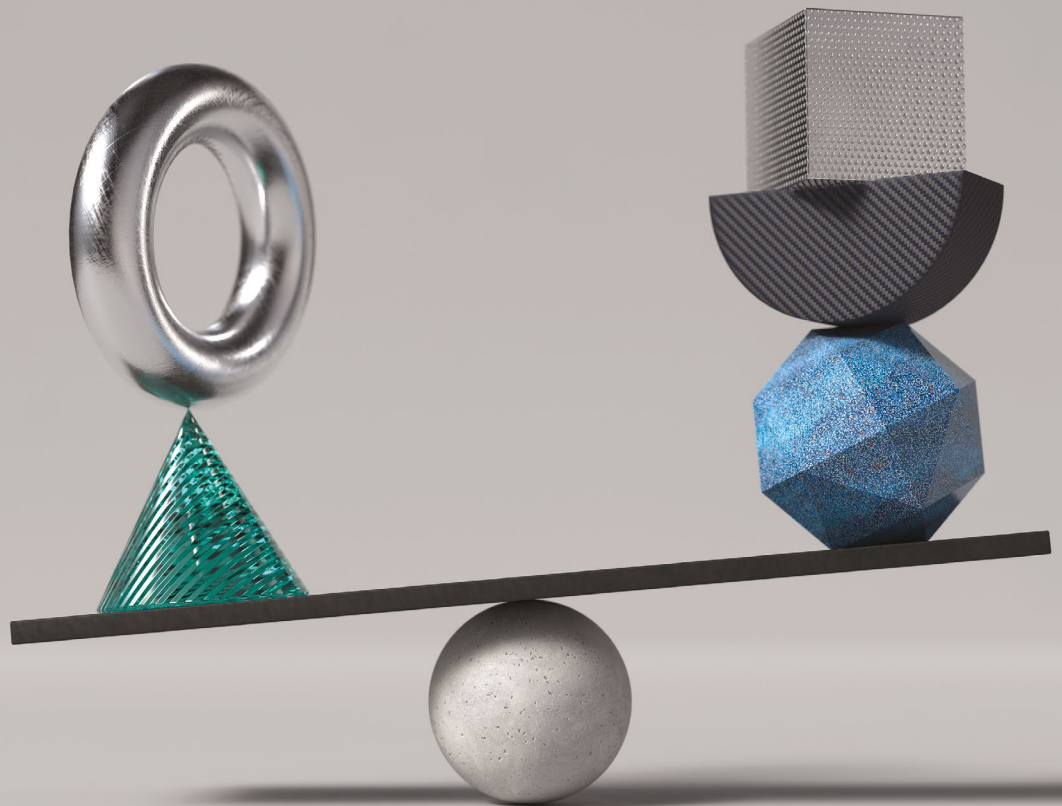
Top tech trends of 2025

AI-powered everything



Capgemini RESEARCH INSTITUTE

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Who should read this report and why?

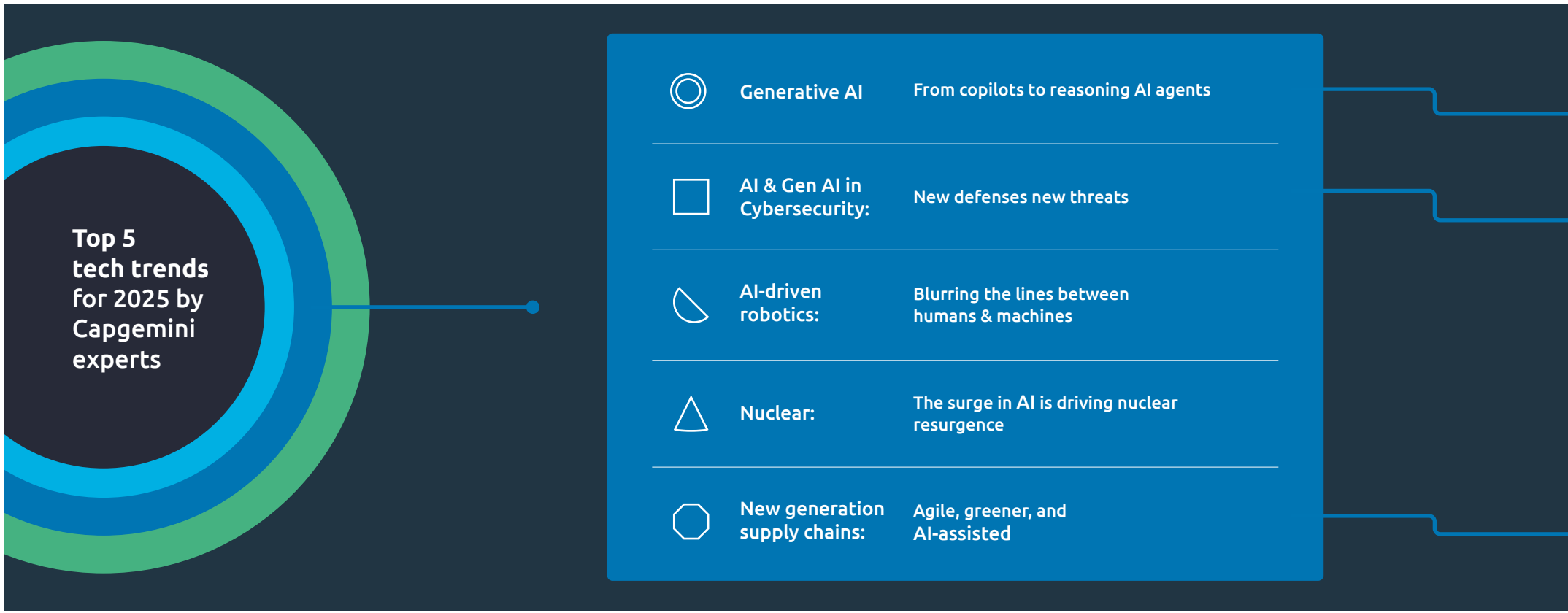
This report is designed for C-suite executives and business and innovation leaders. The report presents our convictions regarding what will be the most impactful technological trends of 2025. It offers valuable insights into the trends we see dominating the tech landscape, while looking back on the accuracy of our predictions for 2024. Data from a comprehensive survey of industry executives, the investor community, and in-depth discussions with experts support our predictions. The insights we derive from this analysis will help technology and business leaders in establishing sound strategies and impactful investments.

