The Stern Stewart Institute

We *didn't start the fire*

PERIODICAL #33

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We *didn't start* the *fire*

Billy Joel's 1989 anthem races through four decades of crises – and resolves them all in one convenient chorus: We didn't start the fire. It was always burning since the world's been turning. History as an alibi. Europe has quietly adopted that chorus as its economic policy. Trump's tariffs, Putin's war, China's subsidies, demographics – all exogenous, all somebody else's arson. We didn't start the fire. And in fairness: nobody denies it has to be fought. We just fight it our way – wrong measures, half the pressure, and a press conference for every bucket of water.

The flames, meanwhile, are no longer metaphorical. What we are witnessing is not the decline of the German car industry – it is its disappearance as an economic force. The industry was never just about cars. It was an ecosystem: profits that financed suppliers, research, wages, and ultimately the fiscal room in which German – and European – politics could operate. A tenth of our economic substance, evaporating in slow motion while we debate fleet emission targets for 2035.

The transatlantic comparison tells the same story. Twenty years ago, the US and Europe were peers in output, growth, and influence. Then the paths diverged – not through one dramatic event, but through choices. America kept rewarding innovation, risk, and building. Europe leaned into regulation, process, and caution. Choices compound. Twenty years later, the gap is no longer a statistic; it is a strategic condition.

Here is the uncomfortable truth behind the comfortable chorus: it doesn't matter who started the fire. What matters is whether the fire brigade shows up with water – and ours has spent a decade polishing the truck and holding stakeholder dialogues on the color of the smoke. Worse: some of the fuel is unmistakably our own. Energy prices that tax our industrial core out of the market. A bureaucracy that treats every builder as a suspect. A welfare state that rewards absence from work. These fires we did start – and we keep feeding them.

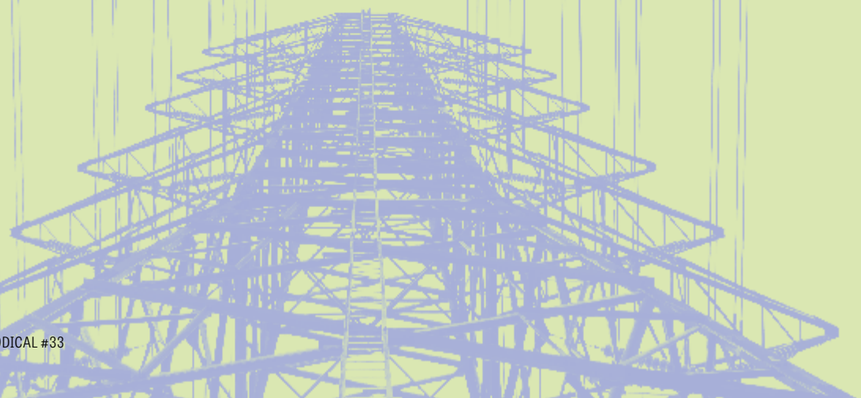
The to-do list is not sophisticated; it is embarrassingly obvious. Deliver cheap energy as industrial policy, not as an afterthought of climate choreography. Cut bureaucracy with a target, a deadline, and consequences. Reward risk-taking instead of insuring against it. Invest in infrastructure with the urgency we finally found for defense. Rebuild the welfare state around one principle: contribution. And rethink immigration from scratch – wide open for the skilled and motivated, firmly closed as a pathway into social systems, and, as in the US, with a clear expectation that everyone joins the workforce. None of this requires genius. It requires the one resource our politics treats as scarce: the will to decide.

That is the real difference between Austin and Berlin, between Washington and Brussels – not capability, but posture. One system manages fires. The other manages responsibility away.

So yes – we didn't start the fire. But we own the building. Our authors have brought the extinguishers. Come on and join them...Enjoy your read.

Gerhard Nenning

Reliable. *Efficient.* Stable.



Anne-Laure de Chammard
Member of the
Executive Board
Siemens Energy

Anne-Laure has run everything from industrial decarbonization to construction conformity – now she leads one of the world's major energy transition efforts.

Why Europe's Energy Transition Now Hinges on System Delivery

Europe is not simply entering another chapter of the energy transition. We are entering the Age of Electricity – an era in which power becomes a decisive currency of competitiveness, societal stability, and geopolitical agency. Demand is rising as the system is rebuilt: more electrification, more variable generation, new types of large loads, and new requirements on grids and flexibility.

In other words, we are not only expanding the system, but we are also transforming it while keeping it running. Resilience has therefore become an operational necessity: the ability to keep the lights on, protect critical infrastructure, and restore systems quickly when disruptions hit – whether driven by extreme weather, cyber risks, or supply constraints.

A new energy framework

For years, we spoke of the energy trilemma – balancing sustainability, affordability and reliability. But today that triangle is no longer enough: resilience must stand as a fourth cornerstone. Because resilience doesn't come from wishing things were perfect – it comes from being ready when they're not. That is why security and affordability move to the foreground – not against decarbonisation, but as the precondition for sustaining it politically and economically. A transition that feels unreliable or unaffordable loses acceptance and speed.

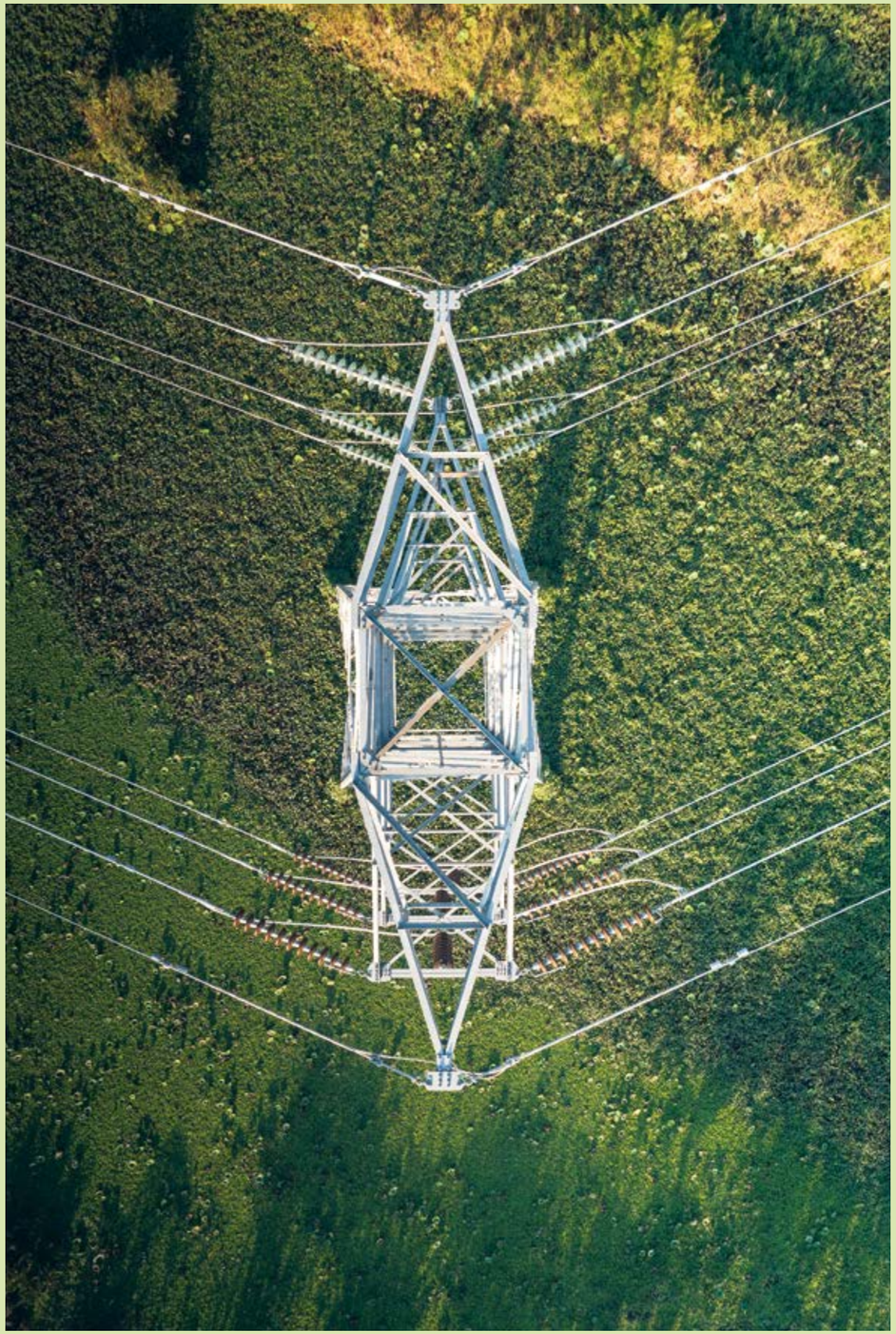
That shift is already measurable: electricity demand is rising faster and more concentrated than many plans have so far captured. Electrification in industry and buildings, electric mobility, and digitalisation all push power demand upward. What is new is the pace and the clustering of load in specific places. Data centres are the clearest example. The International Energy Agency (IEA) expects their electricity consumption to more than double by 2030, from roughly 415 terawatt-hours in 2024 to 945 terawatt-hours – roughly the scale of today's Japan. Development in this arena is advancing at a breakneck pace, faster than any previous technology cycle: The computing power used to train leading AI models has been growing exponentially, doubling roughly every few months. But this is not only more electricity; it is a different kind of demand: concentrated, fast-growing, and unforgiving on reliability. If we underestimate this, we may add clean generation capacity without necessarily building a system that households and businesses can trust.

At the same time, it matters to acknowledge how far we have already come. Renewable energy reached a historic milestone and in 2025 overtook coal in global electricity generation for the first time. And renewables are no longer the economic problem some still assume. The International Renewable Energy Agency (IRENA) shows that utility-scale solar and onshore wind are among the lowest-cost sources of new power. 91% of renewable projects commissioned in 2024 delivered electricity cheaper than the least-cost new fossil alternative. The agency also estimates that renewables helped avoid around USD 480 billion in fossil-fuel costs globally in 2025.

Yet precisely because clean electricity is becoming cheaper, demand accelerates – and with it, the premium on grids, flexibility, and stability. The success of renewables raises the bar for the system that must move, balance, and reliably deliver those electrons.

This is why the energy transition should not be framed as a race for one winning technology. It is the construction of a system. A system that must be available when needed, efficient in its use of resources, and stable under stress. That is the practical meaning of reliable, efficient, and stable. And it is the standard against which investment decisions, industrial location choices, and public acceptance will be made.

Electricity demand is rising faster and more concentrated than many plans have so far captured.



Delivery is the differentiator

Accordingly, the bottleneck is increasingly not generation, but system capability. Dependable electricity supply needs grids, cross-border interconnections, digital control, and flexibility. Without adequate grids, even cheap wind and solar become expensive, because congestion, curtailment, and uncertainty raise system costs. Flexibility is not a footnote; it means storage that can absorb power and release it later; consumers that can shift demand in time; fast reserves that can step in; and grids that isolate faults automatically before a local disturbance becomes a cascading failure.

There is also a basic physical truth: a power system needs dispatchable capacity – assets that can respond on demand regardless of the weather. The higher the share of variable renewables, the more important it becomes to secure supply for periods when wind and sun contribute less. That is why flexible gas-fired plants still matter in the transition: they provide fast, controllable capacity that can replace coal and stabilise the system when renewables dip. The point is to keep the system stable through credible transition pathways – designed from the start for decarbonisation, including hydrogen-ready operation and, where appropriate, carbon capture – so that emissions keep falling over time.

Up to here, the discussion has been about the energy system as a whole: generation, grids, and security of supply. But a large part of the transition will be won – or lost – somewhere else: in energy-intensive industries. In industry, energy is a core production factor, often as high-temperature heat, process steam, or continuous power for large drives and compressors. Assets run for decades; downtime is costly; and retrofits must fit into narrow maintenance windows.

A large part of the transition will be won – or lost – somewhere else: in energy-intensive industries.

The business case for industrial decarbonization is therefore driven from two directions at once: regulation and climate targets on the one hand, and economics on the other. Reducing fossil fuel use – whether through electrification or a fuel switch – lowers exposure to volatile fuel markets and carbon costs, while efficiency is a direct cost lever – every saved kilowatt-hour strengthens competitiveness.

A practical example illustrates what this looks like in practice. At Shell Chemicals Park Moerdijk, steam-driven systems have just been replaced with electric drives; Shell expects that by operating with clean electricity emissions at the site can be reduced by around 230 kilotons of CO_2 per year. Beyond emissions, the move improves the predictability of operating costs by reducing exposure to fuel price and supply risks.

Europe frequently slows itself down through avoidable complexity: fragmented requirements, specifications, and processes for essentially similar tasks.

No transition without traction

This is where industrial transformation either scales or stalls: between technical feasibility and practical delivery. In energy-intensive industry, time is a scarce production factor. The longer a project sits in limbo, the more risk and financing cost it accumulates.

This is why grid connections and permitting are so central. Renewable energy and storage projects around the world are waiting to be connected to the grid. In Europe alone, around 1,700 gigawatts are on the waiting list in 16 countries. This is electricity that exists on paper but can only support AI or industry once it is actually fed into the grid. In Europe, it often takes seven to ten years to permit a new power line, while only two to four years to build it; more than half of delays are now linked to permitting processes rather than engineering or materials. What is true for the power sector is also true for energy-intensive industry: if connections and approvals do not keep pace, efficiency gains and emissions reductions remain on paper, and investment decisions migrate to places where execution is more predictable.

Even where permitting improves, Europe frequently slows itself down through avoidable complexity: fragmented requirements, specifications, and processes for essentially similar tasks. That undermines scale, stretches lead times, and drives up cost, because planning and procurement are reinvented again and again. A single European transmission project can involve around 20,000 pages of technical specifications and drawings – because standardization is missing. Common technical standards act as accelerators here: they reduce friction, lower risk, and turn one-off projects into repeatable patterns that can genuinely scale.

So the sober conclusion is this: Technology exists. Progress is visible. The next phase of the transition will now be decided primarily by our ability to deliver projects that are bankable and repeatable. This applies to grid expansion as well to industrial retrofits. Where permitting takes years, standards clash, and schedules keep slipping, a technical solution becomes an investment risk. Where, on the other hand, planning, grid access, and rules are reliable, the same solution becomes a scaling template.

It's all about industrial implementation: how do we build a system that can absorb rising electricity demand and reduce emissions at the same time? That requires less complexity and more repeatability: permitting that works to clear timelines; technical standards that scale across Europe; and system planning that links generation, grids, new loads, and flexibility from the start, instead of patching them sequentially. And it requires delivery capacity: skills, supply chains, and project management – everything that turns plans into reality.

Between *long-term DNA* and *short-term shock-waves*

Axel Wachholz
Group CFO
Phoenix Contact

Axel has spent 25 years transforming industrial companies – from consulting turnarounds to leading family-owned champions. While others debate the future of industry, Axel Wachholz shapes it.

German Family-Owned Technology Champions in a Fragmenting World

Monday. Board Meeting with open end. Times are tough, so is competition. We are a German multi-billion tech company, 80% of our revenue is non-German, we are family-owned since 1923 with a strong culture and entrepreneurial mindset. Our board meetings should be about global markets, customer requirements, product innovations, strategic capital allocation, organizational efficiency, and digitalization. But they are not.

To a (too) large extent they are driven by geopolitical risk & situation, nerve centre insights, legal compliance, regulatory requirements and building financial resilience in the light of uncertainty. This is neither new, nor surprising, but it changes everything:

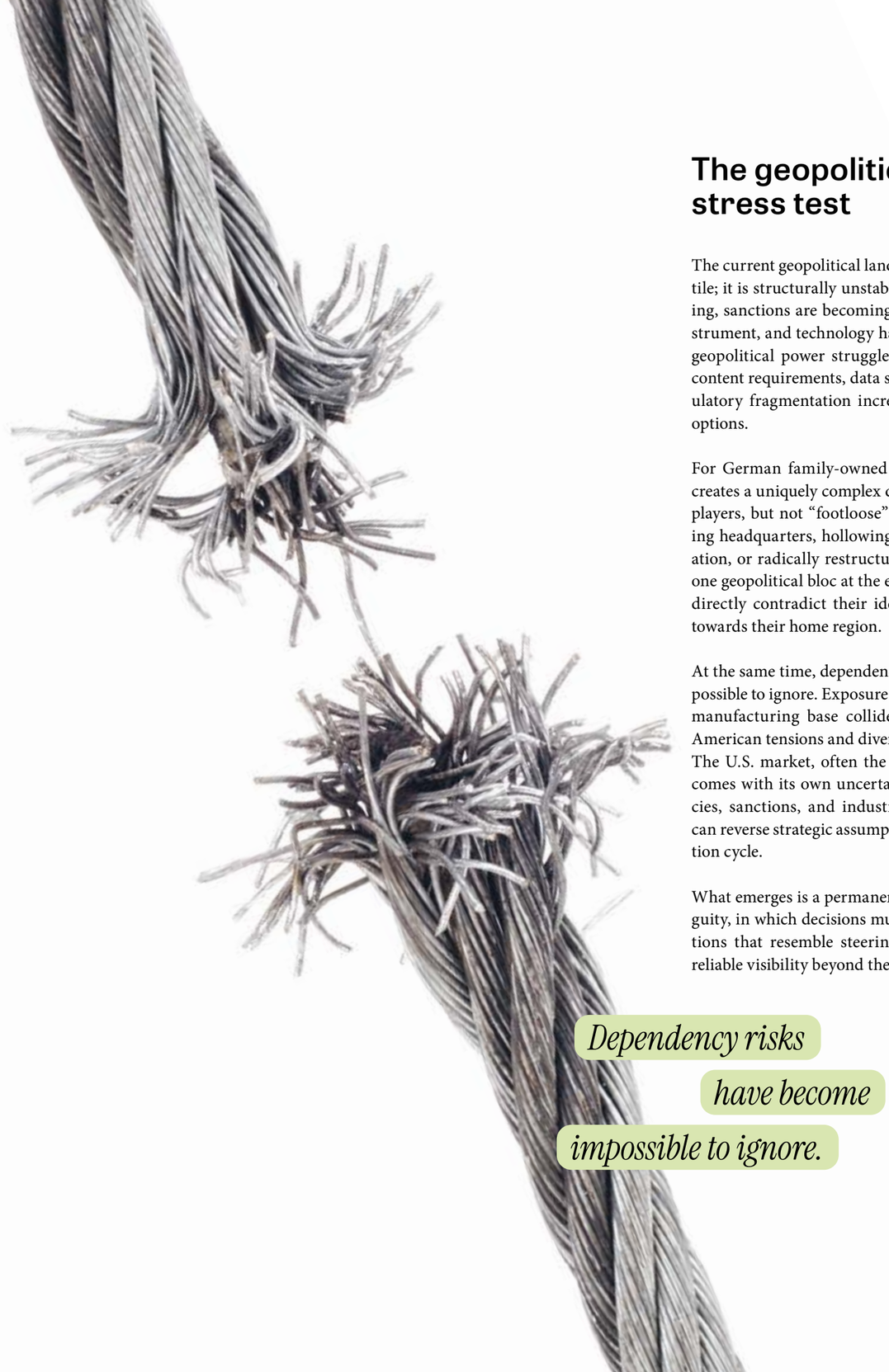
By any traditional definition, Germany's technology-driven family enterprises are built for endurance. Yet the world they face today is anything but stable.

The current geopolitical landscape is not merely volatile; it is structurally unstable.

Reality bites

Germany's globally renowned *Mittelstand* and large family-owned technology groups have long been admired for a distinctive combination: deep engineering expertise, strong regional roots, global market leadership in niches, and an ownership structure designed for decades rather than quarters. Companies like ours exemplify this model: Firmly embedded in Germany, closely connected to the region, employees and communities, and guided by family values that privilege continuity, responsibility, and resilience over rapid financial optimization.

But the industrial and geopolitical environment in which these companies operate has changed with unprecedented speed and intensity. While their headquarters, talent base, and cultural identity remain anchored in Germany and Europe, a significant share of their revenues is generated in Asia and in the Americas, most notably the United States. This global footprint, once a source of diversification and growth, has turned into a strategic tension field.



