

Engineering and R&D Pulse 2026

Capgemini Research Institute 2025

RESEARCH BRIEF

**How are engineering leaders
navigating speed, agility, and
cost pressures in the age of
AI?**

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Who should read this report and why?

This report is primarily intended for senior decision-makers in engineering and R&D functions – including chief R&D officers, VPs and heads of engineering or product development, chief technology officers (CTOs), and innovation directors – who are navigating today's challenging business landscape. It provides an overview of the strategic evolution of engineering and R&D functions in response to rising cost pressures, longer time-to-market cycles, intensifying global disruptions – from supply chain shocks to talent shortages – and the impact of technology, especially AI.

The report is also relevant to chief financial officers (CFOs) and chief supply chain officers, whose decisions regarding capital allocation, procurement strategy, and supplier ecosystems shape the effectiveness and agility of engineering functions. Informed by insights from 1,500 global executives, the report distills the key trends, organizational shifts, and technology priorities that are redefining market competition and strategic direction. It offers actionable guidance to help decision-makers navigate disruption and accelerate transformation in a fast-changing environment.

01

Executive summary



The urgency for Engineering and R&D transformation is real

Engineering and R&D leaders from across sectors, including aerospace, to automotive, energy, life sciences, and beyond, are urgently articulating a need to transform: 44% believe their organizations risk losing significant market share if they cannot accelerate their innovation processes within the next five years. Even more (48%) say they need to bring down their costs significantly in order to stay competitive. Executives believe costs must be reduced, on average, by 10%; design and development time by 9%; and production ramp-up time by 8% over the next two to three years.

Preparedness gaps in the face of macro disruptions compound the challenge

While addressing these realities, engineering leaders must also contend with disruption from the broader business environment. Some factors are harder to mitigate than others. Less than one third of executives believe their organizations are prepared to address geopolitical uncertainty, supply chain disruptions, and talent shortages, for example. This lack of preparedness makes transformation even more challenging. As organizations face both persistent and unpredictable disruptions, there is an acute need for the agility to adapt quickly and remain resilient. (Interestingly, while AI is seen as a significant influencing macro-factor, most believe that they are reasonably prepared to seize its opportunities.)

Core engineering metrics are heading in the wrong direction

While speed, agility, and cost reduction remain top engineering and R&D priorities for surveyed organizations, our data suggests that these metrics are sliding backwards. Nearly eight in ten (78%) respondents say costs¹ have increased over the past three years, and over a quarter of these say the increase was significant (more than 15%). In addition, nearly half (48%) report an increase in design and development timelines, underscoring the need for a new approach. These trends vary from sector to sector. For example, telecom organizations are notably less likely to report cost and time-to-market increases, suggesting that some sectors may be better positioned than others to manage these pressures. Executives point to a range of organizational and systemic barriers undermining efficiency and agility. These include supply chain constraints, talent shortages, resistance to change, legacy systems, weak innovation cultures, and regulatory or compliance challenges.



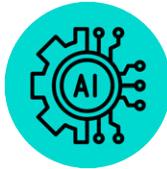
Unlocking efficiency and agility: Digitization and diversifie outsourcing top the agenda

Digitization and outsourcing are the top strategies to improve engineering and R&D efficiency, while tech partnerships and internal streamlining are gaining traction. While all forms of outsourcing are increasing, organizations are adding to their portfolio of models to include performance-based outsourcing, build-operate-transfer (BOT) arrangements, and revenue-sharing partnerships. This suggests that they are seeking a stronger focus on outcomes, the opportunity to share risk, and the agility to respond more effectively to competition and disruption. Organizations are also turning to digitization to boost agility, with 40% already fast-tracking implementation of digital scenario planning tools and another 36% implementing them. Alongside this, many are rolling out flexible operational systems and rethinking supply chains and product design to enhance agility. These efforts reflect a broader shift toward more resilient, responsive engineering operations.



Emerging technologies are catalysts for engineering reinvention

More than six in ten (63%) executives see emerging technologies and digital innovation as enablers of change, with AI, digital twins, and next-generation materials ranking as the most transformative technologies for engineering over the next two to three years. While the global average stands at 63%, prioritization varies across geographies: organizations in China lead, with 81% prioritizing digital innovation in engineering and R&D, followed by the US at 73%, while Europe trails with 60%.



AI is shaping the future of engineering and R&D

In the next two to three years, AI's impact on engineering and R&D is set to intensify. Over 75% of executives expect an enhancement of 20-50% in outcomes, including speed to concept, time to market, productivity, product value, and cost reduction. Executives anticipate the most significant AI impact in maintenance and support, documentation and compliance management, and research and concept development. More than eight in 10 (84%) organizations plan to increase investment in AI for engineering and R&D over the next two to three years. China and Japan show the strongest momentum, with 92% of organizations planning to increase AI investment in engineering and R&D, while the Netherlands and the Nordics show the least momentum, at 62%.

In the age of AI, engineering talent remains critical

However, even as AI adoption is set to grow, executives continue to value traditional engineering skills and human ingenuity. Only 15% believe that AI can replace the problem-solving and creativity of human engineers and designers.



Recommendations

To accelerate transformation, organizations must redesign engineering strategies to focus internal talent on high-impact work, while tapping into partner ecosystems, AI, and global capabilities:

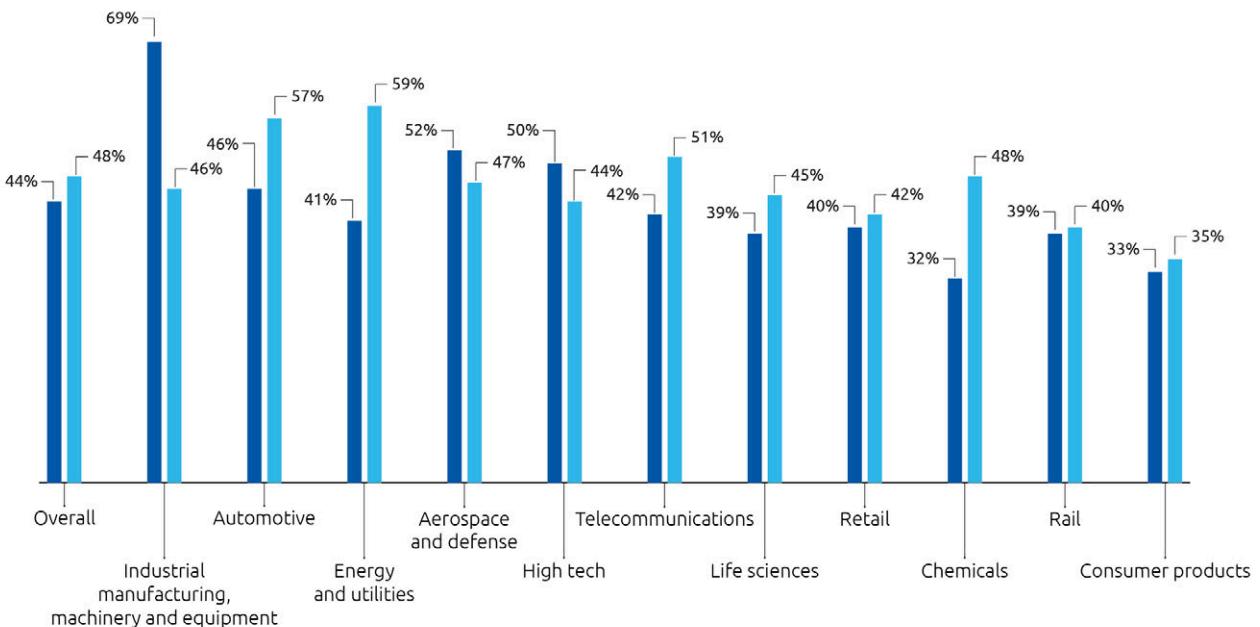
- Apply multiple AI modalities through a structured deployment approach to unlock value at scale
- Transform engineering for flexibility to balance cost, speed and agility demands
- Broaden access to global talent and invest in workforce development to address talent shortages
- Expand the engineering partner ecosystem to unlock capacity for impact.

02

The urgency for
engineering and R&D
transformation is real

Organizations are under pressure to innovate faster and cut costs

- Innovation risk [Percentage of executives who agree with the statement: "We risk losing significant market share to startups and emerging market players within the next five years, if we fail to innovate faster"]
- Cost risk [Percentage of executives who agree with the statement: "Without significant cost reductions, our organization risks becoming uncompetitive against startups and emerging market players within the next five years"]



“

We are in a global competition with China, and it's not just EVs. And if we lose this, we do not have a future Ford. [...] China's successful for good reason. It has great innovation at a very low cost.”²

Jim Farley
CEO | Ford

“

In biopharma, China's dramatic speed, cost and scale have triggered a shift in the global competitive landscape.”³

Albert Bourla
CEO | Pfizer



China's rapid ascent across strategic industries is reshaping the competitive landscape and intensifying the urgency to adapt

EVs



~67%

China's share of global EV sales⁴

- In Europe, the share of Chinese EV brands has grown from 0.4% in 2019⁵ to 10.6% in June 2025⁶.
- Brands like BYD and Geely have outpaced traditional automakers by launching new models faster and at lower costs⁷.

Batteries



>75%

China's share of batteries sold globally⁸

- In 2024, average battery prices in the US and Europe were 31% and 48% higher than in China⁹.
- Leading manufacturers such as CATL and BYD have scaled up production faster and more efficiently, and achieved higher manufacturing yields than their competitors¹⁰.

Solar manufacturing capacity



>80%

China's share in all the manufacturing stages of solar panels (e.g. polysilicon, ingots, wafers, cells, and modules)

- Global solar PV manufacturing capacity has steadily shifted from Europe, Japan, and the US to China over the past decade.
- China is home to the world's top 10 solar PV equipment suppliers¹¹.



...China's rapid ascent across strategic industries

Biotech & pharma



35%

Projected share of FDA approvals by 2040 for drugs originating in China, up from just 5% today

- China's biotech sector is expanding rapidly – annual revenue is projected to grow to \$34 billion in 2030 and \$220 billion by 2040.
- Chinese biotech companies are increasingly developing novel, high-value drugs.¹²

Aerospace & defense



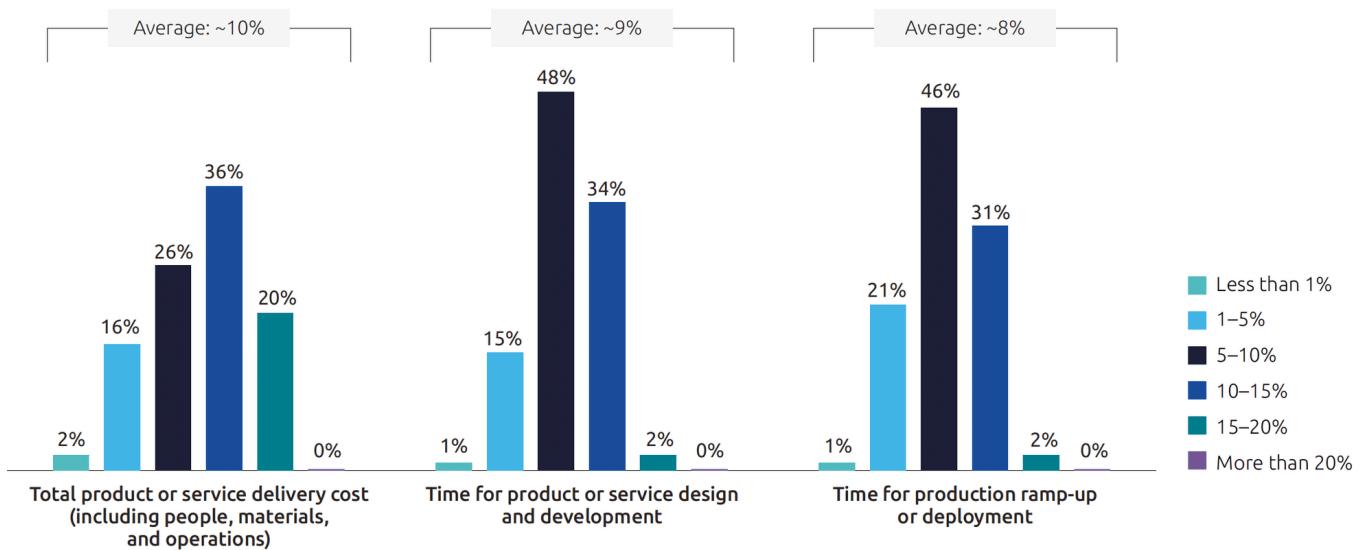
>1,000

Orders placed domestically for COMAC jets¹³

- China is investing heavily in COMAC, its state-owned aircraft manufacturer, to grow its aircraft market share.
- COMAC plans to begin its international expansion in Southeast Asia by 2026, before targeting Western markets.¹⁴

The cost of staying competitive – driving a 10% reduction in cost and faster time-to-market

Over the next two to three years, what level of improvement/reduction does your organization need to achieve in the following areas to remain competitive?



