mid-2000s, a large German retail bank, following the acquisition of a building society, held more than 20 million customer records. To leverage this vast amount of data effectively, the bank commissioned Comma Soft to develop a business intelligence solution specifically designed to achieve this goal – to analyze customer data, transform it into meaningful profiles, and make these insights transparent for target group segmentation, product management, and marketing. Our consultants systematically achieved these objectives with the newly developed Postbank-INFONEA® platform.

With the new solution, bank employees were able to intuitively and in real time analyze millions of customer records as part of the customer management system, supported by a new data pool. This could even be done locally and on the go with the appropriate hardware. In addition to the processor-optimized code, INFONEA®'s in-memory technology played a key role in making this possible. The average response time on a high-performance laptop was just one to two seconds. For the first time in the history of the bank, authorized employees were able to perform complex operations without specialized IT knowledge – completing them in seconds instead of days.

This also had operational implications: the understanding of the needs of existing customers grew, and these insights also allowed for conclusions to be drawn about potential customers. The retail bank was able to actively offer the right products to both groups. This new data era also provided operational support for the acquisition of the building society. The case demonstrated early on how a large company could manage complexity with the right IT technology and turn it into a value-creating, competition-critical asset.

> **"**Now, we can ask questions that or competitors aren't asking.**"**

The new planning process in the bank's marketing department demonstrates how effectively managed complexity can yield significant results. The introduction of INFONEA® completely reshaped the processes involved in developing and marketing new products: previously, analysis of which customer segment a new financial product might appeal to was only conducted after the product had already been developed. The new data transparency allowed the bank to create precise customer profiles and detailed target group definitions based on predefined questions and evaluation criteria. Only on this basis were tailored products developed and marketed with precision. Personalization instead of a one-size-fits-all approach: with this new marketing intelligence, Postbank adopted a new credo in product offerings and customer engagement.

> **"**The tool represents a quantum leap in the efficiency of our work.**"**

Active Directory: A true game changer

In the late 1990s and early 2000s – or in Windows terms: from 98 to ME to 2000 and XP – implementing standard solutions from major providers became a core area of focus for us. Comma Soft emerged as a pioneer, especially in the rollout of Microsoft's central directory service, Active Directory (AD). AD formed the foundation of every Windows 2000-based network infrastructure. The innovation: it allowed IT departments or external consulting partners to assign rights and resources in Windows networks not just to individual machines, but to entire

groups of employees – and to adjust them as needed. This enabled enterprise-wide authentication and centralized password management. Instead of being stored on the local machine, this information was now managed by an AD server. This also marked the arrival of single sign-on (SSO): users could now access company-wide resources and applications with a single login – a change that had major implications for both workflows and IT administration. It was another key building block on the path to today's mobile computing.

IT goes mobile

The rapid pace of technological development also gave a significant boost to changes in work processes – or, more accurately, several boosts. With the rise of the internet, e-commerce flourished. The first web applications began to supplement, and in many cases gradually replace, stand-alone software products. Mobile devices became increasingly prevalent in businesses, with the 2007 iPhone making internet-enabled smartphones mainstream. These changes were further accelerated by the growing adoption of DSL, mobile broadband, and Wi-Fi – foundational technologies that would later support the rise of remote work, the Internet of Things, and cloud computing. This shift gained significant momentum with the launch of Amazon Web Services, followed by cloud initiatives from Google, IBM, and Microsoft with Azure. In purely technological terms, companies could already outsource their IT infrastructures. Howe-

ver, the real hurdle often lay in data security – an issue that remains just as relevant today.

The World Wide Web was also evolving. User-generated content was gaining importance, and social networks such as Facebook and LinkedIn were providing companies with entirely new opportunities to engage with and understand their target audiences. Web 2.0 (also known as the „social web") was born. Marketing and HR departments recognized these new opportunities and adapted their strategies accordingly. End customers and users could now also communicate and connect with each other more easily. This networking not only made authenticity in brand communication increasingly important, but it also increased the potential for fraud by criminal actors. This created a real boost for IT security: firewalls, antivirus protection, and encryption have remained key issues in cybersecurity to this day.

• 2010s:

When one hype chases the next

Cybersecurity became the central focus in corporate IT once again with the next wave of innovation. While internet use, business intelligence, and knowledge and complexity management gradually evolved, cloud and mobile computing made a strong impact. Between 2010 and 2013, the Bring-Your-Own-Device (BYOD) trend introduced a new paradigm that caused headaches for CIOs worldwide. More and more

employees wanted to use not only their personal laptops, but also the new internet-enabled smartphones and tablets – for work, personal use, and everything in between. Each additional external device integrated into corporate IT introduced a new attack vector. BYOD also highlighted how employees' attitudes toward their workplace and work itself had evolved: mobility became increasingly important, and the fewer restrictions, the better.

During this time, a carousel of trends, hypes, and buzz-words emerged, shifting rapidly and leaving a more or less lasting impact: from the Internet of Things to Industry 4.0 and the digital twin; from virtual reality to augmented and extended reality; from cloud computing to the platform economy; from data science to the data-driven company and big data; and from machine learning to deep learning to artificial intelligence. Change was rapid and increasingly disruptive, rather than merely evolutionary. The motto of this tech decade: „Move fast and break things." Established business models were sometimes pulverized overnight by dynamic start-ups.

All of this unfolded under the umbrella of digitization. While the term has existed since the advent of computers, originally referring only to the conversion of analog data and processes into digital form, by the 2010s it had evolved into a broader term encompassing the fundamental digital transformation across society, the economy, and public administration. For businesses, this always entails a digital transformation. It addresses not

only technologies and processes but also employees, corporate culture, and a radically changed customer relationship – aiming to achieve a sustainable realignment of business models, strategies, and corporate cultures in the new digital landscape.

At Comma Soft, we recognized early on the critical role that digitalization and digital transformation play in the competitiveness of companies. Not only in the consulting business, where we help our clients implement the latest technologies, but also in our responsibility to actively engage in the public debate on these issues. In 2015, Comma Soft took the initiative to launch the „Petersberg Declaration on Digitalization" at the annual „Petersberg Talks" congress. Signed by numerous decision-makers, we officially presented this document to the then EU Commissioner for Digital Economy and Society, Günther Oettinger, in February 2016. In 2017, we took the next step by inviting the public to engage in discussions on the topic – still new in the business context at the time – at the first „Discussion Forum on AI."

[5] Capgemini: Change Management Studie 2010.

Change Management

The dilemma of digitalization: The pressure to act is high, but companies often find it difficult to approach the change in an organized manner.[5]

1

Does your company have its own budget for change management/projects?

yes **26%**   no **74%**

2

How important is change management in your company in 2009?

- Very important
- Important
- Less important
- Insignificant

38 | 54 | 7 | 1
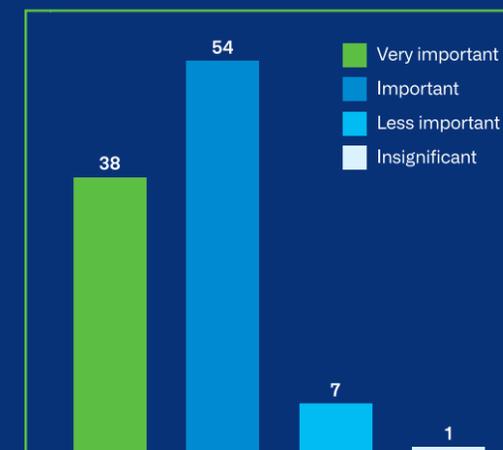
3

How important will change management be for your company in 2012?

- Very important
- Important
- Less important
- Insignificant

43 | 52 | 5 | 0
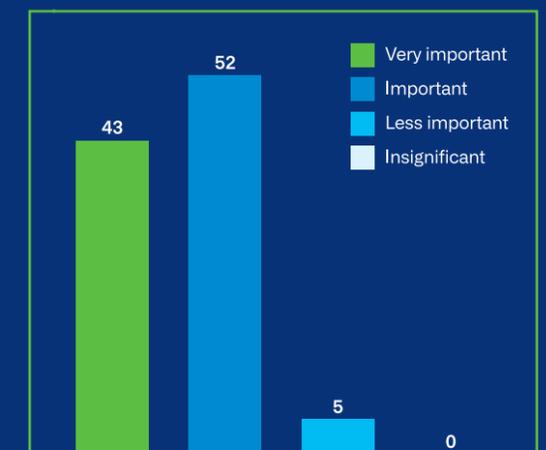
Source: © 2010 Capgemini Consulting
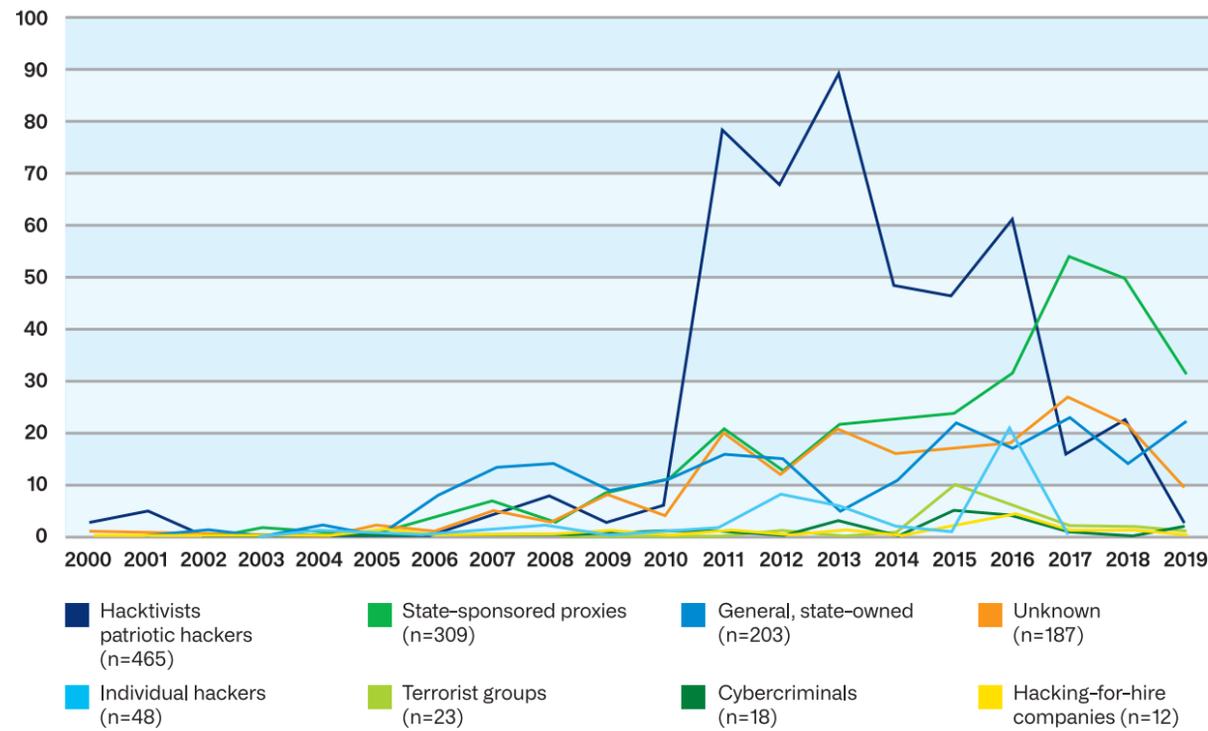
The rise of cyberattacks (2000 to 2019)[6]

Legend:
- Hacktivists patriotic hackers (n=465)
- State-sponsored proxies (n=309)
- General, state-owned (n=203)
- Unknown (n=187)
- Individual hackers (n=48)
- Terrorist groups (n=23)
- Cybercriminals (n=18)
- Hacking-for-hire companies (n=12)

Zero Trust: How cybercrime is forcing IT departments to rethink their approach

At the beginning of 2010, a large-scale, targeted cyber-attack campaign once again severely undermined the sense of security within corporate IT. The „Operation Aurora" attack targeted several major US companies, including Google, Adobe, Yahoo, Juniper Networks, and others. The suspected perpetrators: state-supported hackers. This served as yet another wake-up call for the industry. Companies' network infrastructures were becoming increasingly complex, business processes were shifting more and more to the internet, and mobile devices had long since become essential for stable business operations. As a result, issues such as data security, corporate espionage, and cybercrime were rapidly moving to the forefront.

During this time, a paradigm shift occurred in how IT security risks were perceived. Until then, access and clients within the company's own network were generally considered trustworthy, and internal activities were not seen as a threat. To effectively defend against attackers, the focus was solely on building the strongest possible defenses on the outside. The classic „castle and moat" approach was increasingly called into question. Although the term emerged later, a comprehensive reassessment of security concepts, especially for protecting critical infrastructures, was long overdue. This laid the