The geopolitical stress test

The current geopolitical landscape is not merely volatile; it is structurally unstable. Trade barriers are rising, sanctions are becoming a normalized policy instrument, and technology has moved to the centre of geopolitical power struggles. Export controls, local content requirements, data sovereignty laws, and regulatory fragmentation increasingly dictate strategic options.

For German family-owned technology groups, this creates a uniquely complex dilemma. They are global players, but not "footloose" multinationals. Relocating headquarters, hollowing out domestic value creation, or radically restructuring footprints to satisfy one geopolitical bloc at the expense of another would directly contradict their identity and responsibility towards their home region.

At the same time, dependency risks have become impossible to ignore. Exposure to China as a market and manufacturing base collides with escalating Sino-American tensions and diverging regulatory regimes. The U.S. market, often the second strategic anchor, comes with its own uncertainty: shifting trade policies, sanctions, and industrial policy activism that can reverse strategic assumptions within a single election cycle.

What emerges is a permanent state of strategic ambiguity, in which decisions must be made under conditions that resemble steering in heavy fog, without reliable visibility beyond the next few months.

Dependency risks have become impossible to ignore.

Long-term orientation meets short-term reality

Family-owned enterprises often differ from listed corporations in their orientation. They are not primarily driven by shareholder value, but by stakeholder value: employees, customers, suppliers, regions, and future generations of owners. Equity is treated as a scarce and valuable resource, not as an instrument for financial engineering. Personnel decisions follow a logic of loyalty and long-term capability preservation rather than rapid workforce adjustment.

This philosophy has been a strength for decades. In today's environment, however, it is also a source of profound tension.

The frequency of external shocks has reached a level that makes traditional planning cycles almost obsolete. The COVID-19 pandemic, semiconductor shortages, global logistics breakdowns, Russia's war against Ukraine and the resulting sanctions regime, escalating conflicts in the Middle East, rising tensions involving Iran, and the growing unpredictability of U.S. trade and industrial policy have created an environment in which multi-year forecasts quickly lose validity.

The frequency of external shocks has reached a level that makes traditional planning cycles almost obsolete.

At the same time, new "hype cycles" with real economic impact are triggering massive, short-term shifts in demand, capital allocation, and political attention: data centres, shifting energy ecosystems, electrification, automation, and defence technologies. For family enterprises, the dilemma is acute: reacting too slowly risks strategic irrelevance; reacting too fast risks undermining the very principles that define their identity.

A real-world case

Seen through our lens, this tension becomes tangible. We recognized the emerging realities early and understood their systemic implications: geopolitical fragmentation, technology-driven productivity leaps, and a reordering of global value chains. Yet recognition alone does not automatically translate into action.

The challenge lay in the gap between what is necessary and what is feasible. Decisions that are clearly correct from a strategic rationale often require time-consuming internal alignment within family-governed structures: portfolio adjustments, footprint diversification, acceleration of technology investment, or organizational transformation. Unlike publicly listed companies, where capital market pressure can force rapid moves, family enterprises must reconcile urgency with responsibility.

This has led to moments of perceived sluggishness. Not due to lack of insight, but due to the complexity of translating insight into actionable change without breaking the social and cultural fabric of the organization.

Cultural transformation under external pressure

One of the most striking consequences is that transformation is no longer being driven primarily by long-term family strategy, generational succession planning, or organic growth ambitions. Instead, externally induced shocks are forcing deep changes in culture, governance, and operating models, particularly at headquarters and parent-company level.

The result is a shift in the Target Operating Model that is reactive rather than visionary in origin. Decision-making fundamentally shifts, planning horizons shorten, and traditional consensus-oriented processes come under strain. Employees who joined the company expecting stability and gradual evolution now face a reality of continuous change, reprioritization, and "management by sight."

This marks a profound cultural turning point. The implicit social contract of the family enterprise – stability in exchange for loyalty and performance – is being renegotiated under pressure from markets and geopolitics rather than internal choice.

A new industrial revolution

It is tempting to frame the current situation as yet another industrial revolution driven by technology and productivity. In truth, it is something broader and more unsettling: a reorganization of global markets and power structures in which technology is both the driver and the battlefield.

Unlike previous industrial revolutions, this one is not primarily about expanding global integration. It is about fragmentation, system rivalry, and strategic autonomy. Supply chains are being regionalized, technological standards are diverging, and corporations are increasingly expected to act as extensions of national or bloc-level interests.

For German family-owned technology companies, this raises existential questions. How to remain globally competitive while maintaining regional identity? How to reconcile stakeholder responsibility with the need for rapid, sometimes painful decisions? How to invest boldly under conditions of geopolitical uncertainty and regulatory unpredictability?

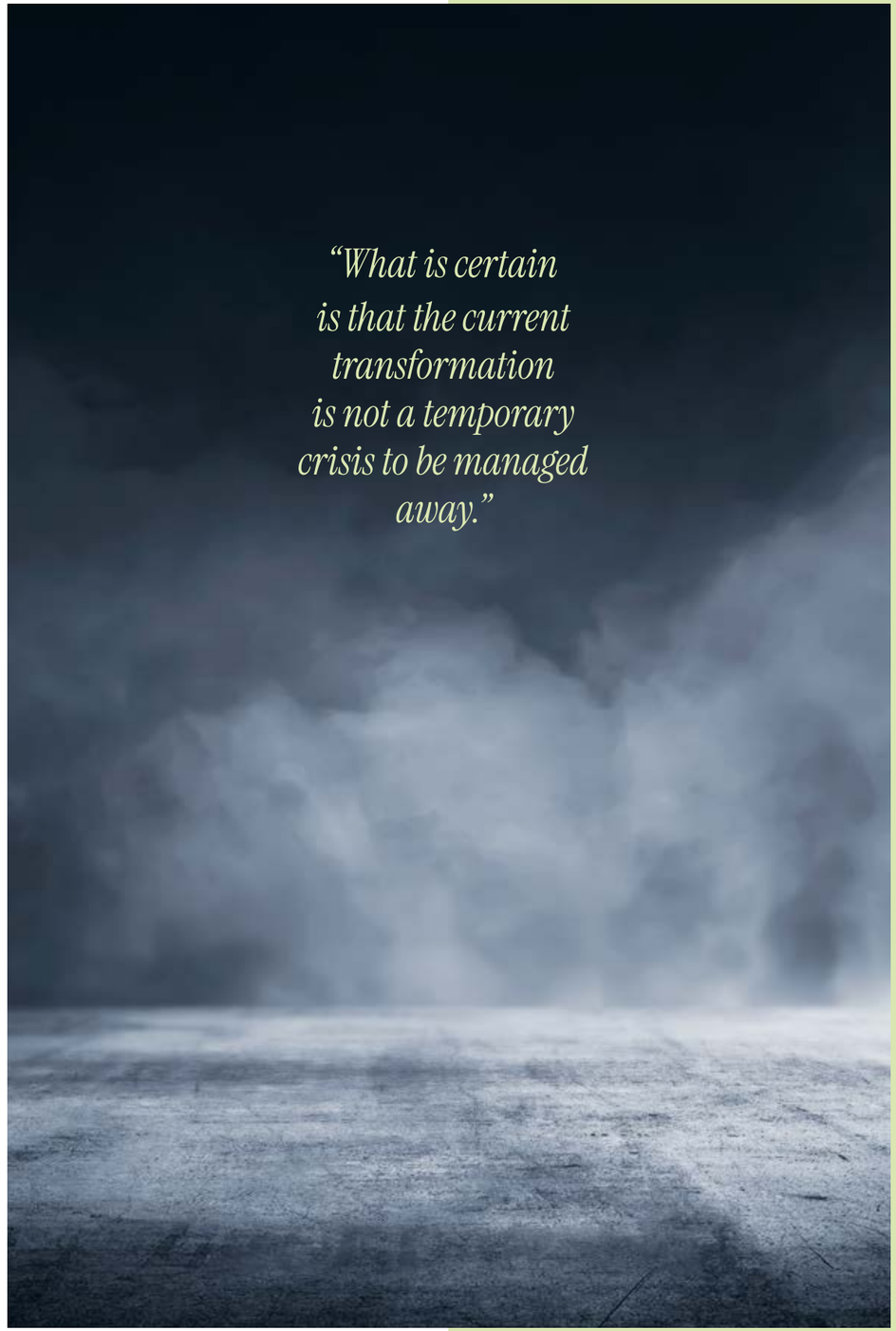
An uncertain path forward

There are no simple answers. What is clear is that the traditional playbook no longer applies. Family-owned technology champions must develop new forms of strategic ambidexterity: preserving long-term values while mastering short-term agility; protecting core capabilities while selectively decoupling from geopolitical risk hotspots; and fostering a culture that can absorb continuous change without losing its moral compass.

The outcome remains uncertain. Some will succeed in redefining their role in a fragmented world. Others may struggle under the weight of contradictions they did not create.

What is certain is that the current transformation is not a temporary crisis to be managed away. It is a structural shift of historic magnitude. For companies like ours and its peers, the challenge is not just to survive it, but to find a new, credible position within a reordered global industrial landscape.

The destination is unclear. The journey, however, has already begun.



Resilience *is key*

Why Industrial Transformation Requires Speed, Discipline, and Optionality

Markus Forschner
CFO
Robert Bosch

Markus started out coding, not counting before he ever touched a balance sheet. Now he runs the numbers behind one of the world's industrial giants. Turns out the best finance chiefs think like engineers first.

In the industrial world, it is misleading to speak of a "return to normal." Normality, as we once understood it, no longer exists. Change is not a temporary deviation from stability. It has become the stable condition itself.

The central question is therefore how companies can prepare for disruption and build organizations capable of remaining resilient while continuously transforming – from a position of strength, not weakness.

The greatest risk is not crisis – but inertia

Europe, and especially Germany, have long benefited from industrial strength, engineering excellence, and globally integrated markets. Today, this model is under pressure from multiple directions at once. Decarbonization, digitalization, hybrid globalization, and intensifying global competition – particularly from China and the United States – are putting this model under pressure from multiple directions at once.

The greatest risk in such an environment is not external shock. It is internal delay. Companies rarely fail because they fail to see change entirely. They fail because they recognize it too late – or respond too cautiously. Transformation, therefore, is ultimately a question of speed, learning, and the willingness to challenge established structures early enough.

Companies rarely fail because
they fail to see change entirely.
They fail because they
recognize it too late.

Bosch: continuity and change as a strategic advantage

Bosch has always seen continuity and change as strategic factors for success. Ensuring adaptability is a continuous task and was also set out in the will of founder Robert Bosch: to align the company with markets, technologies, and economic conditions in a constantly evolving and future-focused manner for a meaningful development.

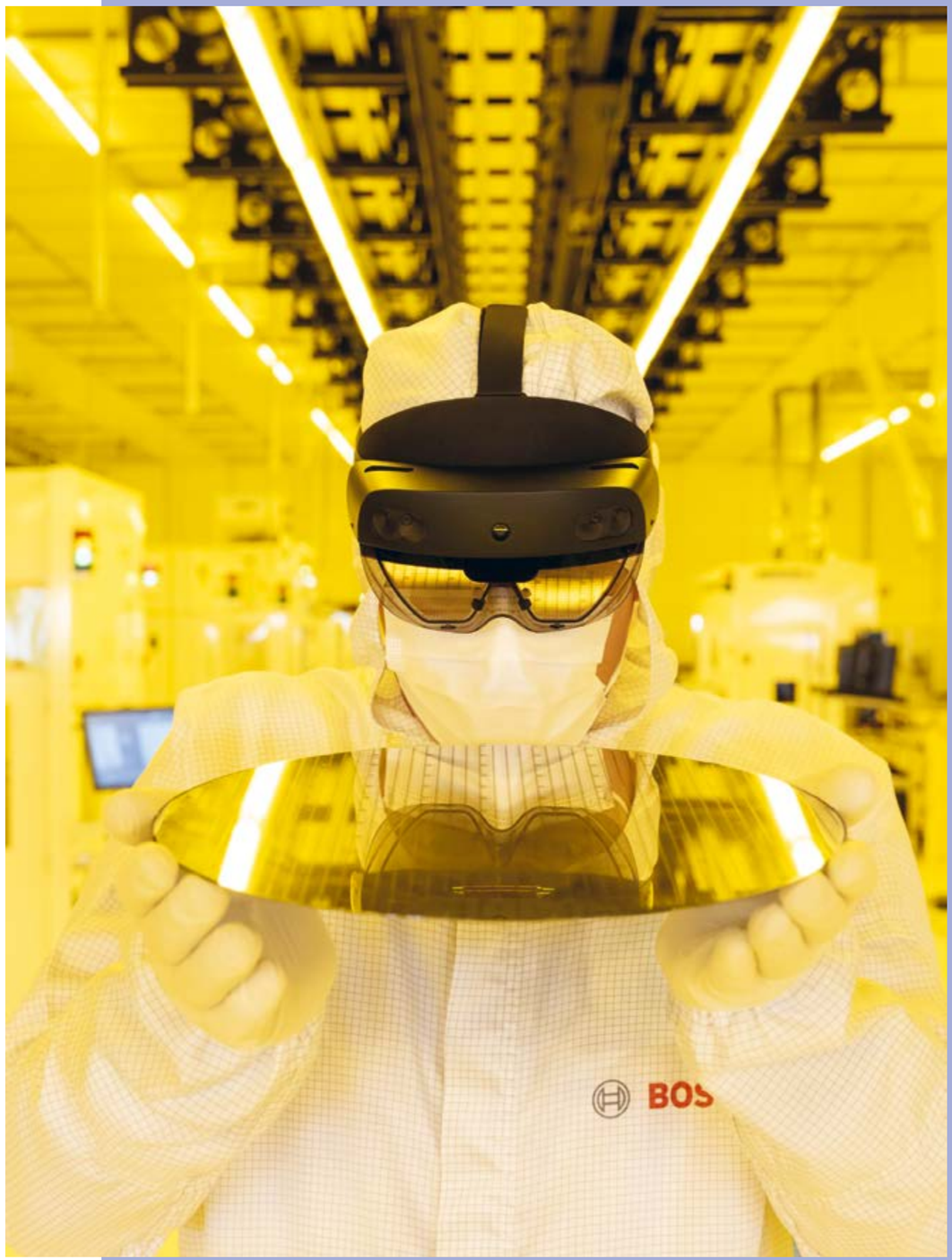
A key differentiator of Bosch is our unique ownership setup. The company is predominantly owned by a charitable foundation structure anchored in the principles of long-term continuity and independence.

The majority of share capital is held by the Robert Bosch Stiftung GmbH, while voting rights are exercised by Robert Bosch Industrietreuhand KG, ensuring that economic performance, long-term responsibility, and the founder's guiding principles remain aligned.

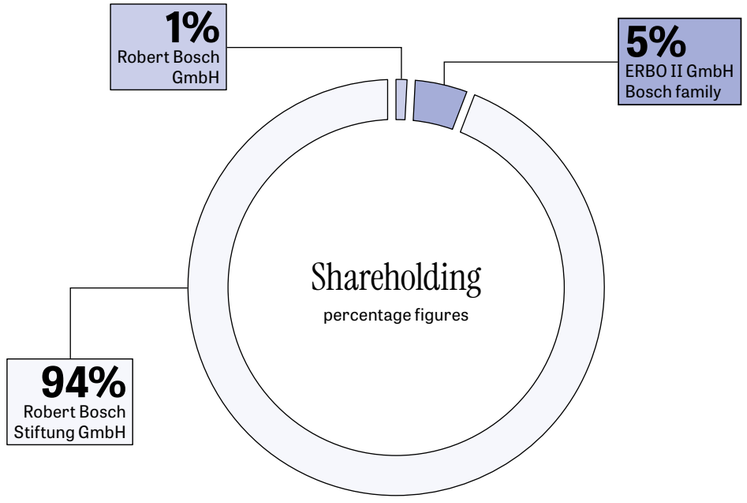
This structure is fundamentally different from publicly listed corporations. It is designed to ensure that Bosch can act independently of short-term capital market pressures while remaining fully committed to financial discipline and competitiveness.

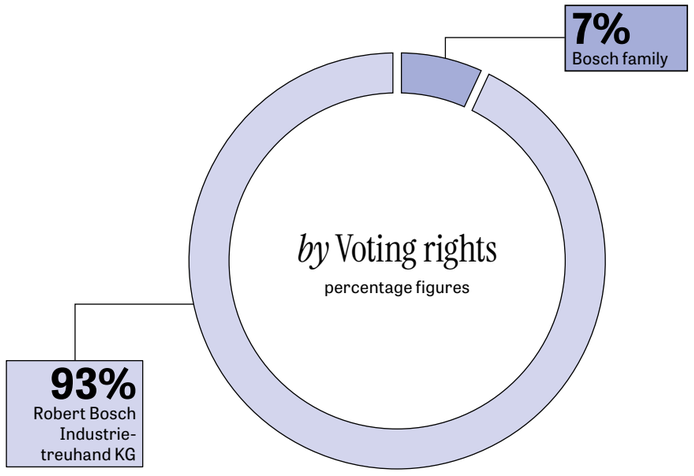
This independence is a major strength in times of necessary structural transformation. It allows Bosch to invest with patience, to act counter-cyclically, and to prioritize long-term technological capability over short-term earnings optimization.

At the same time, this independence also creates accountability: the responsibility to remain competitive, efficient, and strategically focused.



Shareholders of Robert Bosch GmbH





Financial strength is not static.

Financial strength as strategic foundation

A key pillar of this resilience is our financial strength. Maintaining a strong investment-grade profile, including a rating "A" from S&P Global Ratings and Fitch, is a central strategic priority. It enables access to financing under stable conditions, counter-cyclical investment in transformation, and long-term industrial commitments at scale. But a strong investment rating also requires discipline. Financial strength is not static. It must be earned continuously through performance, efficiency, and responsible capital allocation.

In an industry transformation of this magnitude, financial robustness is not a constraint – it is a prerequisite for action.

Technology neutrality as disciplined optionality

The Bosch Group deliberately pursues a technology-neutral approach. This is sometimes interpreted as a lack of focus, especially in the current transformation to electromobility in Europe. But in highly uncertain technological transitions, narrowing technological focus too early can become a strategic risk.

That is why Bosch continues to invest across multiple domains:

- electromobility
- hydrogen technologies
- semiconductors
- industrial AI
- software-defined systems
- and efficient combustion technologies.

This is disciplined optionality: maintaining strategic flexibility while increasing clarity through real-world scaling and market feedback.

Global strength, diversification, and relative robustness

Because technological uncertainty remains high, diversification becomes a strategic resilience mechanism. Bosch's global diversification across industries, technologies, and regions provides a structural buffer in a volatile environment.

Bosch is independent of a single technology transition, a single market, or a single customer ecosystem. This breadth is a stabilizing factor in a fragmented global economy.

At the same time, diversification must be combined with focus, execution discipline, and the ability to reallocate resources quickly when conditions change.

Industrial change is reflected directly in financial results and operational decisions.

Financing change: transformation in the financial figures

Industrial change is reflected directly in financial results and operational decisions. Last year, Bosch generated approximately €91 billion in revenue, while the operating margin of around 2% reflected cyclical pressures and elevated transformation investments.

At the same time, Bosch implemented required restructuring measures of approximately €2.7 billion, addressing structural adjustments in parts of the business affected by market shifts, technological change, and evolving cost structures.

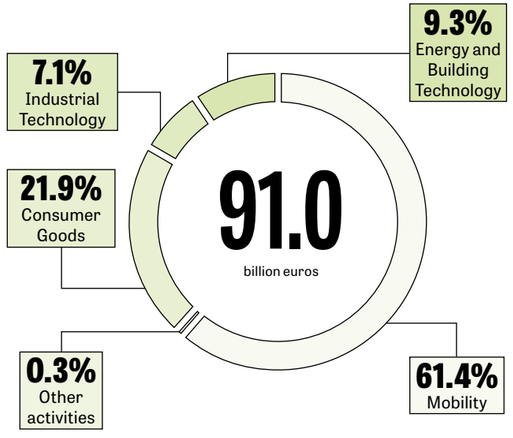
These measures are expressions of active portfolio management in response to structural change. Transformation has a cost – but the greater risk lies in delaying necessary adjustments.