This report is based on:

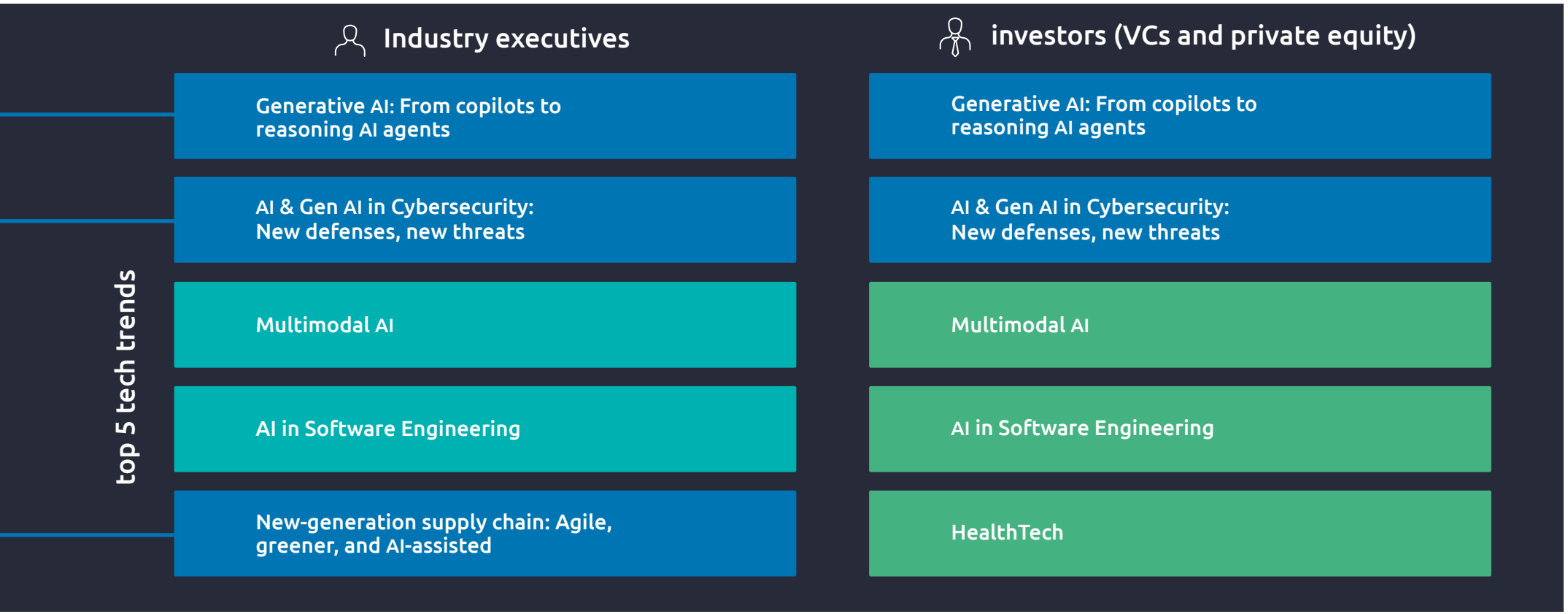
- A global survey of 1,500 C-suite executives from 12 major countries across North America, Europe, and Asia-Pacific.
- A global survey of 500 investment professionals from venture capital, private equity, and the commercial banking industry, from 12 major countries.
- In-depth interviews with 24 industry leaders, analysts, and academics.

All surveyed organizations are significant players in their respective sectors, with annual revenue exceeding $1 billion. The global survey was conducted in October 2024.

For more details, please refer to the research methodology section at the end of the report.



Source: Capgemini Research Institute



Source: Capgemini Research Institute, Top Tech Trends in 2025 investor survey, October 2024, N=1,500 industry executives and N=500 investors

Trend that overlaps with Capgemini experts' prediction

Executive summary

It's that time of year again. Tech sector gurus are competing to identify the trends that will dominate in 2025. At Capgemini, our deep understanding of technology, coupled with decades of experience as a strategic and transformation partner to our clients around the world, puts us in a unique position to predict the most impactful trends in 2025.

A key theme underlying our predictions is that AI and generative AI (Gen AI) are driving forces. This view is shared by industry executives around the world and the investor professionals from venture capital and private equity. We also anticipate that AI/Gen AI will drive significant growth in other key technologies. Our top five tech trends to watch in 2025 are:

1. Generative AI (Gen AI): From copilots to reasoning AI agents

Autonomous intelligent systems are becoming more prevalent in performing certain tasks. These AI agents are capable of learning and adapting to new situations, making them valuable assets in various industries, from customer service to healthcare. The next step in this tech evolution will be the rise of the 'super agent,' capable of orchestrating and optimizing multiple AI systems. In 2025, these advancements will enable new AI ecosystems across industries, elevating efficiency and innovation to new heights.

2. AI & Gen AI in cybersecurity: New defenses, new threats

AI is transforming cybersecurity from both sides of the legal divide, elevating both cyberattacks and cyberdefenses to new levels of sophistication. At the moment, the criminals have their noses ahead: almost all organizations surveyed (97%) in our recently published report say they have suffered breaches or security issues related to the use of Gen AI in the past year.[1] Industry executives in our survey ranked AI and Gen AI in cybersecurity as the highest of more than 60 trends that we analyzed.

3. AI-powered robotics: Blurring the line between human and machine

Collaborative robots (cobots) and AI-driven robotics are used in various industries to enhance productivity and safety. These technologies enable human and robot to perform precision tasks in concert. While hard-coded, task-specific machines used to dominate robotics, the development of Gen AI is now spurring the creation of new products, including humanoid and collaborative robots, that can adapt to diverse scenarios and learn continuously from their environments. With robots creeping towards full autonomy and AI taking on complex decision-making roles, the future of work may see a shift in traditional hierarchies.

4. The surge in AI is driving nuclear resurgence

Nuclear energy is a focal point for 2025, propelled by the urgent need for clean, dependable, and controllable power (in part owing to the rise of AI and other new tech). Although, in October 2024, very few top executives globally identified small modular reactors (SMRs) as a top-three sustainability technology for 2025, the surge in SMR-related news in the last few weeks of this year suggests 2025 could be pivotal.

5. New-generation supply chain: Agile, greener, and AI-assisted

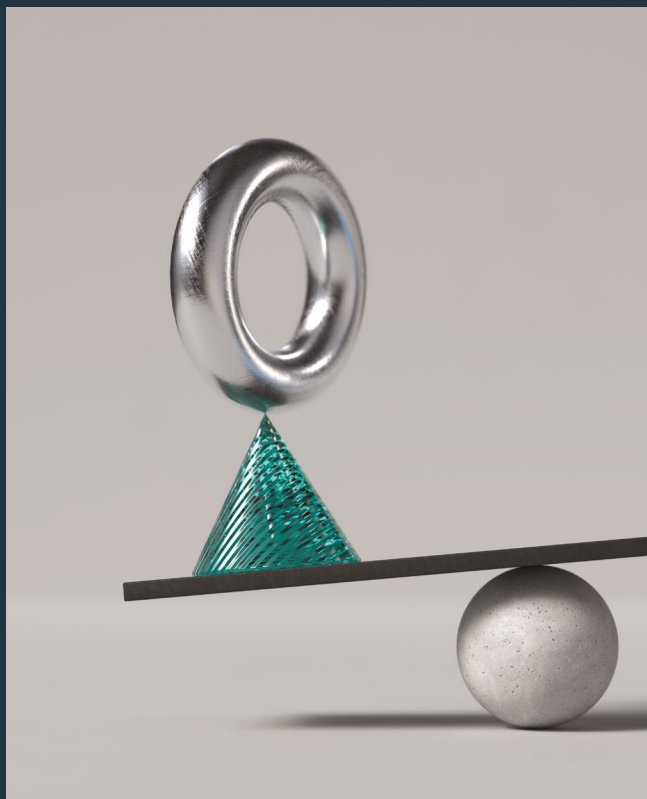
In recent years, businesses have had to navigate increasingly complex, unpredictable market conditions. Technologies including AI, data, blockchain, Internet of Things (IoT), and connectivity with terrestrial-satellite networks, play a strategic role in enhancing cost efficiency, resilience, agility, circularity, and sustainability of supply chains. Additional regulatory and environmental constraints will make this shift critical to ensuring competitiveness, agility, and resilience.