*Cost includes all costs that go into making a product or delivering a service including people, materials, and daily operations.

*Time for product or service design and development includes testing and quality assurance/certification.

*Time for production ramp-up or deployment covers manufacturing engineering and factory commissioning up to the start of production.

Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.

“

Today, it is no longer size that guarantees survival, but speed.”¹⁵

Thomas Schmall

Member of the Board of Management |
Volkswagen

“

We’re shifting from perfection-first to iteration-first. Products must meet current needs quickly and evolve through rapid cycles – speed is now a strategic imperative.”

Andrew D'Souza

Director, Global R&D |
3M

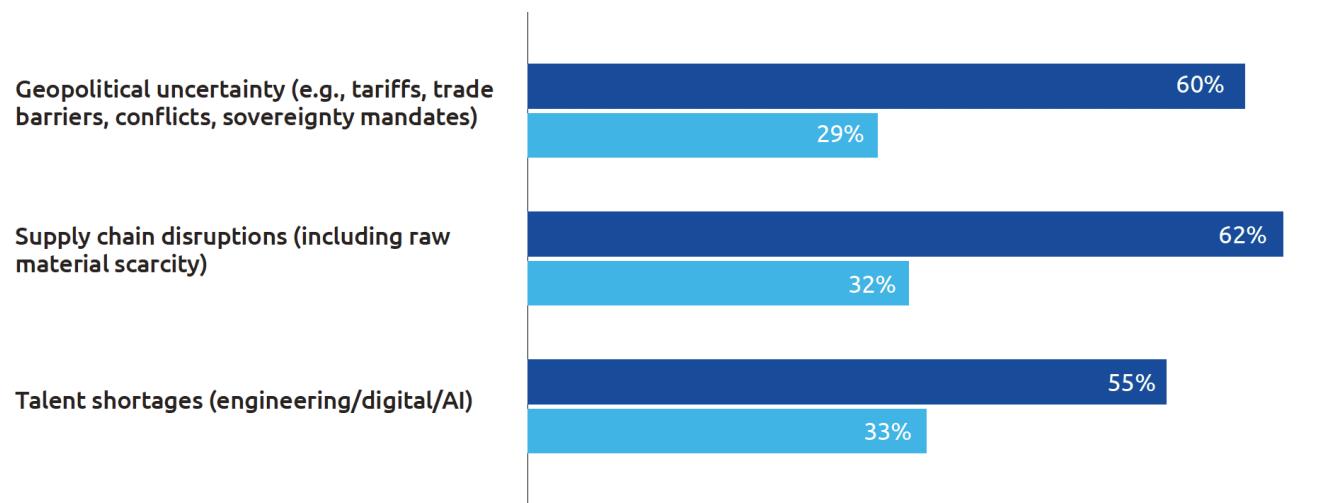




Deepening global uncertainty and disruption complicate the race to adapt

Less than one third of executives believe their organizations are prepared for geopolitical uncertainty, supply chain disruptions, and talent shortages.

Engineering and R&D threats versus preparedness



■ Percentage of executives who identified each global challenge as a major threat to their engineering and R&D function over the next three to five years

■ Percentage of executives who say that their organization is prepared to respond to the challenge

Supply chain disruptions and labor shortages in the aerospace industry have created record backlogs that could take over 13 years to clear.¹⁶



Geopolitical risks are forcing us to rethink everything – from sourcing strategies to talent development. It's a complete reset."

Ramakrishnan Ramanathan

Vice President, Born Electric Vehicle,
New Mobility | Renault Nissan



The world is facing a shortage of young people with engineering and STEM skills. Some estimates show nearly one in three engineering roles will remain unfilled every year from now to at least 2030. This poses a serious risk to the energy transition.¹⁷

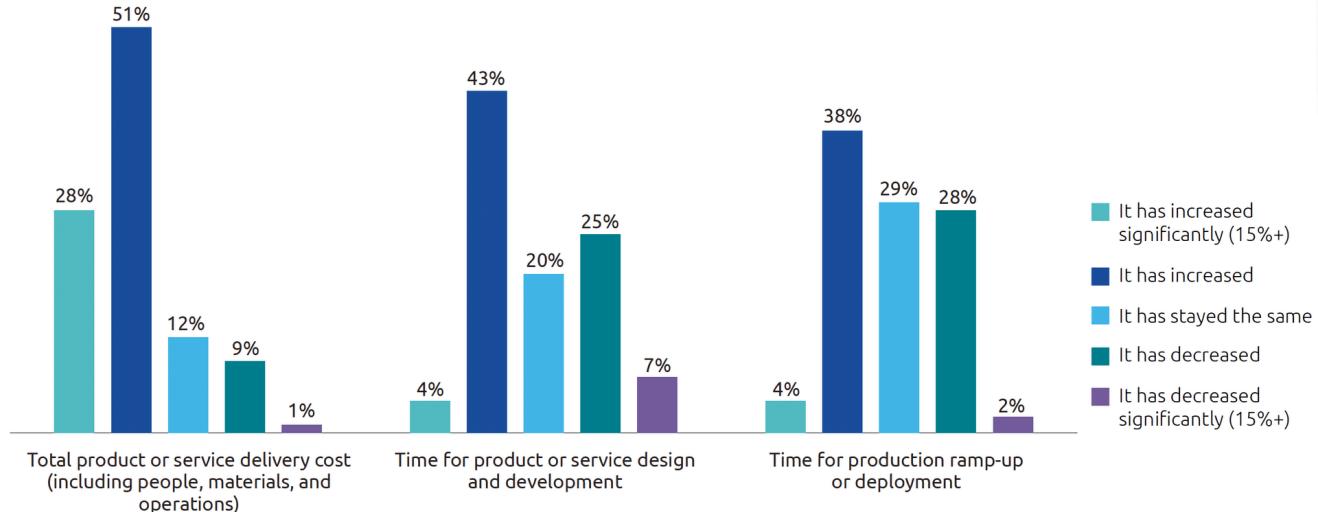
Ignacio Galán

Executive Chairman | Iberdrola

Core engineering metrics are heading in the wrong direction

78% of organizations report higher costs, and nearly half (48%) have experienced longer design and development timelines over the past three years.

How have the following aspects of your engineering and R&D operations evolved?



*Cost includes all costs that go into making a product or delivering a service including people, materials, and daily operations.

*Time for product or service design and development includes testing and quality assurance/certification.

*Time for production ramp-up or deployment covers manufacturing engineering and factory commissioning up to the start of production.

Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations

Top barriers to improving cost, speed and scale

54%
Supply chain constraints

53%
Lack of skilled talent

49%
Resistance to change

48%
Legacy systems or outdated technology

Notably, almost half (47%) of European respondents cite regulatory and compliance challenges as a major barrier (compared to 37% in the US and 39% in China).



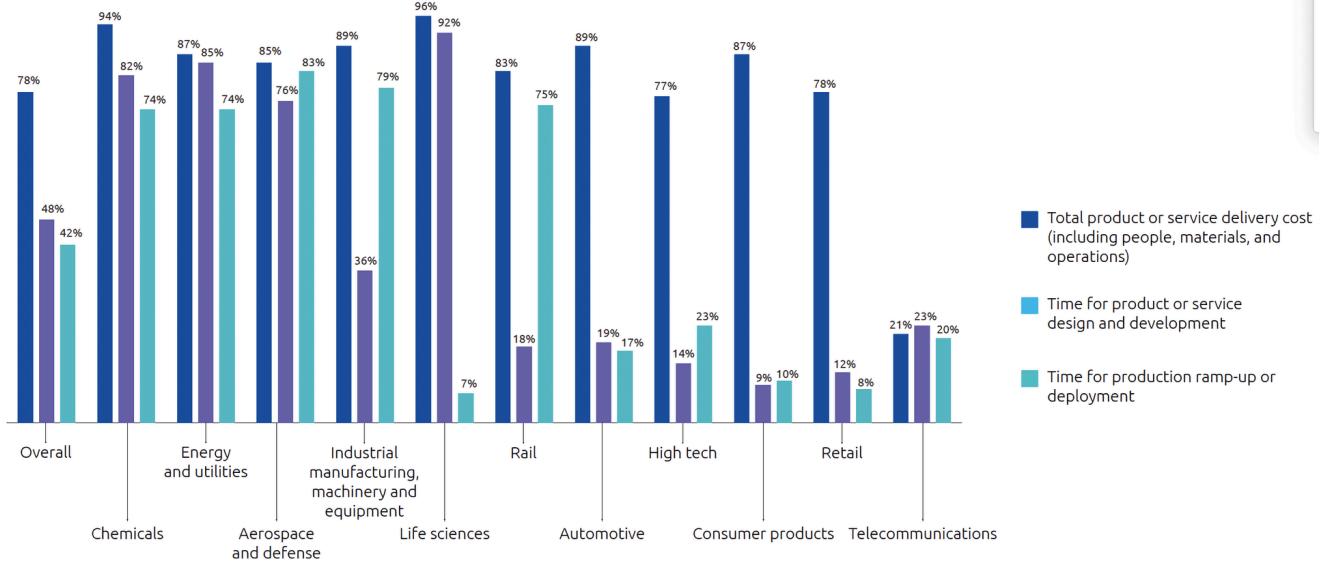
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We currently don't make enough money from our cars, while our costs for energy, materials and personnel have continued to rise. We cannot continue as before.”¹⁸

Thomas Schäfer
CEO, Volkswagen Passenger Cars

Cost and time increases have played out differently across sectors, reflecting operational realities

Percentage of executives reporting increases in the following over the past three years – by sector



Examples of sector-specific challenges:

Energy: Over the past four years, costs and procurement lead times for critical grid components – such as power transformers and high-voltage cables – have nearly doubled, creating major challenges for grid developers.¹⁹

Aerospace: In the past year, over 70% of US manufacturers experienced serious supply chain disruptions, with lead times for key components such as semiconductors, titanium alloys, and electronics rising 30–50% above pre-pandemic levels.²⁰