Europe and China: execution speed and the new industrial reality

Europe remains one of the world's strongest industrial regions. Its strengths in engineering, research, industrial quality, and regulatory standards continue to provide a powerful foundation. However, competitiveness increasingly depends on speed of execution, not only on innovation capability. Many European companies have to deal with structural challenges such as high energy costs, regulatory complexity, and slow permitting processes create friction in scaling innovation into industrial leadership.

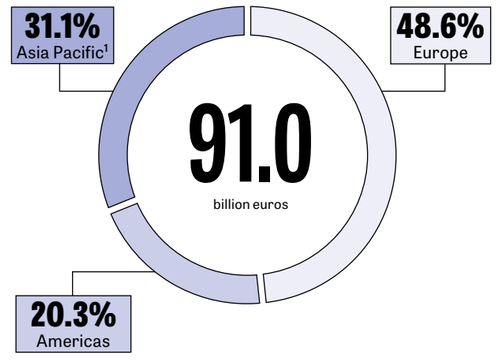
At the same time, China has emerged as a full-scale industrial competitor and benchmark for speed, integration, and scaling capability. For Bosch, China is one of the most important global markets – but also a place where technologies are developed and scaled at exceptional speed. China is simultaneously customer, partner, and competitor.

Sales revenue



by business sector

percentage figures



by region, 2025

percentage figures

[1] Including other countries and Africa

The challenge for Europe is therefore to translate innovation into industrial scale with sufficient speed and consistency.

Without this alignment between technological ambition and industrial execution, even strong innovation ecosystems risk losing long-term relevance.

This can be a competitive edge for companies like Bosch that combine European engineering expertise and industrial reliability with greater organizational speed, adaptability, and execution capability in global markets.

Without this alignment between technological ambition and industrial execution, even strong innovation ecosystems risk losing long-term relevance.

Conclusion: resilience from a position of strength

European companies in particular can enter a period of structural transformation from a comparatively strong position when they are diversified, globally embedded, financially robust, and characterized by long-term thinking.

These strengths can help to master major challenges of transformation. They provide the ability to address transformation from a position of stability rather than vulnerability.

At the same time, structural resilience alone is no longer sufficient. In an environment defined by continuous technological, geopolitical, and industrial disruption, resilience increasingly depends on organizational adaptability.

For decades, industrial success was built primarily on predictability, precision, and optimization. These strengths remain essential. But they must now be complemented by further capabilities:

- speed of decision-making,
- software and systems thinking,
- and the willingness to adapt established structures early enough.

Transformation and the ability to change are becoming permanent requirements. Resilience is about remaining capable of acting decisively within change – and, where possible, shaping it.

In that sense, Bosch is embracing change from a position of structural strength – continuously reinforced through adaptability and execution, and rooted in 140 years of experience.

To *get the most* out of AI, *start with people*

Bill Anderson
CEO
Bayer

Bill made his name turning around blockbuster drug pipelines in the pharma industry, before becoming the first American ever to run Bayer. Now he's steering one of Europe's toughest corporate turn-arounds, betting big on Bayer's next generation of drugs and crop science.

How one life sciences enterprise bucked the command-and-control hierarchy – and is using artificial intelligence to give people more command of the company's mission.

Is the arrival of generative artificial intelligence the dawn of a new age of progress or the jobs apocalypse? Tech companies are investing in AI infrastructure at a breakneck pace. Markets are still unsure if we're barreling toward a productivity boom, a bubble, or somewhere in between. The public is torn between optimism about new opportunities for progress and fatalism about what AI means for the workforce.

But there's one point on which the AI maximalists and doomsayers agree: Something big is here, on par with the invention of the steam engine or the internet – two technologies that dramatically changed how work gets done. And now the world's companies, including the one I lead, must figure out how artificial intelligence can make their work better.

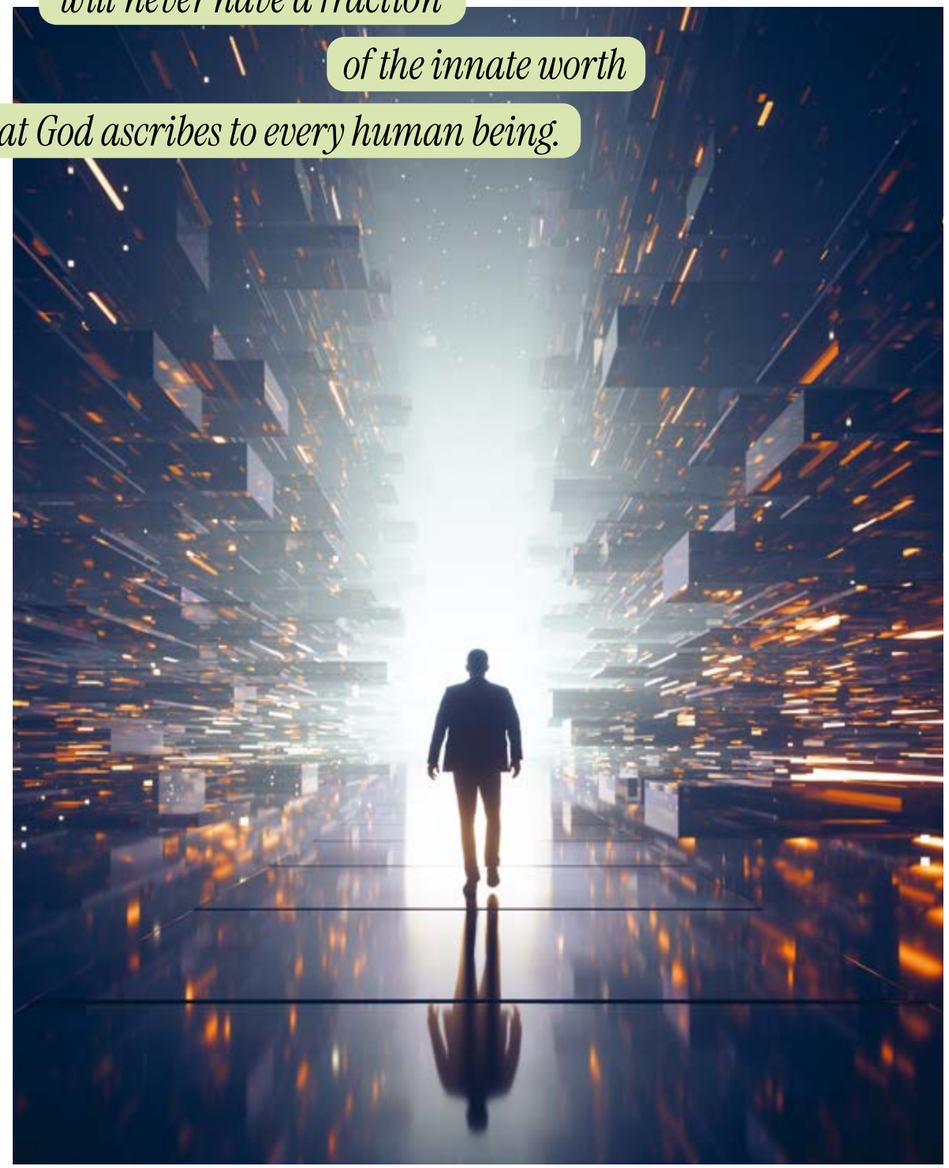
At Bayer, our efforts follow three principles:

1. AI serves people, not the other way around.

Human beings are special. We are created in God's image, with inherent dignity and rights. Work is a central part of what it means to be human. AI, on the other hand, is a tool. It was created by humans. It has extraordinary functions, but it's not human. Even the most recursive superintelligence will never have a fraction of the innate worth that God ascribes to every human being.

This might sound philosophical and moral. It is. It means we value people and we use tools – not the other way around.

Even the most recursive superintelligence will never have a fraction of the innate worth that God ascribes to every human being.



In each area, our analysis of how to implement AI starts with a simple question: What would it mean for the mission?

2. It is all about the mission.

Every company exists to serve a mission. At Bayer, ours is Health for all, Hunger for none. What does this mean? Everything we do must first advance this cause.

We have used "Old AI" in this spirit for years. Machine learning and advanced computing systems have revolutionized the way we scout new medicines, model biological systems and develop new crop protection molecules. Here's an example. For 30 years, there's been next to no innovation to help farmers control weeds in row crops like corn and soy. In 2028, Bayer is planning to launch icafolin, agriculture's first novel molecule in weed control that was designed and modelled with AI.

Now consider what's possible in the life sciences when you throw agentic AI into the mix. Every year, Bayer processes more than 25 billion data points in seed genotyping. Whether it's improved yields, more insect resistance, or strengthened resilience to extreme weather, imagine the discoveries in plant breeding that are just waiting to be unlocked.

Or in drug discovery: Today, Pharma companies only have the resources to investigate a finite number of drug targets. In the future, AI agents could greatly expand the number of targets, as well as increasing the proportion that could be effectively drugged.

This is not to say that our AI implementation efforts are only limited to R&D. In fact, we're deploying AI in nearly every corner of our enterprise, from marketing to procurement to financial modeling. In each area, our analysis of how to implement AI starts with a simple question: What would it mean for the mission?

3. AI won't fit in your org chart.

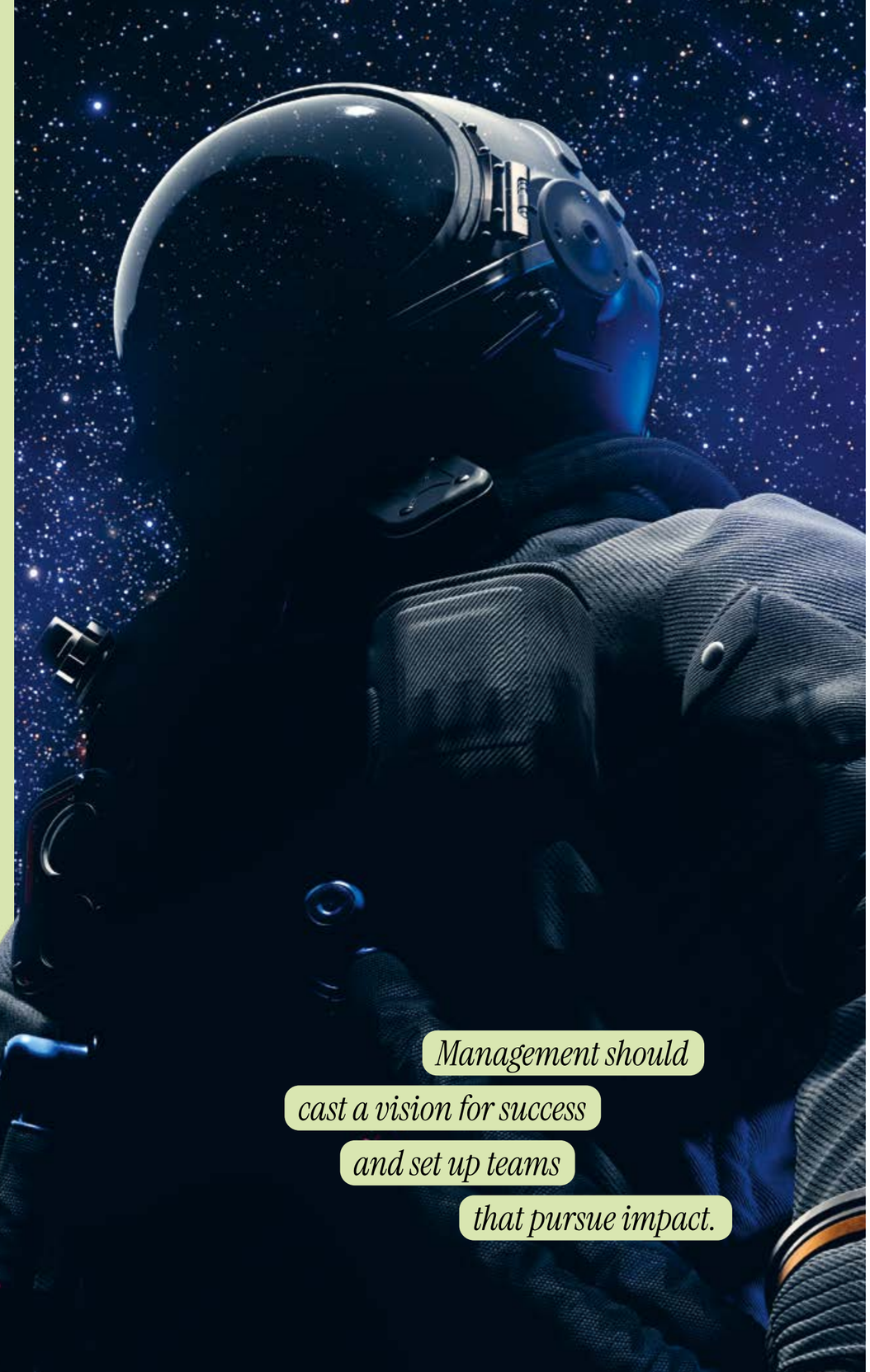
For three years, Bayer has adopted a unique, radical way of working. We've cut the number of organizational layers roughly in half. We've reduced the number of managers from more than 15,000 to 4500 – many of whom are still with the company in a capacity that's hands-on, not managerial.

Today, instead of the line manager or the CEO, the people on the front lines of the business are running the company. They're the ones who make decisions about which products to invest in, which projects to resource, which sales region to prioritize, and much more. In short, each of the 88,000 people at Bayer has greater power over the company's mission.

Why is this important? The traditional hierarchical organization wasn't built for the artificial intelligence era. The next generation breakthroughs won't come from departments with ten layers or global taskforces, and they certainly won't come from CEOs or management teams. They will come from individual contributors and small teams who see a need and put their blood, sweat, and tears into fixing it.

Management should cast a vision for success and set up teams that pursue impact. But the power of the technology belongs in the hands of the people. A company in which everybody can tap into the same information as the CEO is only effective if everybody is empowered to act like a CEO.

There's no crystal ball forecasting how the AI revolution will shake out. There's no blueprint for companies to harness AI to get an edge. The pace of change is so rapid that some of the most important companies of the next century don't even exist yet. But the winners of the AI era will have a clear sense of who they are and whom they exist to serve.



Goods always find a way

How Global Trade Is Reorganizing – and Supply Chains Are Growing More Complex

If you run a logistics company that is more than 500 years old, you develop a certain perspective on disruption. You learn that the world was never truly stable. Stability is often just a temporary illusion created by periods of relative prosperity and peace. Trade routes have always shifted. Borders have changed. Wars have interrupted markets. Political systems have risen and disappeared. Yet goods kept moving.

Wolfram Senger-Weiss
CEO
Gebrüder Weiss

Wolfram joined the management board of his family's logistics company in 2005. From 2012 to 2018, he represented Austria's freight forwarding and logistics industry as president of its national association. Today, he is CEO of Gebrüder Weiss.

Goods are like water.
They always find a way.

Today, however, the perception of crisis feels different because everything happens simultaneously, instantly, and visibly. Every disruption becomes global news within minutes. Every conflict immediately triggers speculation about the "end" of globalization.

From tariffs and trade disputes to the wars in Ukraine and the Middle East, executives are navigating an environment of permanent geopolitical uncertainty. But from the perspective of logistics, one observation remains surprisingly consistent: Goods are like water. They always find a way.

The quiet engine of prosperity

That simple observation reflects one of the great strengths of the global economy. Over the past three decades, the fluid international exchange of goods has created unprecedented prosperity around the world. Global logistics did not just accompany this development; it enabled it. This is why today's debate about the "end of globalization" often misses the point.

This does not mean that current developments are harmless. The geopolitical fragmentation of the world is real. Costs are rising. Supply chains are becoming more complex. But complexity should not be confused with collapse. What we are witnessing is not the end of globalization. We are witnessing its reorganization.

For decades, companies optimized for cost, speed, and scale. Today they must optimize for resilience – and increasingly for individuality.

Products are no longer merely made for an anonymous mass market; they are configured and assembled for specific customers or use cases.

Mass production is over

The old logic was scale through standardization. The new logic is scale despite individualization. Products are no longer merely made for an anonymous mass market; they are configured and assembled for specific customers or use cases. That creates value for customers – and complexity for supply chains.

This is where logistics becomes more than transportation. It becomes the discipline of making complexity manageable. At Gebrüder Weiss, we experience this every day: customers are asking for solutions that connect borders, transport modes, regulations, data and customer expectations into one functioning system.

The pandemic, the war in Ukraine, tensions in the Middle East, and trade disputes have accelerated this shift. Businesses are diversifying suppliers, sourcing markets and transport routes. But this is not deglobalization. It is adaptation.

The world economy remains deeply interconnected because modern prosperity is built on international exchange. People and companies understand that principle. Ecosystems cannot simply be rebuilt behind national borders. Autarky may sound tempting in political speeches. Economically, it is mostly an illusion.

Redirection, not standstill

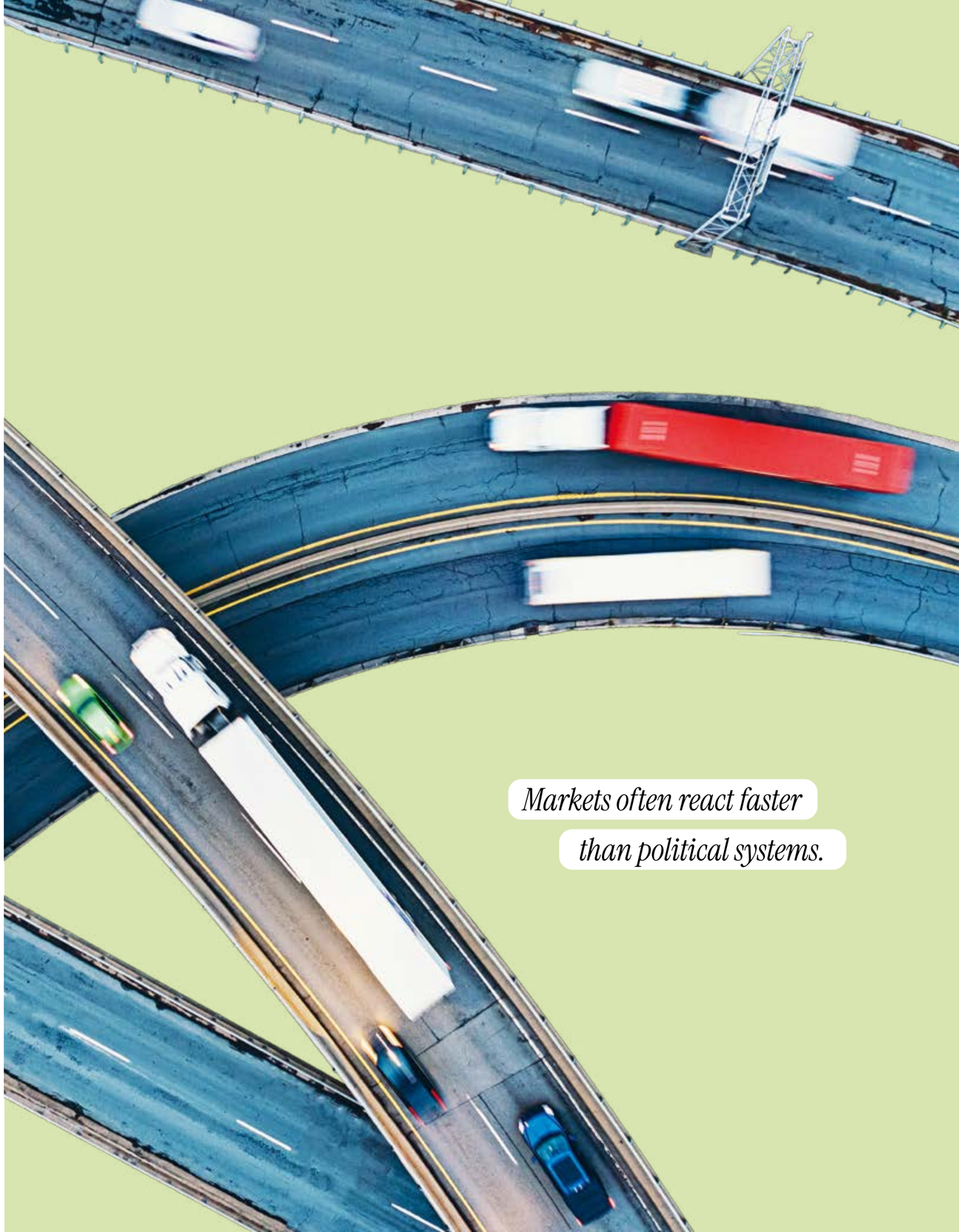
Even aggressive tariff policies ultimately struggle against economic gravity. Tariffs create friction. They increase costs. They generate uncertainty. But in most cases, they do not stop trade itself. Instead, they redirect flows, change sourcing structures or shift investments into different regions.