A few observations about these trends:

AI-powered everything: AI (such as AI agents, and AI-powered robotics), or a second-order effect of the surge in AI (e.g., the resurgence of nuclear energy), drive most of our trends. It's clear that, directly or indirectly, AI is the biggest current tech influencer.

Convergence impact: These trends lie at the intersection of major technological breakthroughs and, therefore, have cross-disciplinary impact. For example, AI and robotics is set to revolutionize manufacturing, warehousing, logistics and beyond. New generation supply chain – a convergence of AI, digital twin, and clean tech – will transform every sector that it influences.

Sustainability and innovation: Sustainability lies at the heart of current innovation. Supply chains need to be more agile than ever but also transparent in sourcing and, where possible, circular. However, the fact remains that AI demands huge energy resources. For it to be truly sustainable, nuclear is going to be the key.

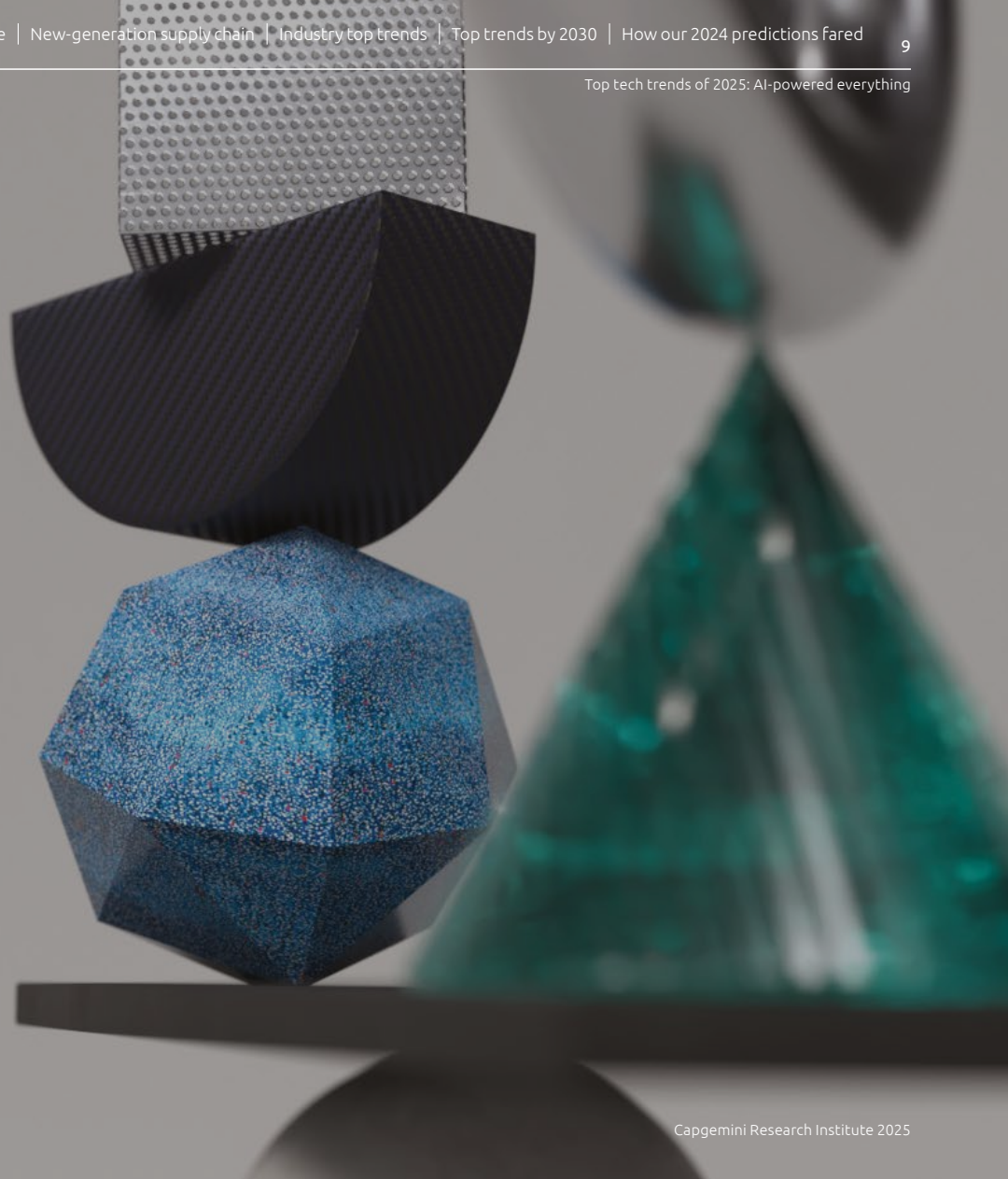


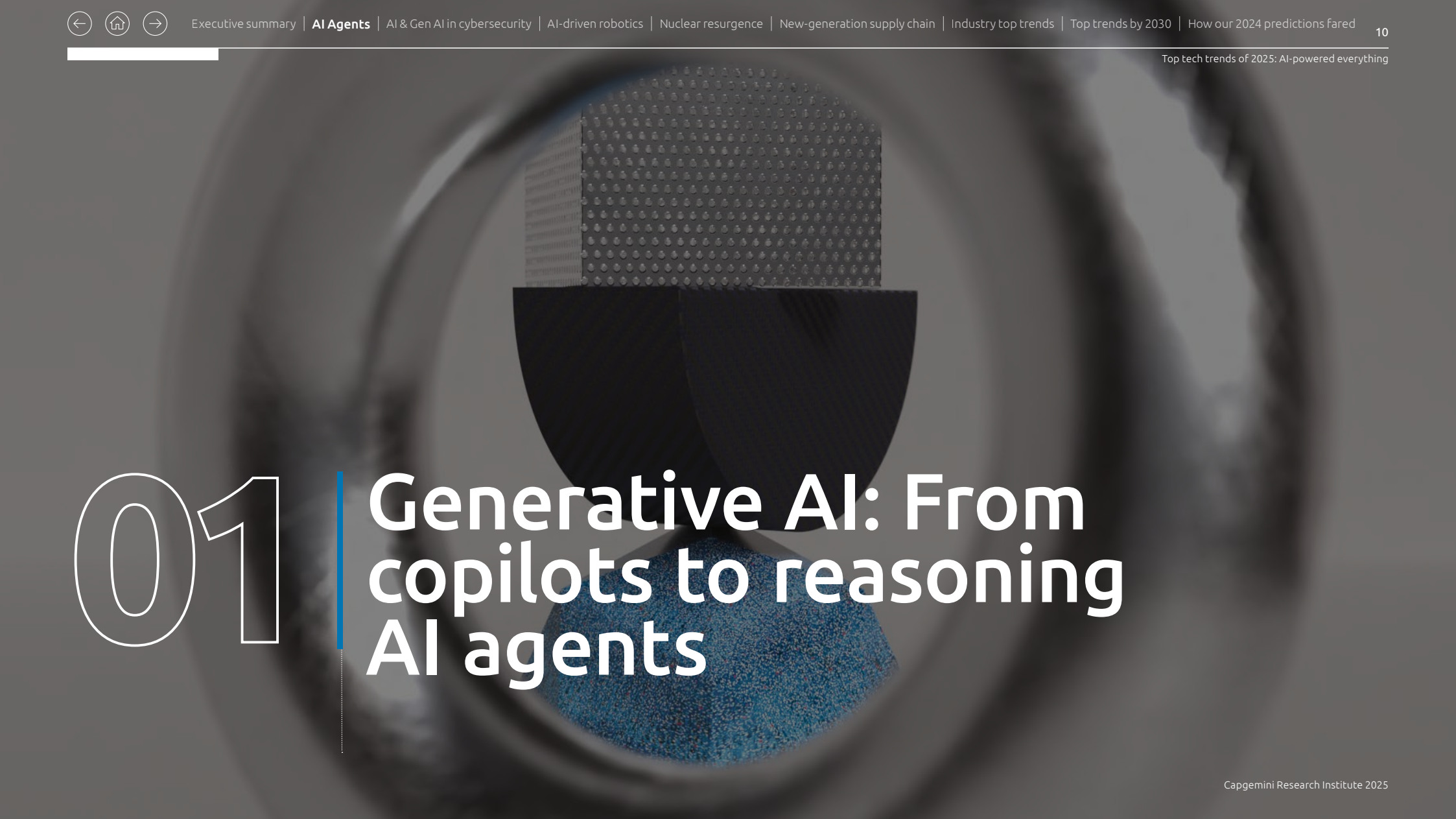
"Last year, Capgemini's Top 5 Tech Trends predicted the emergence of smaller Gen AI language models and AI agents, both of which came to fruition. We also signaled the importance of post-quantum cryptography, which was confirmed by the publication of the National Institute of Standards and Technology's [Post-Quantum Cryptography Standardization] last summer. And, as anticipated, semiconductors have been the center of attention in 2024 with significant evolution driven by the massive use of AI and Gen AI, as well as shifts in market dynamics.

In 2025, we believe AI and Gen AI will have a major impact on companies' priorities and also on many adjacent technology domains, such as robotics, supply chains, or tomorrow's energy mix."

Pascal Brier
Group Chief Innovation Officer,
Member of the Group Executive Committee, Capgemini

I. Our top five tech trends of 2025





01 Generative AI: From copilots to reasoning AI agents

In 2025, 51% of organizations will be partially or fully scaling up AI agents, and nearly seven in ten executives rank AI agents and multi-agent systems as one of the top three tech trends in the AI and data domain.

70%

of industry executives and 85% of investors (VCs) that follow the AI and data tech domain pick AI agents as a top three impactful technology for 2025.

Although industry executives trust AI agents to an extent, more than half (57%) acknowledge the need for robust safeguards.

Why AI agents will be a top tech trend in 2025