Life sciences: Pharmaceutical R&D spending increased by nearly 60% from 2012 to 2022, while timelines from initiation of a clinical trial to completion of patient enrollment increased by 26% between 2019 and 2023, reflecting rising R&D complexity.²¹

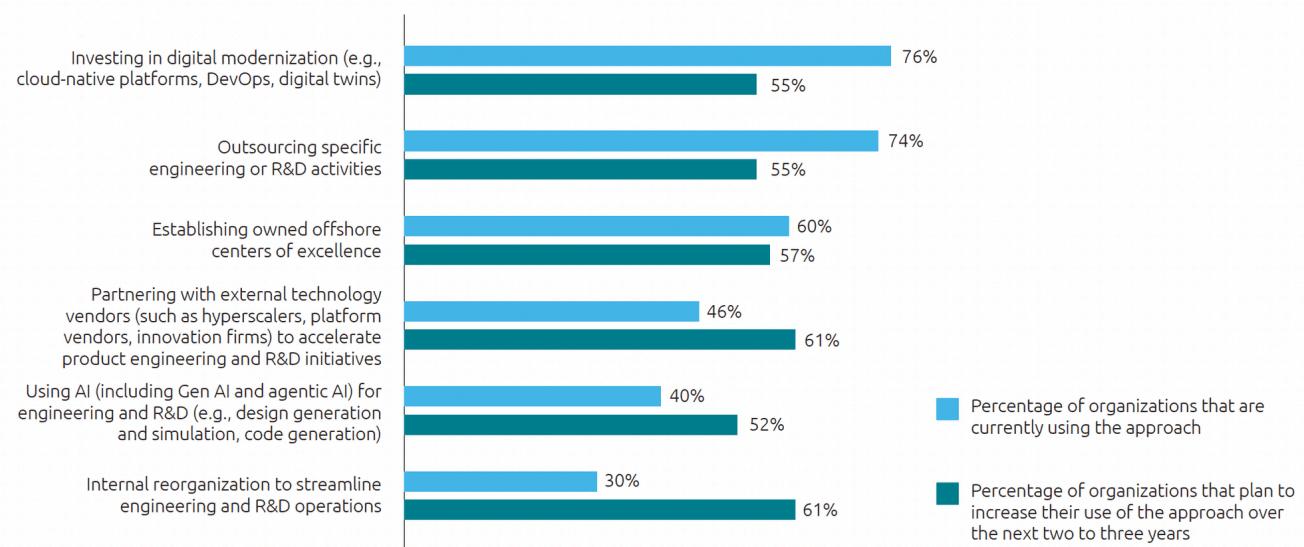
03

Unlocking efficiency and
agility: Digitization and
diversified outsourcing
top the agenda



Digitization and outsourcing lead efficiencyorts, while tech partnerships and internal streamlining are gaining traction

Current and planned adoption of efficiency approaches in engineering and R&D



Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.

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While production demand surges in the aerospace and defense industries, skilled labor in manufacturing is going to remain a problem, and the cost of raw materials will continue to rise. This will, in turn, drive the need for investment in automation, advanced machine tools, and the use of digital manufacturing solutions to improve quality, output, and more effective use of existing assets.”²²

Dan Janka

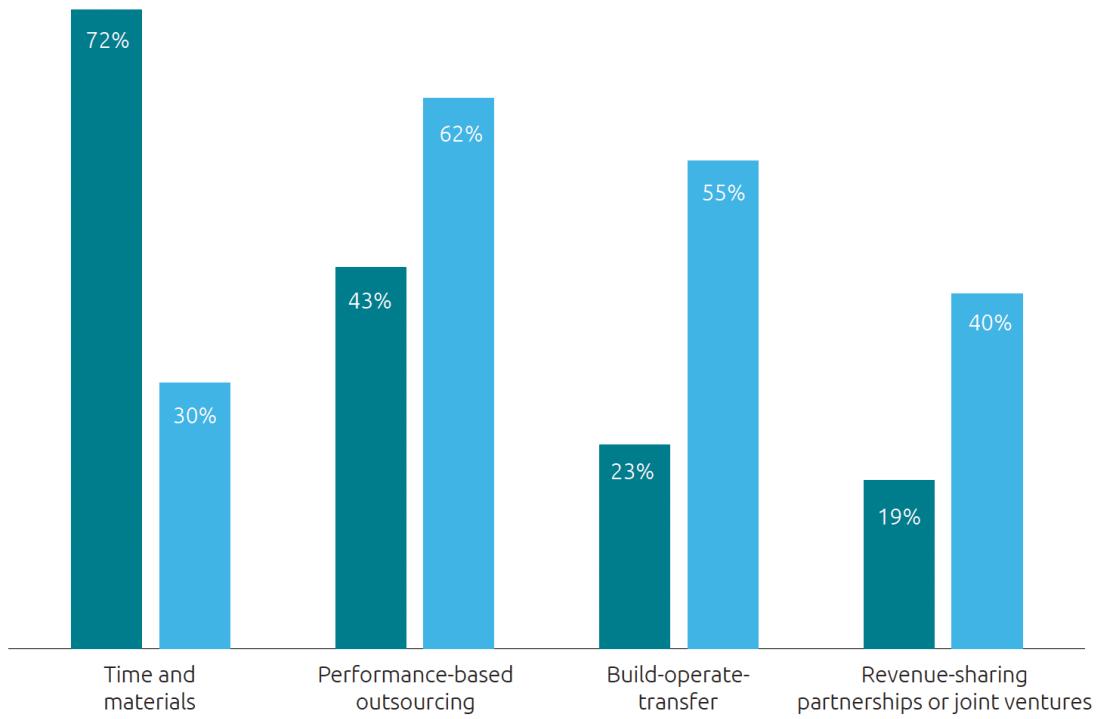
President | Mazak Corp.

A Japanese manufacturer of advanced machine tools serving sectors including aerospace and defense

Organizations are pivoting toward outcome-driven and collaborative outsourcing

■ Percentage of organizations that use the following models to a significant extent

■ Percentage of organizations that plan to increase the usage of the following models over the next two to three years



- In 2024, global engineering and R&D spend was estimated at \$1.52–1.53 trillion – with about 5% allocated to outsourcing.²³
- Time and materials (T&M) remains the dominant outsourcing model – used to a significant extent by 72% of organizations.
- But interest in outcome-focused and partnership-driven models is surging.
- This shift reflects organizations' need to tie engineering spend with faster, more tangible outcomes amid rising cost and speed pressures.
- Further, 81% of organizations use some form of a formal framework to guide outsourcing and partnering decisions (albeit only 32% have embedded it into their processes).



To boost agility, organizations are investing in digital tools and reconfiguring systems, supply chains, and products

What actions is your organization taking (or planning to take) over the next two to three years to improve global agility?



Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.

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Agility is not a nice-to-have. It is a must-have and a strategic survival trait. A single sanction, tariff, or raw material shock can wipe out carefully planned five-year &D roadmaps unless organizations are able to pivot. Agility equals resilience in today's geopolitical climate.”

Vivek Sharma

Head of Global Partner Management |
Bosch



Engineering agility in practice

Tech levers to retool production lines

Mercedes-Benz is using digital twins and real-time data to plan and retool production lines before physical changes are made, allowing new models to be introduced with minimal disruption. This approach speeds up ramp-up times, reduces errors, and enables flexible production of electric, hybrid, and combustion vehicles on shared lines.²⁴

Product redesign to reduce material dependencies

Automotive suppliers **Mahle** and **Valeo** have developed a high-performance electric motor that eliminates the need for rare earth materials. Similarly, **Niron Magnetics**, a US-based advanced materials startup, is creating rare-earth-free permanent magnets, while **Toyota** and **Tesla** are working to minimize rare earth usage in future vehicle designs.

This shift is critical, as China controls up to 70% of global rare earth mining, 85% of refining capacity, and about 90% of rare earth metal alloy and magnet production – making it a major bottleneck for the automotive industry.^{25a} ; ^{25b}

“

To be agile, we've delegated more decisions locally. Speed is now a survival factor, not just a competitive advantage.”

Ramakrishnan Ramanathan

Vice President, Born Electric Vehicle, New Mobility | Renault Nissan





“

Engineering leaders currently face an unprecedented set of challenges: the rapid pace of technological change, the convergence of digital and physical worlds, a background of increasing societal demands, all in an environment of unpredictable external forces. These complexities require more than just strategic plans; they demand actionable principles that can guide day-to-day operations and long-term projects.”

Keith Williams

Executive Vice President, Chief Technology Officer, Capgemini Engineering

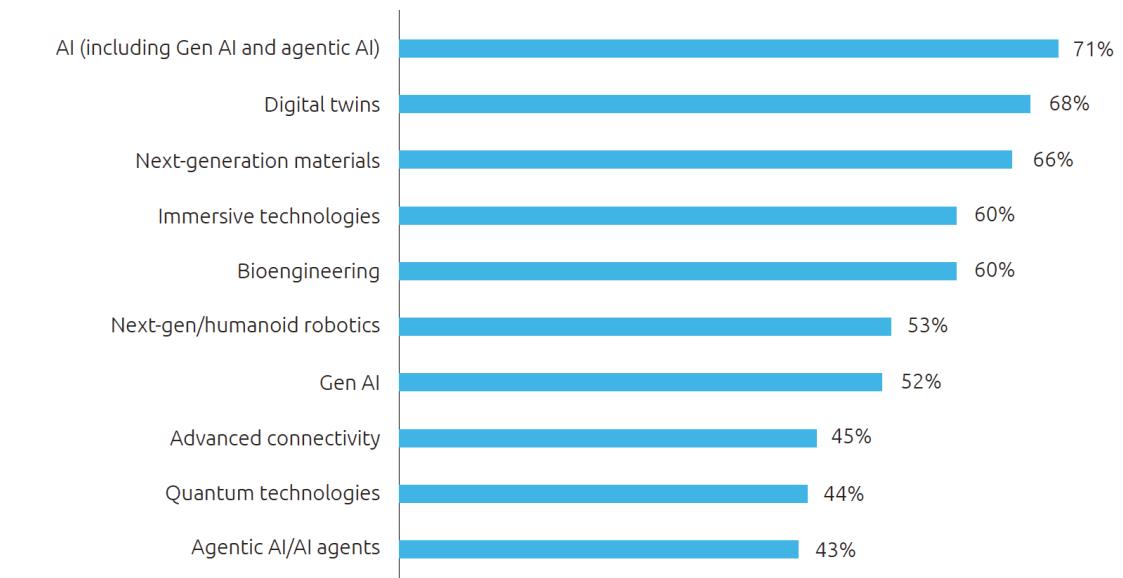
04

Emerging technologies are catalysts for engineering and R&D transformation



AI, digital twins, and next-gen materials top the list of technologies expected to transform engineering and R&D

Percentage of executives who believe the following technologies hold high potential for their engineering and R&D functions over the next two to three years



Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.

63%

...of executives identified **innovation and value creation through digital technologies** as strategically important for their engineering and R&D function over the next 12-18 months.

- Enthusiasm for Gen AI and agentic AI is tempered by concerns over accuracy and reliability, unlike scientific AI and machine learning (ML), which are valued for their precision.
- Notably, 53% of executives cite reliability and accuracy concerns as a major challenge to scaling AI (including generative and agentic AI) in engineering and R&D.



How technology is rewiring engineering.