When traditional routes become unavailable, alternative corridors emerge almost instantly. In the Middle East, for example, geopolitical instability has forced companies to rethink established shipping lanes. The logistics industry developed alternative combinations of sea and land transport through neighboring countries. The supply chains continued functioning.

Global logistics networks are highly dynamic systems. They continuously reorganize themselves around political, economic and physical constraints. Markets often react faster than political systems.

At the same time, however, the economic environment has become more demanding. Energy costs remain elevated. Inflationary pressure has increased. Regulatory complexity continues to grow, especially in Europe.

For export-oriented economies like Germany or Austria, this matters enormously.



Central Europe's winning formula

Central Europe became one of the world's industrial powerhouses because it combined engineering excellence, industrial productivity, political stability and open access to global markets. If industrial competitiveness weakens, logistics inevitably feels the impact as well.

Europe sometimes risks becoming too focused on managing risk instead of enabling growth. We analyze carefully, discuss intensely and regulate extensively. Meanwhile, other regions operate with greater speed and pragmatism.

Europe still possesses extraordinary strengths: industrial know-how, infrastructure, education, technological expertise, political stability, and highly specialized companies. But confidence and speed matter too. Economic strength is not only about capabilities. It is also about momentum.

Our industry reflects the real condition of the economy. It mirrors industrial activity, trade intensity and business confidence. When economies slow down, we feel it quickly. When optimism returns, we feel that too.

Adaptation is the real superpower

And despite everything, I remain fundamentally optimistic.

Not because current challenges are small, but because adaptation has always been humanity's greatest strength. Over centuries, trade has survived wars, revolutions, financial crises, technological disruptions and political fragmentation. The mechanisms continuously evolve, but the underlying logic remains surprisingly stable: people want to exchange goods, ideas, technologies and resources.

The world still runs on movement: raw materials, industrial components, pharmaceuticals, food, energy systems, and consumer products will never be equally dispersed.

Yes, the world is becoming more fragmented politically. Yes, supply chains are becoming more complex. Yes, costs are rising. But global trade itself remains remarkably resilient. Goods continue to move. Markets adapt. New routes emerge.

Like water, trade flows ultimately seek the path of least resistance.

The real question is therefore not whether globalization survives. It will. The more important question is whether Europe retains the confidence, speed and entrepreneurial mindset necessary to remain one of its central engines.

I believe it can.

But optimism alone is not enough. It requires investment, competitiveness, openness to innovation and a willingness to embrace change rather than merely manage it.

The world is not standing still. And neither should we.

Adaptation has always been humanity's greatest strength.

Carissa Véliz
Associate Professor
University of Oxford

Carissa is challenging the biggest myths of the AI age. In her latest book, Prophecy, she argues that forecasts are less about predicting the future than controlling it.

AI is the new Oracle of Delphi; *that's bad news*

Our world is increasingly ruled by prophecy. These days, we prefer talking about forecasting, but even if the techniques have changed – we no longer look for glimpses of the future in animal entrails or stars but in algorithms – and prophets have changed their job titles – from oracles to astrologers, and from social scientists to computer scientists and tech executives – the political function of prediction remains the same.

Predictions are all around us, opening and closing off doors for us, deciding whether we get a job, or a loan, or an apartment, influencing everything from medical triage to geopolitics. Machine learning – the kind of AI that is most commonly used in gadgets like your smartphone, tools like chatbots, and decision-making algorithms like software for hiring – is nothing but a prediction machine. What it's doing is using historical data to fill in the blank of what it's being asked to do, whether it's predicting text, images, or whether someone will be a good employee. "Oracle" is a technical term in machine learning: a system of perfect prediction.

"Oracle" is a technical term in machine learning: a system of perfect prediction.

Much of what tech executives say amounts to painting pictures of the future for us: tomorrows that are empty of jobs and full of robot butlers and automated transport. Prediction markets are gaining traction, expanding in the fortunes they trade in, the attention they get, and the influence they wield. A substantial proportion of what both academic journals and newspapers publish is not about the present but about the future.

Tomorrow brought to you by Silicon Valley

It is easy to forget that predictions are not facts. Facts are about the present or the past; the future doesn't exist yet, and there are no facts about what hasn't yet happened. At best, predictions are educated guesses. More often than not, however, and especially when it comes to predictions about the social world, they are power plays in disguise. When a tech executive says that in the future everyone will be using AI for everything, he doesn't have magical powers to look into what's around the corner; he's doing marketing.

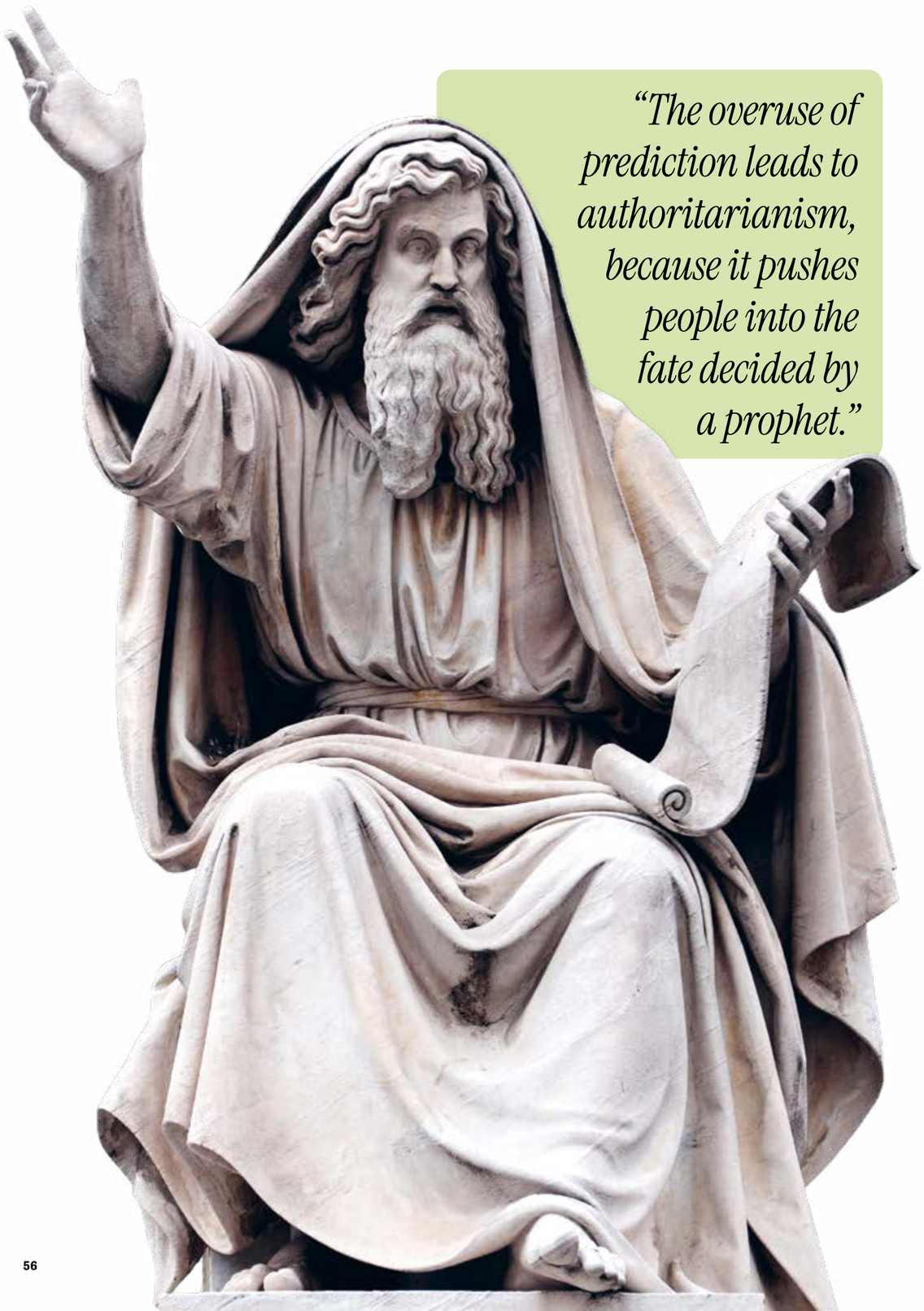
Predictions are deceptive because they sound like descriptions of the world, but a more realistic analysis reveals them to be closer to commands. The philosopher J.L. Austin argued that there are some kinds of assertions that are not meant to describe anything but rather they are tools to do something; they are speech acts, as he called them. Predictions about the social world are deceitful speech acts in that they seem like they are descriptive but in fact are normative – they don't refer to facts but rather invite us to act in a certain way. What the tech executive is telling you with his prophecy is to buy his AI. When we give credence to prophets, when we believe their predictions and act accordingly, when we are doing is obeying them, doing as they say.

The perfect crime

What makes predictions about the social world all the more dangerous is their tendency to become self-fulfilling prophecies – to bring about the reality they purport to be merely foreseeing. Even worse, self-fulfilling prophecies are the perfect crimes because they erase any error signal. We will never know whether the person denied a job by an AI would've been brilliant at it; they will remain unemployed if other firms are using the same kind of algorithm, and the AI company will claim that it is 99.9% accurate, but at the cost of creating the reality it claims to be predicting. Often, the problem is not that AI might get the prediction wrong, but that it might getting right by fabricating the future: by rewarding those it selects for opportunities, and punishing those it doesn't.

What makes predictions about the social world all the more dangerous is their tendency to become self-fulfilling prophecies.

We are using AI to make decisions about loans, jobs, housing, sentencing, bailing, and more. These are contexts in which fairness matters. But predictions are not clear and transparent criteria. They are not even contestable. Since they are about the future, predictions cannot be challenged for being false.



"The overuse of prediction leads to authoritarianism, because it pushes people into the fate decided by a prophet."

Democracy doesn't do divination

The overuse of prediction leads to authoritarianism, because it pushes people into the fate decided by a prophet, instead of allowing them leeway to defy their odds. Democracy shouldn't be led by divination or betting; it should be led by facts and liberal values, neither of which match well with predictions. Prediction markets are a good example of the kind of predictive practices that distort and erode democracy.

We are so anxious to know what the future holds that we are suckers for oracles, ancient and new.

The argument in favour of prediction markets – that they contribute to society through offering valuable information in the form of the wisdom of the crowds – depends on an indefensibly naïve view of prediction as a quest for knowledge, ignoring how they are used by the powerful to increase their power. Recently, OpenAI fired an employee for having used confidential company information for betting in Polymarket. On another occasion, six anonymous accounts made $1.2 million betting for the attack on Iran; some of those accounts were funded hours before. In yet another case, a journalist got bullied to change his report about a strike by gamblers who stood to earn $900,000 from a bet in a prediction market.

We are so anxious to know what the future holds that we are suckers for oracles, ancient and new. We tend to think of AI as cutting-edge technology; ancient Greeks thought the same about their oracles and medieval people about their astrologers. Philosophers like Socrates, Plato, Aristotle, and Epicurus rose as the voices of reason in the face of ancient myths and superstitious beliefs in fate; it's our turn to rise to the occasion. We shouldn't give credence to prophets. The future is unwritten, unknowable, and up to us to write.

Why Demand-Side Flexibility Is the Missing Link in the Energy Transition

Unlocking affordability

Marc Spieker
COO
E.ON

Marc spent years untangling Uniper's carve-out from E.ON, one of Europe's biggest corporate spin-offs – managing everything from the separation to the capital markets listing. After seven years steering the finances, he's switched to running the commercial side itself.

The energy transition across Europe is no longer a question of ambition. It is a question of affordability – for the system as a whole and for customers' bills. Wind and solar energy have moved from the margins to the center of the system, costs of generation have fallen dramatically, and the political support behind decarbonization remains strong. Yet, a growing concern is beginning to dominate the debate: Can this shift to a decentralized, renewable-based system remain economically sustainable?

At the heart of this concern lies a structural imbalance. For decades, energy systems have been designed for controllable supply. Today, however, electricity is increasingly generated when the sun is shining and the wind is blowing – not necessarily when and where it is needed. Meanwhile, more active customer participation and the electrification of various sectors are fundamentally reshaping demand. Yet the debate on energy transition still centres on expansion – which is too short-sighted. In reality, the success of this endeavour will depend far less on how much we build than on how well supply, grids and demand are aligned. Energy efficiency then takes on a different meaning: the real lever to ensure affordability, system stability and security is not to use less energy, but to use it more intelligently to boost energy asset productivity.

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The result? Going forward, we will have to manage a far more complex and dynamic system. We will need to shift consumption in time and respond to price and system signals, aligning demand with renewable supply without compromising customer comfort or economic activity. The missing link? Demand-side flexibility.

When supply and demand drift apart

Much of the current investment pressure in the energy system is driven by peak demand, not average consumption, for which infrastructure must be built. At the same time, variable renewables make supply more volatile. The real challenge lies in bringing both sides together as generation does not always coincide with demand – neither in time nor in location: Renewable energy is often available in large quantities where demand is limited, while consumption centers need it elsewhere and at different times.

Solar generation increasingly exceeds demand at midday, while evening consumption peaks sharply. This mismatch leads to curtailment on one side and costly peak capacity on the other. The wider the gap, the higher the system cost. Demand-side flexibility directly addresses this gap by turning demand into an active variable. It enables consumption to move closer to availability.

This has three implications for affordability. First, flexibility reduces the need for over-dimensioning infrastructure. Flattening peak demand reduces the need for network and backup investments and improves asset utilization. Second, flexibility ensures that low-cost renewable electricity is used rather than curtailed. Over time, this contributes to a structurally lower price level in the system. Third, flexibility creates customer value by enabling customers to respond to price signals, lowering costs while stabilizing the system. This is not just a system benefit – it means tangible savings for customers who participate. Europe's energy future will be won only if customers don't merely comply – but actively co-create.

Affordability depends not only on how electricity is generated, but on how efficiently it is used: without flexibility, electrification creates new peaks; with it, system efficiency improves.

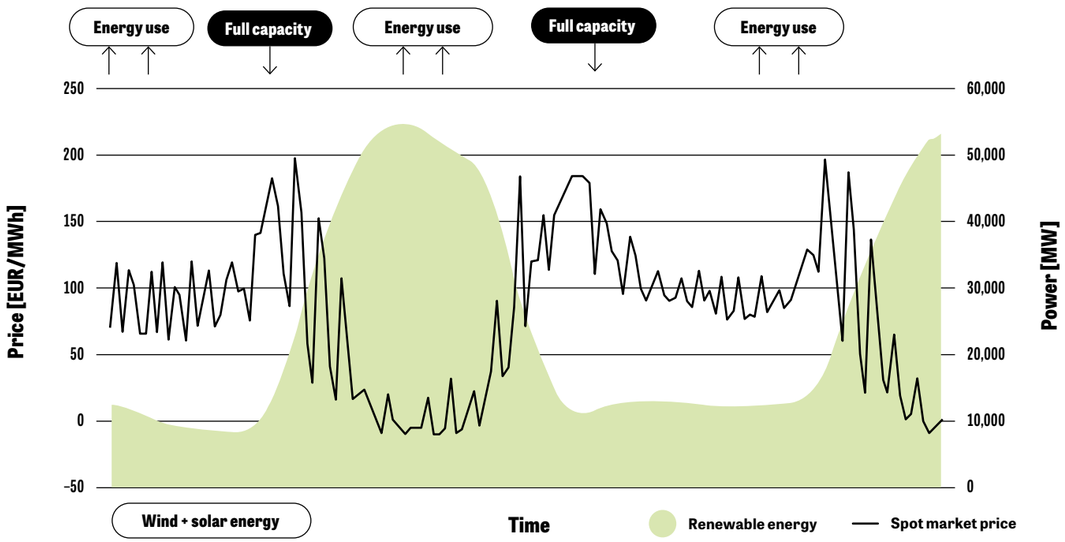


Fig. 1: Flexibility enables shifting consumption of electricity to when demand and costs are low.
[Source: E.ON]

Electric vehicles, heat pumps, storage and smart home technologies are turning households into flexible system assets.

From Potential to system value: turning distributed assets into usable flexibility

Electric vehicles, heat pumps, storage and smart home technologies are turning households into flexible system assets. Industrial processes, increasingly automated and digitally controlled, can respond to price signals in real time. Aggregators are beginning to bundle these distributed assets into virtual power plants, making flexibility visible and tradable. A fundamentally different system logic is emerging, with flexibility distributed across millions of assets rather than concentrated in large power plants.

This leads to customer impact being the new currency of the energy transition. Only solutions that deliver tangible value to customers will be adopted fast enough and at scale. Yet unlocking this potential requires more than the deployment of hardware: a coherent system architecture built around three critical pillars – digitalization, market design and customer-centric solutions.

Digitalization forms the backbone of this architecture. Real-time data, smart meters and interoperable devices are needed to enable, measure and control flexibility, yet delayed rollouts and missing technical standards still limit scale. At the same time, flexibility must be valued consistently across wholesale markets, grid operations and retail pricing so that clear incentives reach end users. Adoption will ultimately depend on solutions that are simple, automated, trusted and economically attractive: most customers will not actively manage consumption, but will embrace solutions that deliver savings with minimal effort. The long-term cost advantage of an electrified single-family home compared to a home with conventional heating and the use of a combustion engine car will increase to an average of 18% by 2050, and even 19% for a multi-family home in Germany. Currently, the advantage is two or three percent.

Annualised household energy costs,

incl. heat and transport[1], €, 2023 real, Germany

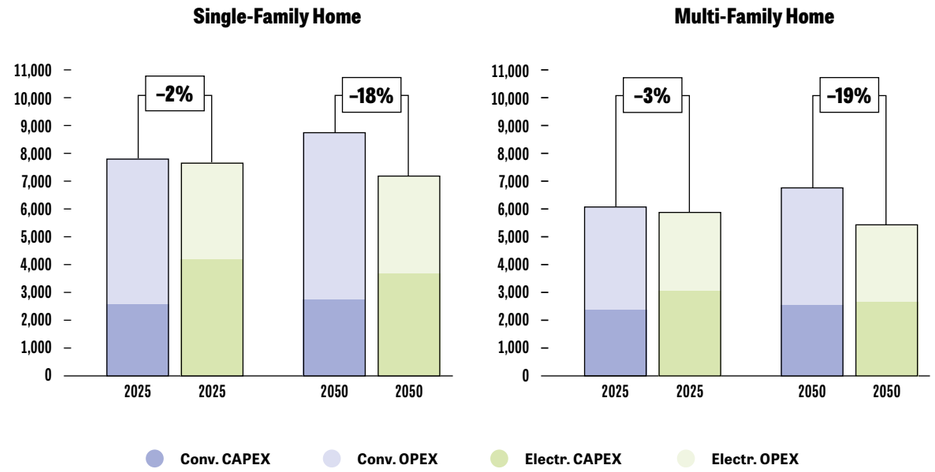


Fig. 2: Decreasing average household energy costs by higher electrification.
[Source: E.ON SE (2025), The Energy Playbook – an affordable strategy to net zero]

[1]Annalised household energy costs, including investments and fuel assuming initial investment made in 2025 | Note: Analysis based on typical consumption profiles of single- and multi-family households in Germany assuming retail elctricity prices and excluding CAPEX subsidies | Source: E.ON analysis

Smart use, lower costs: flexibility creates customer value

From a European perspective, the timing could hardly be more critical. Electrification is accelerating, e.g. driven by electric vehicles, heat pumps and battery storage applications (see fig. 3). Beyond decarbonization, this is a flexibility opportunity, offering tangible benefits for customers and the system as a whole: By shifting consumption to periods of high renewable output, these technologies turn volatility into value. In a system, where supply, grids and demand continuously balance in real time, value is created not only by producing energy, but by coordinating it intelligently. The focus moves from selling kilowatt-hours to enabling solutions. The value lies in managing complexity for customers, optimizing consumption, integrating assets and translating system signals into lower costs, better use of renewable electricity, and a more stable and affordable energy system.