[6] https://www.transcript-open.de./
doi/10.14361/9783839468883-007#read-container
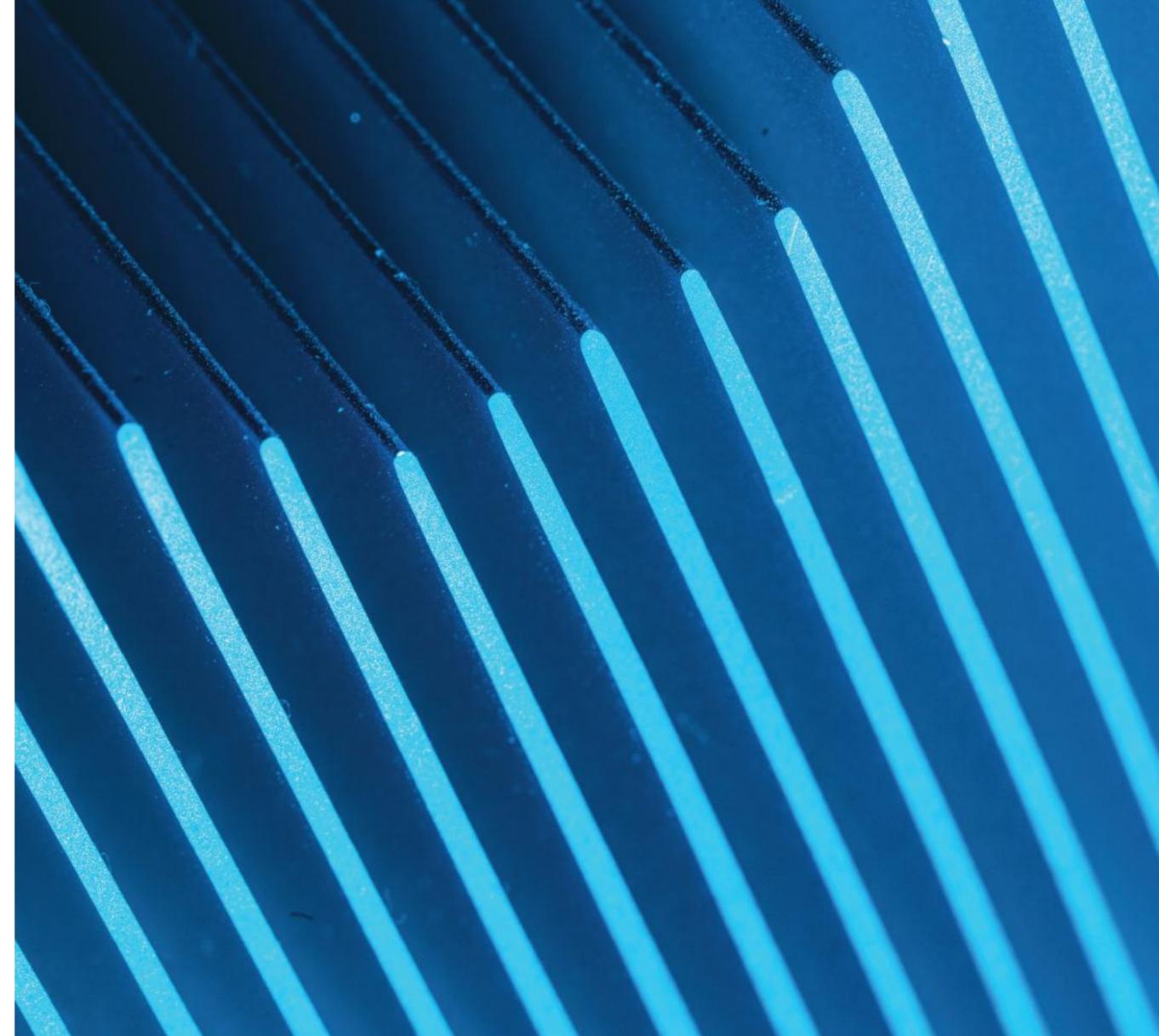
foundation for the Zero-Trust model, which remains the gold standard for network security to this day. The motto: never trust, always verify. Trust no user account, identity, valid password, or known device. Every access must be justified, and every request verified – whether it originates from inside or outside the network.

Comma Soft has been working with Zero Trust from an early stage. Since 2013, we have supported a large German conglomerate with an industrial focus in transforming its IT. In that year, the group began consolidating its identity and authentication solution, which had

been spread across many instances, and migrating it to a unified operating and security model. At the same time, we also supported the separation of the medical and energy technology divisions. From 2020, these measures formed the foundation for the company's Zero Trust initiative. We helped the group analyze and understand the complex environment. We then developed a comprehensive concept for the future technology stack, infrastructure, and operations – including all the technological and organizational challenges expected in this scope.

The fine art of separation

Our extensive infrastructure expertise has made Comma Soft a trusted partner for complex projects, particularly in the context of mergers and acquisitions. One of our first clients in this area was a German automotive manufacturer. In 2007, when the company sought to divest its U.S. subsidiary, we developed the corresponding IT separation strategy and implemented it in close collaboration with the client's IT department. Nearly fifteen years later, we supported the same client with a second global IT separation – this time, carving out an independent product division from the larger corporate group. Both infrastructure projects have been extremely successful. They were so complex and extensive that they significantly expanded our expertise in this area. The first-place award in the „Technologies" category at the WirtschaftsWoche „Best of Consulting Award 2024" highlights just how satisfied the automotive client is with our work. This award is not given by an independent jury, but is based entirely on feedback from the clients we have supported.

Cloud and mobile computing – the force of the platform economy

Six months before Microsoft launched the era of large-scale cloud computing in 2010, Comma Soft had already developed a cloud migration strategy for a leading German automobile manufacturer. Since then, we've been actively advancing the topic, helping companies fully leverage the technology's potential – whether by building their own platforms or transitioning to a data-driven business model. At the same time, another megatrend – the platform economy – gained momentum. Companies no longer aimed to grow „for themselves" but sought to establish pioneering platforms that would attract as many participants as possible. This phenomenon had a Darwinian side effect: „The winner takes it all." The best platform prevailed, while the others fell behind.

This was driven by the network effect. The value of a platform increased with its adoption rate – fueled by more paying corporate customers, as well as end users connecting with more like-minded individuals. This placed the operators at the central interface between providers and customers – directly drawing from the data source.

Benjamin Schulte, now CEO of Comma Soft, at CeBit 2012

Anyone who could analyze this data, identify patterns, and create customer profiles gained valuable insights. This was precisely the foundation for the success of Google, Amazon, Apple, Facebook, and Microsoft – companies that continue to dominate the platform economy today. Meanwhile, many more specialized B2B platforms, such as Salesforce AppExchange, Faire, and SAP Ariba, were establishing themselves in the market.

Business Intelligence: The oil refinery of the 21st century

An often-used comparison today: „Data is the oil of the 21st century." No surprise, as the entrepreneurial reassessment of data's relevance often drives the fundamental transformation of entire business models. If data is the oil, then modern BI and analytics solutions are the refineries. They convert raw data into valuable insights and tangible business value, significantly enhancing competitiveness. This requires powerful algorithms and analytical tools – technologies that have long been our core competencies.

What the platform economy represents for handling data at the macro level, data-driven companies embody at the micro level. However, it will take some time before traditional companies fully recognize the true value of their own data – particularly their process data. In this area, we've been supporting our clients from an early stage, helping them store data in an organized way, ensure its quality, and analyze it with intelligent tools – turning it into a strategic resource for long-term business success. We systematically analyze our customers' data silos using modern big data and analytics technologies. This approach yields valuable insights – for instance, to optimize the operation and proactive maintenance of systems, machines, and engines, or to analyze customer behavior. The success of such projects depends entirely on data quality. The rule of thumb: „Garbage in, garbage out." Even the best analysis tools and data analytics concepts are only as good as the data they analyze.
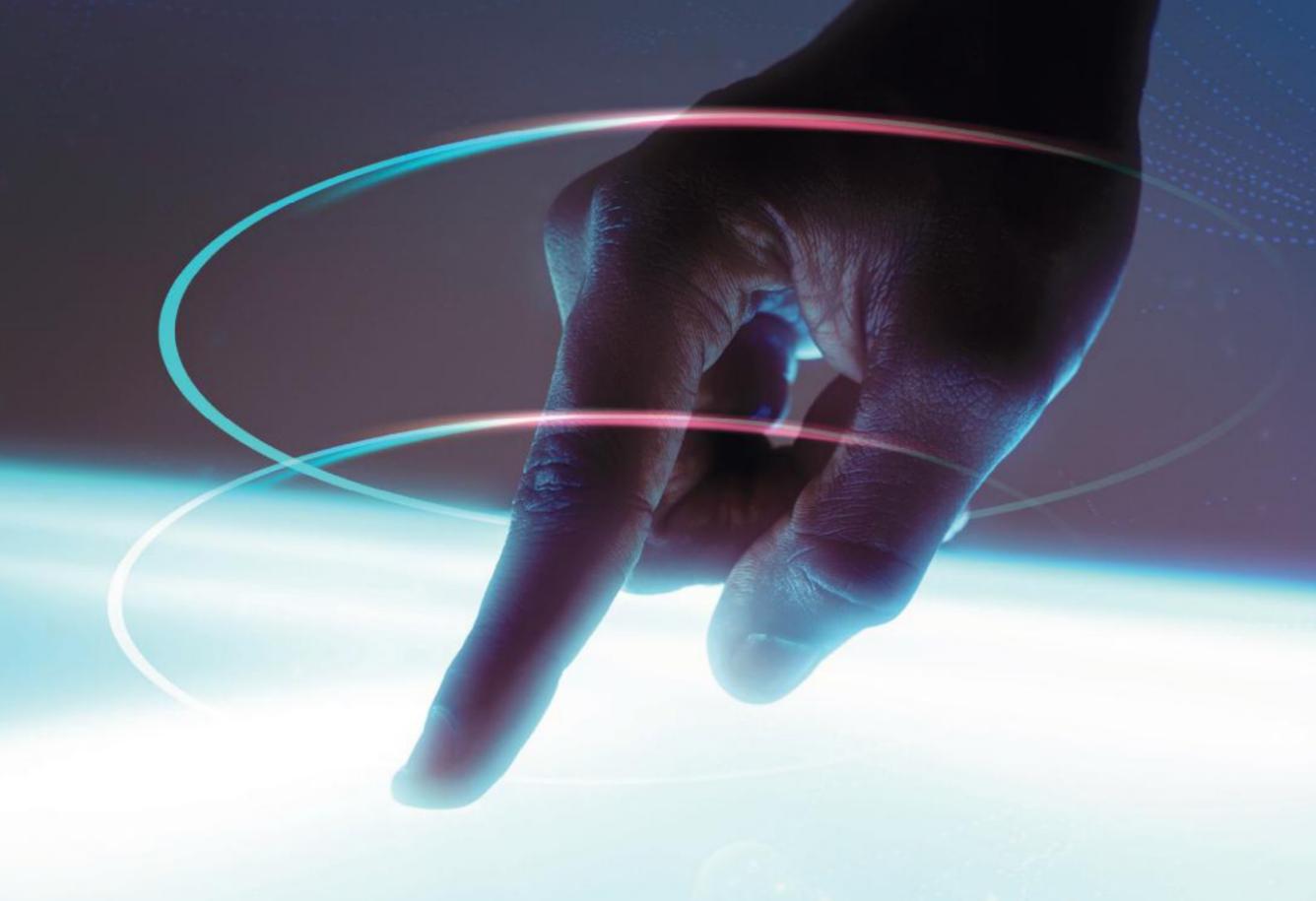
The dawn of a new AI era

Natural language and handwriting recognition, the first victory of a computer over a chess world champion by IBM's Deep Blue, and even the introduction of an early agent-like assistant with Microsoft's Clippy: by the late 1990s, artificial intelligence was steadily making its way into the headlines, driven by increasing computing power, smarter algorithms, and rapidly growing volumes of data. As a result, AI also began moving into the spotlight for both businesses and society. Nevertheless, the breakthrough was a long time coming. It wasn't until 2012 that the topic gained momentum again after a long period of dormancy. The new hot topics: machine learning, neural networks, and deep learning – which goes far beyond mere pattern recognition. Computing power has since surged, thanks to parallel processing architectures on graphics cards, which handle the new AI tasks much faster and more efficiently than traditional processors. NVIDIA is leading the way in this area: the company's CUDA architecture has matured over the past six years, and the corresponding hardware is now widely supported by production-grade software. This enables data- and performance-hungry neural networks to be trained efficiently and at scale – a technological leap that is massively accelerating AI development.

In 2016, AlphaGo from DeepMind finally defeated the Go world champion, Lee Sedol. It was an impressive demonstration of the capabilities of learning machines using neural networks. The rule-based brute-force method employed by Deep Blue 20 years earlier now seemed like a technology from the Stone Age. In contrast, AlphaGo and, a year later, AlphaZero relied on reinforcement learning. AlphaZero even operated completely without human instructions. It learned by playing – guided only by penalties and rewards that optimized the AI's learning process.

For us at Comma Soft, this was just the beginning. The business world also started to take notice. As AI systems became more powerful, the immense potential of this technology for companies grew even greater.

Data-driven research networked worldwide: FASTGenomics

At Comma Soft, we have long been closely connected to scientific research. One example of this collaboration is FASTGenomics, a platform we developed in 2014 in partnership with the LIMES Institute at the University of Bonn. It provides a secure cloud infrastructure for managing and analyzing large volumes of biodata. With interactive and AI-powered analysis tools, researchers worldwide can efficiently analyze complex genetic and cell biology data and share their findings with the broader research community.

The „Human Lung Cell Atlas" demonstrates the true performance of FASTGenomics. The project, part of the European research program DiscovAIR and led in terms of information technology by Comma Soft, uses AI to provide precise insights into the cellular structures of the human lung. This is especially aimed at benefiting the treatment of chronic degenerative lung diseases such as COPD and ILD. Researchers can then make the data obtained available to the global network for further analysis via FASTGenomics. The collaboration platform also allows the findings to be shared with pharmaceutical companies.

During the Covid-19 pandemic, science and industry initially had limited access to research data on the progression of infections. Being able to share findings quickly and in compliance with data protection regulations was also a significant challenge. In this context, we were able to quickly contribute to the solution with an effective development, this time in collaboration with a German health research center. The result: Immuno-Hub, an analytics platform for distributed learning that enabled researchers to quickly gain and share insights about new virus variants and their effects.

Our commitment to data-driven technologies in the research and industrial sectors extends well beyond FASTGenomics. Our Pharma & Life Science team regularly supports companies in the fields of machine learning and generative AI to optimize the processing of large volumes of unstructured research data across the entire value chain: from preparing complex biological datasets, identifying biomarkers, and optimizing production processes, to providing data-driven decision support for improving clinical trials.

- ## 2020s:

The post-industrial revolution

In the first half of the new twenties, the modern IT landscape is once again undergoing a multifaceted upheaval. The pandemic, in particular, which disrupted everyday life in Europe by early 2020 at the latest, served as a catalyst for technological advancements. Lockdowns forced work processes and IT infrastructures to be overturned and reinvented almost overnight. This accelerated the acceptance of digital solutions – far beyond the business world. Our day-to-day work as an IT consulting partner for companies of various sizes made one piece of wisdom particularly clear to us during this time: those who are adaptable are resilient.

AI's iPhone moment

In November 2022, the iPhone moment of generative AI occurred: OpenAI introduced ChatGPT, a chatbot based on the already-researched GPT-3 model, marking the debut of the first publicly accessible generative AI. Although still in its research preview stage, even experts were surprised by its capabilities. What's even more remarkable is how quickly the once-niche topic of artificial intelligence gained global acceptance. The telephone took 76 years to reach 50 million users, the computer reached this milestone in 14 years, and the internet took only four. ChatGPT, however, reached 100 million users in just two months – an achievement that outpaced all previous milestones.

Whether it's ChatGPT, Claude, or Perplexity, whether for text or image generation, or for audio or video synthesis: generative AI presents a wealth of new opportunities and significant potential for business operations. Our clients are already recognizing both the opportunities and risks of GenAI. The questions it raises are not only complex from a business management perspective but often delve into ethical or philosophical realms. The rise of generative AI continues to feel like a Copernican revolution for the workplace and work processes. It is a major disruption, a catalyst for opportunity, a disruptive force, and a Herculean regulatory challenge all at once. The algorithms of large foundational models no longer just recognize patterns; they now generate text, images, music, and code. All of this is produced at a quality that increasingly rivals the creative and cognitive abilities of humans – often relying on the liberal use of their intellectual capital.