At Capgemini, we believe the use of AI agents – autonomous AI systems capable of independently handling end-to-end tasks and collaborating as multi-agent systems – will be one of the biggest tech trends for 2025. AI and generative AI (Gen AI) are about to initiate the 'dawn of agentification' (see Figure 1), which will see AI systems evolve from tools that concentrate on isolated tasks to specialized programs capable of handling a connected series of instructions, such as browsing the web, placing online orders, and collecting information.

In 2023, the first generation of Gen AI focused on simple, easy-to-train applications such as chatbots and virtual assistants. These systems were dependent on human instruction and intelligence to function. In late 2023, we predicted the rise of the second generation of AI agents. These programs have more capabilities and can perform limited actions on behalf of users. Initially driven by startups, the last four months of 2024 saw major tech companies come to the party.

In the last quarter of 2024, large tech firms, including Microsoft, Salesforce, OpenAI, NVIDIA, Anthropic, and Google, have rushed to embrace the AI agent trend, launching specialized solutions and tools to accelerate AI-powered agent development.

Our recent Gen AI research revealed that 82% of companies plan to integrate AI agents in the next 1–3 years to develop automation and enhance efficiency. Industry estimates valued the market for AI agents at around $5.1 billion in 2024 and project it to grow to $47.1 billion by 2030 (a CAGR of 44.8%).[2] Recent announcements by Salesforce and Microsoft support these projections. For example, Microsoft's recently launched Magentic-One is a new open-source multi-agent framework designed to manage complex, multi-step tasks. It features an 'orchestrator' agent that directs specialized agents – Websurfer, FileSurfer, Coder, and ComputerTerminal – to enhance productivity and efficiency in everyday tasks such as data analysis and information retrieval.[3]

82%

companies plan to integrate AI agents in the next 1–3 years to develop automation and enhance efficiency.

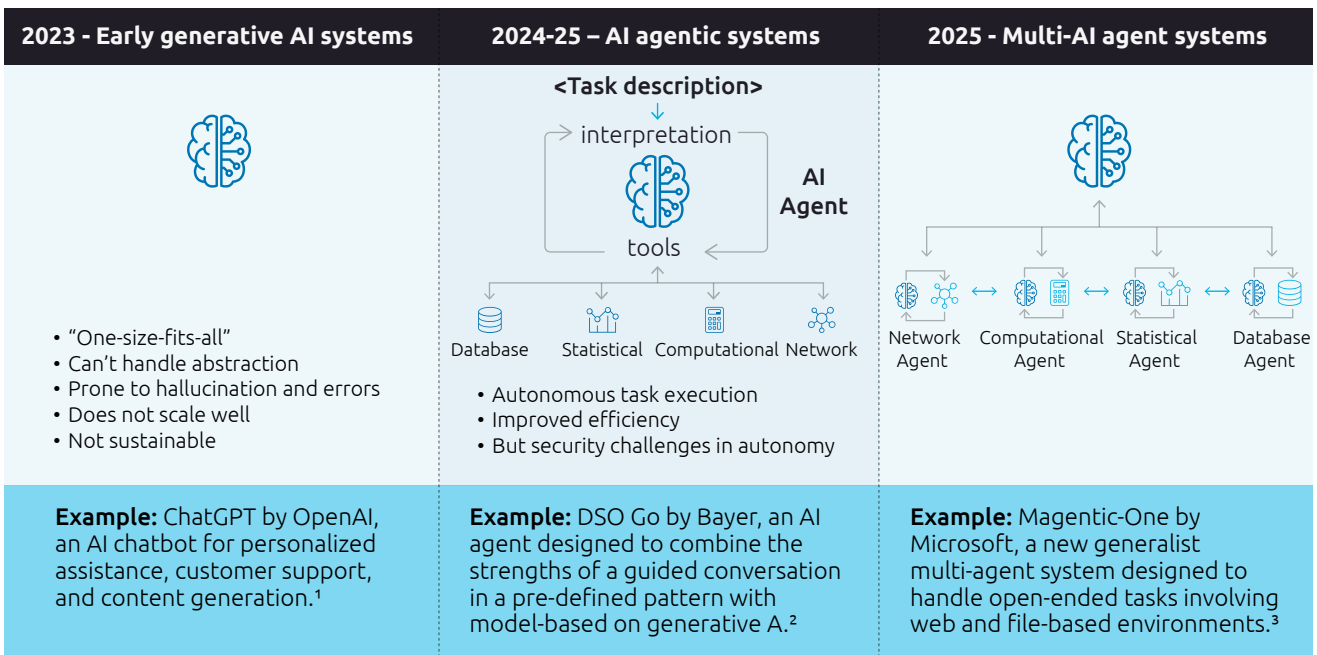
Hyperscalers ramping up innovation and investment are turbocharging AI agent development, unlocking smarter, faster, and more efficient systems to transform industries and redefine what's possible. A Salesforce representative adds: ***"Unlike chatbots and copilots, Agentforce's AI agents are able autonomously analyze data, make decisions, and take action, including via customer interaction and by improving marketing campaigns."*** [4]