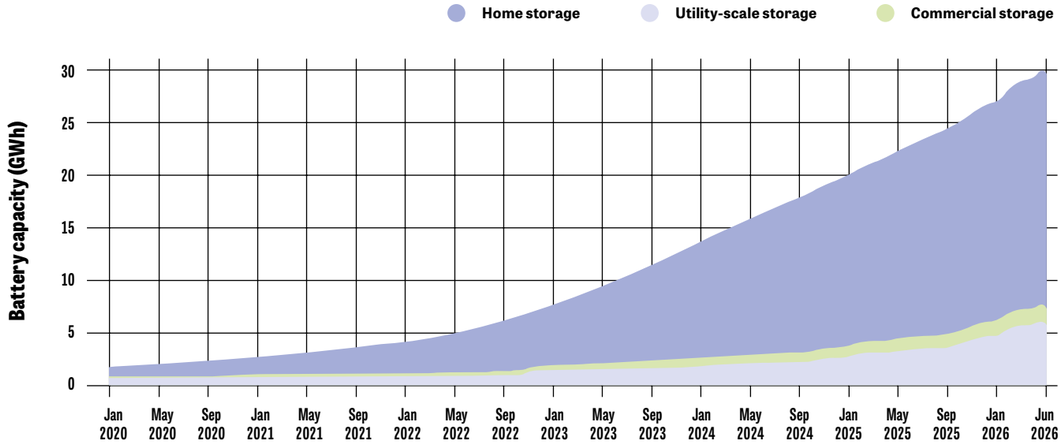
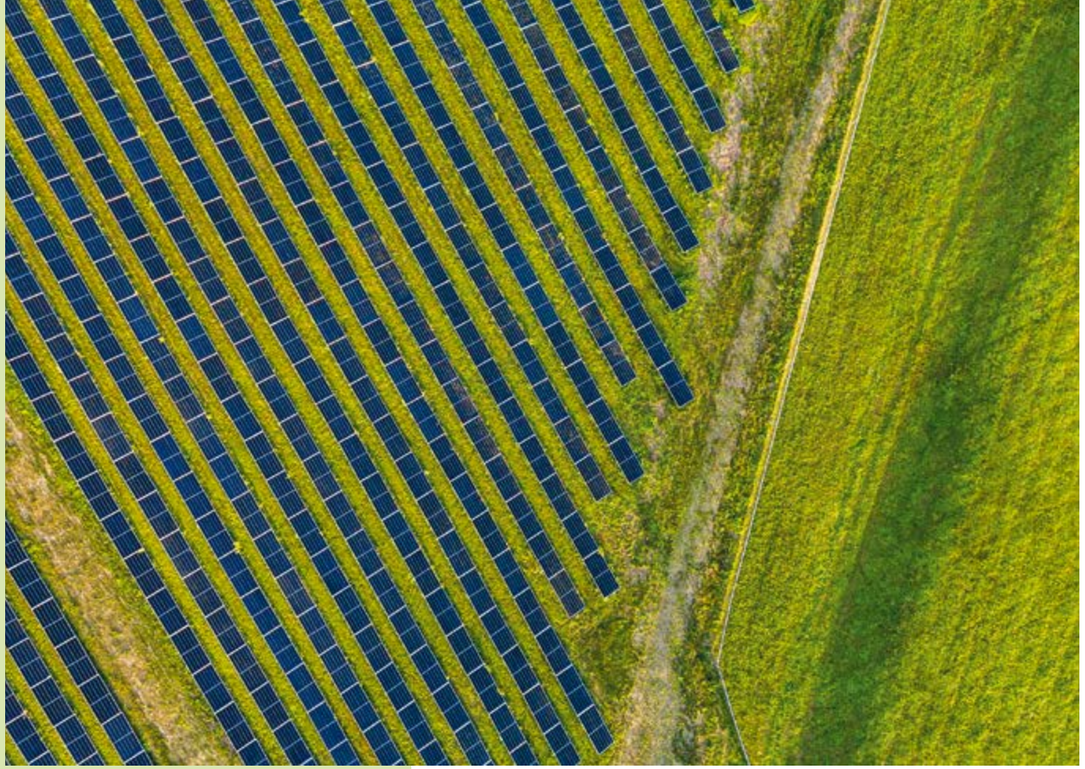


Fig. 3: Monthly analysis of battery storage development in Germany based on the Federal Network Agency's Core Energy Market Data Register (MaStR).
[Source: Institute for Power Electronics and Electrical Drives (ISEA) and Institute for Power Generation and Storage Systems (PGS), RWTH Aachen University]

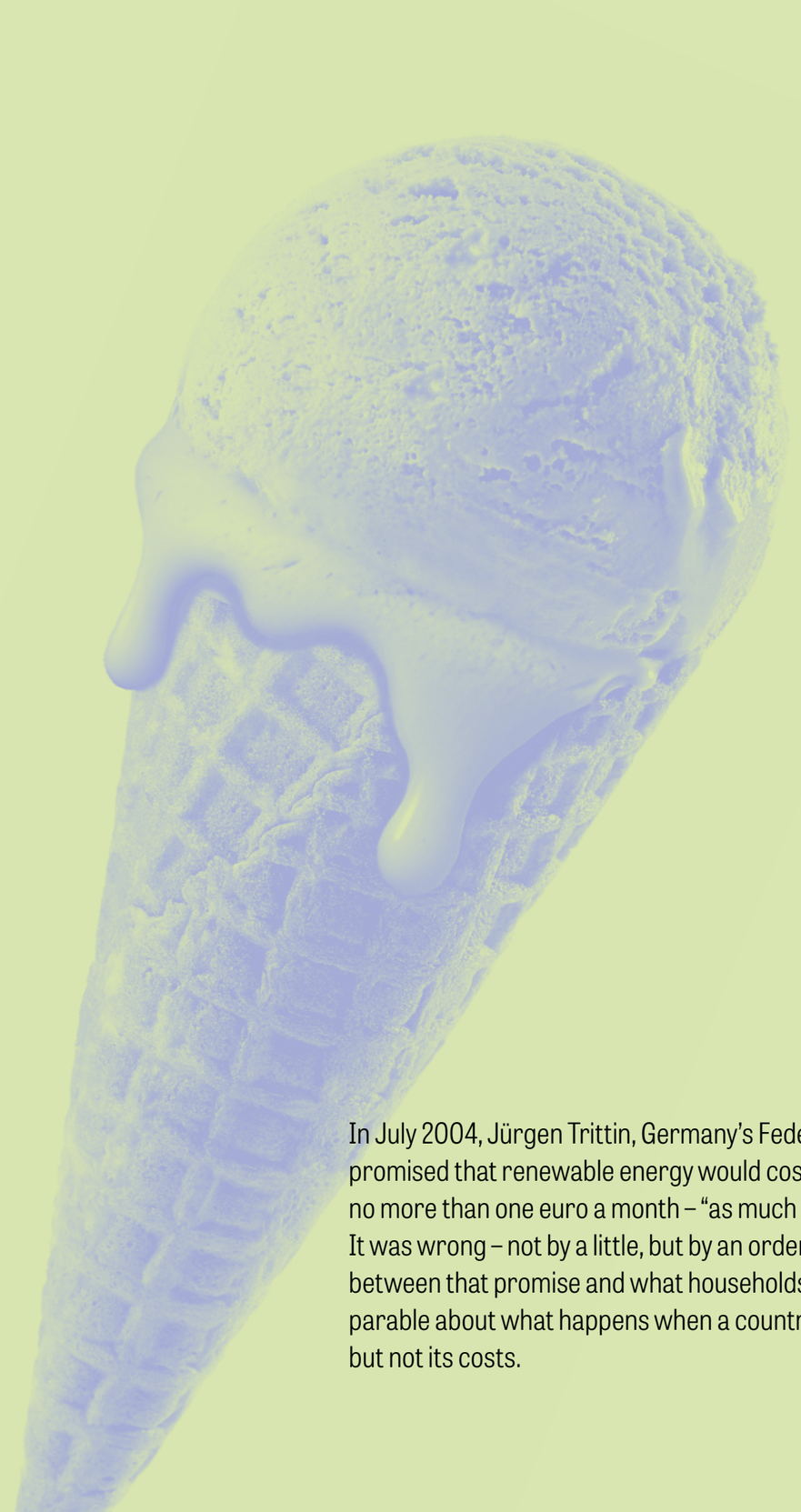


From a European perspective, the timing could hardly be more critical.

At E.ON, we see this shift as our mission: To offer our customers the best solutions so they can reap tangible benefits and participate in the energy transition. Demand-side flexibility is central to reducing costs, increasing efficiency and strengthening resilience. If flexibility is to deliver its full value, it must move beyond pilot projects and niche applications into mass adoption, providing a pragmatic pathway to align climate ambition with economic reality.

The perceived trade-off between sustainability and affordability can be mitigated by rethinking demand. Flexibility is not a technical detail. It is a strategic lever. And it may well determine whether the energy transition succeeds not just environmentally, but economically.

The nobody dares to name



Jesko von Stechow
CFO
Westfalen

Jesko combines financial leadership with responsibility for people and culture, turning strategic ambition into an organization built to win. With decarbonization at the heart of Westfalen's vision, he is positioning a family business with more than 100 years of history to lead into a low-carbon future.

In July 2004, Jürgen Trittin, Germany's Federal Environment Minister, promised that renewable energy would cost the average household no more than one euro a month – "as much as one scoop of ice cream." It was wrong – not by a little, but by an order of magnitude. The gap between that promise and what households actually came to pay is a parable about what happens when a country governs its ambitions but not its costs.

Energy policy has always balanced three things: a clean supply, a secure one, and an affordable one. Together they form what the World Energy Council calls the energy trilemma – three goals that reinforce each other only when pursued together, and undermine each other the moment one is neglected. Germany's Energiewende has never lacked ambition on the first two counts. What it has lacked, from the very beginning, is a serious answer to the third.

Two targets, and a silence

Ask a German policymaker where the country's renewable share should stand by 2030, and you get a precise, legally binding answer. Ask about grid reliability, and you get monitored indicators and published statistics. Ask what electricity should cost – for a factory competing against Chinese or American rivals, or for a family deciding whether to trade its gas boiler for a heat pump – and the answer turns vague. What you get is principles, aspirations, general commitments – nothing you could hold anyone accountable to.

The comfort of a number that flatters

Germany cites one number with justified pride: by 2024, renewables supplied more than half of the country's electricity. That is real progress – but it can also flatter, creating the impression that the transition is further along than it is. Electricity, after all, is only one part of the energy system; across transport, heating and much of industry, fossil fuels still dominate. A cleaner power sector is not the end of the transition. It is the prerequisite for a much harder phase still ahead: electrifying how Germany heats its homes, moves its people, and runs its factories. The 54 percent figure, taken alone, is politically comforting but strategically incomplete – it measures progress in the sector that is furthest along, while the biggest gap still to close sits in the sectors furthest behind. As that harder phase draws more energy demand onto the grid, the price of electricity stops being a side issue and becomes the main one.

A warning already written

Germany does not need to imagine what happens when good intentions substitute for a governed cost target – it has already lived through it once. The surcharge that financed early renewable expansion was meant to be a modest, temporary levy. Four things quietly compounded for two decades, unconstrained by any framework that might have forced an earlier correction: locked-in feed-in tariffs, underestimated grid costs, an unhedged dependence on Russian gas, and the uncounted cost of integrating weather-dependent power. Then Russia's invasion of Ukraine turned a slow drift into a shock. Household prices have since retreated from that peak, but remain among the highest in the industrialized world. Industrial customers fare no better by comparison: German factories pay among the highest electricity prices of any leading industrial economy.

What was missing was never technical insight – it was a mechanism to make the drift visible early enough to correct, and someone accountable for correcting it.

German factories pay among the highest electricity prices of any leading industrial economy.

A number, not a wish

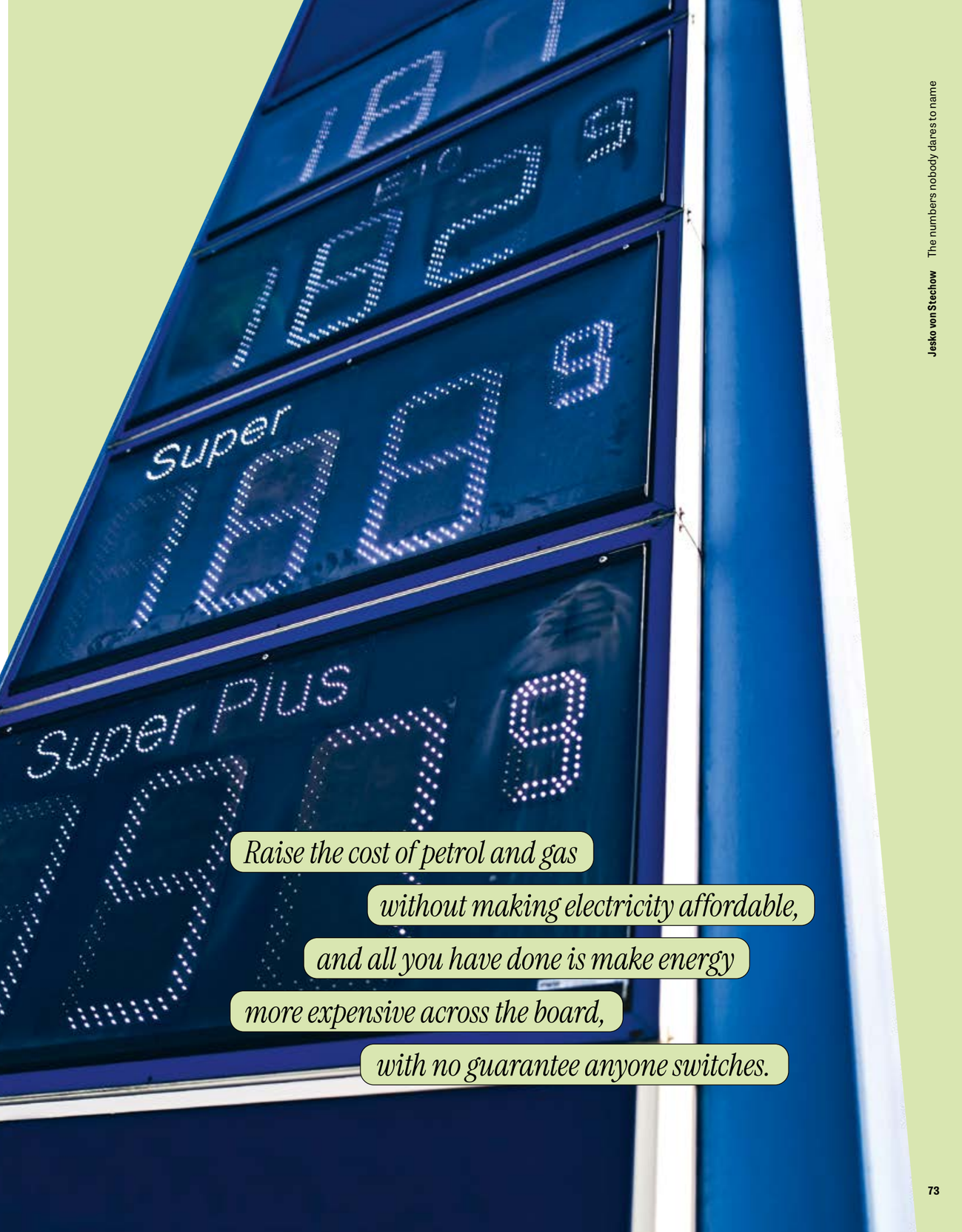
An affordability objective that exists only as a principle is not a policy. It is a hope. If Germany is serious about the third leg of the trilemma, it needs to do for prices what it has already done for renewable shares and grid reliability: define a corridor, publish it, and govern toward it. A sensible corridor would put industrial electricity sustainably below 15 cents per kilowatt hour – in the range France already achieves – with household prices settling around 25 to 28 cents. That is not a giveaway; it still reflects the genuine cost of a cleaner system. But it is materially below where Germany sits today, and precise enough that someone could be held responsible for reaching it.

The value of such a number lies less in the figure itself than in what a credible, durable price does to behaviour.

The value of such a number lies less in the figure itself than in what a credible, durable price does to behaviour. Companies deciding whether to build the next energy-intensive factory or data centre in Germany are not looking at this year's tariff – they are underwriting a cost base a decade or more out, and uncertainty keeps the money on the sidelines. The same is true, more modestly, for the household weighing an electric car or heat pump against the familiar petrol pump or gas boiler.

This is also what makes the transition self-reinforcing rather than self-limiting. A competitive, credible electricity price does not just reduce bills – it changes the direction of the whole system. Cheaper, more reliable power draws in the investment that builds out grids, storage and generation faster. Faster build-out brings costs down further and lets clean power displace fossil fuels more quickly in transport, heating and industry. And every household or company that switches spreads the system's fixed costs across a larger base, pushing the price down again for everyone still connected to it. Once that loop starts turning, it feeds itself. A high, uncertain price does the opposite: it keeps investment cautious, slows switching, and leaves fixed costs to be shared among fewer users, pushing the price the wrong way. Whether Germany ends up in the virtuous version of that loop or the vicious one is decided less by how much money is spent than by whether the price signal is credible enough to act on.

Carbon pricing was meant to help tilt that balance, and a rising cost on fossil fuels is necessary. But it only pulls the system in the right direction if electrification is genuinely the cheaper path. Raise the cost of petrol and gas without making electricity affordable, and all you have done is make energy more expensive across the board, with no guarantee anyone switches.



Raise the cost of petrol and gas without making electricity affordable, and all you have done is make energy more expensive across the board, with no guarantee anyone switches.

Bigger, not just more expensive

A natural worry is that a lower, capped price would starve the system of the money it needs to be built. But once heating, transport and industry are electrified, a much larger volume of electricity sold, even at a lower price per unit, need not mean less revenue overall – it can mean a bigger system rather than a more expensive one. Some of the transition's cost will inevitably be paid outside the electricity bill, through public budgets rather than tariffs; that is a legitimate choice, but a costly one, and it should be made openly. Carbon-market revenue, real and growing as it is, will never on its own come close to what full-scale grid and generation build-out requires. The rest has to come from private capital – and private capital moves toward calculability, not ambition. A credible price corridor would not force anyone to invest. But it would remove one of the biggest reasons they currently hesitate.

We owe the public, our employees, and our investors a better answer than a shrug.

Naming the number

The energy trilemma was never meant to let governments pick their favourite two goals out of three. It was meant to force them to hold all three at once, because neglecting any one eventually drags the others down with it. Germany has proven, twice over, that it can set a number and govern toward it. It has yet to prove it can do the same for the price its own citizens and companies will actually have to pay.

The minister who promised one scoop of ice cream a month was not lying – he simply made a promise without a model behind it, and without anyone accountable for what would happen if the model turned out to be wrong. Two decades on, we are still living with the consequences of that unguarded optimism, and there is still no honest, binding answer to the question he never really asked: what should this actually cost? We owe the public, our employees, and our investors a better answer than a shrug. The energy transition is the defining industrial undertaking of this generation. Two goals were never going to be enough. It is time someone dared to name the third.

The minister who promised one scoop of ice cream a month was not lying – he simply made a promise without a model behind it.

The permanent and the fluent

The furniture industry is an unlikely place to learn about strategy. Yet designing a chair and running a company increasingly require the same discipline: distinguishing what is permanent from what is fluent.

Nora Fehlbaum
Chairwoman of the
Board of Directors
Vitra

Nora is Chairwoman of the Board of Directors of the Swiss furniture manufacturing company Vitra, leading the family-owned company in the third generation. The third generation represented by Nora puts the spotlight on sustainable thinking and action.