Companies are no longer asking if they should use AI – but how and to what extent. However, instead of rolling out smart tools and cobots on a large scale or initiating sweeping transformation processes, companies often start by implementing solutions gradually. This development is picking up speed as the potential of generative AI becomes more apparent. The tasks are gradually becoming more complex: drafting proposals, emails, and texts, designing PowerPoint slides, easing the burden on customer service, speeding up programming, and managing knowledge. GenAI automates routine tasks, supports creative work, accelerates decision-making, and frees up time for core priorities.

However, technology is no guarantee of quick success. It requires commitment, planning, time, and expertise. There is no one-size-fits-all manual for its use. Every employee contributes to this process – through their day-to-day interactions with the technology. Only those who share this experience and consistently build new skills in working with this foundational technology can integrate AI meaningfully into existing processes, further develop it, and tailor it to their specific needs.

At the same time, generative AI is easy to adopt, and the corresponding investments can be planned and tailored to individual needs. Lock-ins are rarely an issue. This makes the technology particularly well-suited for SMEs and family businesses. It is already fundamentally changing how leaders work. Establishing such solutions across the organization requires not only technology practices set from the top down but also a culture of experimentation actively encouraged, along with the creation of safe spaces.

New foundational technology, new roles, and new questions

However, it is not only managers, but also employees, freelancers, and the self-employed, who are increasingly redefining their roles in interaction with intelligent machines. The central questions are consistently similar: How can companies become more efficient, productive, and competitive through the use of AI? How can generative AI be meaningfully integrated into business processes – and where should they start? What risks need to be considered, such as those related to data protection and copyright? How trustworthy is the output? Is it enough to simply try it out, or is a comprehensive strategy required to successfully integrate this new foundational technology? And how can companies get their employees on board and encourage them to use AI assistants to seek answers to these questions themselves? After all, acceptance and a willingness to learn are crucial for ensuring that new disruptive technologies contribute to the company's success.

AI-as-a-Service with Alan by Comma Soft

Companies are increasingly questioning whether they should use the LLM products of market leaders or develop their own applications internally – based on valid data and tailored to their specific needs. How can AI be seamlessly integrated into existing business processes in a customized, practical, secure, and efficient way? This is where we step in with Alan. We developed our GenAI colleague as an AI SaaS solution with the goal of providing our customers with efficient, privacy-compliant, and application-focused AI support. Alan can deliver enterprise knowledge in real time, is fully GDPR-compliant, meets all regulatory compliance standards, and enables companies to process their data securely and independently, without compromise.

Comma Soft is currently implementing Alan in insurance companies, banks, and manufacturing firms. However, the solution is generally suitable for companies of all sizes.

"With Alan, we're working to establish EU-compliant use of generative AI that can fully realize its potential across the entire organization. Our efforts center around four key priorities: seamless integration, robust security standards, open access for all employees, and the cultivation of a transparent AI culture. The first implementation projects with Alan and other AI solutions have already seen great success. We firmly believe: GenAI is far more than just a passing trend."
Benjamin Schulte, CEO at Comma Soft

Remote work and the future of work

We can't reflect on the present without addressing one of the most profound transformations in the modern workplace in recent years – one that also marked a lasting IT trend: the shift to remote work triggered by the pandemic. Companies that had previously relied on traditional workplace models were forced to pivot to remote setups at unprecedented speed due to Covid-19.

At Comma Soft, remote work had already been well established by that time – not as the sole form of collaboration, but as an integral part of our daily routine. We had also implemented remote work strategies

Looking back, I'd say Comma Soft not only enabled virtual collaboration for its clients, but also led the way by setting a strong example."

Elke Eusterholz, Principal Consultant at Comma Soft since 1998

With this unavoidable technological pressure, the need for a secure IT infrastructure is also growing. Cyberattacks on the numerous remote workstations connected to the company network are increasing significantly, making VPNs, Zero Trust, and endpoint security solutions essential. According to figures from the German Economic Institute, cyberattacks in home
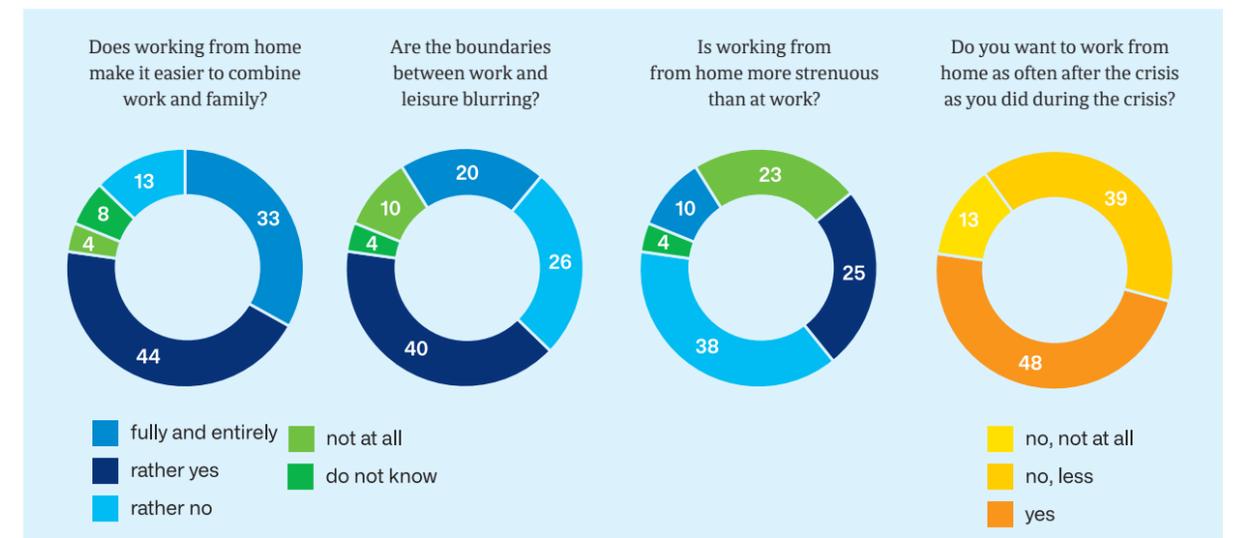
Employees are in favour of working from home even after the pandemic.[7]

in client projects, including for a major automotive manufacturer. Still, the suddenness of the situation in early 2020 naturally had an impact on us as well.

This was accompanied by a surge in the use of cloud services like Microsoft 365 and Google Workspace, as well as collaboration tools such as Zoom, Slack, and Microsoft Teams.

"Free choice of workplace and flexible working hours – what's taken for granted today, we introduced back in the 2010s. Thanks to tools like Office 365, SharePoint, and later Teams, along with the right equipment such as laptops and VPN clients, everything ran smoothly.

offices alone caused damage of around 52.5 billion euros in 2020 – 31 billion euros more than in previous years. While "new work" had often been met with skepticism in previous years, the pandemic gave the movement new momentum, significantly shaping the world of work. Alongside emerging technologies and new forms of digital collaboration, many companies began gradually redefining their work culture. Even more radical ideas are now emerging under the umbrella of "next work" – and these, too, are increasingly becoming part of corporate culture.

[7] https://www.boeckler.de/de/auf-einen-blick-17945-Auf-einen-Blick-Studien-zu-Homeoffice-und-mobiler-Arbeit-28040.htm

"Reflecting on 35 years of Comma Soft, I see a long and exciting journey – each stage marked by transformation. In many instances, we have actively contributed to shaping that change. And yet, it feels as though we are only at the beginning. I look forward to what lies ahead: to emerging technologies, to the continued evolution of Comma Soft, and to moving forward – always in close partnership with our clients."

Stephan Huthmacher, Founder and Chairman of the Supervisory Board

Rooted in the present – tuned into the future

Progress continues every day – sometimes in small steps, sometimes in great leaps. Automation and AI are playing an increasingly central role in digital workflows, while robotic process automation is fundamentally reshaping repetitive tasks. Intelligent tools support decision-making, and AI agents are now taking on even complex tasks more independently. New frontiers are already on the horizon, such as the convergence of quantum computing and artificial intelligence. Disruption remains a driving force of change – and is evolving from buzzword to everyday reality across many industries.

At Comma Soft, the new, the unknown, and every emerging development are a source of fascination. We welcome the opportunity to rethink creatively and explore new possibilities.

We aim to make technology practical by delving into its depth, exploring its potential and limitations, discovering its benefits, and making them accessible. This drives maximum efficiency gains and value creation. We share our experience as first movers with our clients – not only to enhance their competitiveness but, above all, to actively shape the future.

What guides us through change is the Comma Soft spirit – driven by curiosity, a scientific mindset, uncompromising quality standards, and a focus on solutions, not problems. □

The authors:

Stephan Huthmacher

Dr. Markus Knappitsch

Ayda Stommel

Sounds of Tech – The Retro Quiz

Over the past few decades, the technology at our workplaces has evolved rapidly – and with it, the sounds of the many devices we use. Can you still recognize the sounds of the past? Put your sound memory to the test in our quiz! The answers are on the back cover.

The full quiz is available on our landing page (simply scan the QR code at the top right).

Sound 1
Can you guess the sound?

Sound 6
Can you guess the sound?

Sound 2
Can you guess the sound?

Sound 7
Can you guess the sound?

Sound 3
Can you guess the sound?

Sound 8
Can you guess the sound?

Sound 4
Can you guess the sound?

Sound 9
Can you guess the sound?

Sound 5
Can you guess the sound?

Sound 10
Can you guess the sound?
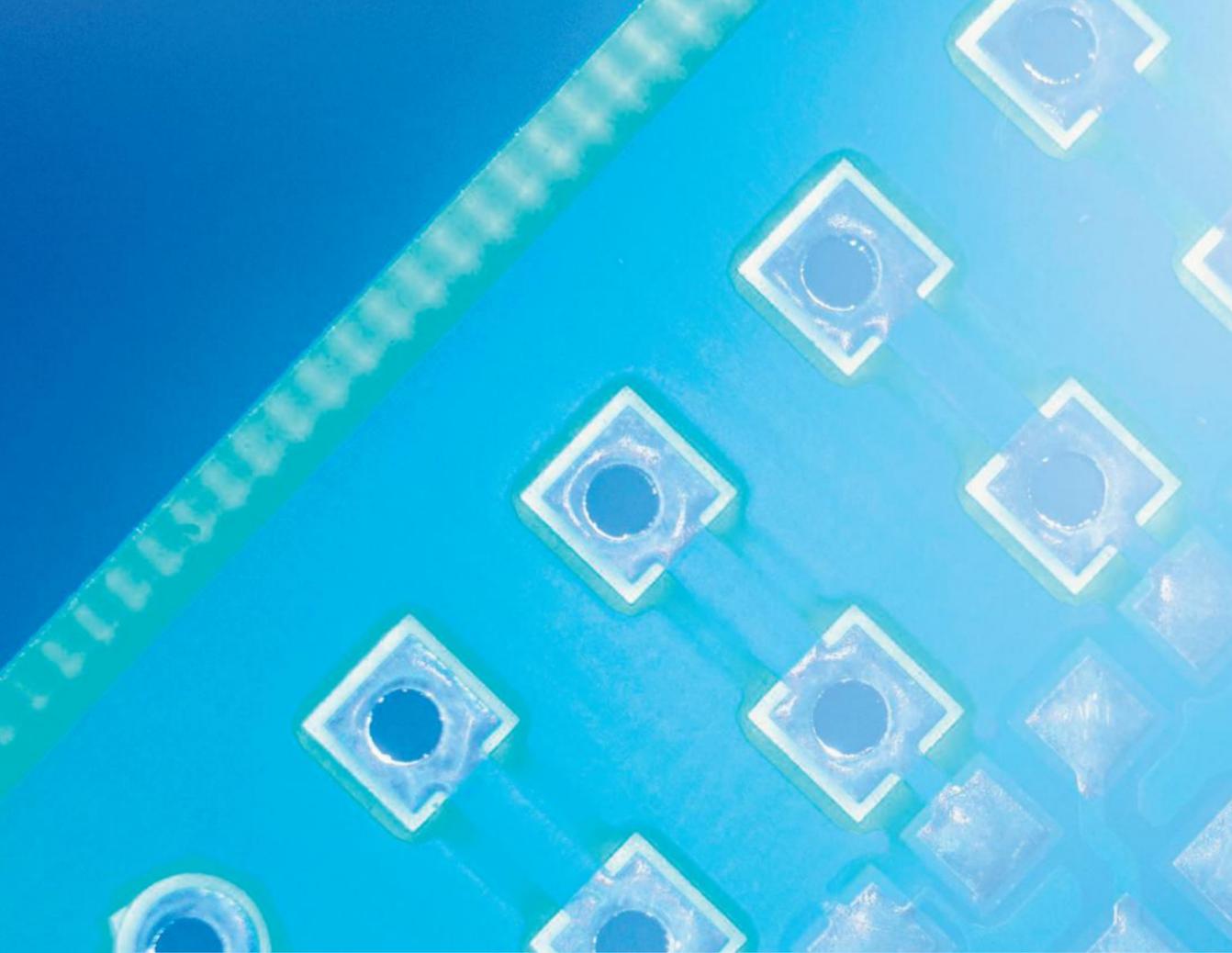
Quiz Answers

1. This is the sound of an IBM electric typewriter with a typeball head from the 1970s.
Source: Typewriter, IBM Selectric II by secretmojo

2. This was the original sound of a fax connection from the 1980s and 1990s.
Source: Fax Transmit, Beginning by esplin9466

3. This is the pause sound from Tetris on the Game Boy, circa 1989 (with a slightly dying battery).
Source: Nichols Electronics Omni Music Box – The Peddler. mp3" by theblockofsound235

4. That was the original sound of an IBM hard drive (DJNA-371350) from around 1999.
Source: hard disk drive IBM (1999) by viertelnachvier

5. In the early 2000s, a computer's boot time gave you plenty of time to make a cup of coffee.
Source: Coffee maker.mp3 by solifer

6. That was the Windows 95 startup sound.
Source: The Microsoft Sound.wav by goldenzoomi1

7. Today, things are much faster – but back then, the internet had a sound of its own: like this 56K modem dialing in, circa early 2000s.
Source: 56k Modem.mp3 by BlueNeon

8. Wait... were you just getting a call on your Nokia 3310, circa 2000s?
Source: nokia 3310 ringtone.mp3 by DerenMedeFromLeslieScotland

9. In 2020, most employees were working from home. Meanwhile, this is what the office sounded like.
Source: 03_empty office, ambient.wav by 16F_Panska_TisonD

10. Here's what it sounds like to flip through the print edition of our Travel Report.
Source: Browse Magazine.wav by justeluis

How we build bridges between science, technology, and industry

From research assistant to founder of an IT start-up: Comma Soft was founded by Stephan Huthmacher practically straight out of university. To this day, we maintain our close ties to the scientific community.