In 2025, we anticipate a significant leap forward. As these agent systems scale, they will become more specialized and autonomous, with enhanced reasoning capabilities (see Figure 1).

Andrew Ng, Founder and CEO of DeepLearning.AI and Landing AI, says: ***"I think AI agent workflows are going to drive tremendous progress in AI this year, probably more so than the next generation of foundational models."*** [5] Interconnectedly or independently, AI agents are starting to execute complex actions autonomously. AI agents or 'agentic AI', along with multi-agent generative systems (MAGS, AI frameworks enabling collaborative problem-solving through intelligent agent interactions), have the potential to revolutionize industries by collaborating seamlessly, optimizing supply chains, personalizing customer experience (CX), and enhancing decision-making. Figure 2 lists several key players in the AI agent ecosystem.

FIGURE 1.

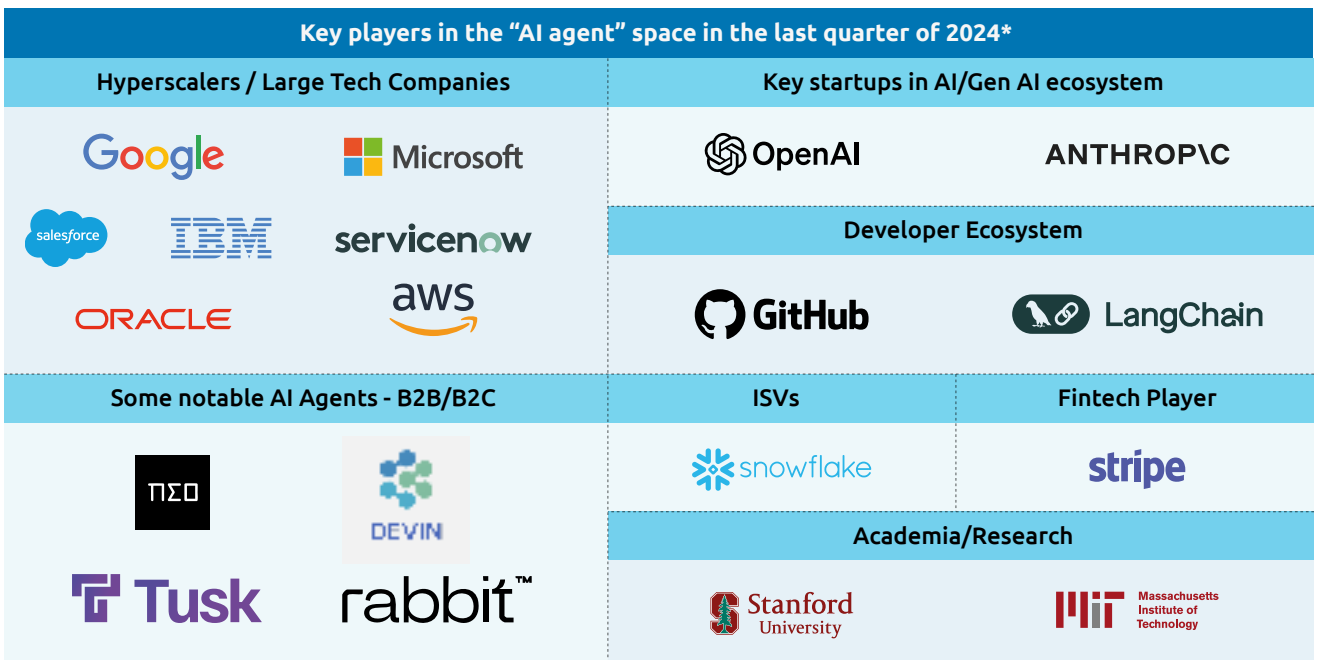
From the first generation of LLMs to AI agentic systems in 2025



Source: Capgemini Research Institute analysis, Capgemini Applied Innovation Exchange – San Francisco.

FIGURE 2.

Key players who shaped the AI agents landscape in the last quarter of 2024



*Non-exhaustive representation

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Source: Capgemini Research Institute analysis.

David Edelman, a fellow of Harvard Business School, says: ***"Organizations are deploying tools to help consumers interact with their own AI agent, for instance, to find the best information, create the best itinerary possible, and manage it."*** Using improved communication protocols, agents can tap into inflows of real-time data, heightening efficiency and responsiveness. As many as 64% of organizations agree that AI agents will significantly improve customer service.[6]

Personalized intelligent financial assistance tools previously reserved for businesses could manage these customer interactions to create a tailored experience. Ethical frameworks will guide deployment, addressing concerns around privacy and bias while fostering trust and innovation. For example, Stripe's new software development kit (SDK) enables AI agents to handle financial transactions, book payments, issue virtual cards, and manage metered billing in workflows integrated with large language models (LLMs).[7] AI agents could streamline CX, offering automated budgeting, instant payments, subscription management, and optimized investments.

What organizations and investors are saying

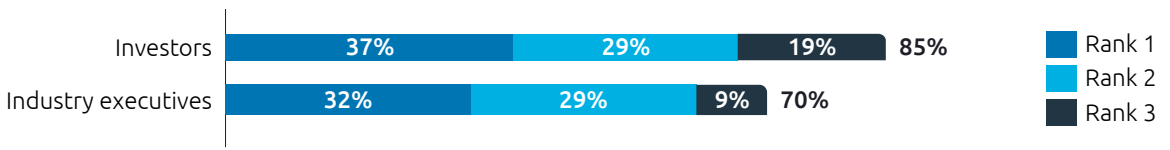
It's not just our experts at Capgemini who see AI agents making their mark on the business world, with 70% of industry executives and 85% of investors that follow the AI and data tech domain picking AI agents as a top-three impactful technology of 2025 (see Figure 3). On top of this, 85% of insurance industry executives, 81% of retail industry executives, and 75% of consumer product manufacturing executives ranked AI agents as a top-three tech trend for their sectors in 2025. Overall, executives from eight out of the 12 surveyed sectors ranked AI agents among the top five tech trends in 2025.