CEOs are expected to present five-year strategies. Boards expect them. Investors take comfort in them. They give employees a common direction and create the reassuring impression that the future is largely under control. The problem is not strategy. It is the illusion of predictability.

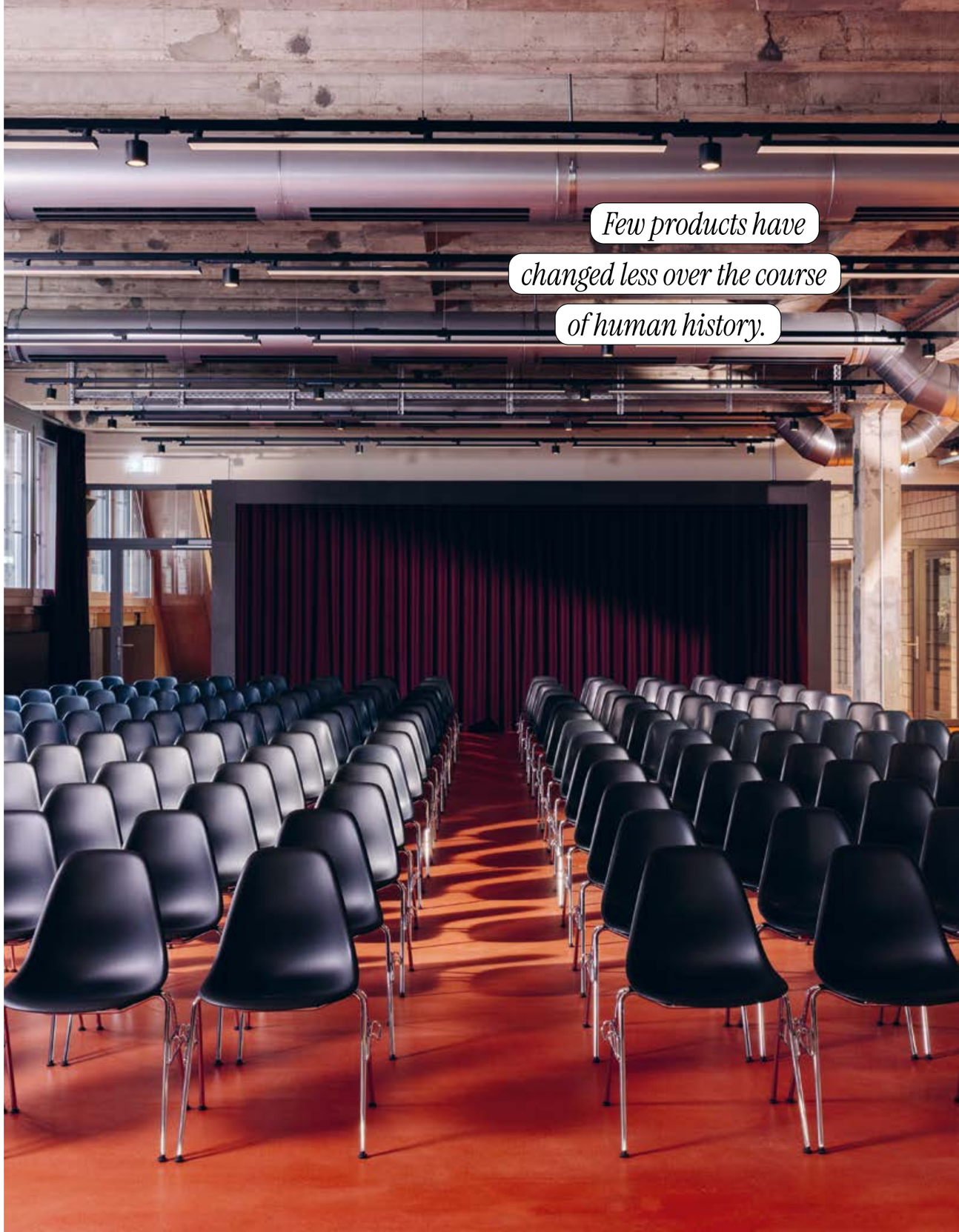
The past five years have exposed that illusion. A pandemic, geopolitical conflict, fractured supply chains and the sudden arrival of generative AI reshaped entire industries. Few appeared in anyone's strategic plan. All demanded immediate action. The organisations that adapted best did not abandon long-term thinking. They separated what should remain stable from what should remain fluent. Ambition, purpose and values should be remarkably constant. They define where an organisation wants to go and the boundaries within which it operates. The route, however, should remain open. Management becomes less about executing a predetermined plan than about repeatedly finding a new path towards the same destination.

The problem is not strategy. It is the illusion of predictability.

Same chair, different century

We – Vitra – make furniture and the chair illustrates this distinction particularly well. Few products have changed less over the course of human history. A chair has legs, a seat, a back and often arms. A chair still solves the same problem today as it did centuries ago: supporting the human body in a seated position. Human beings evolve, but slowly.

The development of a new Vitra chair takes two or three years from idea to market. In the world of artificial intelligence, that feels almost geological. Yet we continue to invest in new products because the permanence of the object outweighs the volatility of its surroundings: everything around the chair is fluent. How it is marketed, sold, repaired, leased or owned and used continues to change. AI will change how customers discover products. Regulation will change how they are manufactured. Climate policy will change which materials are acceptable. None of this alters the simple proposition that people will continue to need well-designed places to sit. The challenge is therefore not to redesign the chair every time the world changes. It is to understand which parts of the business should change with it.



Beauty born of scarcity

Economists know the “lipstick effect”: during periods of uncertainty consumers continue buying small luxuries that offer comfort or optimism. Design history suggests something more profound. Periods of scarcity do not merely change what people buy. They often become the moment in which entirely new forms of beauty emerge.

Jean Prouvé, a French designer, owned a steel factory: yet his Standard chair used the material purposefully and where the structure demanded it and – when steel became scarce during the second World War – he replaced it entirely with wood. Charles and Ray Eames developed a method for bending plywood while designing leg splints for wounded soldiers. This technique was eventually applied to furniture and the Plywood Group came to be. Neither project began as an attempt to create a design icon. Both were practical responses to constraints that helped strip away everything unnecessary. As a result, these objects outlived the crises that produced them. The resulting objects remain contemporary until today.

What machines still can’t do

The crises of our own time are different, but they ask similar questions. Climate change challenges us to develop products that can be repaired, maintained and remain useful for decades. Artificial intelligence presents a different challenge. Machines are becoming extraordinarily capable of producing information, analysis and images. They may answer questions faster than we can, but they cannot give identity and meaning to a generation. Beauty, culture and design are not the opposite of technological progress. They become more important because of it. In this time, the physical environments surrounding us become an important remaining expression of identity, belonging and human connection.

Perhaps this explains the renewed fascination with twentieth-century classics. They offer continuity in a period when much else feels unstable. But nostalgia cannot be a long-term strategy. Every generation deserves objects that respond to its own circumstances rather than borrowing the identity of another age. The responsibility of design is therefore larger than solving functional problems. A good chair outlives the crises that produced it. It becomes part of how an era understands itself.

Beauty, culture and design are not the opposite of technological progress.

Innovation has no boundaries

Charting a Course for Europe's Future: A Five-Pillar Roadmap for Innovation Made in Europe

These days, if you believe the prophecies of doom intoned by many international observers, the technological and economic future of Europe, and Germany, in particular, is sealed: a marginalized continent squeezed between superpowers to the West and to the East, drifting through a sea of volatile uncertainty, a continent unable or unwilling to take decisive action, or so it seems.

Martin Babilas
CEO
ALTANA

With 25+ years in the company and at its helm since 2016, Martin knows how to navigate change from the inside out. His experience at the intersection of technology, sustainability, and long-term value creation makes him a compelling voice on leadership in a rapidly changing world.

Europe has everything at its disposal to live up to the challenges of shaping the continent's future.

I beg to differ. It is true that time is of the essence now and bold initiatives are needed to prevent Europe from reaching a point of no return. But I am convinced we can succeed. Not because times are easy – were they ever? – but because Europe has everything at its disposal to live up to the challenges of shaping the continent's future, with innovation as a key driver.

I have always seen myself as an innovation enabler, because innovation drives growth. It is the basis for everything else. Drawing from more than 25 years of experience at ALTANA Group, one of the world's leading specialty chemicals companies, I would like to go beyond an analysis of the certainly necessary short-term priorities.

By now, we are all too familiar with the issues. There is no lack of insight, but rather a lack of action. Looking beyond the obvious, I would like to suggest a five-pillar roadmap for turning Europe into a global innovation hub. Let us take a look at Europe across sectors, guided by the core questions: What is needed from companies to drive Europe's economy forward? And what is required from politics to facilitate this very progress?

Understanding innovation:

First and foremost, both industry and politics need to change their mindsets by revisiting the very strengths that have built this continent: the pursuit of innovation and science, driven by diversity, talent, and free trade.

These strengths have always been fostered by values such as openness and trust, empowerment to act, and appreciation. It is no coincidence that these are also the core values of a corporation like ALTANA, deeply rooted in Europe.

Secondly, we need to redefine innovation: EU companies should focus on innovating in industrial technologies and markets, leveraging their established strengths in B2B manufacturing and engineering applications.

Thirdly, stability and innovation are not opposites. A key European industry, the chemical sector, for example, has been quietly but steadily undergoing a real high-tech evolution by embracing digitalization, automation, and AI, the silent "21st century industrial revolution."

R&D funding:

Yes, Europe does attract much less VC, generates fewer unicorns, and lacks a major platform economy.

But the perceived innovation gap between the EU and the rest of the world looks quite different when analyzing the global 2024 R&D investment dynamics. For example, EU companies sharply increased R&D in the energy sector (+19.8%), far exceeding growth in the U.S., Japan, and China, while also outpacing these regions in the health sector and recording a 4.8% rise in aerospace and defense.

European companies need to stay committed to innovation.

European companies need to stay committed to innovation, in good times and in bad, as long-term progress requires long-term commitment. At ALTANA, for example, we have always placed innovation at the center of our activities and have invested an above-average 7% of our annual revenue in R&D every year.

Political Framework:

We all know the quip, “the U.S. innovates, the EU regulates,” but is it really true?

Building on the milestone Draghi report on EU competitiveness, the 2025 “Competitive Compass“ points out that “the EU has all the assets to lead in the global economy of tomorrow. It has unrivaled talent and a skilled workforce, a large pool of private capital, a continental-size single market, a stable and predictable legal environment, the rule of law, and a unique social market economy.”

I could not agree more. But what we need now is concrete and fast action, a tangible tailwind from policymakers to unleash innovative strength.

The EU has taken the first steps in the right direction: The European Commission’s policy agenda sets out to support value creation through technology, to advance the 2050 climate-neutrality commitment while ensuring the attractiveness of the EU as a manufacturing base, and to curb the EU’s foreign dependencies and increase security, especially in critical raw materials and key enabling technologies such as semiconductors. And in March 2026, EU leaders agreed on a “One Europe, One Market“ roadmap aiming at cutting back regulations, ensuring affordable energy, fostering Europe’s industrial renewal and innovation, and attracting investment.

And there is more to come with the European Innovation Act, creating cross-sectoral legal framework conditions to remove barriers in order to expedite commercialization of R&D results, thereby enabling faster time to market and shorter innovation cycles. It is of decisive importance that this does not again get diluted by the particular interests of individual member states or pressure groups.

There must be a much more effective reduction of red tape to mitigate the danger of deindustrialization. In this context, the Industrial Accelerator Act (IAA), proposed by the European Commission in March 2026 as part of the Clean Industrial Deal and the Joint Communication on Strengthening the EU’s Economic Security, will be an important step.

Talent & education:

Innovation results from human minds working together. As for Europe, it is the education, training, and expertise of people – their ingenuity, creativity, and diversity – on a scale that only a single-market economy of some 450 million can provide.

Innovation results from human minds working together.

Across the EU, companies are embedded in long-established knowledge and science networks, connecting them with research institutes, universities, and key customers. Increasingly attracting researchers, graduates, and skilled professionals from around the world, as some labor reports suggest, Europe, a continent with aging societies, nevertheless must do much more to make education and investing in Europe a priority. This entails a much faster and less bureaucratic immigration process for skilled professionals and talent, particularly in STEM-related fields.

Attracting talent is a global competition and the EU needs to engage in a more compelling marketing of its USPs in this area. Europe does enjoy sophisticated vocational and technical school systems as well as a strong tertiary education sector with excellent universities, affordable tuition costs, and access to world-leading research opportunities, not least because Europe guarantees an open-minded, free, and uncensored academic environment.

Hidden innovation champions:

Contrary to the rest of the world, particularly the U.S., some 23% of patent holders in the EU are small and medium-sized companies. Family-owned businesses have proven to be surprisingly resilient for more than a century. In Germany, 88% of all private companies are family owned. They account for 46% of the revenue generated by the private sector.

Both policymakers and corporates need to ask themselves what they can learn from SMEs and family-owned enterprises and how we can enable their innovations more effectively. Already today, some of these are niche innovators, software disruptors, and essential partners in regional tech ecosystems, particularly in deep tech and disruptive technologies, as well as drivers of the twin transition, linking green and digital technologies.

Taken together, this constitutes a unique European innovation landscape that we need to appreciate and advance now. In doing so, business and politics should take their cue from these few lines: “Europe will not be made all at once, or according to a single plan. It will be built through concrete achievements (…),” a call to action written 76 years ago in the Schumann Declaration, the nucleus of European unity.

Let us start today – and together.

Across the EU, companies are embedded in long-established knowledge and science network.

Progress needs company

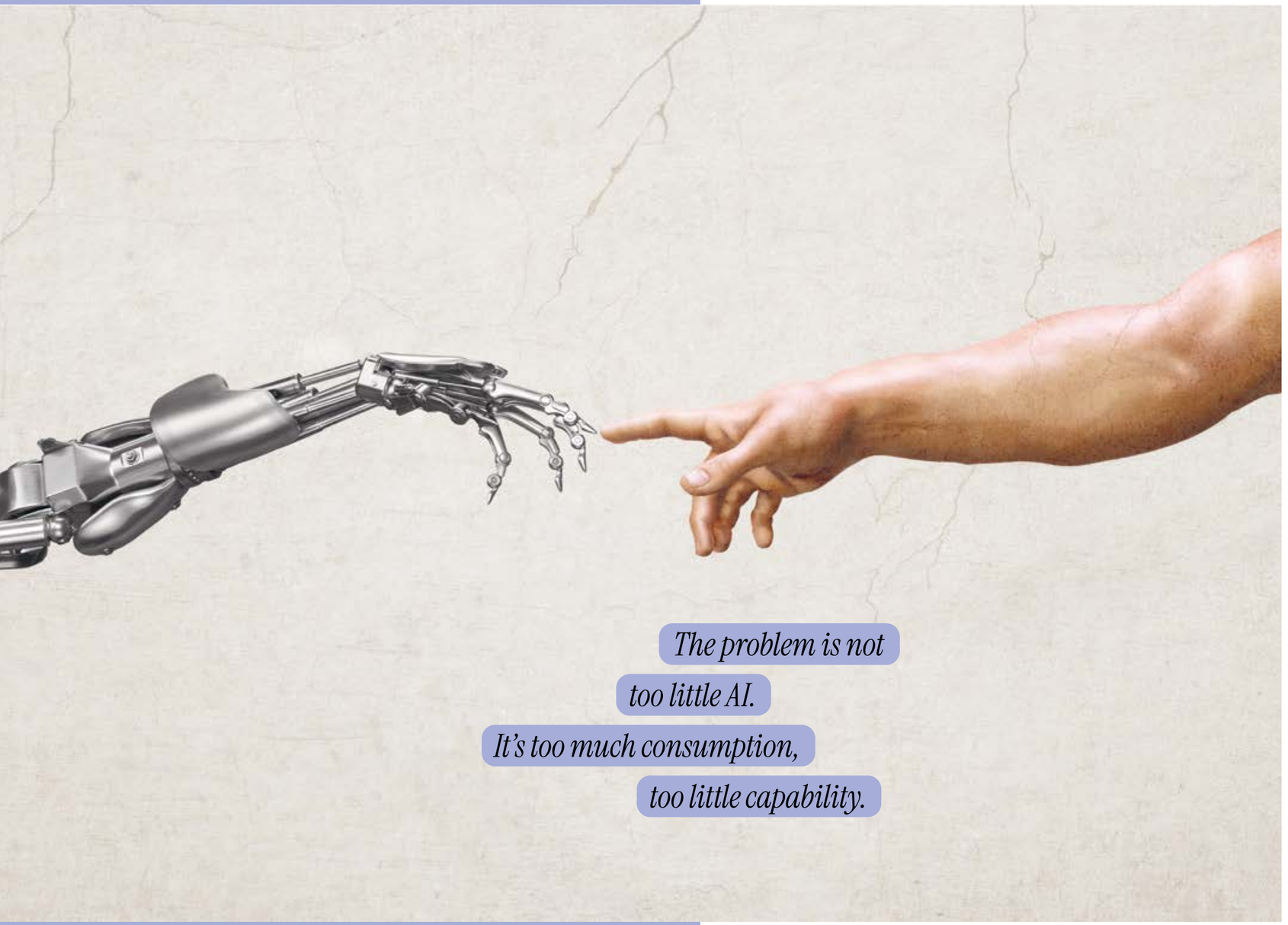
Laura Rudas
EVP, Palantir
Advisor & Investor
in tech ventures

A decade inside the machinery of national politics, then a jump to the table where governments and the world's most consequential data company now negotiate. Few people alive have a sharper read on where intelligence, power, and data actually intersect.

AI: Europe's Last Opportunity

Two days in a large hospital. Day one: agents, LLMs, impressive demos, energy in the room. One question stayed unanswered: would any of it run reliably in live operations?

BAD



Day two: a notification on a nurse's phone. At the right moment. Inside her workflow. That's the difference. Not chatbots. Beds. Discharges. Transfers. Operating room capacity. Whether scarce resources reach patients in time. Day one was consumption. Day two was capability.

More than a decade at Palantir has shaped my views. It made me optimistic that Europe still has what it needs – and furious about how little it does with it. Europe wants to be right. Others want to win.

Europe needs:

1. Stop consuming AI. Operationalize it.
2. Stop talking sovereignty. Build it.
3. Stop keeping the builders out. Get them in.

1. Stop consuming AI. Operationalize it.

AI is not about intelligence. It is about operational capability.

Europe should treat AI not as a technology trend but as a test of institutional agency: can a hospital, a factory, a grid, a ministry, a supply chain actually become stronger because of it?

A chatbot answers a question. An operational AI layer transforms an organization: the capability to stabilize shift plans, make power grids more resilient, increase factory throughput, and give soldiers tools for safer missions – ideally deterring conflict before it begins.

The problem is not too little AI. It's too much consumption, too little capability. A 2025 MIT/NANDA study put it at 95 percent of organizations seeing no measurable return on 30 to 40 billion dollars in generative AI. The number is contested. The pattern is not.

Token consumption is not progress. There's a movement happening in the US right now over enterprise sovereignty – who controls your data, who keeps your value, who you're really working for when you run your business on someone else's model. And Europe is still fighting the last war. Many of the C-levels in this network know this best; I am not sure about today's policymakers in Europe.

Organizations buy technology and believe the problem is solved. But AI is not an end in itself – for companies and states alike, it is a productivity tool. A tool that should make you stronger.

This is why an ontology – a shared semantic layer connecting data, processes, rules, and responsibility – becomes strategic. It turns AI into an operational layer: models can be swapped, data stays where it belongs, and intelligence becomes part of your own infrastructure.

The next divide will not run between countries with AI strategies and countries without them. It will run between economies that embed AI into their operations – and economies that don't.

Europe needs to stop shadowboxing and installing speed bumps at a turtle race. And those of us who have seen how easily policymakers get distracted by the wrong fight have a responsibility to say so. Too much is at stake: productivity, security, growth, jobs, state capacity.

The question is not: how do we position ourselves on AI? The question is: which problem do we solve by Friday?

The question is not:
how do we position ourselves on AI?
The question is:
which problem do we
solve by Friday?

2. Stop talking sovereignty. Build it.

Politics taught me how to hold contradictions together. Engineers taught me how to design them away. Sovereignty is an operational capability, not a political identity – institutional sovereignty, not flag-waving.