AI

Aramco is using AI-powered large quantitative models (LQMs) to design and optimize new materials and chemical processes for its oil and gas facilities. This approach helps Aramco accelerate product development, improve performance, and reduce carbon footprint.^{[26](#)}



Digital twins

Volkswagen Group plans to use digital twins to simulate, test, and refine every aspect of vehicle development. Engineers, designers, and professionals across Volkswagen, Audi, and Porsche will collaborate in a virtual environment to accelerate innovation, reduce costs, and ensure regulatory compliance.^{[27](#)}



Next-gen materials

To meet rising demand for smaller jets, **Airbus and Boeing** are exploring faster, more scalable production methods using thermoplastics, which can be reheated, reshaped, and welded using advanced techniques like ultrasound, eliminating the need for rivets and reducing structural weight. Industry ambitions are to reach production rates of up to 100 jets each per month.^{[28](#)}



Bioengineering

Novonesis is using bioengineering to develop enzyme- and culture-based innovations that replace chemical-intensive processes, enabling more sustainable and efficient product development across industries such as food and consumer goods.^{[29](#)}



But most technologies remain in pilot or limited use phases

How mature is your organization with the use of the following technologies in engineering and R&D?

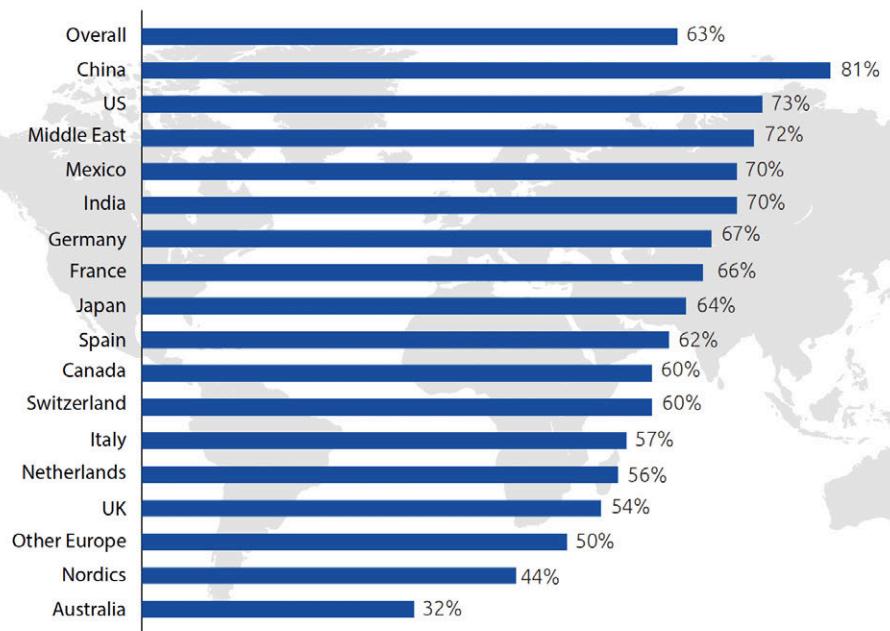


Top barriers to scaling AI adoption, for example, include reliability concerns, integration hurdles, talent shortages, resistance to change, and weak governance for Gen AI and agentic AI.



Organizations in China top the list in prioritizing digital innovation in engineering and R&D

Percentage of executives who rate innovation and value creation using digital technologies as strategically important for their organization's engineering and R&D functions over the next 12-18 months



Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.

China aims to become a global science and technology leader by 2035, identifying the next five years as a window of opportunity for achieving major breakthroughs. Since 2020, national spending on R&D has increased by 48%.³⁰



“

AI will be the most critical enabler of engineering speed and efficiency. But its real value lies in how it augments human ingenuity, not replaces it. The organizations that succeed will be those that blend AI's capabilities with the creativity and judgment of their engineering talent.

Dr Andy Vickers

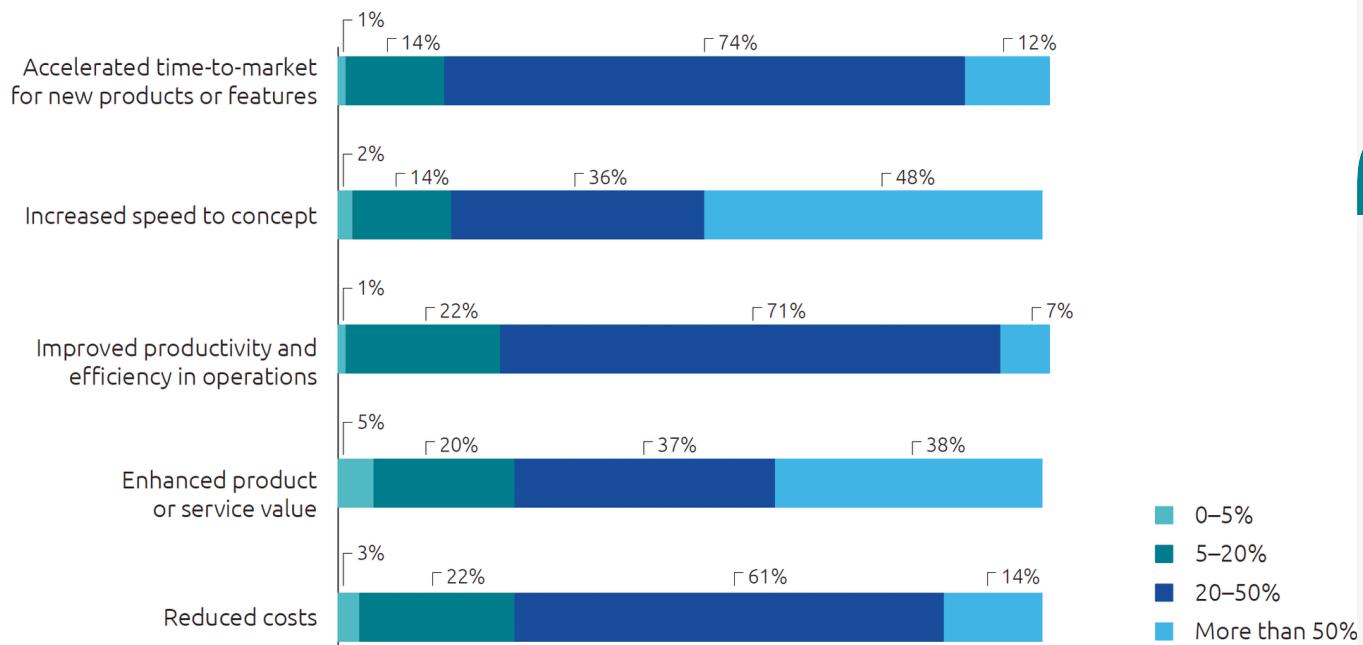
Vice President, CTO Generative AI, Capgemini Engineering

05

AI is shaping the future of engineering and R&D

AI's impact on engineering and R&D is set to accelerate in the next two to three years

To what extent does your organization expect to experience the following benefits from the use of AI (including Gen AI and agentic AI) in engineering and R&D over the next two to three years?



- Speed to concept stands out as the top area of expected high impact, with nearly half of organizations anticipating more than 50% gains.
- Product/service value also shows strong expectations for high impact (38% expect >50% gains).
- Time to market, productivity, and cost reduction are also expected to deliver solid gains, primarily in the 20-50% range.

“

Generative design enables 30–50% faster design cycles and 20–30% material savings. R&D efficiency gains include a 20–40% productivity boost in software coding and calibration. AI inspection has led to up to 30% reduction in downtime and 20% yield improvement in electronics fabs. AI-enabled features can add up to €2,000 per vehicle in lifetime revenue.”

Vivek Sharma

Head of Global Partner Management | Bosch



AI-led transformation will cover the whole engineering lifecycle

Executives anticipate the most significant AI impact in maintenance and support, documentation and compliance management, and research and concept development



60%
Research and concept development



41%
Design and prototyping



45%
Simulation and testing



62%
Documentation, compliance, and IP management



51%
Manufacturing operations



71%
Maintenance and support

Percentage of executives who believe AI (including Gen AI and agentic AI) will transform engineering and R&D activities over the next two to three years



AI's impact across the engineering lifecycle: examples

RESEARCH AND CONCEPT

DEVELOPMENT

Pfizer is using Gen AI to help scientists search and extract insights from vast volumes of research data – often up to 20,000 documents per drug. By enabling natural language and voice-based queries across multiple repositories, AI significantly reduces manual effort, potentially saving up to 16,000 hours and accelerating early-stage research.³¹

DOCUMENTATION, COMPLIANCE, AND IP MANAGEMENT

Glide, a US-based startup, offers an AI-powered platform to build custom compliance dashboards. AI agents automate reporting, monitor regulatory changes, and manage documentation workflows, freeing up engineers, managers, and compliance officers to concentrate on critical, high-value activities.³⁴

DESIGN AND PROTOTYPING

Siemens is integrating Gen AI into its NX design software to automate and optimize key design tasks. Engineers can interact with an AI copilot using natural language to run simulations, adjust components, and receive design recommendations – reducing manual effort and accelerating product development.³²

MANUFACTURING OPERATIONS

ABB has launched Genix Copilot, a Gen AI-powered assistant to help manufacturers turn complex industrial data into actionable insights through natural language interactions. By processing data from multiple sources, including shop floors, enterprise systems, and operator conversations, it provides users with real-time, actionable insights to enhance decision-making and boost productivity.³⁵

SIMULATION AND TESTING

Eaton is using Gen AI to simulate manufacturability, cost, and performance outcomes. By generating and validating design iterations in minutes, the company has reduced design time by up to 87%, enabling faster decision-making and accelerating time to market.³³

MAINTENANCE AND SUPPORT

BMW is piloting Factory Genius, an AI assistant that helps maintenance teams quickly diagnose equipment faults. It uses Gen AI and a large language model to understand natural language queries and search internal manuals and logs to deliver tailored troubleshooting suggestions that significantly speed up error diagnosis.³⁶



A deep dive: AI-driven engineering transformation at Rolls-Royce

Rolls-Royce is applying Gen AI and machine learning (ML) to accelerate innovation, boost efficiency, and reduce costs across engine design, turbine production, and engine health monitoring.

Accelerating engine design



Smarter defect detection



Predictive maintenance



Rolls-Royce is using AI to transform engine design, traditionally a painstaking, years-long manual process. AI enables engineers to explore a wide range of design parameters in hours and accelerates component selection and assembly. This reduces manual effort, enables teams to innovate faster, and shortens time to market.

Rolls-Royce is using AI to analyze turbine vibration data and guide inspectors to specific areas, replacing the need to manually check millions of cooling holes each month. This targeted approach has increased machine utilization by 30%, reduced scrap from manual errors, and cut fault resolution time from days to near real time.