"We believe that as AI agent systems scale, they will become more specialized, autonomous, and give rise to multi-agent systems."

FIGURE 3.

AI agents will be a leading tech trend in 2025

Share of industry executives and investors saying AI agents will make a major impact in the AI and data space in 2025



Source: Capgemini Research Institute, Top Tech Trends 2025 survey; October 2024, N =1,500 executives, and N = 500 VCs (Investors). N = 856 executives and N = 298 investors in our survey follow AI and data technology domain who answered the question.

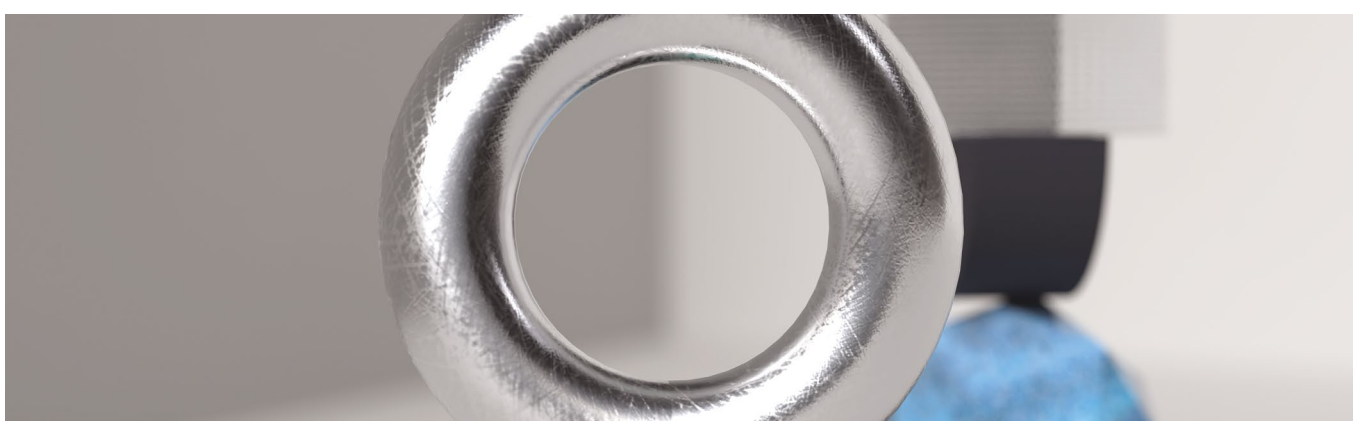
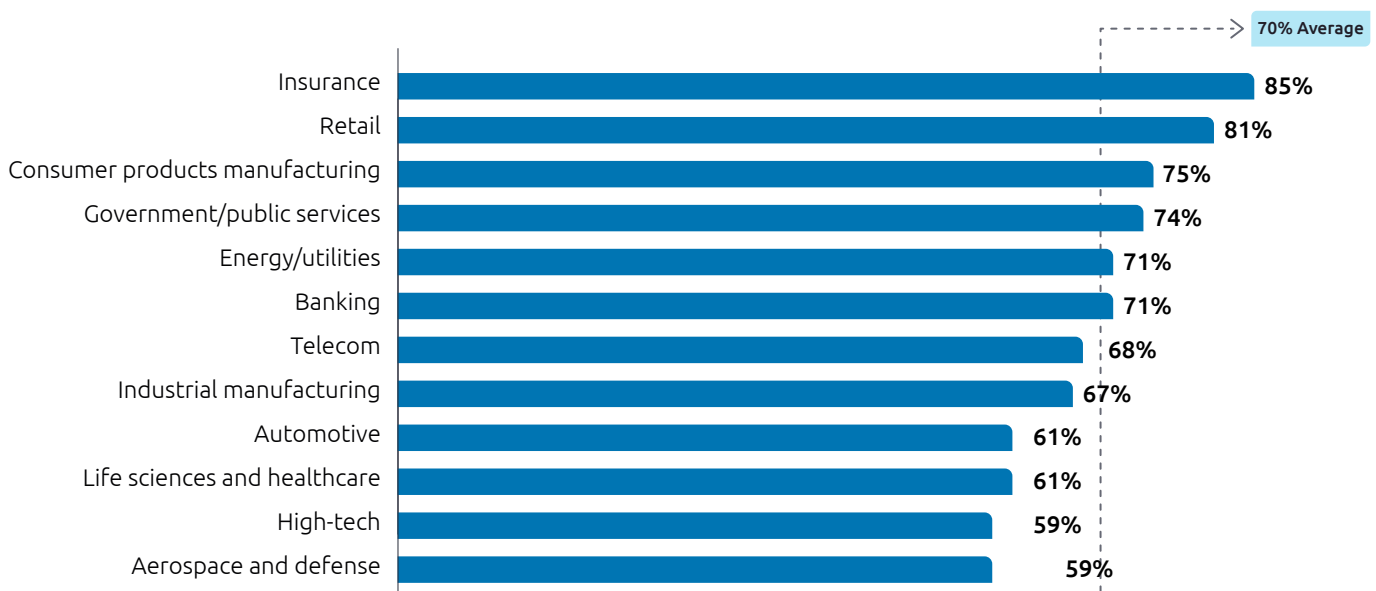


FIGURE 4.

Nearly seven in 10 industry executives rank AI agents and multi-agent systems as one of the top three tech trends for 2025 in the AI and data domain

Share of executives ranking AI agents as one of the top 3 trend in the AI and data domain, by sector



Source: Capgemini Research Institute, Top Tech Trends survey; October 2024, total N = 1,500 Executives, N = 856 executives in our survey who follow AI and data technology domain, answered this question.

8 out of **12** sectors

Overall, executives from eight out of the 12 surveyed sectors ranked AI agents among the top five tech trends in 2025.

FIGURE 5.