To foster exchange between science, technology, and business, Stephan Huthmacher launched the "Petersberg Talks" in 2005 – a platform for interdisciplinary dialogue among thought leaders and trailblazers from across these fields. Every fall for over 20 years, we have gathered there to explore the key questions shaping our digital future – through scientific, technological, societal, and cultural lenses.

Digitalization quickly emerged as a defining theme of fundamental transformation. Since then, recurring topics have included artificial intelligence, quantum computing, and the energy transition.

On September 27, 2025, the Petersberg Talks will take place for the 17th time. This year's theme: "Worlds of the Future – DeepTech and Science as Building Blocks for a Sustainable Legacy." In the meantime, we warmly invite you to visit our website, where you can explore past contributions and highlights from previous years – filtered by topics that matter most to you. We look forward to welcoming you! □

Below Deck
How Şeyma Aslan ventures into new worlds

Business administration, mechanical engineering, study abroad experiences in China, Thailand, and Turkey – and now IT consulting at Comma Soft. You've had quite an exciting journey, Şeyma. How did these experiences lead you to where you are today?

(laughs) Yes, my journey has definitely been exciting and full of variety. I didn't come from a typical academic background where a career in the sciences was mapped out from the start. But that hasn't been a disadvantage – quite the opposite. It gave me the freedom to explore, try different things, and ultimately find my own path. And that's exactly what I did.

I've always been fascinated by numbers – and by the world of tech. Maybe precisely because it wasn't something people around me talked about every day. But over time, just thinking about numbers in a theoretical way wasn't enough. I wanted to understand processes hands-on, bring products to market, and drive real change. That's why, after two semesters, I expanded my studies in Business Administration to include Mechanical Engineering. That decision set my life on an exciting new course. Mechanical Engineering gave me the practical depth I was looking for – and it opened new doors. My curiosity about the world led me even further: to China, Thailand, and Turkey.

Today, in IT consulting at Comma Soft, I'm able to bring both worlds together – bridging analytical thinking and hands-on implementation in projects to create real value. The path hasn't always been straightforward, but every challenge and experience has inspired and motivated me to follow my own direction.

It sounds like an exciting journey, but not always an easy one. Were there moments when you had doubts?

It certainly wasn't always easy to find my footing in a completely new world, and I had to overcome more than a few obstacles. But I've always known what drives me – what I'm passionate about – and I've pursued that path with determination, ultimately reaching my goal. I also see new fields or industries much like the exciting journeys I took during my studies and free time: new worlds waiting to be explored, full of adventure – even if things don't always go according to plan. I think that mindset carries over well into my current work. I advise clients strategically, with a focus on cybersecurity. In our projects, we regularly face new challenges brought on by an increasingly volatile world. But that doesn't discourage me – it fascinates me. I have the opportunity to actively develop solutions and support companies in tackling urgent problems. In the end, we don't just overcome a specific hurdle together – we come out stronger and better prepared for the future. What motivates me, time and again, is when clients say afterward: "Thank you – we're so glad we tackled this together and were able to make real progress."

As a consultant, your perspective matters: What advice would you give to people navigating new technologies, projects, or change in general?

For me, it's always been essential to stay engaged in ongoing exchange and to think beyond the obvious. I've made a point of getting to know as many colleagues as possible. Both peers and mentors have been invaluable – not just as professional role models, but also because they challenge my thinking and have helped me understand the importance of critical reflection. Fortunately, critical thinking isn't just useful on the job – it comes in handy in everyday life too. (laughs

I see a lot of parallels with traveling here, too: if you plan everything down to the last detail or book a package tour, you know exactly what to expect – until something unexpected happens. And that can always happen. So why not embrace a bit more flexibility from the start? When I travel, I plan the beginning and the end – but leave the stages in between open and spontaneous. Or, as we say in IT projects: I take an agile approach. That way, I stay flexible and open to discovery – whether it's finding something off the beaten path or meeting new people. Their experience and perspectives often spark ideas I never would have come up with on my own.

I want to encourage everyone to stay focused on their vision – while also being open to new experiences and thinking outside the box along the way. Change always brings an opportunity to grow and to discover new horizons. Stay curious and open-minded – because I truly believe that's the key to real progress and personal growth.

Şeyma Aslan *is an Associate IT Consultant for IT Strategy at Comma Soft. Outside of her consulting work, she's passionate about travel and actively advocates for equal opportunities.*

The Path to Becoming a Digital Champion

A roadmap for companies on the journey to effective digital transformation

AI, Zero Trust, and the virtual reality workplace: How can we navigate the path to an uncertain future?

In the previous article, we explored the historical development of digitalization over the past few decades. The takeaway was clear: the path has been complex and demanding from the very beginning. And we're still only at the starting line when it comes to tomorrow's challenges – because the digital world continues to evolve at a rapid pace, pushing companies to rethink established practices and act with greater speed. What's needed now more than ever: adaptability, innovation, and agility. The conditions are challenging: we live in an era defined by "VUCA" – volatility, uncertainty, complexity, and ambiguity. These have become the new normal. Technologies are evolving at a rapid pace, markets are shifting overnight, and customer expectations continue to rise. At the same time, it's nearly impossible to track and make sense of all emerging trends. From artificial intelligence and Zero Trust as a new cybersecurity paradigm to generative AI and augmented reality in digital collaboration or maintenance, the range of topics companies must evaluate and manage today is vast. Yet, it is precisely within this dynamic that a significant opportunity exists. Companies that actively drive change and advance to the next level of digitalization will be the winners of the future. So, the key question is: how do you elevate your company to the next stage of digital transformation?
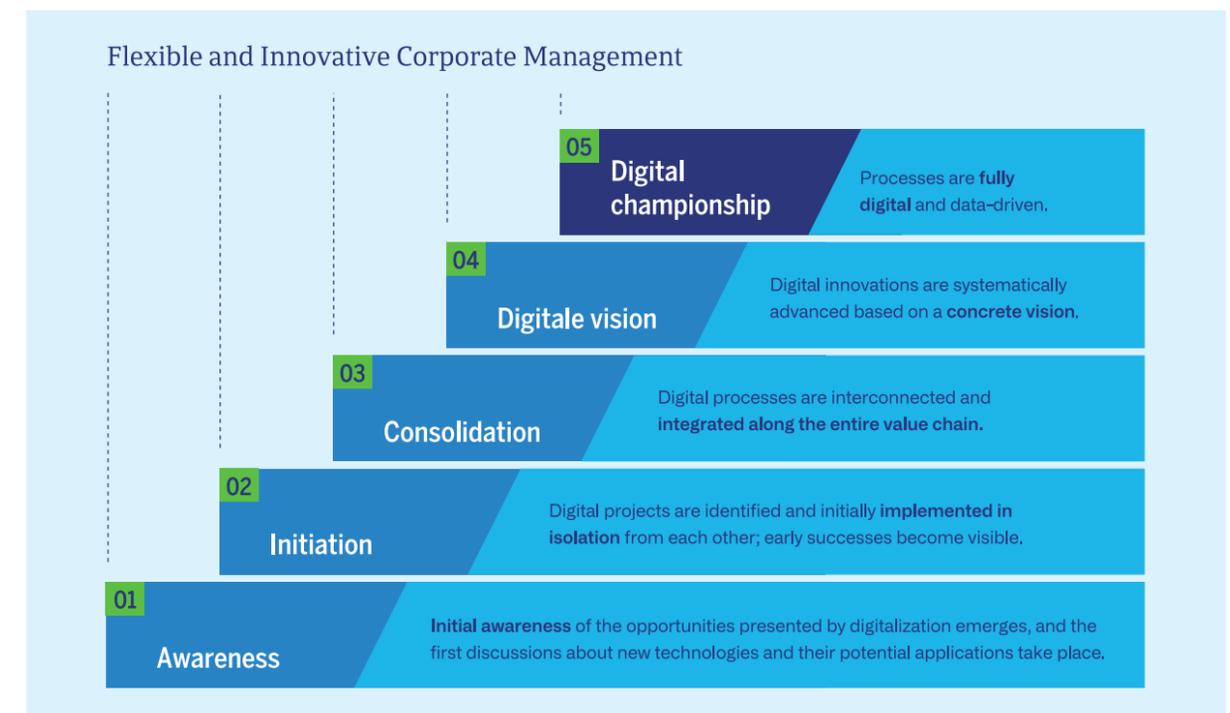
Positioning and starting point:
The digital maturity level

Knowing the digital maturity level of your company allows you to strategically plan the next steps for further development and make your company more competitive in the long term. We begin by providing you with a model to help position your company. Our maturity model offers clear guidance for assessing your company's digital positioning, enabling you to identify the concrete measures needed to reach the next level.

The model we're about to briefly introduce and will later use comes from our extensive consulting experience and serves as the foundation for our digitalization assessments. It has proven to be highly practical in numerous client projects. The model consists of five stages (levels) of digitalization. With a brief criteria checklist for each stage, you can easily assess where your organization currently stands.

Flexible and Innovative Corporate Management

05 Digital championship — Processes are **fully digital** and data-driven.

04 Digitale vision — Digital innovations are systematically advanced based on a **concrete vision.**

03 Consolidation — Digital processes are interconnected and **integrated along the entire value chain.**

02 Initiation — Digital projects are identified and initially **implemented in isolation** from each other; early successes become visible.

01 Awareness — **Initial awareness** of the opportunities presented by digitalization emerges, and the first discussions about new technologies and their potential applications take place.

This is where we come in. We provide a practical toolset designed to help you navigate this dynamic landscape and move forward. First, we introduce the proven Comma Soft model for assessing a company's digital maturity level. This model outlines the journey from awareness of digital transformation to achieving digital champion status, broken down into five stages. It helps you assess your organization's current position in the digital transformation process and understand the challenges and opportunities at each stage. What specific steps are necessary at your current stage? What strategic decisions need to be made?

We then introduce our system of nine pillars of digitalization: a structured approach that defines key areas of action. These pillars help to organize the complexity of digital transformation and focus attention on the most critical issues. The goal is to sort through the numerous challenges and make them manageable, creating space for meaningful developments. This methodology has proven successful in strategic collaborations with our clients and provides you with a valuable foundation to strategically advance your organization.

How can you elevate your organization to the next level of digitalization? Let's take a closer look at this.

01 Awareness

During this phase, awareness of the importance of digitalization begins to emerge. Managers and employees are increasingly recognizing the tangible opportunities that digital technologies offer for process optimization. Initial discussions take place regarding new technologies, their potential applications, and associated risks. The primary goal at this stage is to foster understanding and acceptance of digital transformation within the organization.

Where does your organization currently stand?

▶ Is there regular communication at the management level regarding digital opportunities and potential implementations?
▶ Has there been any collection and evaluation of how processes could be digitally optimized? Is there a regular exchange on this topic?

02 Initiation

The first digitalization projects are identified and implemented, often as proof of concepts (PoC). This phase is marked by tangible (though mostly isolated) initiatives, such as automating repetitive tasks or introducing and initially using digital tools (like early wikis, digital whiteboards such as ‚Miro,‘ or task boards like ‚Trello‘). Initial successes begin to emerge, but many activities remain disconnected, lacking a unified digital strategy.

Where does your organization currently stand?

▶ Have initial pilot projects for digitalization been identified and executed?
▶ Has the effectiveness of new technologies been tested in PoCs?
▶ Are digital activities still isolated, or have they started to become interconnected?

03 Consolidation

In the consolidation phase, the goal is to better connect and integrate digital activities. Digital technologies are deployed across the entire value chain. Cross-functional collaboration becomes the standard. Minimum Viable Products (MVPs) are developed, gradually scaled, and integrated into operational processes. The focus shifts more towards customer centricity, with data utilization for value creation becoming a central topic. The aim is to eliminate internal silo thinking.

Where does your organization currently stand?

▶ Is there cross-functional collaboration across the value chain?
▶ Are MVPs developed, implemented operationally, and scaled?
▶ Is data viewed as an asset that should be strategically managed?
▶ Are isolated data silos integrated for MVPs?
▶ Is there success in breaking down silo thinking to foster cross-divisional cooperation?

04 Digital vision

This phase focuses on developing and implementing a company-wide digital vision. Digitalization is deeply embedded in the organization, with digital innovations being driven forward in a continuous and structured way – both in the automation of internal processes and, data-driven, in the development of new products and services, as well as in customer communication. Employees actively contribute to implementing and independently optimizing the digital strategy. The organization becomes more agile and data-driven. A comprehensive digital vision for the company's future begins to take shape.

Where does your organization currently stand?

▶ Is there a clear, comprehensive digital vision for the company?
▶ Is digitalization being actively driven across all areas?
▶ Is there a well-established exchange on technological innovations?
▶ Are there organizational structures in place to direct and manage digitalization projects?