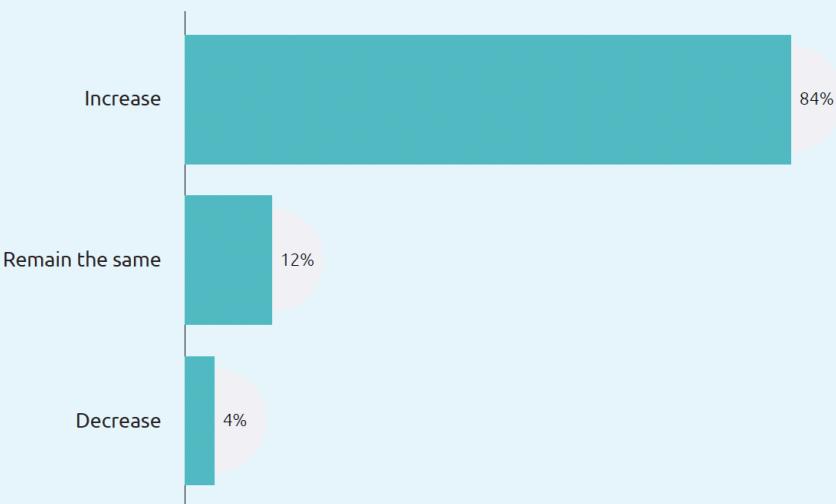
AI-powered monitoring systems track thousands of engine parameters and enable remote adjustments to maintenance setups. This proactive approach helps prevent around 400 unplanned maintenance events annually, saving millions in repair costs and minimizing disruptions to customers.³⁷



AI investment in engineering and R&D is set to surge, with 84% of organizations planning to increase spending over the next two to three years

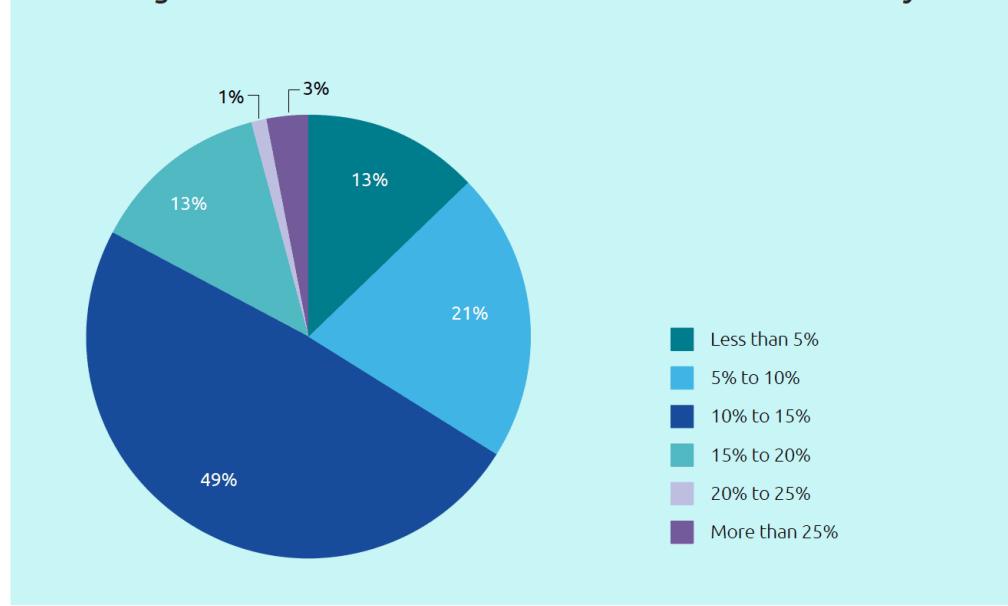
Among those who plan to increase investment, nearly half are planning a 10-15% increase over the next two to three years

How do you expect your organization's investment in AI (including generative and agentic AI) for engineering and R&D to change over the next two to three years?



Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.

Percentage increase in investment in AI over the next two to three years



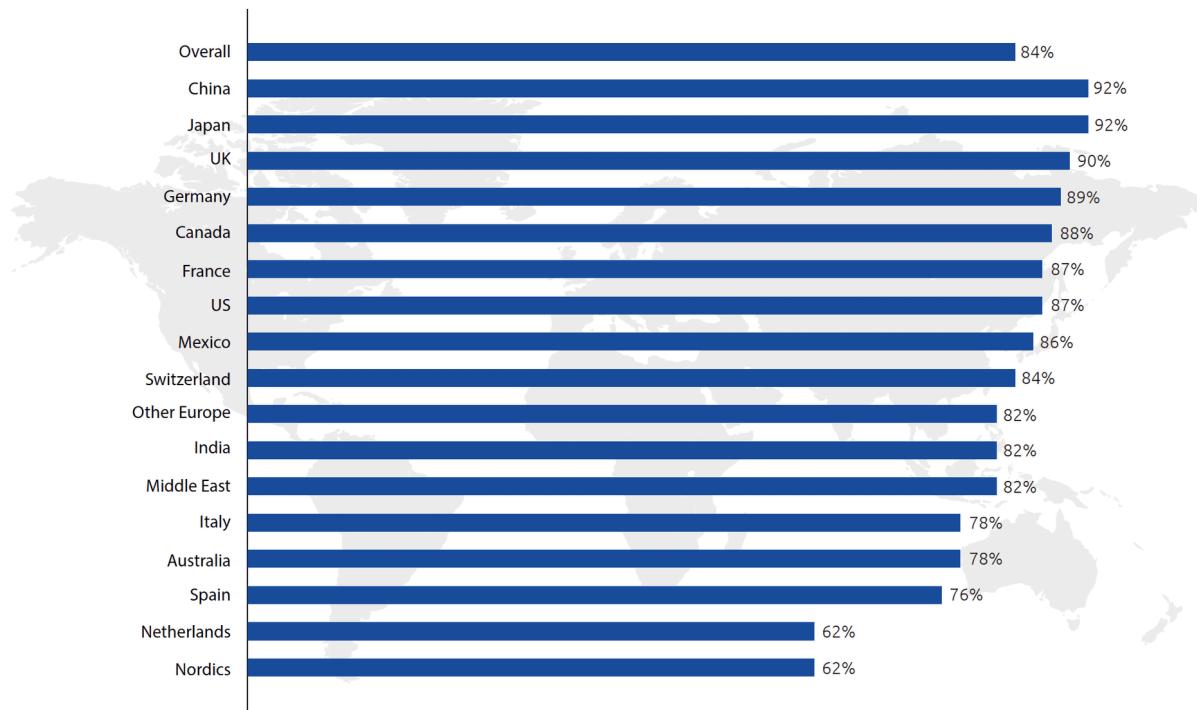
Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,260 organizations that are planning to increase investment in AI over the next two to three years.

Organizations currently allocate approximately 7% of their total engineering and R&D budgets to AI-related initiatives, and plan to increase this by an average of 11% over the next two to three years.



Organizations in China and Japan show the strongest intent to increase AI investment in engineering and R&D

Percentage of executives who expect their organization's investment in AI (including generative and agentic AI) for engineering and R&D to increase over the next two to three years

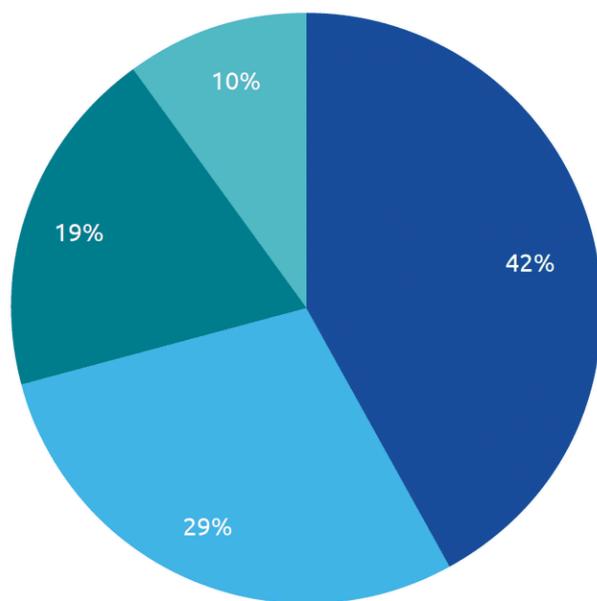


- China and Japan currently allocate the highest share of engineering and R&D budgets to AI – 9% and 10% respectively (compared to a global average of 7%).
- 92% of executives in each country plan to increase AI investment in engineering and R&D over the next two to three years, with expected growth of 13% in China and 15% in Japan (compared to a global average of 11%).



Organizations are leaning toward flexible AI strategies that blend proprietary development with commercial solutions

Which of the following best describes your organization's primary approach to adopting AI technologies in engineering and R&D?



- Adopt a hybrid approach, combining in-house development and external solutions
- Buying off-the-shelf AI tools
- Developing proprietary AI tools in-house
- Currently evaluating options, with no clear development strategy defined yet

This reflects the need to balance IP protection with cost efficiency in engineering contexts.



Engineering talent remains critical in the AI age

Executives continue to value traditional engineering skills and human ingenuity

Percentage of executives who agree with the following statements:

AI cannot replace the creativity and problem-solving abilities of human engineers and designers



Engineering degrees are still relevant in today's job market, despite rapid changes driven by AI and automation



■ Disagree

■ Neutral

■ Agree

Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.

“

*People are the judges of what truth is, and we're still hiring more and more engineers because they're the final arbiters of our engineering.”*³⁸

Lisa Su

CEO | AMD

“

*While AI can assist in generating design options or automating certain processes, it lacks the contextual understanding of the intent of the design. It's always going to be a human who drives that aspect of their design.”*³⁹

Shirish More

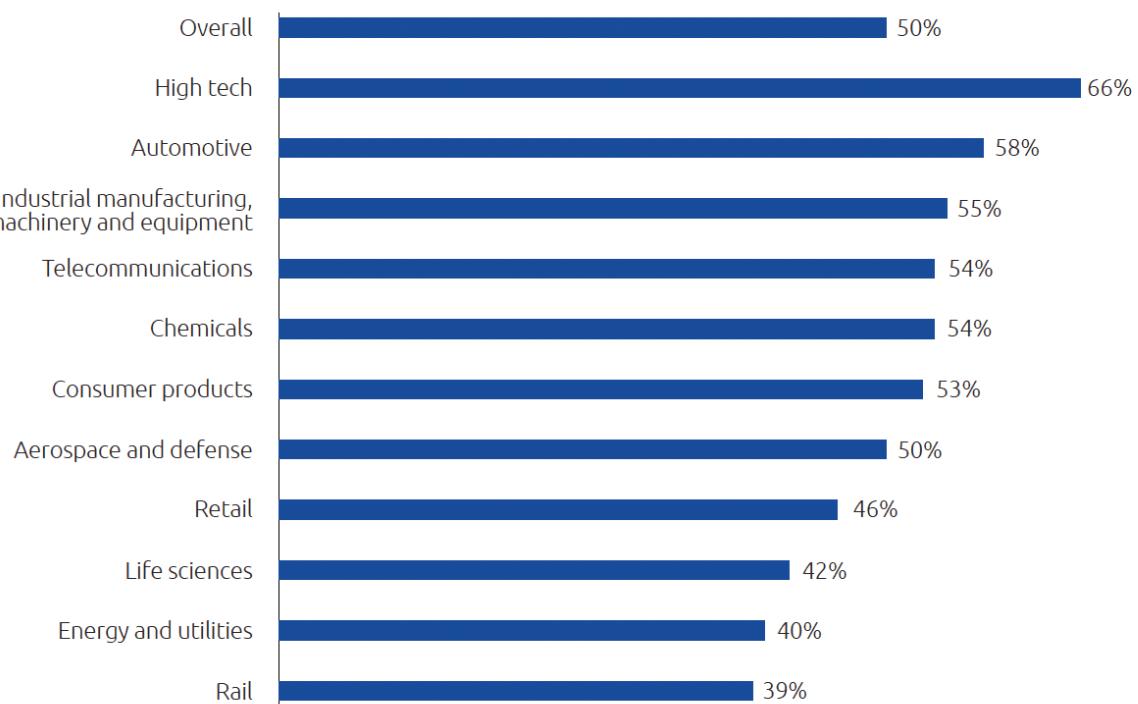
Senior Technical Product Manager for NX Architecture, AI, and PLM SaaS Transformation | Siemens



Balancing human talent and AI is now a workforce priority

Percentage of executives who agree with the statement

Over the next three to five years, we expect engineering and R&D teams to evolve into hybrid human AI workforces, with Gen AI and agentic AI contributing significantly to core activities



50%

...of executives say that over the next three to five years, they expect engineering and R&D teams to evolve into hybrid human AI workforces, with Gen AI and agentic AI contributing significantly to core activities.