Select investments on AI agents in last six months of 2024

Company	Country	Product/Solution/Service	Funding Value	Date of Investment	Investors
OpenAI		Use AI agents to advance reasoning models	$6.6 billion	October 2024	Led by Thrive Capital, Nvidia, Microsoft, SoftBank, Tiger Global, Khosla Ventures, and others
crewai		Launches Enterprise Cloud Platform for AI Agents	$18 million	October 2024	Blitzscaling Ventures, Craft Ventures, Earl Grey Capital, and notable AI figures such as Andrew Ng and Dharmesh Shah
DevRev		Operationalizing Gen AI in the enterprise with 1-click data migration from legacy systems and lightweight AI agents	$100 million	September 2024	Khosla Ventures, Mayfield and Param Hansa Values
Skyfire		Building a payments network that enables AI agents to make autonomous transactions	$8.5 million	August 2024	Neuberger Berman, Brevan Howard Digital, EveryRealm, Draper Associates, ARCA, and Ripple
COGNIGY		Using conversational and Gen AI to pre-train AI agents to resolve a high volume of customer requests	$100 million	June 2024	Led by Eurazeo Growth, with participation from existing investors Insight Partners, DTCP, and DN Capital

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Sources:
Forbes, "ChatGPT maker lands $6 billion for AI Agents in biggest round ever," October 2024.
Analyticsindiamag, "crewai secures $18 million funding and launches enterprise cloud platform for AI agents," October 2024.
Techcrunch, "The Silicon Valley-based company raised a $100 million Series A round that included investors like Khosla Ventures," September 2024.
Finextra, "Skyfire raises $8.5m to bring autonomous payments to AI agents," August 2024.
Businesswire, "Cognigy raises $100m as major enterprise brands depend on Its AI agent workforce," June 2024.

Expected adoption in 2025

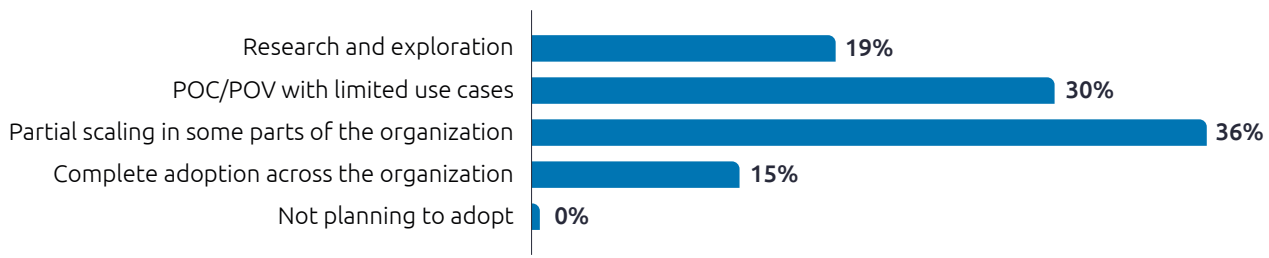
Just over half of organizations (51%) will be partially or fully scaling up AI agents in 2025 (see Figure 6). About one in five is still in the very early stages (19%). Among those at the proof-of-concept (POC) stage, 55% of executives from automotive and 45% from consumer products and manufacturing say that, by the end of 2025, their organization will have POC/proof-of-value (POV), with some use cases in place. Although the adoption mostly concerns agent systems, we anticipate a pivotal shift toward multi-agent systems in 2025.

Larger organizations (annual revenue above $10 billion) are scaling more rapidly than smaller organizations. Of the former, 45% have completed some AI scaling and, of the latter, 21%. A significant number of industrial manufacturing (45%), retail (43%), high tech (43%), and banking (40%) executives say their organizations will have partial scaling in 2025.

FIGURE 6.

Over half (51%) of organizations will be scaling up AI agents in 2025

Organizations' expected level of adoption of AI agents in 2025



Source: Capgemini Research Institute, Top Tech Trends survey; October 2024, N = 1,500 Executives. N = 856 Executives in our survey follow the AI and data technology domain who answered the question.

51%

of organizations will be partially or fully scaling up AI agents in 2025.

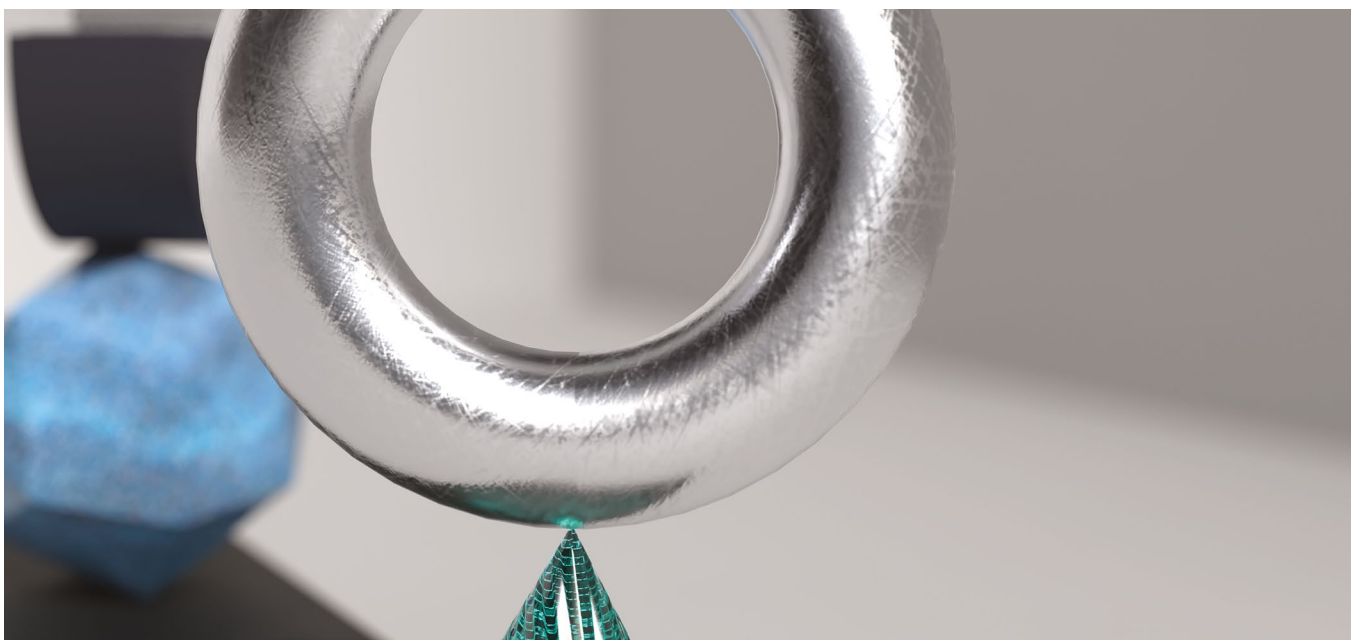
What are the key barriers to adoption at scale?

For all of the potential that AI agents hold, the technology is still in development. Our survey found that the biggest concerns of executives looking to scale AI-related tech are:

- Lack of strategic vision, funding, or leadership support (65%)
- Unclear return on investment (52%). As organizations face significant cost pressures, using smaller modals, as well as running them closer the edge will be key.
- Inadequate technology/tooling infrastructure (47%)
- AI agents and fault-tolerance: Building multi-agent systems is complicated, as every agent needs to have a 'fault tolerance,' (i.e., a failsafe mechanism to prevent serious underperformance).

While evolving quickly, LLMs remain an immature technology dogged by reliability and training-data concerns, as well as ethical, cultural, and workforce-related challenges. Our recent research found that bias in Gen AI models leading to embarrassing results (68%) is the biggest ethical concern among executives.[9] While executives trust AI agents to an extent, more than half (57%) acknowledge the need for robust safeguards. Also, most (70%) organizations across sectors see limited data and AI talent, skills, and knowledge as major hindrances to Gen AI adoption at scale.