05 Digital championship

At the final stage, the company becomes a true digital leader in its industry: business processes and models are largely digital and data-driven, physical products are enhanced with services, and data transparency allows the organization to adapt to market changes almost in real time. Employees possess extensive digital and data-driven skills, continuously driving innovation. Digital development has become an integral part of the corporate culture. Evaluating, developing, and integrating new technologies is a standard, established process within the company.
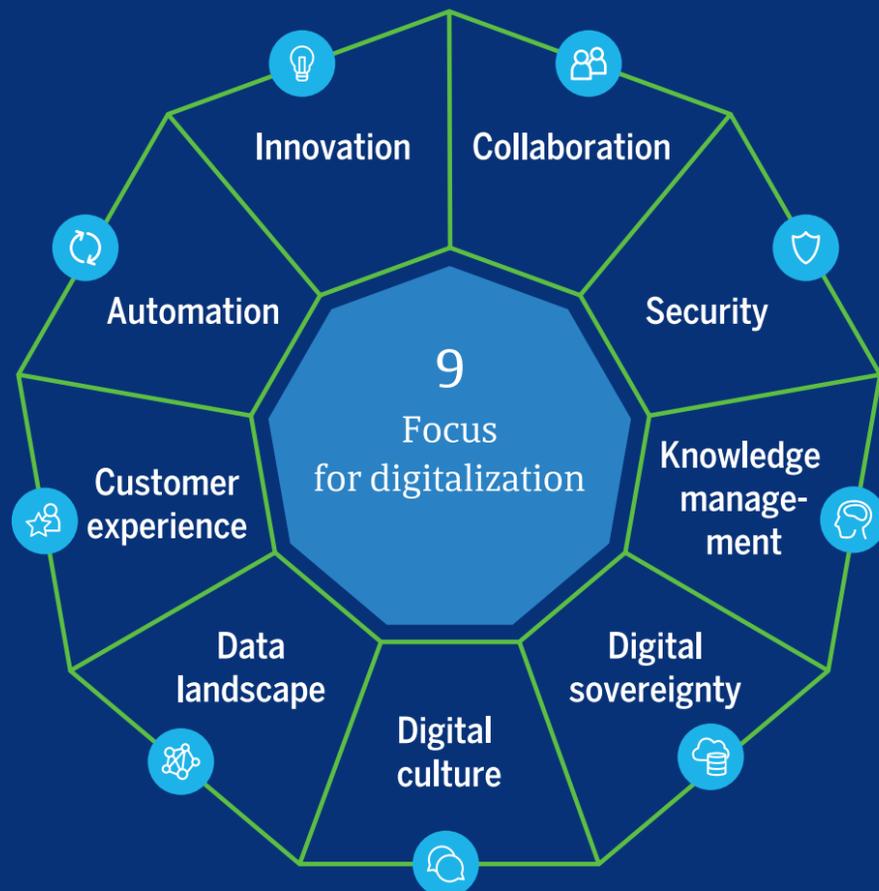
Where does your organization currently stand?

▶ Are processes and business models as digital and data-driven as possible?
▶ Are adjustments to market demands made in real time?
▶ Is continuous exchange on technological innovations deeply embedded in the culture?

Now, it's up to you to position your company based on the stages described. Ask yourself: Where does your organization currently stand? Have the first digital projects been launched, or are you already in the consolidation phase – or even the digital vision phase? Each stage presents unique challenges and opportunities. The right awareness will help you plan the appropriate next steps and drive digital transformation forward strategically.

Making complexity manageable:

Our nine areas of focus for digitalization

The starting point is now clear. How does the transformation journey through the technology landscape continue? Digitizing a company is complex, but it doesn't have to be overwhelming. To make this complexity tangible and manageable, we've developed a framework divided into nine key areas of focus. Each area addresses a crucial aspect of digital transformation, helping you prioritize and manage the relevant topics more effectively. Together, these areas form the big picture that companies need to stay competitive and innovative in the long run. We will briefly introduce each area to give you a sense of how they collectively structure the overall topic. Our approach is based on strategic customer projects from recent years and has been proven effective in practice. You may not yet have developed expertise in some areas – but that's perfectly fine! We're here to guide you as you explore new territory.

9 Focus for digitalization — Innovation, Collaboration, Security, Knowledge management, Digital sovereignty, Digital culture, Data landscape, Customer experience, Automation

Collaboration: The future of teamwork – today!
Future collaboration will be heavily shaped by artificial intelligence (AI) and new ways of working. Concepts like remote work and hybrid teams are already the norm today, but what will optimal collaboration look like in five years? AI-powered tools will boost efficiency and redefine creative processes, as well as the way teams collaborate. Technologies like natural language processing (NLP) and automation will reshape everyday work and create seamless communication channels within the organization and beyond.
▶ *Example: Tools like Microsoft Teams, combined with AI assistants such as Alan or Microsoft Copilot, support a wide range of activities.*

Digital culture and skills: The future at your fingertips
What skills and knowledge will employees need in five years? How do younger generations, in particular, want to work digitally? Digital transformation is driven not only by technology but also by the people who use it. It's essential to develop digital skills at all levels of the organization and foster a culture that encourages continuous learning and digital innovation. This culture not only drives innovation but also cultivates employees who are motivated and engaged.
▶ *Example: Awareness of proper data handling ("data literacy"), cybersecurity, and other areas are becoming essential digital competencies*

Customer & User Experience (CX/UX): Your customers expect to be wowed!
The way companies interact with their customers has fundamentally changed in recent years. But what will customer interactions look like in the future? Which touchpoints and channels will be crucial over the next five years? Personalization, automation, and delivering a seamless customer experience across all channels will become increasingly important.
▶ *Example: Omnichannel customer platforms that use AI to personalize content and services, such as Salesforce or HubSpot, as well as after-sales services for machinery and complex products.*

Data landscape, analytics & AI: The core of your digital future
Data is at the core of digital transformation. The key questions are: Which data is strategically important, how can I organize it effectively, and which analytics and AI tools do I need? Building a structured data landscape, supported by advanced analytics and AI tools, empowers companies to improve processes and make data-driven decisions.
▶ *Example: Generative AI in the form of large language models like ChatGPT, as well as decentralized data architectures such as data meshes.*

Automation and operational excellence: Redefining efficiency
Resources are limited. So, which processes can be automated to enhance operational efficiency? Automation is key to boosting productivity and reducing costs. Companies should assess which tasks and processes can be automated using Robotic Process Automation (RPA) or AI-driven solutions. Automation is also critical for cybersecurity to stay ahead of the growing threat landscape.
▶ *Example: RPA platforms like Power Automate or UiPath, combined with AI to automate repetitive workflows such as incoming mail classification, and the automated integration of orders and purchase orders into the ERP system.*

Knowledge management: Your knowledge is invaluable!
Given demographic shifts, the shortage of skilled workers, and the ever-increasing volume of data and knowledge, the question arises: How severe will it really be when experienced employees retire? Developing an effective knowledge management system is becoming essential. Companies must ensure that critical knowledge is preserved. New technologies, such as AI-driven knowledge databases, can help store and share knowledge.
▶ *Example: Knowledge platforms like SharePoint or Confluence, powered by AI, that curate relevant content for new employees.*

Digital sovereignty and infrastructure: Securing your independence
Cloud technologies dominate today, but the future may lie in the combination of cloud and edge computing. How can companies maintain their digital sovereignty and avoid becoming dependent on individual providers, while still benefiting from the scalability and flexibility these technologies offer? Building a flexible, secure IT infrastructure that leverages both cloud and edge resources is essential.
▶ *Example: Multicloud and standardized architectures for sovereignty and flexibility.*
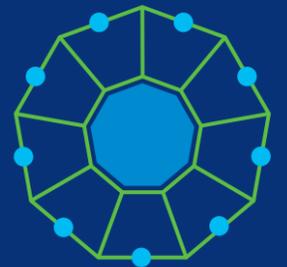
Security: Protection that scales with you
As digitalization progresses, the digital attack surface expands. Cybersecurity is more critical than ever to securely leverage the benefits of increased digital maturity. Cybercrime is also continuously evolving, exploiting the same technological advancements. Companies must be prepared to respond dynamically and adapt to new threats as they emerge. What are the implications of GenAI for cybersecurity? And how can companies remain resilient in the years to come? The answer lies in a strategy of continuously evolving their cybersecurity approach, leveraging current concepts such as Zero Trust, along with the latest generative and ‚narrow' AI technologies (i.e., AI that lacks general understanding and performs specific tasks, such as translation or facial recognition).
▶ *Example: Zero Trust security frameworks as a core security paradigm, combined with AI-powered systems for anomaly detection.*

Innovation: What the future has in store for you
Innovation is the driving force behind long-term growth. But which areas of innovation should companies prioritize in the coming years? Whether it's using blockchain for supply chain traceability, interacting with the digital twin via mixed reality, or developing new AI-based business models – the choice of the right innovation areas is critical. Naturally, innovation as a cross-cutting theme affects all of the above areas. This category focuses on implementation: How do I embed innovation in my organization? Equally important is how to approach technologies that fall outside the "normal" integration timeline of an organization (3-5 years).
▶ *Example: Using AR glasses on the production line to assist with quality control.*

These nine areas of focus provide a framework for structuring and prioritizing your company's digital transformation. By consistently monitoring these areas and staying up to date with technology, you can navigate the complexity of digitalization and make strategically informed decisions to ensure long-term success.
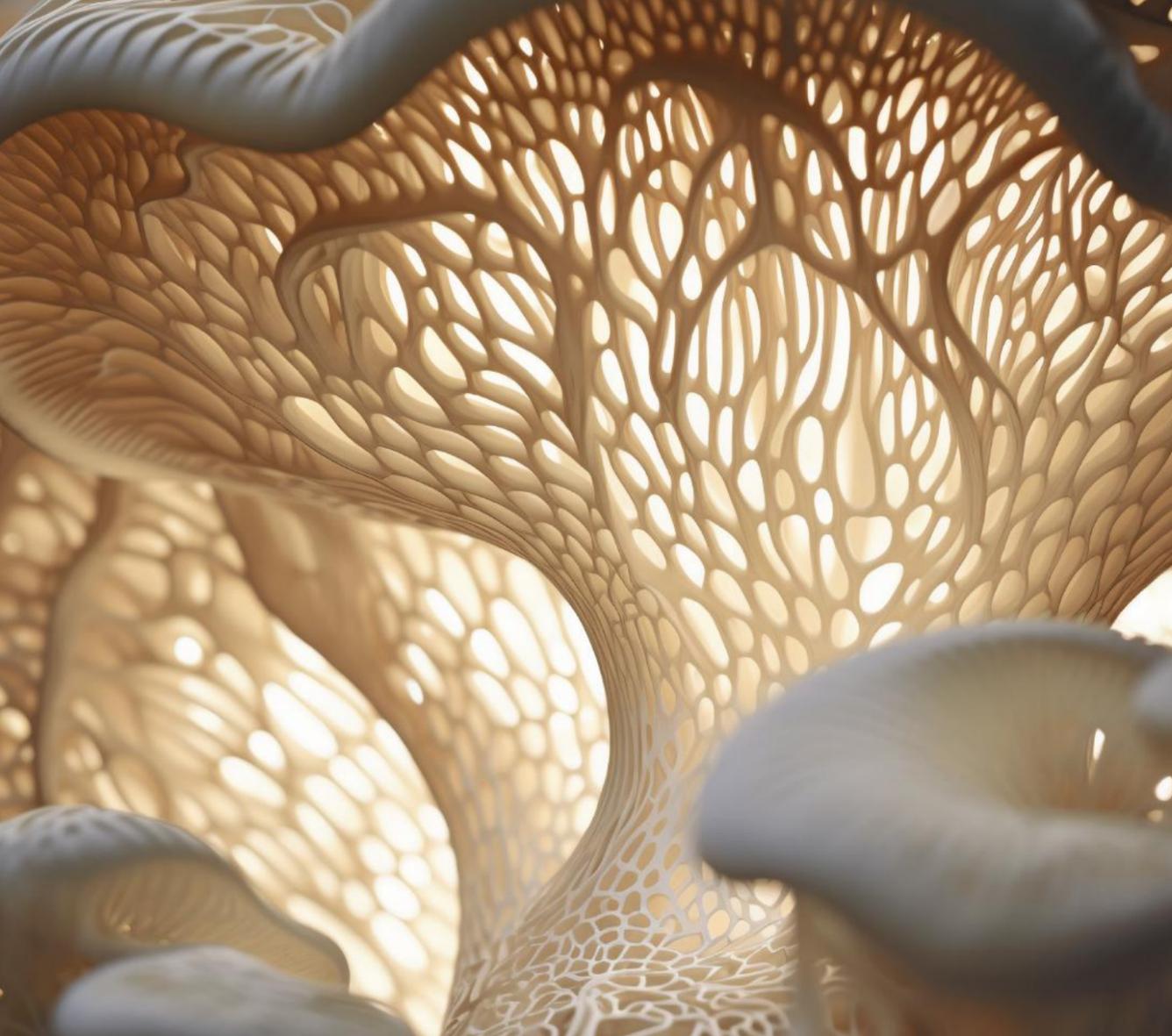
Next level

Your roadmap to becoming a digital champion

The maturity model and the nine pillars of digitalization now provide the framework you can use to think strategically about the next digital level of your organization – based on your current status. We will examine the individual transitions and best practices for each of the nine pillars, focusing on organizational and procedural aspects rather than technologies. The question of which tools should be introduced at which stage will be addressed in one of the upcoming Travel Reports.

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01 ## From awareness to initiation
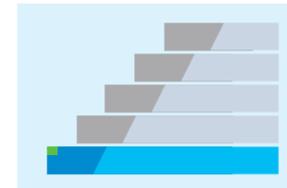
Entering the digital world!

Digitalization has captured your attention (or that of your organization) – now is the perfect moment to harness this energy and spark enthusiasm across the company. This first transition is crucial, as it involves easing fears, stimulating curiosity, and demonstrating that digitalization offers more than just complex technology. Interactive formats like workshops, surveys, and internal idea competitions encourage collaboration and invite all employees to share their perspectives. The goal? To foster a vibrant awareness of the opportunities, challenges, and new possibilities of the digital future!

Main objectives in this phase are as follows:

- **Embrace technology as an opportunity and alleviate fears:** Ignite your organization's enthusiasm for digital possibilities by making the benefits and new opportunities tangible. Address concerns and demonstrate that digitalization is not a threat, but a gateway to efficiency and creativity.
- **Secure commitment from leadership:** Ensure that your managers are both convinced and actively engaged in implementing the new digital strategy. Their support is crucial to sustainably integrating digital initiatives into daily business operations.
- **Develop a strong mission for digital transformation:** Create a strategic mission statement that defines the company's digital transformation as a goal, path, and vision. This mission will guide the next steps and provide direction for all employees.

Collaboration: Sparking enthusiasm for new ways of working

Plan workshops and discussion sessions for leadership to explore the potential of modern collaboration tools like Microsoft Teams and Zoom. These sessions can focus on hybrid work models and the flexibility of "new work." Show how these tools transform workflows and foster greater communication and connection – regardless of where the team is located.

Security: Cybersecurity as a collective effort

Organize IT security training that provides a foundational understanding of the threats and opportunities associated with new technologies. The topic becomes especially compelling when AI and cybersecurity are discussed. AI, and particularly GenAI, presents numerous new opportunities but also requires a strong security mindset – especially at the leadership level. Expose your management team to these risks to foster awareness and commitment for further actions.

Knowledge management: Raising awareness for knowledge retention

Increasing turnover due to new life models, a shortage of skilled workers, sabbaticals, illnesses, and, not least, age-related departures driven by demographic changes, are bringing knowledge management into focus. Begin with documentation projects and identify key team members who can capture, share, and actively contribute insights. This creates a foundation to prevent the loss of valuable experience and critical business knowledge siloed within teams.