“

Making human-machine collaboration more widely available allows engineers to accelerate code development, increase innovation, and tackle skilled labor shortages.”⁴⁰

Roland Busch
CEO | Siemens AG



AI skills are in demand – but action is lagging

50%

...of executives cite talent shortages as a major challenge to **scaling AI** in engineering and R&D.

58%

...of executives say that there is a **shortage of engineering graduates with AI skills.**

48%

...of executives say that they are **actively investing in AI-focused upskilling and reskilling programs** for their engineering workforce.

“

Every department is required to run at least one AI project. It's not just about KPIs – it's about getting people to engage with AI, understand it, and use it to improve productivity.”

Ramakrishnan Ramanathan
Vice President – Born Electric Vehicle, New Mobility | Renault Nissan



“

AI doesn't replace human intelligence – it amplifies it. Foundational engineering training still matters, and as AI tools evolve, so will our ability to ask better questions and get faster, higher-quality answers.”

K. T. McCann

Vice President, R&D and Innovation, Kellanova



“

As organizations accelerate innovation, digitize operations, and respond to global disruptions, the pressure on talent teams to deliver the right skills, at the right time, in the right place has never been greater. Organizations that invest in their people, embrace AI as a collaborator, and build resilient talent ecosystems will be best positioned to lead in the next era of engineering.”

Marie Hélène Vercaemer
EVP, CHRO, Capgemini Engineering

06

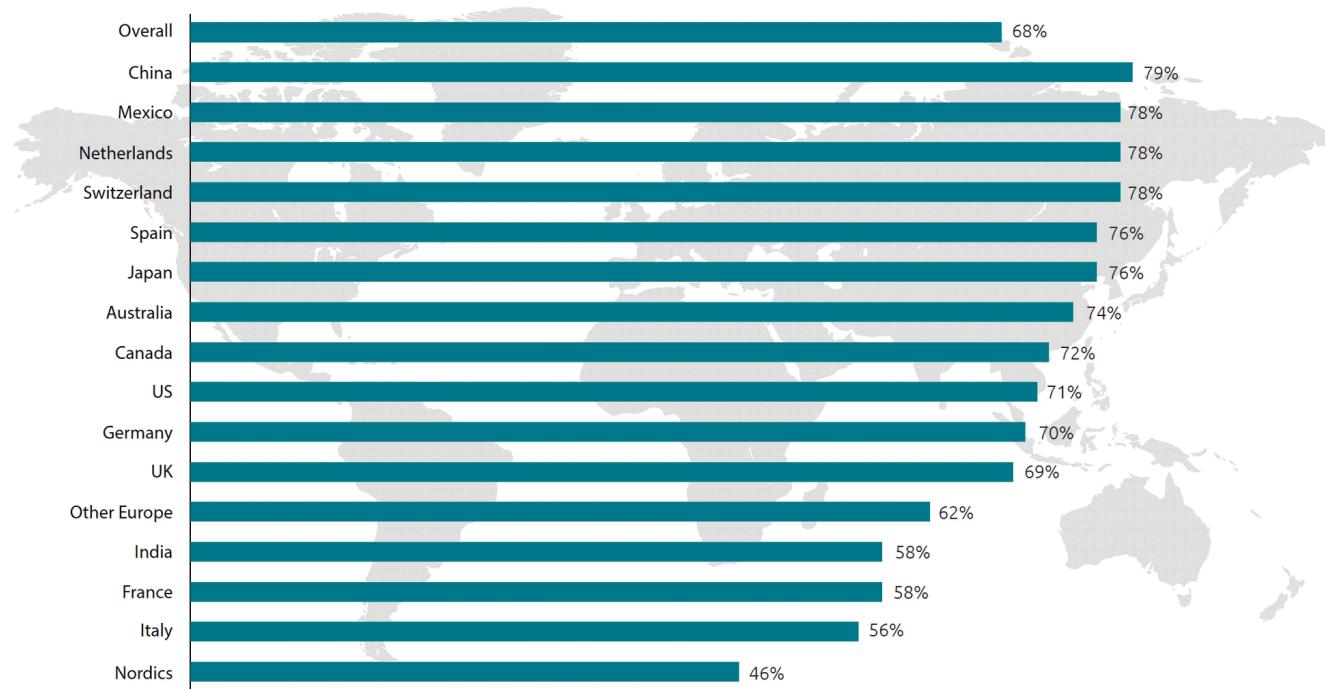
Sustainability is becoming central to engineering



Organizations are ramping up sustainability efforts

68% of organizations plan to increase sustainability investment in engineering and R&D over the next 12–18 months (30% intend to maintain current levels and only 2% expect a reduction)

How do you expect your organization's sustainability-related investments in engineering and R&D to evolve over the next 12–18 months?



58%

...of executives say that sustainability is a key component of their product design processes (**up from 22% in 2022**).

43%

...of executives agree that their organization conducts regular environmental impact assessments as part of their product design processes (**up from 26% in 2022**).



Unilever is accelerating its packaging R&D to cut its virgin plastic use. Through its *“Future Flexibles”* program, it is developing recyclable and compostable alternatives. A new digital tool has reduced development time by 25%, and over 3,000 new materials are being tested to meet its 2035 goal of fully sustainable flexible packaging.⁴¹



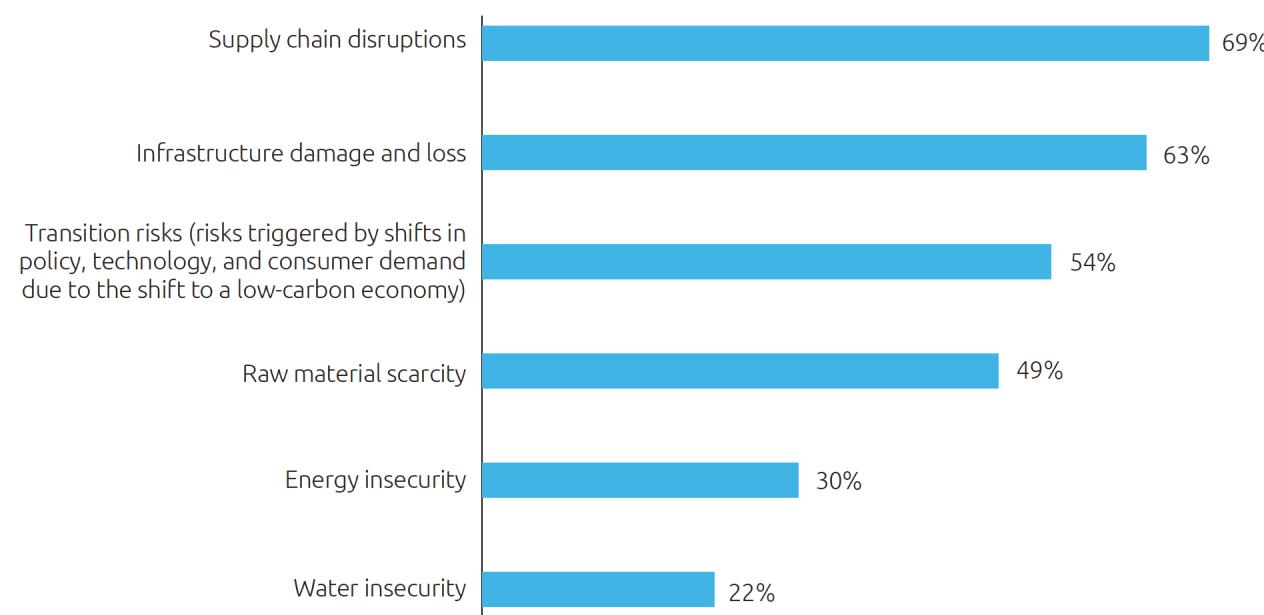
Siemens used AI-powered generative design tools to redesign a robot gripper, reducing the part count by 84% and weight by 90%. This offers potential savings of up to three tons of CO₂ emissions per robot per year and showcases how AI can accelerate sustainable product design and optimize resource use.⁴²



Intensifying climate risks call for increased focus on resilience and adaptation – not just mitigation – in engineering and R&D strategies

Executives recognize that engineering and R&D functions are exposed to a range of climate-related threats

Percentage of executives who say their engineering and R&D function is exposed to the following climate-related risks



- From extreme weather events affecting infrastructure and operations, to shifting regulatory landscapes and market expectations, climate risk introduces volatility that engineering teams must now anticipate and address.
- This means prioritizing resilient materials, systems, and product designs that can withstand future climate disruptions. They must also build new capabilities, including scenario modeling, climate-informed design standards, and cross-functional collaboration with finance, risk, and strategy teams.

07

Recommendations



To accelerate transformation amid ongoing uncertainty and external pressures, organizations must focus internal talent on high-impact work, while capitalizing on partner ecosystems, AI, and global capabilities

Apply multiple AI modalities through a structured deployment approach to unlock value at scale

- Apply hybrid AI – combining deterministic, statistical, and generative approaches – to balance creativity with precision, which is essential in engineering contexts.
- Build foundational capabilities including access to high-quality data, scalable platforms, and robust governance as a prerequisite for scaling.
- Ensure organizational readiness by tailoring AI use cases to business needs, aligning them with operational processes, and addressing legacy integration and change management.
- Foster effective human-AI collaboration by designing AI systems that prioritize trust, transparency, and usability.

Transform engineering for flexibility to balance cost, speed and agility demands

- Standardize and automate core engineering workflows to enable teams to move faster, shift resources easily, and adapt quickly to changing priorities.
- Integrate digital platforms to accelerate collaboration, iteration, and decision-making.
- Create a clear link between strategy and engineering execution to help teams make faster, more informed decisions without losing direction.*
- Empower teams to adapt quickly to change.
- Apply governance to scale successful research and innovation pilots and projects while preventing scattered or misaligned efforts.

Broaden access to global talent and invest in workforce development to address talent shortages

- Establish engineering centers across a diverse mix of countries and regions – not just traditional offshore hubs – to access specialized talent, reduce geographic dependencies, and enable continuous global operations.
- Prioritize high-demand, low-supply skill areas such as AI by combining global talent access with targeted upskilling and reskilling of internal teams, and collaboration with external partners to close capability gaps.

Expand the engineering partner ecosystem to unlock capacity for impact

- Build an ecosystem of trusted partners, including outsourcing partners for non-core or specialized tasks and technology partners to accelerate innovation and access to emerging technologies.
- Explore advanced outsourcing models such as performance-based contracts that link engineering spend to measurable outcomes, such as speed, scale, or cost savings.
- Apply the core/context framework – originally developed by Geoffrey Moore⁴³ – to distinguish between strategic (core) and non-strategic (context) engineering activities – ensuring talent, capital, and leadership focus are directed toward long-term value creation.

*For more information, refer to: [The engineering leader's innovation mandate: Aligning research with business strategy](#).



“

Engineering leaders across industries are under pressure to deliver faster, smarter, and more sustainably. Competition and AI raise the tempo further; nonetheless, increasing speed must never compromise quality. Advantage now rests with those who orchestrate talent, data, and tooling within a trusted ecosystem of technology and service partners – so innovation scales on a bedrock of embedded standards.”