Europe holds many debates about AI: regulation, risks, sovereignty. Not wrong – comfortable. The decisive question is: what are we building with it? Europe should not only protect and preserve, but build – energy, infrastructure, medical progress, state capacity. That is the decisive shift in perspective.

The operators I learn from do not discuss AI. They prototype: on real bottlenecks, with real data, in real workflows – avoiding outages, stabilizing grids, cutting downtime on the line – and they measure the result in output, not in tokens.

At Airbus, the challenge was to ramp up production in a program with millions of parts and international supply chains. Connecting data from production, supply chain, and quality let teams see bottlenecks earlier. The result: a 33 percent increase in production. Out of this grew Skywise – today connecting data from more than 10,500 aircraft, used monthly by over 25,000 people.

That is not a sovereignty speech. That is sovereignty in the supply chain.

Because sovereignty does not mean doing everything yourself or building a wall around Europe. It means working with the best without becoming dependent on them – and building the capability to become better yourself: understanding your own architecture, protecting your data, keeping your value creation, and controlling the learning loop of data, decision, impact, and feedback.

Whoever controls that loop builds advantage. Whoever merely consumes foreign models without building their own learning layer trains someone else's lead.

The politicization of technical sovereignty creates pseudo-sovereignty: the language of control without the capabilities that create control. Language of control is not control. Europe has something no one else has: industry, machines, energy infrastructure, chemicals, logistics, the Mittelstand, complex real-world operations.

The next opportunity lies at the application layer – who connects AI best with the real world, solves the most important problems fastest, and turns that into lasting capability? Not in copying what already exists, but in integrating AI faster, deeper, and better into the real economy than others.

The cooperation between Old Economy and New Economy is Europe's greatest asset. Unused. Europe could become the place where people do not endlessly pilot, but prototype: faster, closer to reality, with direct feedback from industry, energy, mobility, healthcare, and public administration.

The continent of builders – where tech companies come because their products are not just presented, but tested, improved, and subjected to a reality check.

We are worlds away from that.

Europe has something no one
else has: industry, machines,
energy infrastructure, chemicals,
logistics, the Mittelstand, complex
real-world operations.

3. Stop keeping the builders out. Get them in.

Europe has a long tradition of demonizing what it doesn't understand. Had the establishment gotten its way, Semmelweis would have gone down in history as a madman – and we'd have impeccable manners and filthy hands to this day.

In Europe, we perfected the door policy and forgot to throw the party. Europe doesn't need better manners. It needs bad company.

I wish I had understood this more clearly in my time in politics: progress comes from people who make us feel uncomfortable. Looking back, I sometimes wish I had brought more Forward Deployed Engineers into policymaking.

Curious. Relentless. Annoying. Useful. Winning.

Many of the problems worth solving only become visible when uncomfortable people are in the room. People who refuse the premise. People who ask whether the process actually works. People who are less interested in being right than in building something that does.

Many of the most important builders abroad are Europeans themselves. They are not valuable because they are convenient, but because they see the future, inspire others, and create companies, platforms, and jobs.

Europe treats technology like a sympathy contest. That's dangerous – progress was never won by the likable.

We will have to cooperate, confidently, with people whose political views we do not share, because we should still want to understand where chips, biotech, defense, robotics, and AI are heading. I know this first-hand: even after shaking hands, you can still be a feminist. Political views are not contagious.

For that, Europe needs new alliances. Too much is at stake for outdated reflexes. The state, industry, capital, science, workers, and the best builders need to work together – not for another conference, but to solve the hardest problems.

This was once one of Europe's strengths. Think of the founding history of Airbus: Europe learned to turn national interests, industrial capability, and political ambition into a common project.

For AI, Europe has to relearn exactly that – building alliances and executing with speed.

Growth, jobs, security, and independence will not come from sovereignty circles. They will come from ecosystems, from products that work, and from the people who build them.

Thierry Bernard
CEO
QIAGEN

Operating at the crossroads of diagnostics, healthcare, and technology, Thierry brings a forward-looking perspective on how science can accelerate progress and create meaningful impact. His real specialty: turning "sample to insight" from a slogan into an actual business model.

How Predictive Biology Can Move Healthcare From Late Intervention to Better-Timed Action

Before disease decides

Modern medicine can do extraordinary things. But too often it enters the story too late – only after symptoms have appeared, damage has begun or options have narrowed. Healthcare responds with skill and compassion, but the harder question is whether we can move the moment of action earlier: not to treat more, but to treat better, faster, and sometimes not at all.

That is the promise of predictive biology. Not medicine as fortune-telling, and not a future in which every patient receives a fixed biological destiny – human biology is too complex, adaptive and individual for that. The point is not certainty. The point is timing, and timing is becoming one of the defining questions in healthcare.

For decades, healthcare has been organized around visible disease: symptoms appear, tests confirm what is wrong, treatment begins. This model has saved millions of lives, but it reflects a system built around episodes rather than trajectories – medicine waits until disease fits a diagnostic category, by which point patients may already have lost time, health or choices.

Medicine waits until disease fits a diagnostic category, by which point patients may already have lost time, health or choices.

The real failure is not that medicine lacks power, but that too much of it is deployed only after disease has set the terms – late medicine, built into reimbursement, workflows and evidence standards designed around intervention after need becomes visible. Predictive biology asks a different question: not only what disease a patient has, but what is beginning to happen and what can safely wait. The shift is not from medicine to technology, but from reaction to anticipation.

Prediction is not prophecy

The phrase inflates easily, so it needs a sober definition. It is not a promise to know every disease before it happens, nor will it make algorithms wiser than clinicians. Its value is practical: reading biological signals early – genes, molecular markers, immune responses, treatment-response data – and combining them with clinical context to see what may happen next. Individually incomplete, together they reveal direction: Is risk rising? Is treatment likely to work? Is intervention necessary, or would it add burden without benefit? This is not certainty, but usable probability – and that is not modest, since the better we understand uncertainty, the better we know when to act.

At its best, predictive biology gives patients something medicine too often cannot give back: time.

The patient benefit is time

At its best, predictive biology gives patients something medicine too often cannot give back: time. Time to understand risk before crisis, choose therapy before options narrow, monitor before damage becomes irreversible, or avoid treatment unlikely to help. Patients experience healthcare as waiting – for symptoms to make sense, for results, to know if treatment is working. Better timing will not solve every problem, but it can reduce unnecessary uncertainty and give families more room to decide.

The same logic applies system-wide: better information helps scarce resources flow to patients who need them most, shifting healthcare from spending more at the latest moment to acting smarter at the right one. Healthcare has become very good at rescuing patients from crises it might one day help prevent – which is why predictive biology is not only a scientific shift, but a leadership challenge.

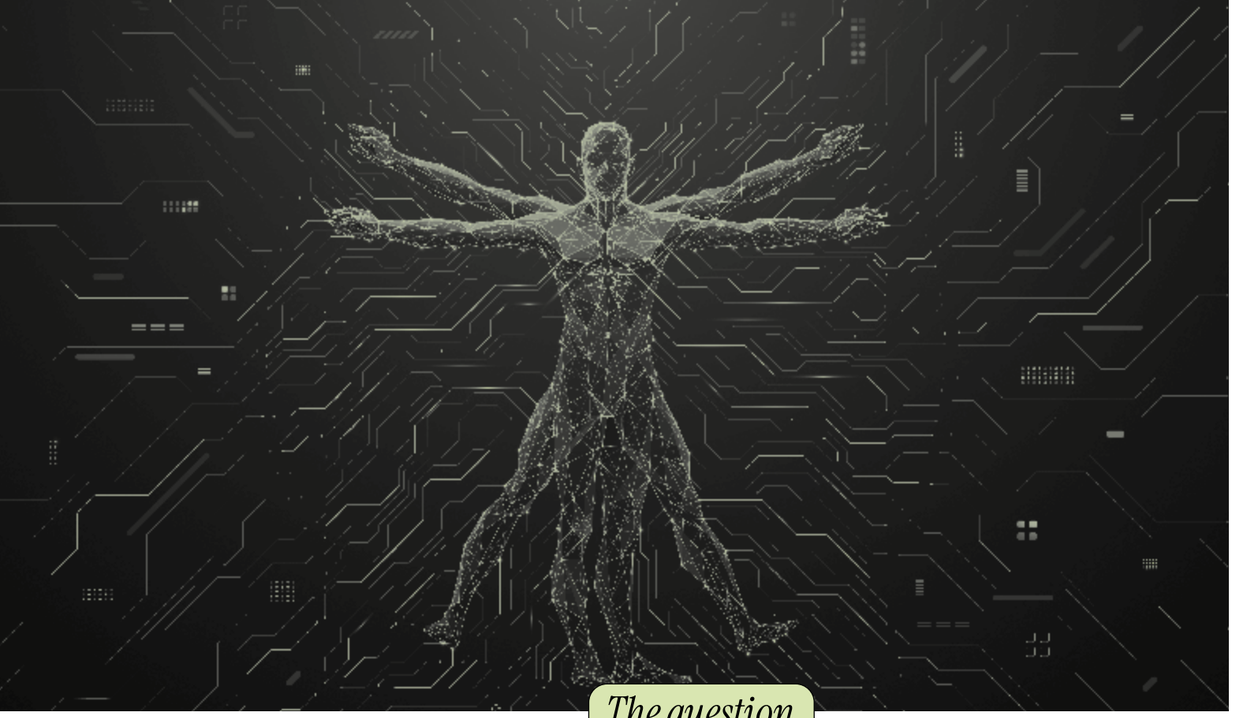
Timing changes outcomes

Cancer care shows what better timing means. Biomarker testing and companion diagnostics have moved oncology toward precise therapy selection: the question is no longer only what cancer a patient has, but which therapy is most likely to work. For some patients this has turned cancer into a condition managed over time, and molecular tools that catch recurrence before it is clinically visible can add a further layer of warning.

In infectious disease, timing is even less forgiving.

In infectious disease, timing is even less forgiving. When a patient may be developing sepsis, speed itself becomes part of the therapy: the faster clinicians understand what they face, the faster they can escalate, de-escalate or adjust treatment.

Tuberculosis offers a third lesson. TB is preventable and curable, yet remains one of the world's most serious infectious threats – an estimated quarter of the global population is estimated to have been infected with the TB bacteria, though only a minority ever develop active disease. The challenge is identifying latent infection before it emerges; a system that waits for TB to become active has already missed its chance. Across oncology, sepsis and TB, the lesson is the same: the decisive variable is not only what we know, but when we know it.



The question is not how much medicine can predict, but which predictions improve decisions.

AI makes biology visible

Predictive biology depends on data, and increasingly on artificial intelligence. No clinician can interpret the full complexity of modern biological information alone; AI can identify patterns across molecular, clinical and population data that would otherwise stay invisible, supporting risk stratification and personalized decisions. But its value lies not in replacing judgment, but in making complexity visible before judgment would know where to look – which makes judgment more important, not less. A model is only as good as the data and validation behind it; bias can be amplified, and explainability matters because patients are people making decisions under stress, not data points.

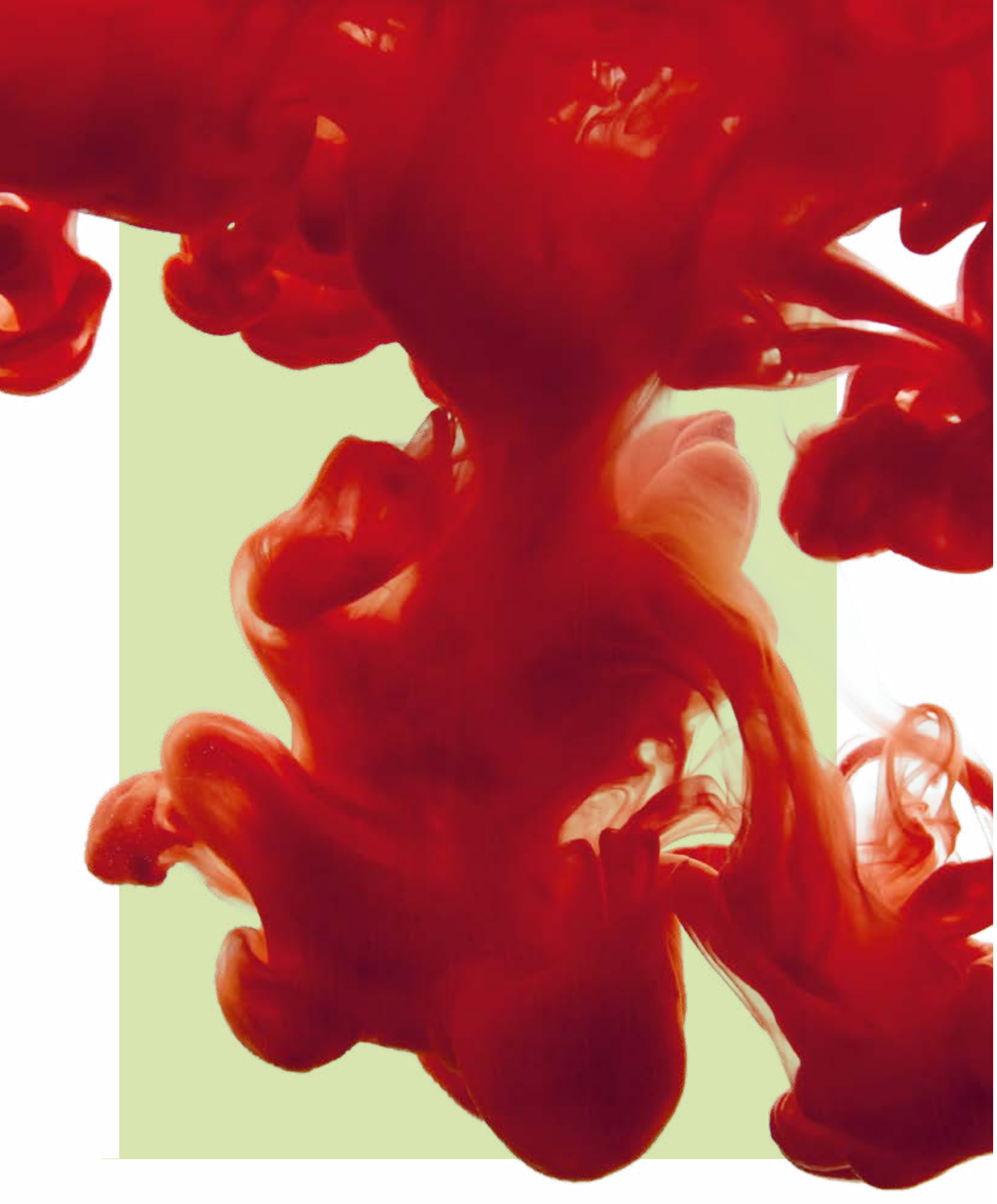
Prediction also has a dark side: a signal can inform but also frighten, guide action but also trigger unnecessary intervention – creating anxiety without action, or widening inequalities if advanced testing reaches only some patients. It must not become a consumer product detached from care; it belongs inside responsible healthcare, measured against real outcomes. The question is not how much medicine can predict, but which predictions improve decisions.

Systems built for rescue must learn prevention

The science is moving faster than the institutions. Most healthcare systems were designed around intervention after need becomes clear – predictive biology asks them to manage risk and prevention instead, which is harder than buying new technology. Systems often speak the language of prevention, but too many still pay mainly for rescue, rewarding activity more easily than avoided harm. That contradiction cannot survive the predictive era: it requires evidence models that value what does not happen, reimbursement that rewards better decisions over more procedures, and workflows that put predictive information to use without drowning clinicians in alerts.

Healthcare leaders will not succeed by bolting prediction onto systems built for reaction; they must redesign how decisions are made and value measured. The winners will not be the systems that test or digitize the most, but those that learn to act at the right moment.

The science is moving faster than the institutions.



Diagnostics are becoming medicine's timing mechanism

This is not theoretical. QIAGEN's work spans finding tuberculosis risk before active disease develops, reducing uncertainty in acute infection through bloodstream testing from positive blood cultures, and matching therapies to patients through companion diagnostics before time is lost to trial and error. These point to a larger change: diagnostics are becoming part of medicine's timing mechanism, translating biological insight into decisions clinicians can use – when to act, adjust, monitor, or sometimes not to treat. The future of diagnostics is not more testing, but better decision-making.

Predictive biology will not eliminate disease or remove the need for clinical judgment and difficult choices. But it can change the moment those choices are made: earlier clarity for patients, better information for clinicians, resources used more wisely across systems.

Modern medicine has become extraordinarily powerful. The next challenge is to make that power arrive sooner, with more precision and discipline. The future of healthcare will not be defined by doing everything earlier or more often. It will be defined by knowing when to act.

Before disease decides.

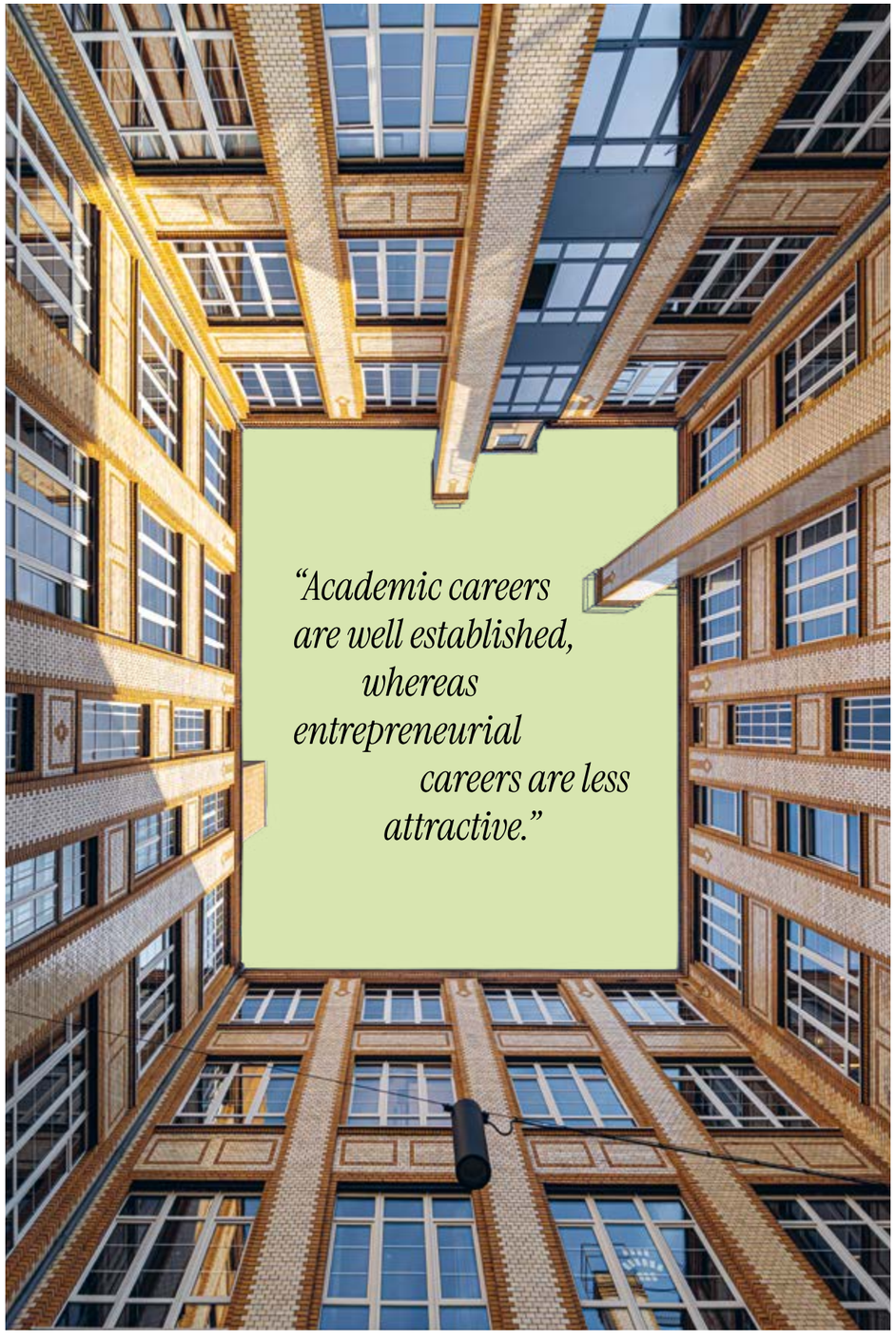
Crystallizing the research dividend, *mobilizing* growth capital

How Germany Can Turn Its Innovative Strength into Value Creation

Stefan Wintels
CEO
KfW Bankengruppe

Stefan spent decades in global Investment & Corporate Banking – guiding some of Germany's biggest banking transactions – before becoming CEO of one of the leading promotional banks in the world. Now he's betting the country's future depends on innovation as much as on the mobilization of private investments.