Digital sovereignty: Ensuring independence and control

Being digitally sovereign means maintaining control over data and infrastructure. Begin with informational sessions that emphasize the importance of cloud computing and other strategic IT topics. Make these issues a priority on your leadership agenda. Raise awareness that digital sovereignty is not just a technical detail, but a foundation for your company's long-term success.

Digital culture and skills: The first steps towards a digital mindset

Introduce initial digital training programs and organize a "Digitalization Day" focused on trends and future topics. This sparks curiosity: employees will realize how crucial digital skills are for the future. Ideally, provide follow-up opportunities for engagement and ample space for participation.

Data landscape and AI: Discovering data as the resource of the future

Spark curiosity about the potential of data and artificial intelligence. In initial workshops, IT, departmental teams, and data protection can collaborate to explore the opportunities that AI offers. This makes it clear: data is a strategic resource, and everyone can contribute to maximizing its value. By the way, many employees will already be using AI systems in their personal lives and can share their firsthand experience.

Customer communication and experience (CX/UX): Initial insights into the digital customer journey

Organize workshops at the management level around the question: "How do we want to interact with our customers in the future?" Develop initial strategies for a future-proof communication approach, focusing on digital touchpoints, channels, and customer preferences, to clarify how the organization can effectively engage with customers digitally. The company that best and most conveniently meets the customer interface in the future will emerge as the winner!

**Automation and operational excellence: Unlocking the potential**

Conduct an assessment of your company's core processes and identify which routine tasks can be automated. Documenting the first processes with automation potential clearly shows how much time can be freed up, which in turn boosts enthusiasm for automation! It's crucial that these ideas, after the ideation phase, don't get shelved but are actively pursued and operationalized. We will discuss how to achieve this later.

Innovation: Promoting creativity and giving freedom

Ideas need both space and structure – create a platform or idea pool where all employees can submit suggestions and contribute creatively. This demonstrates that innovation is a core objective and encourages the workforce to actively shape the company's future.

02 From initiation to consolidation
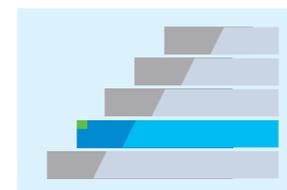
Sharing stories of success and moving forward

With the transition to consolidation, companies take an important step from individual digital pilot projects to an integrated approach where various initiatives work together. The digital strategies and ideas that have already been established are now being further developed and integrated into day-to-day operations across departments. The goal is to connect the initial digital projects, which are often implemented in isolation.

It is now crucial to strengthen the exchange about the various projects and make successes visible – share them within the organization! This makes digital transformation more tangible and motivates all involved. At the same time, establishing communication and feedback channels is key to ensuring that successes and lessons learned are consistently shared and built upon. Engagement always requires commitment!

Another key focus of this phase is connecting digital projects and initiatives across departmental boundaries. This fosters synergies and prevents isolated solutions, allowing digital efforts to be increasingly coordinated and viewed as a unified movement. As a result, the company gains a shared understanding and a clear path forward.

Main objectives in this phase are as follows:
- **Connecting digital initiatives across departmental boundaries:** Transform isolated projects into a synchronized digital transformation effort, where all departments collaborate in harmony.
- **Transform PoCs into MVPs with measurable value:** Focus on digital projects that deliver tangible benefits, rather than just feasibility studies, and gradually integrate them into day-to-day operations.
- **Establish feedback and communication channels:** Share your successes with everyone! Communicate progress both internally and externally, and gather employee feedback.

ence IT infrastructure and your technology stack. Use this phase for initial testing of cloud management, hybrid IT structures, and tools. Create opportunities for closer collaboration between business and IT to ensure a seamless transfer of requirements and a shared understanding of the digital direction. The goal is to work together, not against each other!

Digital culture and skills: Show that digitization can be fun!

To overcome digital uncertainties, a program of foundational training, such as digital literacy, is highly beneficial. Provide all employees with the essential knowledge for digital processes and encourage an open culture around mistakes. For instance, you could launch a company-wide "Digital Culture Challenge" to foster a positive relationship with digital topics, where everyone shares both successes and setbacks. A digitalization theme day, featuring highlights on AI, can also be a valuable initiative!

Data landscape and AI: From PoC to data strategy

Connect successful proof of concepts for the use of analytics and AI. Bring experts together to identify potential synergies. The use of data for decision-making is becoming more concrete and more frequent. Integrate data and analytics topics within a data and AI strategy that aligns with your business and IT strategies. Share the successes across the organization and generate excitement for more! It's also time to address data management in practice. How should your data landscape be organized in the future, and what should the governance framework look like?

Customer communication and experience: Listening and learning

Your digital customer experience starts here: Pilot new digital channels like chatbots or automate FAQs to enhance direct customer interaction. Create new experiences and greater availability for your customers! These digital touchpoints help you better understand customer needs and streamline communication. This also ties into the data strategy mentioned earlier: What customer data do you want – and are allowed – to use in order to provide even more value?

Automation: Eliminate tedious routines

Simple and repetitive processes can also be effectively automated in this phase. Implement additional RPA pilot projects to handle routine tasks and improve efficiency. Share success stories within the organization, and begin using machine learning approaches to free employees from repetitive work, allowing your team to focus on more complex tasks.
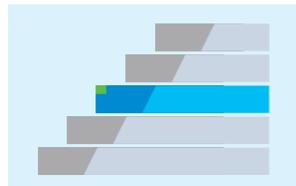
Innovation: Turn ideas into success – step by step

Inspire your employees to participate in idea competitions and innovation workshops. Introduce a "test-and-learn" mindset: even small pilot projects create room for experimentation, allowing your organization to experience its first digital successes. This makes innovation tangible and exciting, with employees actively contributing their ideas. Create opportunities for collaboration and idea-sharing.

Collaboration: Get started and make digital collaboration a part of your daily routine

The focus now shifts to pilot projects that specifically test collaboration tools within individual teams. Implement hybrid work models that provide employees with the flexibility to collaborate independently of location. Consider organizing regular sessions for experience sharing, where users can exchange tips and improvement ideas.

Security: Safety? Absolutely!

As the transition to consolidation progresses, it becomes essential to implement fundamental cybersecurity measures effectively. Adopt proven security solutions to detect and mitigate current threats. Basic steps such as password management, two-factor authentication, and initial threat scenario analysis establish a solid security foundation.

Knowledge management: Safeguard knowledge – your most valuable resource!

Start with knowledge databases and internal wikis that simplify access to essential information for all employees. A mentoring program and tailored change management are key to onboarding new employees and preserving the knowledge of veteran colleagues. Connect employees at all experience levels, bring together different generations, and foster innovation! A strong knowledge foundation ensures information is quickly and easily accessible. Dispersed knowledge is unused knowledge.

Digital sovereignty: Stay in control of your IT strategy

This phase presents an opportunity to define the framework for your organization's future IT strategy. Capture the requirements from the business strategy that influ-

03   From consolidation to digital vision

Bringing together the building blocks and activating synergies

With the first successful digital projects and a digitally savvy workforce, the company is now well-positioned. Leadership supports the digital initiatives. Now, it's time to connect the individual solutions, new ways of working, and projects into a powerful network, create a cohesive overall vision, and integrate it into the organization. The transition from consolidation to a digital vision involves strategically integrating the previously isolated digitalization components across the company to fully leverage their potential. The established structures and feedback loops play a key role in creating a unified vision that is tangible for all employees and effectively bringing it to life.

In this phase, a digital and data community that connects across departments and continuously introduces new ideas plays a crucial role. Events like digital theme days, in-house trade shows, and strong internal com-munication foster exchange and increase the visibility of the milestones achieved. A practical digitalization road-map, aligned with the corporate strategy and value creation, provides structure and guidance for the next steps.

Main objectives in this phase are as follows:
- **Vision and strategic alignment:** Turn the digital vision into a company-wide mission that strengthens and supports the operational business in the long term. Align it with your business strategy.
- **Connecting the dots – creating company-wide connectivity:** Seamless communication and exchange formats to make digital projects tangible as an interconnected ecosystem for everyone.
- **Scale and connect digital initiatives:** Leverage synergies from existing solutions by strategically evolving MVPs and deploying them at scale.

Collaboration: Embrace networking – one team, one vision!
Integrating collaboration tools into daily workflows enables teams to collaborate regardless of time and location. Optimize your hybrid work models by leveraging AI-powered tools like Microsoft Teams and Copilot, or Slack with ChatGPT integration, to efficiently consolidate knowledge and ideas. This makes digital teamwork a natural part of daily operations. Important: ensure sustainable governance to prevent digital fragmentation.

Security: Synergy – make security the foundation of your digital strategy!
Develop a comprehensive security strategy that integrates cybersecurity across all areas and infrastructures. This will provide a solid foundation for your entire digital roadmap. Possible measures include establishing uniform security guidelines, standardizing how data is used, processed, shared, and secured, and implementing robust network security architectures. Through security workshops and regular communication of security standards throughout the organization, you'll also raise security awareness among employees. Additionally, integrate your cybersecurity and product strategy into the IT strategy to leverage various solution ecosystems effectively, without creating potential gaps.

Knowledge management: Build a valuable knowledge repository for the entire company!
Knowledge is your strategic resource, enabling you to consistently realize your digital vision. The goal of this phase is to systematically secure existing knowledge and make it accessible and usable across the organization. This involves documenting and safeguarding valuable content, fostering active networking and knowledge transfer, and ensuring that experiences, insights, and best practices are shared and utilized effectively. To achieve this, you should now implement platforms and tools on a large scale that capture knowledge in a structured way and make it easily accessible – such as wikis, knowledge databases, and interactive learning platforms. Equally important is the establishment of roles and mechanisms that actively promote the exchange of knowledge. A mentoring program, cross-functional teams, and communities of practice ensure that knowledge is continuously shared and developed across departmental boundaries. Knowledge management forms the foundation of a learning organization that remains flexible and adaptable.

Digital sovereignty: Make your infrastructure future-ready and strategically flexible!
The use of data is now also taking center stage from an IT infrastructure perspective. Establish clear governance that defines and controls data handling, access rights, and data protection. The AI readiness of your infrastructure is equally crucial. Ensure the necessary computing power and data structures are in place to implement AI applications and data-driven innovations swiftly and efficiently, integrating them into operational processes. This involves building a modern, scalable data architecture, implementing platforms for machine learning and automation (MLOps – Machine Learning Operations), and evaluating the trade-off between in-house developments and specific tools ("make or buy"). At this stage, it is also valuable to foster strategic partnerships and internal expertise to strengthen your independence from technology providers and continuously enhance the innovative capacity of your infrastructure.

Digital culture and skills: Embedding digital and data literacy organization-wide
The goal now is to embed the selectively developed skills organization-wide. Expand digital training programs to empower your employees and further foster the digital culture. Focus on open communication and learning opportunities for all. Digitalization thrives on people – provide them with the formats and tools they need! It's also beneficial to offer courses on specific topics to develop additional skills within the organization, such as AI and analytics. Ideally, the shared digital vision will keep employees aware of the "why" – why it's worthwhile for each individual to engage with it.

Data landscape and AI: The future is now!

Now is the time to begin designing and implementing a structured AI and data strategy, aligning it with the overall vision. Consolidate your data storage and establish appropriate data governance structures. This will form the backbone for scalable, company-wide data usage and the adoption of powerful AI tools. Whoever controls the data controls the future! A use-case-based implementation roadmap for data value creation is also essential. It should include further stages of development and focus on connecting your initiatives from previous phases. The drive for this should ideally come from across the organization – bottom-up (process perspective of those affected) meets top-down (strategic framework).

Customer communication and experience: Turn your customers into loyal fans!

This phase focuses on seamlessly integrating digital channels and creating a cross-channel customer journey aligned with the shared digital vision. The goal is to deliver a personalized, data-driven customer experience that anticipates customer needs and provides consistent engagement across all touchpoints. For example, you could leverage advanced data analytics to tap into customer preferences, offering relevant content or promotions, or develop tailored service offerings for your products and services. Only by truly understanding the unique realities of your customers' lives can you offer solutions that meet their needs. Marketing automation platforms and AI-powered chatbots enable you to proactively address customer needs and create personalized experiences that align with today's expectations. This is where your organization builds the foundation for long-term customer satisfaction and a consistent, customer-centric brand image.

Automation: Every automated process creates space for innovation – scale smartly!

In the area of automation, the focus now shifts from initial processes to intelligently optimizing entire workflows end-to-end, significantly driving operational excellence. The goal is to move beyond isolated automation projects and develop a comprehensive automation strategy that aligns with the company's overall digital vision, incorporating IT as a key component. This can be achieved by implementing an end-to-end automation framework based on RPA and machine learning. The goal is to establish a holistic structure where automated processes are seamlessly coordinated across all departments. This not only boosts efficiency in daily operations but also sustainably streamlines IT processes. The automated handling of IT tickets is just one example of this approach.

Innovation: Make innovation a habit!

Innovation becomes a cross-functional capability that shapes the framework for the entire company and drives renewal and growth. To achieve this, create an environment where creativity and an innovative spirit are actively nurtured. Internal innovation hubs and regular idea workshops help generate new solutions, while a structured innovation pipeline ensures that promising projects are quickly evaluated, prioritized, and scaled. Support this process with agile methods that enable rapid responses to changing market demands and technological developments. A strong culture of innovation inspires employees to challenge the status quo and actively contribute to the company's digital vision.

04 From vision to digital champion
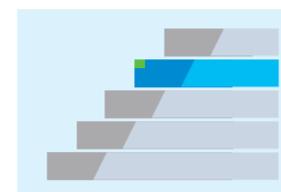
Strengthening the leadership role

To remain a digital champion over the long term, it is crucial to tightly integrate technology, culture, and business models while setting new standards. Your organization has reached a point where it is no longer just adapting and scaling – it is actively shaping and driving digital transformation. In doing so, your company becomes a pioneer and a pace-setter for the entire industry.

Main objectives in this phase are as follows:

- **Establish technology leadership:** Explore new technologies early and put them into practice before others do. This way, you shape trends instead of simply following them.
- **Create strategic excellence through strong synergies:** Foster company-wide collaboration of skills and innovations to maximize impact and drive success.
- **Operational excellence:** Pursue the highest levels of efficiency and agility across all processes to respond to change quickly, flexibly, and accurately.
- **Solidify a culture of continuous progress and change:** Solidify a culture that embraces change and adopts continuous improvement as a core value. Leverage your pioneering position to anticipate change and respond with agility.

Collaboration: Setting new standards together!