Alexandre Audoin

Executive Vice President, Global Head of Industries, Sales & Portfolio
Capgemini Engineering

08

Research methodology



Research methodology (1/3)

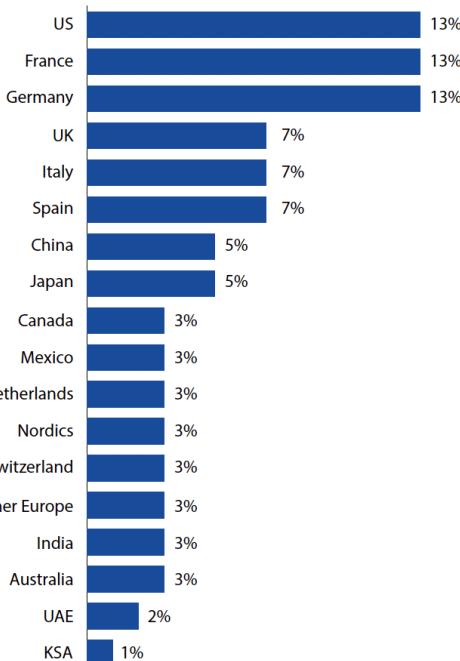
In August 2025, we surveyed 1,500 executives at organizations with more than \$1 billion in annual revenue across 11 industries in North America, Europe, APAC, and the Middle East. Executives surveyed were director-level and above. The distribution of executives and their organizations is provided in the following figures.

The study findings reflect the views of the respondents to our online questionnaire for this research and are intended to provide directional guidance. Please contact one of the Capgemini experts listed at the end of the report to discuss specific implications.

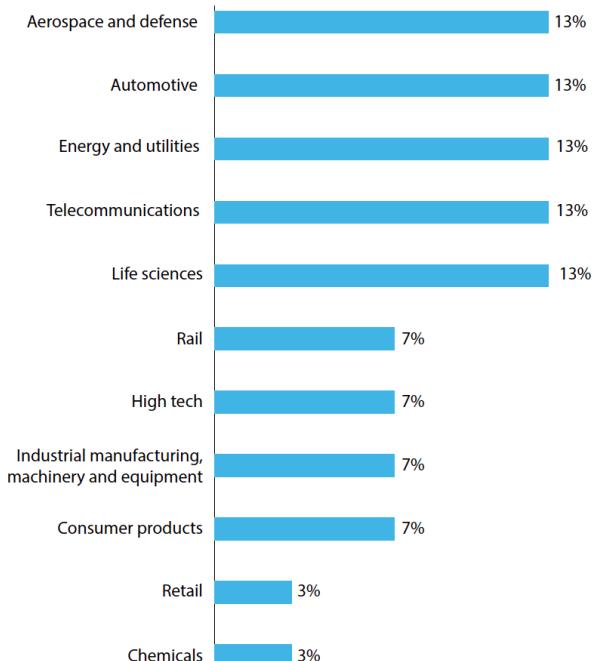


Research methodology (2/3)

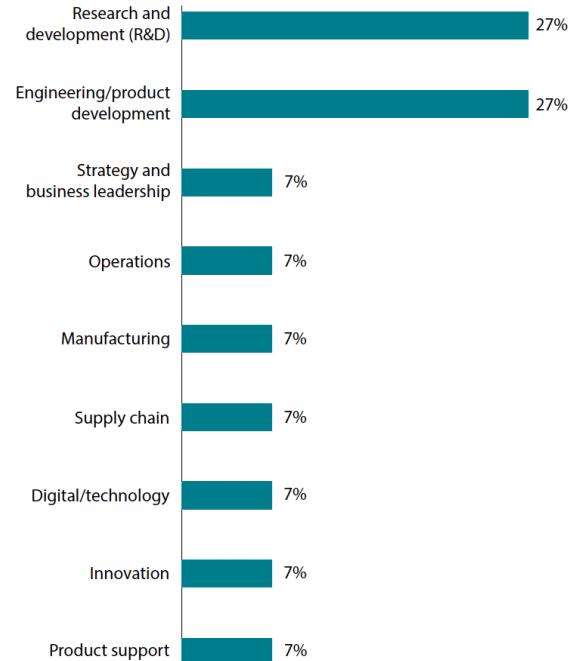
Organizations by headquarter location



Organizations by industry



Executives by department/function

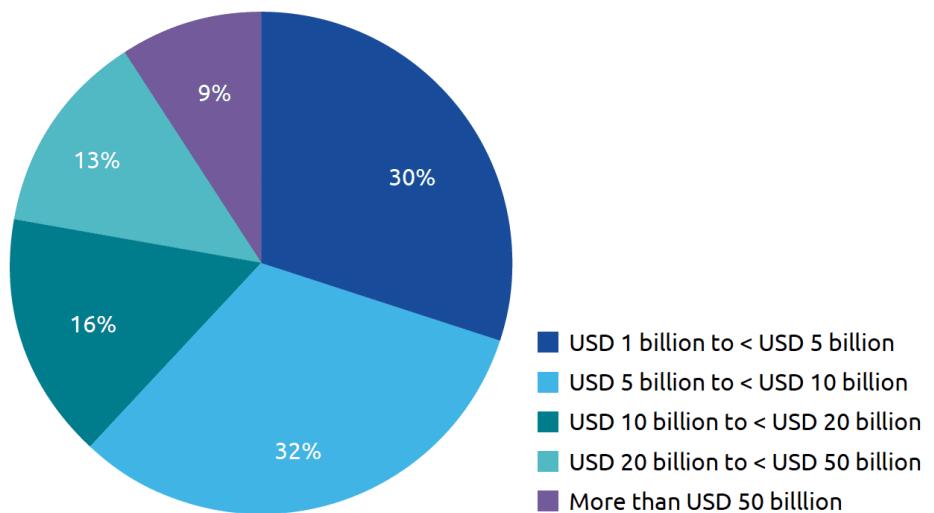


Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.

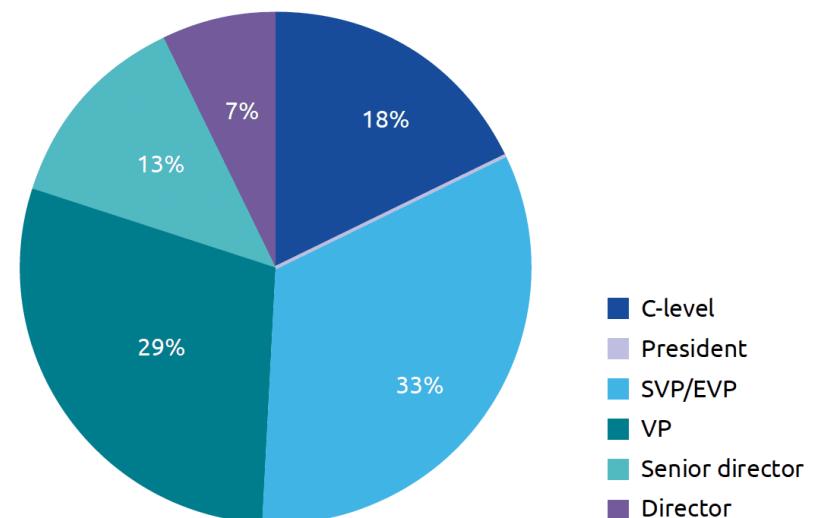


Research methodology (3/3)

Organizations by annual revenue



Respondents by current job title



Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.

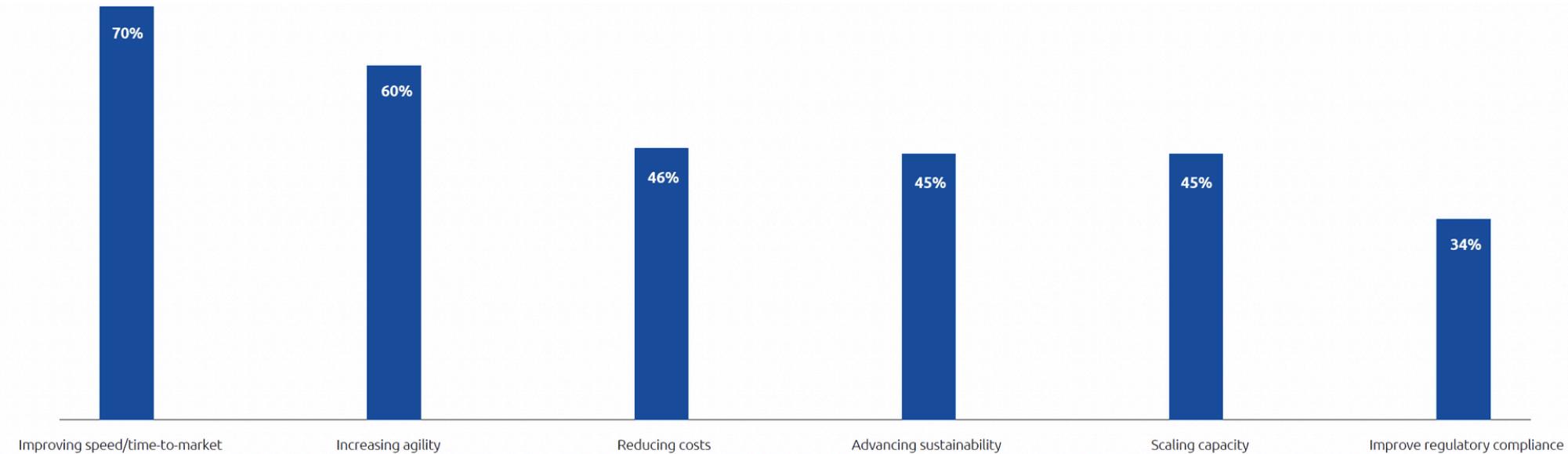
09

Appendix



70% of executives prioritize speed-to-market, followed by agility and cost control

Percentage of executives who rate the following as top priorities



Question: When your organization faces trade-offs among the following strategic objectives, how would you prioritize them? Please rank the objectives below from rank 1 to rank 6, where rank 1 = highest priority and rank 6 = lowest priority.

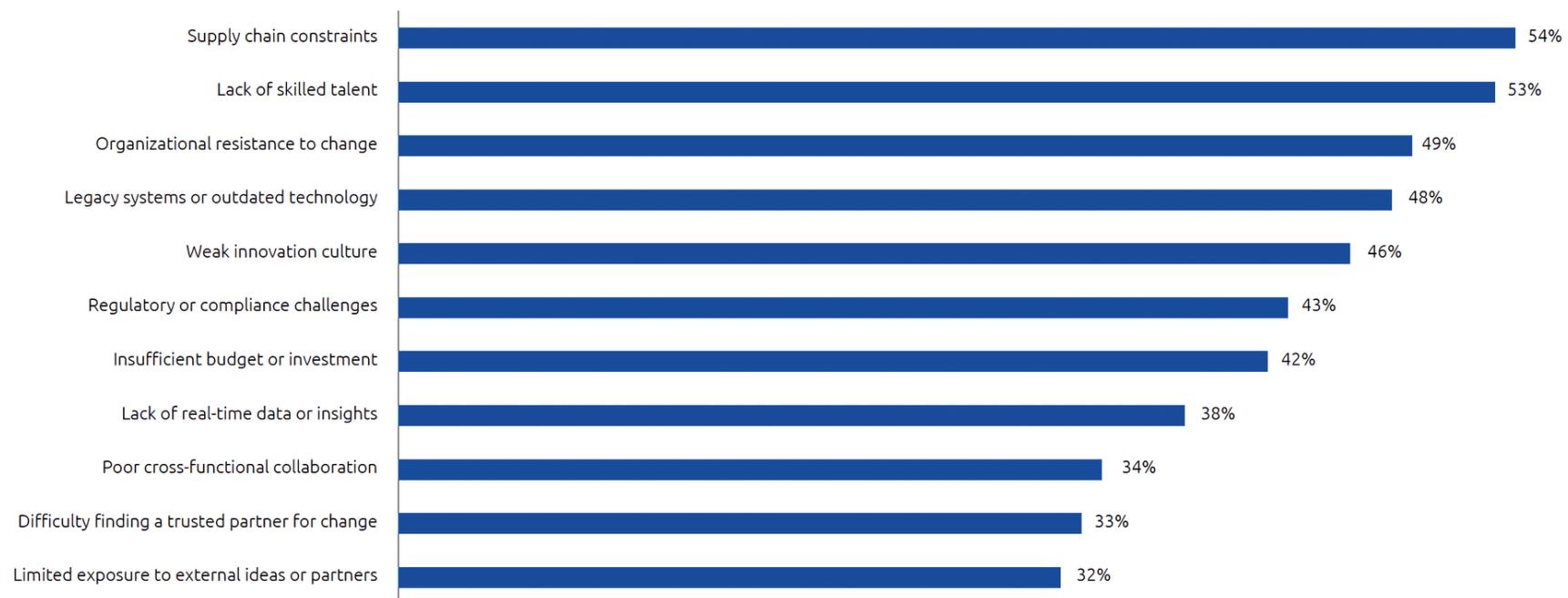
Note: The chart reflects the percentage of executives who ranked each strategic objective among their top three priorities (ranks 1–3).

Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.



Structural barriers are limiting efforts to improve speed, scale, and cost

Percentage of executives who rate the following as top priorities

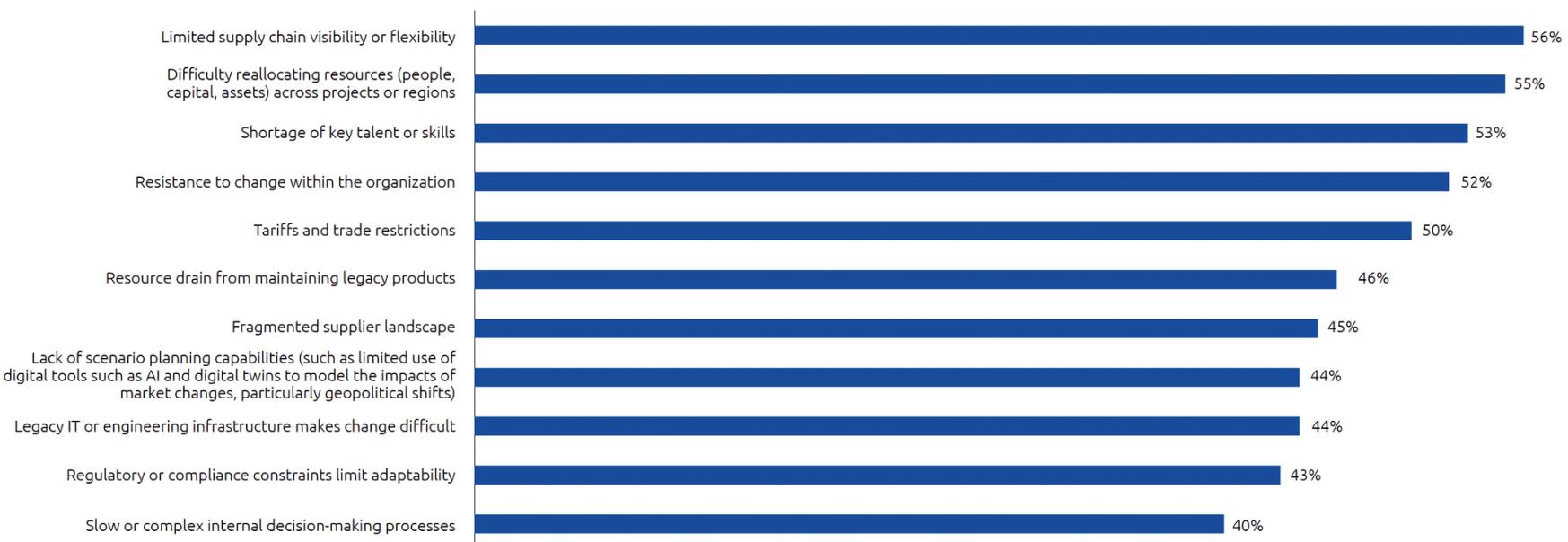


Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.



Organizational agility is hindered by global and internal challenges

Percentage of executives who identified the following factors as major challenges that are hindering their organization's agility and resilience



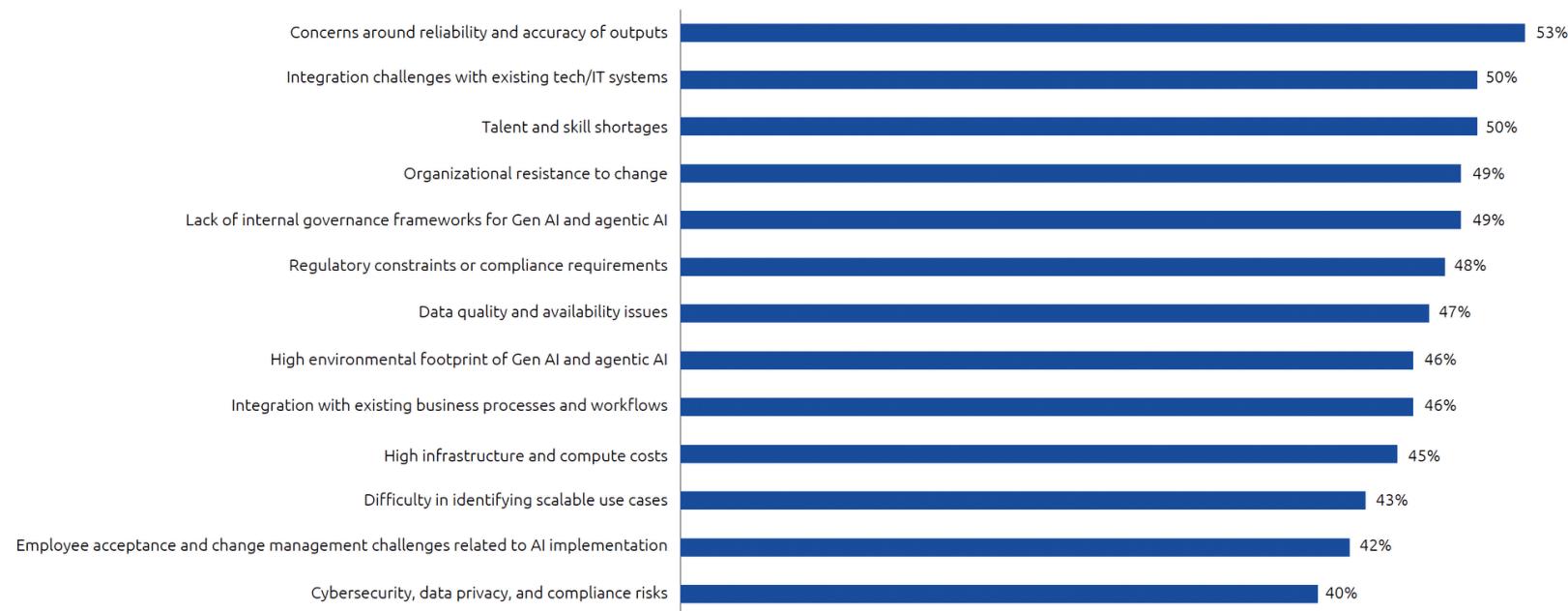
Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.



Barriers to scaling AI in engineering and R&D

What are the biggest barriers that your organization faces in scaling AI (including Gen AI and agentic AI) adoption for engineering and R&D beyond the pilot stage?

Percentage of executives who cited the following as a major challenge



Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.



The path to sustainable engineering is constrained by cost pressures, material sourcing challenges, and redesign complexities

How challenging are the following actions for your organization in advancing its sustainability efforts?

Percentage of executives who cited the following as a major challenge



Source: Capgemini Research Institute, Engineering and R&D trends survey, August 2025, N = 1,500 organizations.



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Julian leads Capgemini Engineering's thought leadership and market intelligence teams, drawing on his experience in strategy, marketing, sales and SaaS. Driven by a passion for technology and engineering as drivers of market transformation and competitive advantage, Julian helps organizations translate innovation into business value. He holds a PhD in Computing and is fluent in English and French.



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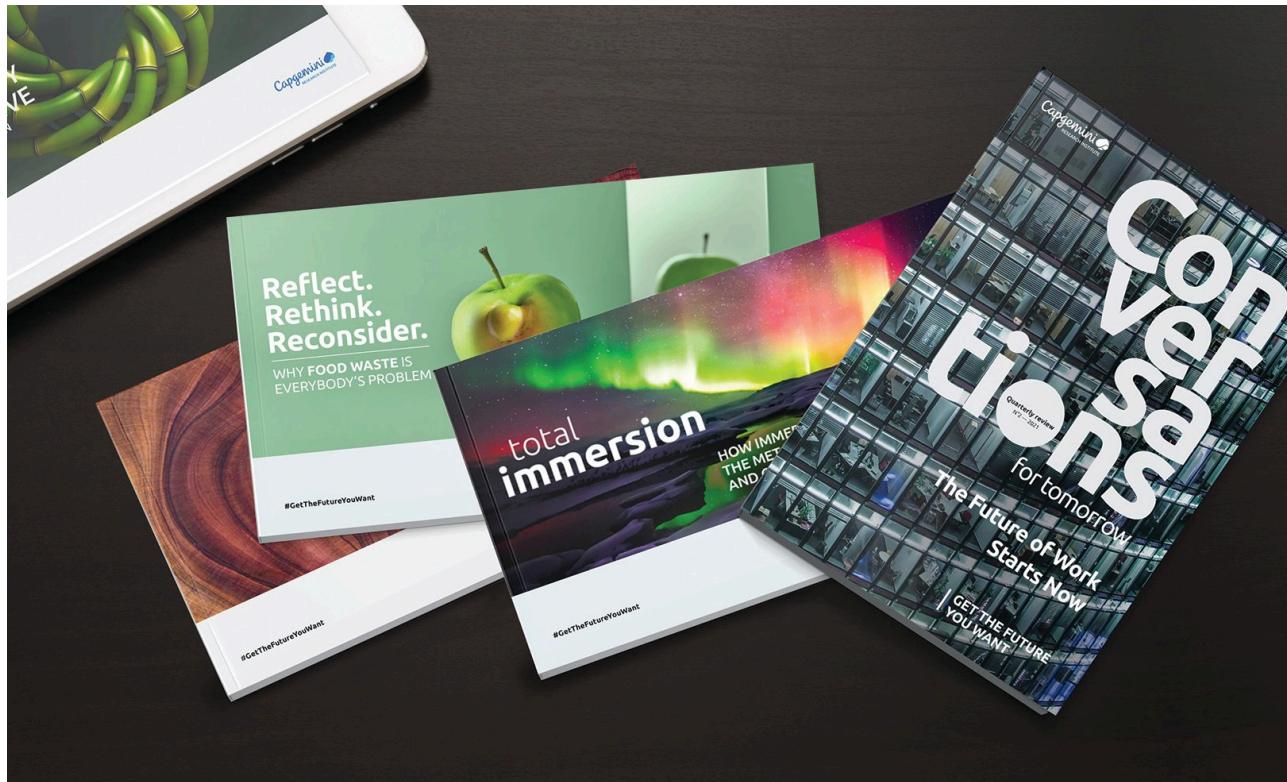
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