Germany has an impressive scientific base and ranks among the world's best in many fields of research. Spending on research and development is high, the quality of basic research is internationally recognized, the number of patent applications is considerable, and Germany regularly ranks near the top of innovation indices.



Yet this strength has so far translated into too little economic dynamism: start-up activity is comparatively low, venture and growth capital per capita lags well behind leading innovation hubs such as the United States, and the number of fast-growing, highly valued technology companies remains very small. Many studies reach the same conclusion: Germany captures too small a “research dividend” domestically. The decisive question is therefore how innovative strength can be consistently translated into economic value creation and growth.

In highly developed economies, long-term growth in prosperity and income can hardly be achieved through more labor or more physical capital anymore. It rests mainly on efficiency gains – that is, the ability to generate more value creation with the same resources. This is where innovation comes in: new technologies, better processes, digital business models and new products raise productivity, open up markets, and strengthen an economy’s competitiveness and resilience to crises.

The decisive question is therefore how innovative strength can be consistently translated into economic value creation and growth.

The gap between research and market impact

Yet there is a significant gap in Germany between this research strength and its economic impact. While scientific performance is impressive, entrepreneurship, start-up dynamism and the ability to scale lag behind. Investment in young, growth-oriented companies – measured against GDP – is clearly behind that of leading nations: venture capital investment accounts for only about 0.2% of GDP in Germany, compared with roughly 1.0% in the United States. To reach a similar level, at least around €40 billion would be needed annually, rather than the roughly €7 billion currently invested. At the same time, the number of large growth companies in the technology sector is significantly lower than in other leading ecosystems. SAP’s IPO took place almost 40 years ago, and the company’s current market capitalization of around €160 billion reaches only about 5 to 10% of the market capitalization of the leading US technology corporations.

This gap has several causes. A central problem lies at the interface between science and business. Although technology transfer offices, incubators and university programs exist in many places, research results are still too rarely converted into marketable products and scalable business models. Academic careers are well established, whereas entrepreneurial careers are less attractive and come with high hurdles – be they cultural, organizational or financial. In addition, the Mittelstand, which forms the backbone of the German economy, is in many cases open to innovation but tends to be cautious about adopting radically new technologies. As a result, the potential to scale research findings through cooperation with established companies is not fully realized.

An underdeveloped equity culture

A second structural weakness is also evident: an insufficient equity culture. Germany has traditionally been a nation of savers rather than broad-based equity investors. This makes it harder to finance risky but high-growth business models – both for start-ups and for the Mittelstand. Equity capital – that is, venture capital, growth capital and other equity-like instruments – is nevertheless a key lever for financing this transformation and keeping the research dividend within the country.

Another bottleneck lies in the growth phases. Innovations often require long development times and substantial upfront investment before meaningful revenues emerge. Conventional debt financing is only of limited use here. Successful German start-ups frequently turn to international investors in later financing rounds because domestic capital is lacking. Capital brings influence with it – over location, strategic decisions, and the build-up of development and production units. As a result, companies relocate key functions or their headquarters abroad. This causes value creation, high-quality jobs and tax revenue to be lost. Innovation that originated in Germany – often supported by public research funding – then generates most of its economic impact elsewhere. The goal must be to capture this research dividend far more strongly within Germany itself.

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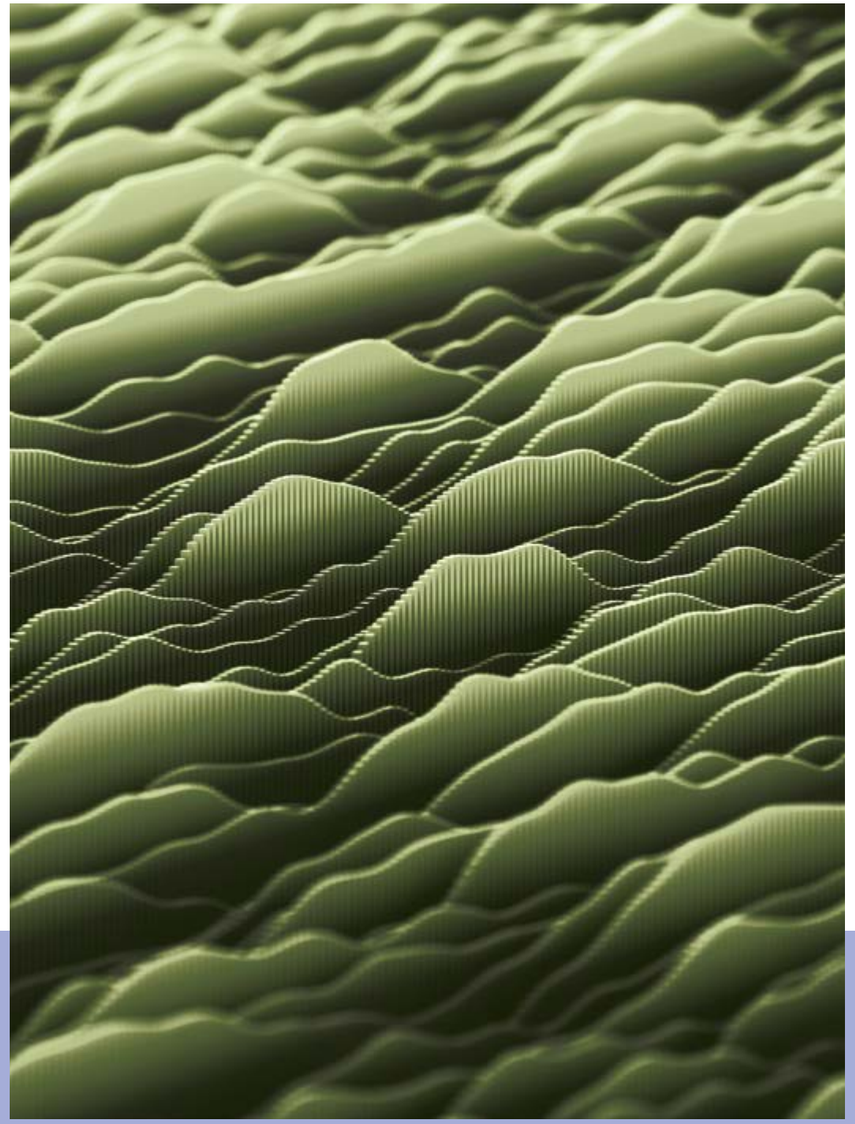
but tends to be cautious about adopting
radically new technologies.



Five levers for change

Achieving this requires a coordinated combination of several measures along the entire innovation and value-creation chain.

First The transition from research to founding a company must be systematically strengthened. Universities and research institutions need incentives and suitable instruments to view spin-offs as an integral part of their mission. This includes professional transfer structures, clear IP arrangements, rigorous entrepreneurship education, and programs that allow teams to test and validate their ideas under entrepreneurial conditions over an adequate period of time. Successful innovation regions – from parts of Germany to ecosystems such as Copenhagen, Tel Aviv or Silicon Valley – show how strong regions become when knowledge, talent and capital circulate within dense networks.

Second Strengthening the entrepreneurial ecosystem is urgently needed. Start-up activity rises when society and institutions regard entrepreneurship as a normal and attractive option. Given Germany's demographic development, it is also important that business succession be viewed as a quasi-new-founding. This calls for a culture that does not stigmatize failure, swift and reliable regulation, and networks in which founders can find mentors, pilot customers and skilled professionals. The Mittelstand can play a key role here by acting more often as the first customer for new technologies developed domestically. At the same time, more than the current 41% of Mittelstand companies should be generating innovations. This requires, in particular, reducing bureaucratic burdens, improving financing options, and specifically addressing the shortage of specialist and digital skills within the Mittelstand.

Third Innovation needs equity capital. The financing gap, especially in the growth phases, must be closed quickly. National and European initiatives already aim to deepen the market for venture and growth capital. What matters is that institutional investors – such as pension funds and insurers – are able to invest in this asset class on a larger scale and under appropriate regulatory conditions. A well-functioning European capital markets union can help ensure that capital flows efficiently across borders to where it is needed for innovation and growth.

Development banks such as KfW play a particular role in this ecosystem. With the Zukunftsfonds (Future Fund), KfW, together with KfW Capital, has been structurally strengthening the supply of equity capital since 2021. The goal is to mobilize around €30 billion by 2030, together with private investors, for technology-oriented start-ups, of which €10 billion is public capital invested through various modules. By the end of 2024, €13 billion had been made available, around €6.6 billion committed, and nearly 2,500 start-ups supported through more than 134 venture capital funds. The WIN Initiative ("Growth and Innovation Capital for Germany") aims to increase commitments to the German and European VC ecosystem to more than €25 billion by 2026. The planned Deutschlandfonds (Germany Fund) will also create an umbrella instrument specifically designed to mobilize private capital for future-oriented investments in Germany.

Fourth It is essential to create attractive framework conditions within a genuine EU single market, so that innovative companies can build and retain their value creation in Germany and Europe. This includes competitive tax regimes, high-performing digital and physical infrastructure, an open labor market for skilled professionals, and reliable planning and legal certainty. Cutting red tape, speeding up approval procedures, and establishing regulatory sandboxes for new technologies should therefore be treated as mandatory, not optional.

Fifth Innovation strategy should deliberately focus on key future fields in which Germany already has strengths – such as green tech. The market for environmental and climate protection technologies is among the most dynamic growth sectors worldwide. In 2023, Germany's green-tech sector achieved a market volume of more than €480 billion, roughly 15% of GDP. Start-ups such as Greenlyte Carbon Technologies – which has developed a technology for capturing CO_2 from the air while simultaneously producing hydrogen, and which is supported, among others, through a fund co-financed by KfW Capital – show how research can be turned into market-shaping business models.

Innovation strategy should deliberately focus on key future fields in which Germany already has strengths – such as green tech.

If Germany succeeds in decisively activating these levers, it can convert its strength in research and development into productivity gains and higher economic output. The challenge is to close the gap between science and market, substantially increase the supply of innovation and growth capital, and establish a broadly shared equity culture. Innovation must not end at the door of an institute or laboratory. It must be systematically translated into business models, growth companies, and ultimately into broad economic impact. What is needed for this is a financial architecture that turns ideas into equity stakes, equity stakes into growth, and growth into prosperity – in Germany and in Europe.

Why *useless* know-ledge may become our *most useful* asset

Kevin Heng
Chair Professor of astrophysics
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Kevin has won two research grants from the European Research Council (worth about 12 million euros in total). Since 2012, he has been a member of World Minds.

To a politician or business leader, it is not obvious why "blue sky" research should be funded at all. This is research that seems to serve no immediate societal function, generates no obvious return on investment or does not produce outcomes of direct industrial or commercial relevance. Disciplines such as astrophysics and mathematics come to mind. Therefore, if universities and national funding agencies were run like businesses, why not eliminate support for these disciplines in the name of efficiency and usefulness?

This objection should not be dismissed lightly. Every euro spent exploring distant galaxies or abstract mathematical structures is a euro not spent on hospitals, infrastructure or immediate technological challenges. The burden of proof therefore lies with the defenders of fundamental research: they must explain why societies should invest in knowledge whose benefits may be invisible for generations.

There is a beautiful essay entitled, "The Usefulness of Useless Knowledge," written by Abraham Flexner in 1939, that addresses this question decisively. Flexner was the founder of America's original utopia for knowledge known as the Institute for Advanced Study, which was built around Albert Einstein after he fled Nazi Germany. Research should be regarded as a balanced portfolio of investments. No venture capitalist expects every investment to succeed. Indeed, a portfolio in which every project is predictable is usually a portfolio without transformative upside. Scientific research follows a similar logic. Applied research represents the low-risk, incremental part of the portfolio; curiosity-driven research represents the high-risk component where the eventual payoff distribution has a long tail. A single discovery – electricity, quantum mechanics, the transistor, the World Wide Web – can repay centuries of investment. The challenge is that the time horizon of discovery often exceeds the time horizon of politics.

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The cultural argument

There is a deeper cultural argument. Civilisations are not remembered only for solving practical problems. Ancient Greece is remembered not because it optimised agriculture or transportation, but because it produced mathematics, philosophy and art whose influence persisted for millennia. Human beings are not merely economic units seeking efficiency; curiosity and the desire to understand our place in the universe are among the qualities that define civilisation itself.

Useless, for now

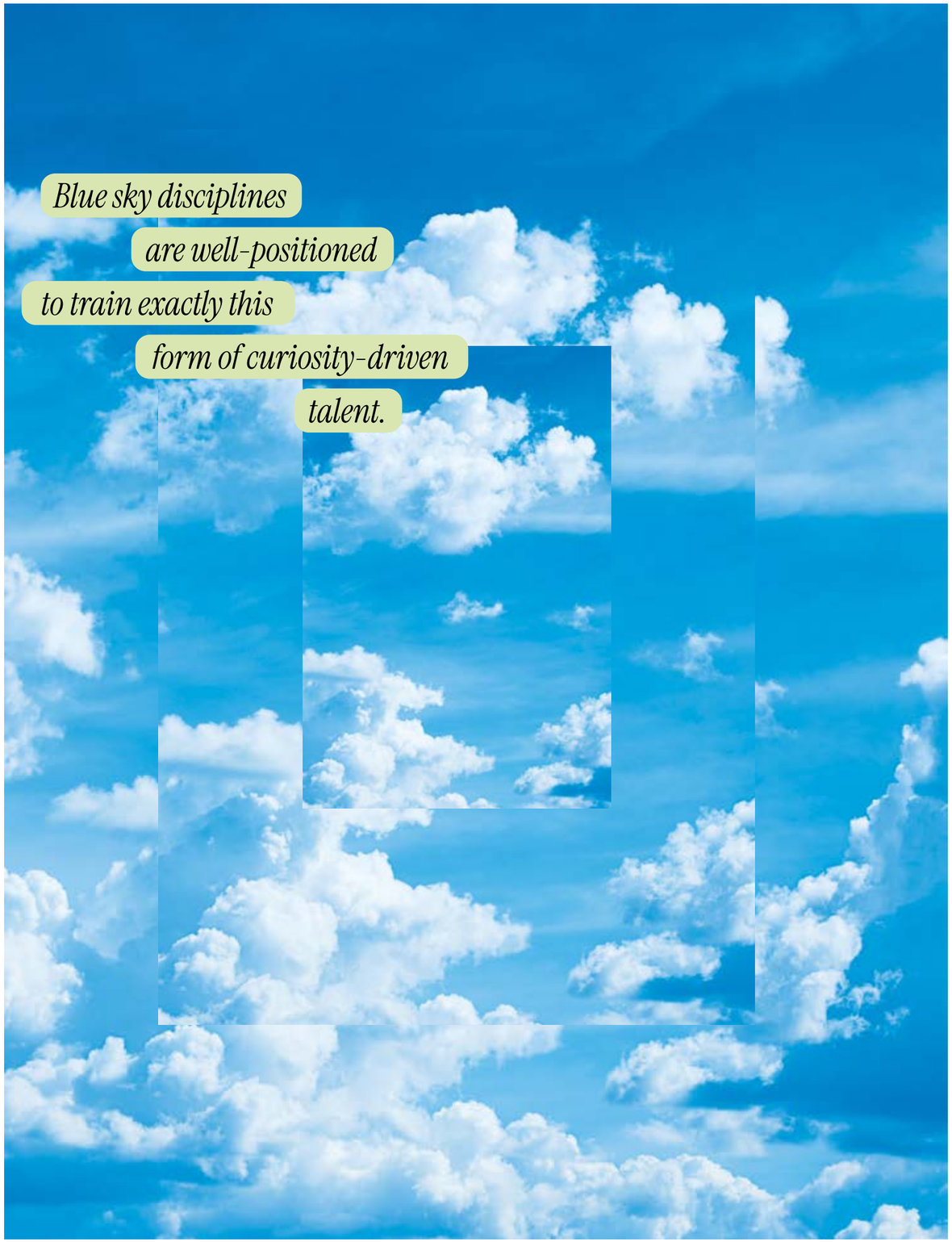
Rather than visualising useful versus useless research, one should think of it as being applied versus not-yet-applied research as proposed by the Nobel laureate George Porter. The overarching reason is surprisingly practical: over long time scales (think decades), the path and character of innovation cannot be precisely predicted. Knowledge that started out as "useless" may eventually have a titanic impact on technology and applications. In its formative years in the 1920s, quantum mechanics was sometimes dismissed by older physicists as "Knabenphysik" ("boys' physics"), an abstract pursuit dominated by a new generation of young theorists. Few could have imagined that this strange theory would eventually underpin semiconductors, lasers and quantum computing.

When Faraday studied electromagnetic induction, there were no electric grids, motors or electronics industries waiting for his discovery. He was not improving an existing technology; he was uncovering principles from which entire industries would later emerge. Einstein developed general relativity to understand gravity, space and time – among the most abstract questions imaginable. A century later, satellite navigation systems require relativistic corrections to maintain their accuracy. Artificial intelligence (AI) and machine learning emerged from decades of seemingly abstract work in mathematics, statistics, computer science and neuroscience – fields such as linear algebra, optimisation theory and information theory that originally developed without today's applications in mind. For centuries, prime numbers were considered among the purest examples of useless mathematical beauty. Today, number theory forms the foundation of modern encryption and digital security.

Knowledge that started out as "useless" may eventually have a titanic impact on technology and applications.

Scientists in disguise

Perhaps more importantly, one cannot predict or control how the talent that a society trains moves from "blue sky" fields dealing with "useless" research to sectors focusing on applications and industry. An astrophysicist is essentially a creative problem solver, who is capable of interdisciplinary thinking and highly trained in data science. Fundamental research trains people under unusual conditions: incomplete information, ambiguous objectives and problems where no textbook solution exists. These are precisely the conditions encountered in leadership, entrepreneurship and technological disruption. The value of training a scientist is therefore not only the specific knowledge produced, but the cognitive machinery created. Often, such individuals end up leading data science teams or adapting their problem-solving skills in the role of a consultant. A society that only trains its citizens for "useful knowledge" is essentially eliminating half of its potential talent pool from the start.



Three countries, three bets

Despite being a small, market-oriented country, Switzerland is a shining example of investing in both fundamental and applied research. Its national funding agency for science does not prioritise application relevance as its outcome. The much larger country of Germany has a long and rich tradition of driving fundamental research via its Max Planck Institutes. By contrast, Singapore prioritises applied research using a "top-down" model that is directly driven by its government. Singapore's model has been extraordinarily successful at rapidly building technological capacity. However, the question for a mature research ecosystem is whether the same mechanisms that accelerate catching up are sufficient for creating entirely new fields. Different stages of national development naturally favour different strategies. Top-down research strategies are powerful when the destination is visible. They can mobilise resources toward semiconductors, biotechnology or AI infrastructure. They are less effective when the destination itself has not yet been imagined. Fundamental research is society's mechanism for exploring unknown unknowns.

In the current age of AI, the most valuable talent is not technical mastery alone – large language models (LLMs) are well on their way to performing this function. It is the ability to ask creative, insightful, probing questions. It is problem design, rather than problem solving. For centuries, education rewarded those who could remember facts and execute known procedures. Artificial intelligence is rapidly commoditising both abilities. In such a world, human advantage shifts toward deciding which questions matter, recognising hidden assumptions, connecting distant ideas and imagining possibilities that do not yet exist. Blue sky disciplines are well-positioned to train exactly this form of curiosity-driven talent. The irony is that the disciplines most often criticised as "useless" have spent centuries cultivating precisely the abilities that may prove most useful.

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