As a pioneer, your company will elevate intelligent collaboration to the next level. With AI-powered collaboration solutions such as Microsoft Copilot and Google Duet AI, meetings, minutes, and daily tasks can be fully organized and documented automatically. Integrating AI to enhance internal communication and knowledge sharing takes seamless global collaboration to an entirely new level. Collaboration beyond company boundaries should also be fully digital and AI-driven – strengthening interactions with both partners and customers.

Security: Making security your trademark

To earn the trust of customers and partners as a digital champion, implementing a Zero-Trust security model is essential. In this model, most access – whether inside or outside the company network – is consistently and continuously verified. AI-driven threat intelligence supports the real-time identification and neutralization of threats. Security solutions such as Cloud Access Security Broker (CASB) and Extended Detection and Response (XDR) assist with posture management, risk management, incident detection, and response. Automating many cybersecurity tools and processes enables more efficient and targeted use of personnel. The cybersecurity organization is fully aligned with the goals of the broader IT and cybersecurity strategy.

Knowledge management: Dynamic knowledge networks

For a true digital champion, knowledge becomes the most powerful resource. Building dynamic knowledge networks using comprehensive knowledge graphs and AI-driven learning management systems (LMS) enables the collection, active linking, and continuous development of specialized expertise. These networks leverage machine learning – based recommendations and provide personalized learning paths that sustainably strengthen your company's know-how. Video documentation of processes complements traditional text-based approaches and, with the help of generative AI, can also be searched semantically.

Digital sovereignty: Act with confidence, independence and purpose!

To strengthen technological independence, develop a modular, standardized infrastructure and a consolidated tool landscape that can respond flexibly to market demands. Data-centricity and future readiness – including interfaces for AI solutions – are integral parts of this infrastructure. It is essential to combine multi-cloud strategies with hybrid approaches to balance scalability, risk, and integration costs.

Digital culture and skills: Learn, inspire, grow!

A culture of continuous renewal empowers employees to independently drive change and use technology in innovative ways. Gamified learning platforms and immersive learning environments – such as those using VR and AR – help develop digital skills and motivate employees to learn. Regular digital assessments and targeted training ensure that teams stay up to date and are able to develop and implement forward-thinking ideas. Importantly, continue to communicate successes and innovations across the organization to keep all colleagues engaged and aligned.

Data landscape, analytics and AI: The data-driven company

To operate as a truly data-driven digital champion in the future, a data-first strategy must become the norm at this stage, with data firmly established as a core C-level priority. This approach ensures that data is actively managed and leveraged as a strategic asset across the entire value chain. Strong data governance is essential, as is a robust IT infrastructure: MLOps practices enable the continuous optimization and seamless operationalization of machine learning and AI models. Take full advantage of generative AI capabilities, especially large language models. Ensure that analytics and AI skills within the organization grow appropriately – both broadly across teams and in depth within specialized expert areas.

Customer communication and experience: Putting customers at the center of your strategy

Make customer communication not just digital, but truly experiential. Connect and personalize customer experiences through omnichannel strategies and personalization across every touchpoint. Leverage generative AI to advance chatbots and virtual assistants that deliver personalized recommendations and 24/7 support. With a 360° view of your customers, you can proactively identify and address their needs. This deep understanding of your customers' real-world context allows you to deliver the right offer at the right time through the right channel.

Automation: Operational excellence as the engine of your digital transformation

Don't view automation as merely a means to an end, but as a strategic tool to make processes more efficient, scalable, and resilient. If all you have is a hammer, every problem looks like a nail. A true champion, however, masters the full range of automation tools and deploys them precisely – from RPA and advanced process mining to generative AI. The key challenge is identifying and applying the right tool for each specific problem. Wherever repetitive processes dominate, RPA remains a proven solution. Where data-intensive decisions are needed, generative AI demonstrates its full potential – whether in text creation, intelligent reporting, or dynamic process design. Reducing complexity must be the top priority. Automation that adds unnecessary complexity ultimately defeats its purpose.

Innovation: Change as a driver – innovation as a shared mission

Innovation is no longer just a project – it is a fundamental part of the corporate culture, embedded across all processes. Innovation ecosystems, fueled by crowdsourcing and co-creation, enable rapid development of new, future-focused solutions in collaboration with internal and external partners. Innovation becomes a cross-functional capability, independently integrated and driven across all business areas. The result: your company stays ahead of the curve and actively shapes the trends and technologies of tomorrow.

05 Digital champion & data-driven organization
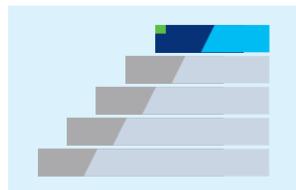
Keep Going!

As a digital champion and data-driven organization, you are among the leading players actively shaping the digital landscape. But how do you maintain your position at the forefront? Champions don't stand still. They don't just follow trends – they create them. Leverage the latest technologies and the most innovative approaches to continually strengthen and expand your position as a digital leader.

Main objectives in this phase are as follows:
- **Strategic positioning as a digital champion:** Ensure that the entire organization understands and embraces the digital champion role. This requires a clear strategic direction that equally promotes innovation, customer centricity, and operational excellence. Your vision should position the company as a digital pioneer while securing sustainable value creation.
- **Technological leadership and innovation strength:** Stay at the forefront of technological developments, set new standards, and actively shape the trends within your industry. This includes strategically evaluating and adopting cutting-edge technologies such as AI, quantum computing, and generative AI to deliver solutions that are truly ahead of the curve.
- **Maintain and expand operational excellence:** Secure and expand operational excellence, strive for the highest levels of operational excellence and ensure long-term flexibility to respond quickly to change. Operational excellence at a champion level means maintaining processes that are agile, secure, and efficient – consistently supporting the company's digital innovation capabilities.

Collaboration is a champion's superpower – use it to break down boundaries in the digital space!

Take your collaboration platforms to the next level. Leverage AI-powered tools like Microsoft Copilot and collaborative AI design platforms to further boost productivity and creativity. Remote collaboration beyond your organization's boundaries should be the norm – even for complex projects. Venture onto new paths: How can augmented reality and mixed reality collaboration be integrated into employees' workflows? The goal is to set new standards for collaborative work – both internally and externally with customers, partners, and service providers.

Security: Security is not a barrier, but a springboard for sustainable innovation!

Organizationally and strategically, your cybersecurity function has long been an enabler and business partner, supporting all IT initiatives both internally and externally for your customers. Corporate, IT, and cybersecurity strategies are closely aligned and continuously adapted to the evolving threat landscape and technological advancements. The cybersecurity organization is structured and equipped with the expertise needed to meet strategic requirements. From an infrastructure standpoint, Zero Trust is the highest priority. Traditional network boundaries have largely disappeared, and every access request – whether from a user, device, system, or sensor – is dynamically and risk-based evaluated. Data classification and data governance are seamlessly implemented, and cybersecurity operates in a highly data-driven and automated manner across reporting, analysis, and response activities. This approach ensures that qualified personnel are deployed strategically to focus on continuous improvement and innovation.

Knowledge management: Knowledge is the fuel of champions – cultivate it and make knowledge infinitely accessible!

Promote and sustain a culture of continuous learning and knowledge sharing. Implement smart knowledge management platforms that leverage AI-powered personalization to ensure that relevant information is always available at the right time and place. Encourage AI-driven semantic search and hybrid mentorship programs that seamlessly connect existing expertise. Structured mentorship combines guidance from experienced colleagues with support from AI systems. Automated knowledge transfer enables employees to acquire and share knowledge faster than ever before.

Digital sovereignty means setting your own rules – shape your own digital landscape!

Rely on state-of-the-art cloud, multi-cloud, and edge infrastructures that deliver maximum flexibility and resilience. Digital champions skillfully navigate the complexities of working with hyperscalers, balancing cost, scalability, sovereignty, and compliance. AI readiness is now the new standard – from machine learning to edge AI applications that accelerate decision-making right at the point of action.

Digital culture and skills: Digital champions never stop learning – set the standards for the digital workplace of tomorrow!

Create and sustain a culture where digital competence is second nature. Foster continuous learning and an experimental mindset to ensure your company can respond quickly and flexibly to new demands. Pay special attention to supporting your tech experts and keeping them connected, for example through digital or data

communities. Leveraging VR and AR for immersive training, personalized learning apps, and AI-driven feedback systems transforms learning into an experience – helping to attract and retain the talent of the future. Important: this development requires space – actively create the freedom and environment needed to make it happen.

Data is your raw material – refine it and remain unrivaled as a data organization!

Data is already at the core of your decision-making, and you are fully committed to a data-first strategy. Stay closely connected to AI research – the pace of advancement is rapid. Ideally, your AI team should regularly review relevant publications on new approaches and methods in AI to test and adopt innovations early. Your Data Strategy 2.0 is closely aligned with your overall business strategy and embedded across all company processes. Continue to integrate valuable external data sources, such as geospatial, market, and weather data. Leverage predictive analytics and machine learning to make accurate forecasts and enable real-time, data-driven decision-making. Generative AI now plays a critical role in supporting creative processes – from marketing and product development to customer engagement.

Customer communication and experience: Make your customers' needs the focal point of your digital strategy – and create experiences that truly captivate them!

Connect your customer communications across all channels to create a truly seamless experience. Leveraging generative AI and „Emotion AI" in the customer experience enables highly personalized interactions and a deeper understanding of customer needs. Automated customer journey analysis and real-time digital surveys create continuous feedback loops, elevating customer communication to a new level. A true champion organization engages with customers even before they realize they have a need..

Automation and operational excellence: Automation is more than efficiency – it's your accelerator on the path to operational excellence!

Operational excellence at the champion level means achieving maximum efficiency and flexibility. Leverage ML, RPA, and AI to automate processes end-to-end, and boost your efficiency even further with innovative approaches like IoT-enabled process control. Automated process analysis helps you continuously learn and optimize workflows. At this point, you'll find yourself asking, "What's left to digitalize?" – because you've already transitioned all processes to digital technologies!

Innovation is in your DNA – create a culture that drives, revolutionizes and inspires!

Promote innovation as the heartbeat of your organization. Champions lead innovation programs defined by strategic integration, a strong willingness to take risks, and a clear focus on delivering customer value. From leveraging quantum computing to tackle optimization challenges to piloting 5G-enabled technologies in the field, a vibrant culture of innovation becomes a true competitive advantage.

Conclusion and outlook

The road to the digital future

Every digital transformation is, in many ways, an expedition. It begins with the first cautious steps toward building awareness and leads to the full integration of new technologies. Along the way, it not only transforms how we work but also redefines the very DNA of companies. In a world of constant change and accelerating technological advancement, standing still means only one thing: falling behind.

> **"**Ideas are rarely in short supply – the real difference comes from relentless implementation!**"**

Focusing on specific action areas, combined with a clear vision, is essential for successfully driving transformation. Whether it's advancing digital collaboration, integrating artificial intelligence into your security architecture, or fully automating business processes – the guiding principle remains the same: act pragmatically, celebrate successes, and continuously improve.

One thing you should always keep in mind: it's not just about keeping pace with new technologies. Equally important is fostering a culture of learning and innovation that empowers your organization to use these technologies effectively and sustainably.

Digital transformation is not a project with a fixed endpoint – it's a continuous evolution. And this is ex-actly where the real challenge – and the excitement – lies: digital transformation means continuously evolving, pushing the boundaries of what's possible, and constantly reinventing yourself.

If you ever find yourself wondering what's next, don't worry – the digital world never stands still. You can look forward to an endless stream of new trends, technologies, and insights. Because the beauty of digitalization is that it has no true „end." Now, only one thing remains: stay committed, stay curious, and shape the digital future – with a smile. □

The author

Dr. Markus
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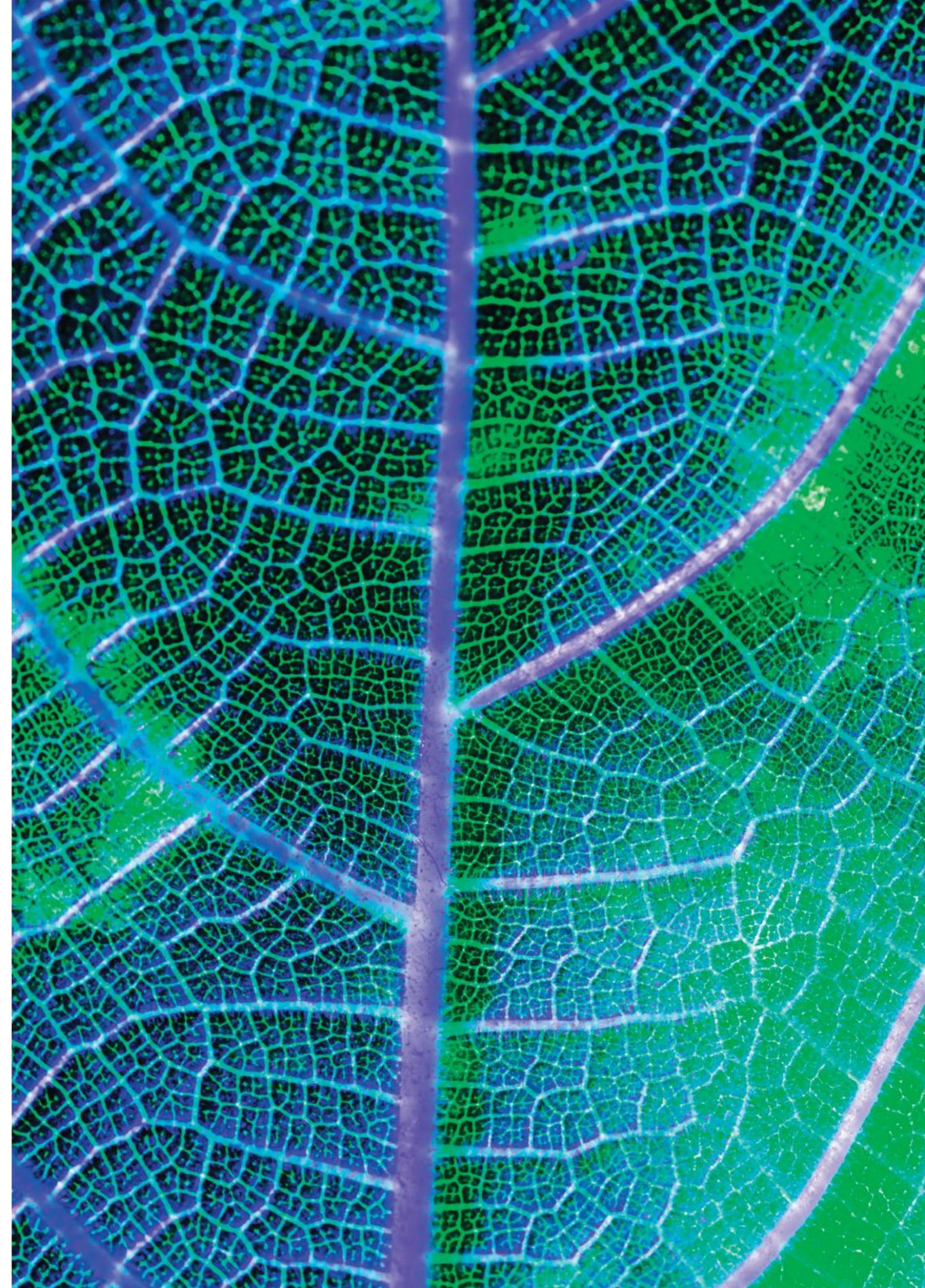
Below Deck
Stephan Huthmacher

At the start of 2025, you handed over the role of CEO to your longtime Management Board colleague Benjamin Schulte and transitioned to the Supervisory Board. What motivated you to take this step?

The succession plan was no accident but the result of a process that unfolded over several years. I'm very pleased that Benjamin is taking over my role, and I see it as a crucial step in securing the sustainable future of Comma Soft. With his expertise and entrepreneurial mindset, he's the ideal person to lead the company. Of course, my age plays a part – I'll be turning 70 in just a few weeks – but what mattered far more to me was the conviction that now is the right time for this transition, not a few years down the road.

What exactly did this process involve?

The process began in 2009 when, 20 years after the company was founded, our Supervisory Board asked me a pointed question: "What would happen to Comma Soft if a brick fell on your head tomorrow?" That blunt question triggered something in me. I realized I had no real answer. It became clear that the way I had been run-ning the company alone wasn't aligned with my goal of building a sustainable, future-ready business that could endure for generations.

So the "brick question" 16 years ago was essentially the spark that got you thinking about a new leadership structure?

Frankly, yes. But the path from realization to solution was anything but easy. For example, I failed in my attempt to bring in external managers. They were highly qualified, but they simply didn't fit our culture. The turning point came when I asked myself one day, borrowing Goethe's words: "Why roam so far? See, the good lies so near."

So you shifted your focus inward?

Exactly. And I realized that the person I had been se-arching for all along was someone I had known for years – and whose collaboration I deeply valued. What's more, Benjamin Schulte's entrepreneurial mindset, along with both his professional and emotional strengths, made him a perfect fit for Comma Soft – and for me. Since we immediately clicked on a personal level, we grew into an increasingly close team. Things worked so well that, in 2016, I asked our Supervisory Board to appoint Benjamin to the Management Board as COO.

What did this change mean for Comma Soft and for you as CEO?

This marked the first real break from the old pattern in Comma Soft's leadership. For the first time in the company's 27-year history, I was no longer solely res-ponsible for day-to-day operations. Expanding the Ma-nagement Board was much more than just a personal relief – it created new synergies and elevated our work at Comma Soft to an entirely new level. Benjamin and I quickly realized that we needed to position the compa-ny for the long term – focusing on resilience, entrepre-neurial thinking, sustainability, and building something that would endure for future generations. Confident in the potential within the company, we launched exten-sive training and development programs, which were eagerly embraced by the entire team and pursued with great dedication. These initiatives sparked a new inter-nal momentum and unlocked fresh potential.

How so?

Everyone leveled up! And we established a second tier of operational leadership below the Management Board: the Executive Management team. This decision

Stephan Huthmacher is the founder of Comma Soft AG and has served as spokesperson for the owning family on the Supervisory Board since 2025.

Stephan Huthmacher speaking at Comma Soft's 35th anniversary celebration.

turned out to be a jackpot – a pivotal moment in Comma Soft's recent history. With these two management layers, we're now able to tackle major global projects more effectively than ever, such as a large-scale separation project in the automotive sector. For that project, we were awarded first prize in the "Technologies" category at WirtschaftsWoche's "Best of Consulting" contest in November 2024.

Was this leadership restructuring the decisive factor in your decision to move to the Supervisory Board?
Absolutely. This transformation has given us lasting strength. We've never been as resilient as we are today. By the end of 2024 – the year we celebrated our 35th anniversary – I felt the perfect moment had arrived to take the next step and begin the transition to a second major shift in our leadership model.

My role is changing, but my deep connection to Comma Soft remains. I will always remain a family entrepreneur at heart. Comma Soft is – and will always be – my life's work and passion. As the representative of the family behind the business, I will continue to advise and inspire Benjamin Schulte and the management team, offering them my knowledge, experience, and support.
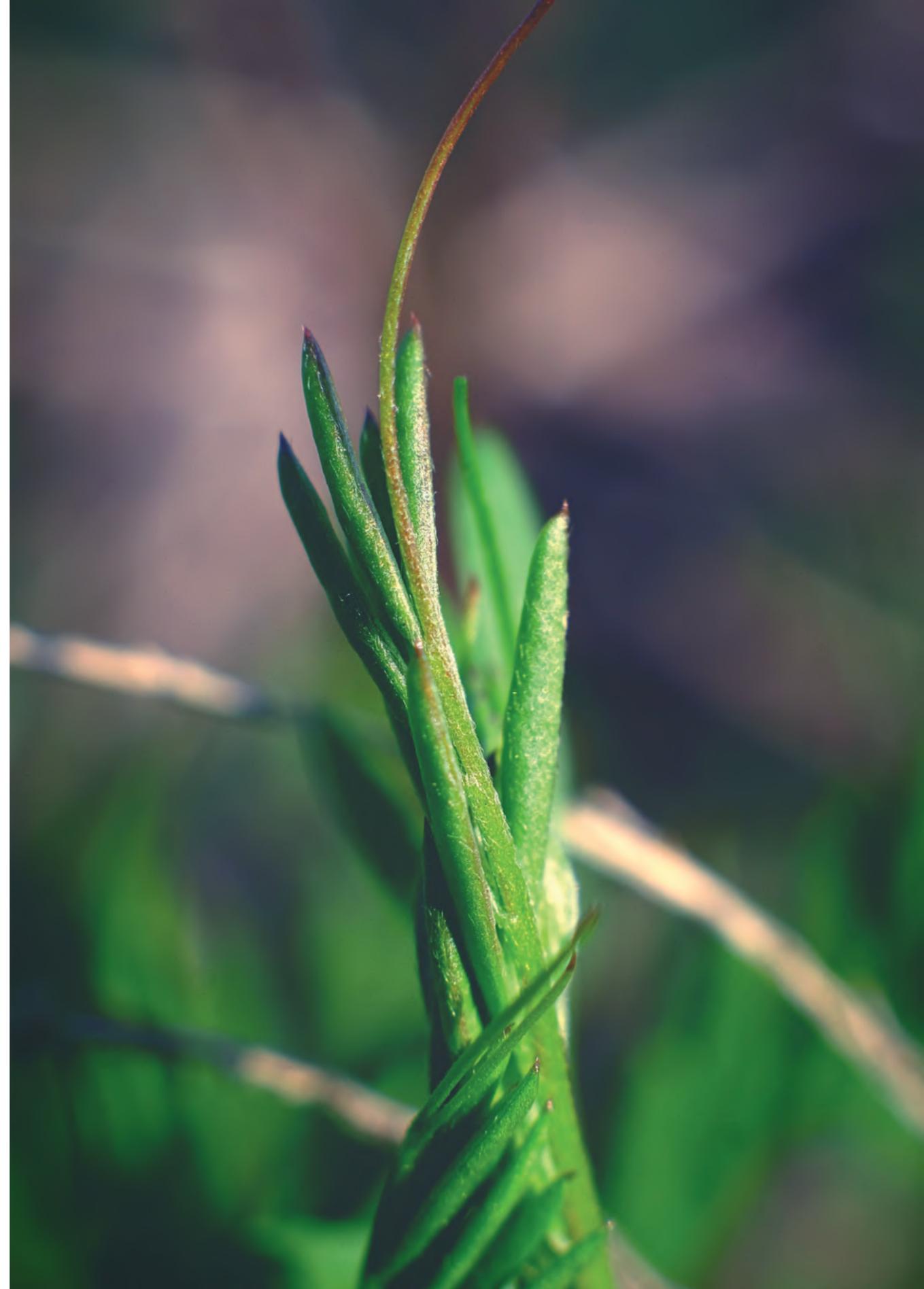
A Journey Through Time:

Cutting-Edge Tech of the 18th Century

Even in Humboldt's time, there were innovations that took people's breath away. Here, we explore six fields that transformed the world in that era.

Orientation: Humboldt explores and maps the world

Humboldt mapped unknown territories with sextants, barometers, and chronometers. His precise measurements made the world more understandable and predictable – paving the way for trade and scientific advancement. Reading suggestion: „Measuring the World by Daniel Kehlmann"[15].

Knowledge management: Lithography and photography – the dawn of the image revolution

The mass dissemination of knowledge and art began with photography and lithography. From Senefelder's lithography (1796)[16] to Niépce's first photograph (1826)[17] and Daguerre's daguerreo-type process (1839)[18], which made photography commercially viable for the first time, marking the dawn of the knowledge society!

Observation & measurement: Precision revolutionizes science

Microscopes, telescopes, thermometers, and barometers revolutionized research[19]. Humboldt masterfully used these tools to measure altitudes, temperatures, and magnetic fields – a milestone for the natural sciences and the data-driven world we live in today.

Communication: Telegraphy – the original digital disruption

In 1837, Samuel Morse's telegraph partly replaced the stagecoach. Messages could now travel in minutes instead of weeks. The world grew more connected, and the Morse code distress signal SOS ("···−−−···") has been saving lives ever since its introduction in 1904.
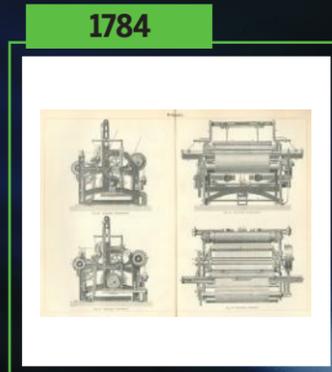
Production: The mechanical loom – revolutionizing textile manufacturing

In 1784, Edmund Cartwright invented the mechanical loom, revolutionizing textile production.[20] Fabrics became cheaper, factories emerged, and the first industrial revolution began to take shape. Machines would now set the pace of progress.

Transportation: Steam power takes over factories, land, and waterways

From Newcomen's first steam engine (1712) to Watt's improvements (1765)[9], the steam engine marked a giant leap into the future across industries: textiles[10], mining[11], paper production[12], metalworking[13], and of course transportation, with steamships and the first locomotive (1804)[14]. Steam truly was the driving force of the Industrial Revolution.

1712
Thomas Newcomen develops the steam engine.

1731
Thomas Godfrey and John Hadley develop the sextant; Hadley also invents the octant.

1712

1730
René-Antoine Ferchault de Réaumur develops an alcohol thermometer and the temperature scale named after him.

1730

1784

1770
High-aperture and color-corrected telescope lenses are developed.

1783
The first manned balloon flight takes place.

1765

1784
Edmund Cartwright develops the power loom.

1796
Alois Senefelder develops lithography.

1799-1804
Alexander von Humboldt undertakes his first research trip to America.

1799
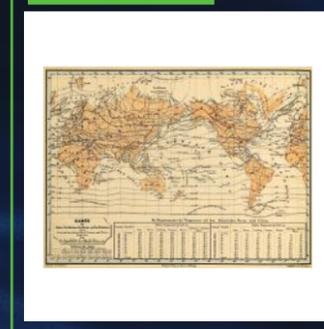
1839
Louis Daguerre develops the daguerreotype, the first commercially viable photographic process.

1804
The first steam locomotive rolls over the tracks.

1826
Nicéphore Niépce takes the first photo with a camera obscura.

1837
Samuel Morse develops telegraphy.

1826

8 https://www.ardalpha.de/wissen/geschichte/historische-persoenlichkeiten/samuel-morse-morseapparat-telegrafie-erfin-dung-100.html | 9 https://www.ardalpha.de/wissen/geschichte/historische-persoenlichkeiten/james-watt-dampfmaschine-in-dustrielle-revolution-100.html | 10 https://link.springer.com/article/10.1007/s43253-024-00129-x | 11 https://www.ncm.org.uk/news/the-rise-of-the-steam-engine/ | 12 https://steammain.com/how-steam-is-used-at-paper-mills/ | 13 https://www.amusingplanet.com/2017/06/the-steam-hammers-of-industrial-age.html | 14 https://www.locos-in-profile.co.uk/Early_Locomotives/Early_1.html | 15 https://www.rowohlt.de/buch/daniel-kehlmann-die-vermessung-der-welt-9783499013225 | 16 https://www.deutschlandfunk.de/vor-250-jahren-geboren-alois-senefelder-der-erfinder-der-100.html | 17 https://www.deutschlandfunk.de/joseph-nicephore-niepce-der-heimliche-erfinder-der-100.html | 18 https://www.ardalpha.de/wissen/geschichte/kulturgeschichte/fotografie-daguerreotypie-daguerre-niepce-geschichte-100~_image-7_-5e4124880dcfd9e3e3ecb9a873057893665d3e84.html | 19 https://humboldt.unibe.ch/erschliessung/transversal/06_erfindungen_und_instrumente | 20 https://www.konstruktionspraxis.vogel.de/die-entwicklung-des-mechanischen-webstuhls-a-c28616c58097e36f4ae4b467d9003e09/

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The Connecting Power of Science

A goosebump moment at the 2024 Petersberg Talks

But then came the surprise: Joscha Bach spontaneously shared how a GEO article about fractals in the 1990s had deeply immersed him in the world of complex numbers as a student, shaping his successful path into science. Shortly after, Prof. Christian Mayr shared a similar story before his keynote speech: he, too, had been inspired to pursue his career by the same article.

The climax came when Prof. Peitgen revealed himself as the author of this article – a work that had profoundly influenced two scientists on their journeys. This unexpected connection, discovered at our forum, was a true moment of serendipity – exactly the kind of inspiring exchange the Petersberg Talks aim to foster. Life writes the best stories, and this moment proved how such encounters can spark ideas that continue to light the world for decades to come.

Comma Soft founder Stephan Hutmacher summarizes: *„I'm thrilled with how atmospheric, inspiring, and relevant our congress was this year. And I can already feel myself thinking ahead to the 17th Petersberg Talks on September 27, 2025."*

Learn more about the Petersberg Talks

A field report by Stephan Huthmacher and all presentations from the last editions can be found here. **www.petersberger-gespraeche.de/jahr/2024/**.

Save the Date
Petersberg Talks 2025
on September 27, 2025

Everywhere an early intuition
precedes later knowledge.

Humboldt.