> *"We're convinced that Gen AI will take a significant leap forward in 2025, from copilots to autonomous agents having enhanced reasoning capabilities"*



"We're convinced that as AI agents evolve into autonomous systems, they are revolutionizing end-to-end tasks, optimizing processes, personalizing experiences, and enhancing decision-making. By transitioning from single agents to multi-agent systems, organizations can overcome issues of control and shift from centralized to decentralized setups, ultimately achieving greater efficiency and flexibility."

Robert Engels
Vice President and Head of Generative AI Lab,
CTO, Insights & Data, Capgemini

02 AI & Gen AI in cybersecurity: New defenses, new threats

AI and Gen AI in cybersecurity is the top ranked trend of 2025 overall by industry executives across more than 60 trends.

75%

Over 75% of executives say their organization will implement AI/Gen AI in cybersecurity in 2025.

Why AI & Gen AI in cybersecurity will be a top trend in 2025

While AI and Gen AI offer transformative potential to enhance security measures, malicious actors have quickly recognized its capacity for malevolent purposes, employing it for sophisticated attacks that target both human vulnerabilities and machine defenses. A huge 97% of organizations have encountered breaches or security issues related to the use of Gen AI in the past year.[10] Organizations today have larger attack surfaces, with complex new tech exposing a multitude of vulnerabilities, and are keen to boost their defenses.

At Capgemini, we believe that, in 2025, AI will power both attacks and defenses on an unprecedented scale. Organizations cannot ignore the heightened cybersecurity threat that accompanies the new technology, including ever more sophisticated phishing, spear phishing, ransomware, deepfakes, and fraud schemes. This evolution allows even small criminal groups to conduct large-scale operations without advanced technical expertise, worryingly democratizing cybercrime and making damaging breaches the new normal. The key now is to establish robust security frameworks that not only harness Gen AI for threat detection and response but also address its inherent risks.

Indeed, governments around the world have responded with stricter regulatory laws. Examples include:

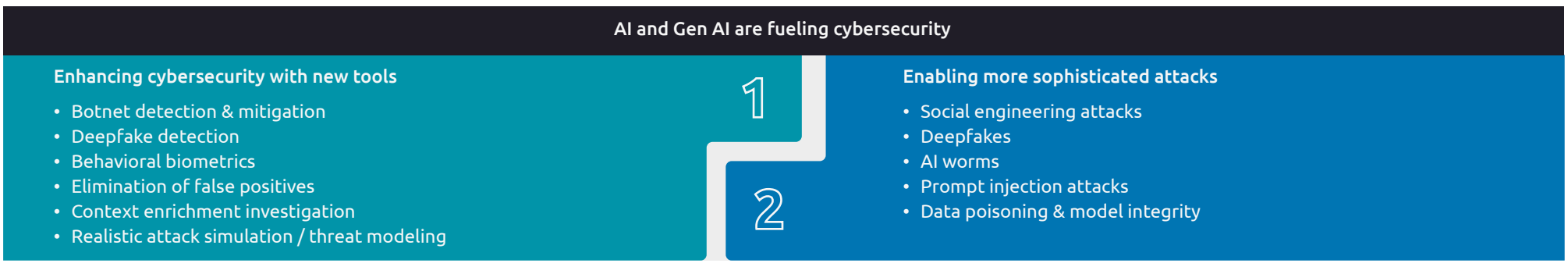
- In May 2024, the US government introduced additional measures into its National Cybersecurity Strategy, including enhancing cybersecurity exercises; securing Internet of Things (IoT) devices; a drive to lead development of standards; and establishing a bureau for international cyber partnerships.[11]
- In August 2024, the Singapore government launched Operational Technology (OT) Cybersecurity Masterplan to enhance the security and resilience industrial control systems and its technologies.[12]
- In 2024, the EU promulgated its Cyber Resilience Act (CRA), requiring manufacturers to embed enhanced cybersecurity measures across a broad range of everyday hardware and software products.[13]

"We used to ask if organizations would suffer a cybersecurity breach. Now, in the age of Gen AI, it is no longer a matter of if, nor when, but how often."

Marco Pereira
Executive Vice President, Global Head Cybersecurity,
Cloud and Infrastructure Services, Capgemini

FIGURE 7.

The advancements in AI and Gen AI introducing both new capabilities and threats to the cybersecurity domain



Source: Capgemini Research Institute analysis.

Generative AI has made it far easier to impersonate someone by generating their "deepfake" voice or video – a realistic audio or video digitally created to appear authentic, often with the intention of stealing money or information.

With its ability to analyze and interpret vast datasets swiftly, AI and Gen AI are allowing early identification of potential threats, making it one of the most impactful trends in 2025. Further, the integration of AI and Gen AI in cyber threats is complicated by the emergence of multi-agent systems that enable coordinated attacks, making detection increasingly challenging.

92%

of organizations we surveyed in 2024 say they experienced a breach in 2023, a significant rise from 51% in 2021.

3 in 5

organizations believe AI is paramount for detecting and responding to attacks.

57%

of organizations believe Gen AI will enhance cybersecurity analysis and more than half (53%) believe that Gen AI will enable security teams to scale operations and handle more sophisticated threats.

Source: Capgemini Research Institute, Generative AI in cybersecurity, November 2024.

What organizations and investors are saying

As cyber threats increase in frequency, organizations are directing investment toward next-generation AI defensive security solutions. Investor funding is flowing to cybersecurity startups with AI integration. These startups raised an estimated $2.7 billion across 154 deals in the first quarter of 2024.[14]

Frederic Lenoir, Head of digital and innovation, Natixis Interepargne (Employee savings and retirement planning arm of BPCE, based in France) comments, ***"We see organizations all over increasingly using AI to prevent and detect fraud. These systems are efficient and include human oversight, enhancing their effectiveness. The use of AI in cybersecurity is expected to grow significantly."***

Gen AI can also create sophisticated simulations to train security systems and personnel for real-world attacks. We see global leaders in cybersecurity, such as CrowdStrike and Palo Alto Networks, integrating AI-powered threat detection. Cisco Security Cloud, for instance, allows users to oversee their entire identity base, secure vulnerable accounts, remove unnecessary privileges, identify unusual behaviors, and prevent high-risk access attempts.[15]

Industry executives responding to our survey ranked AI and Gen AI in cybersecurity as the highest of 64 trends of 2025. A large majority of executives (78%) across sectors rank AI/Gen AI in cybersecurity among the top three technological trends of 2025 in the cybersecurity domain (see Figure 8 below). Eric Caen, ex-Chief Digital Officer at Crédit Agricole SA comments ***"We have seen a spike in the attempts to penetrate our systems likely due to geo-political factors, which is why we are continuously investing in cybersecurity".*** Luciano Valdomiro Dos Santos, Head of Cybersecurity Risk in a Brazilian retail bank, says: ***"Gen AI can create synthetic datasets that help us test and improve our security measures without exposing real user data."***

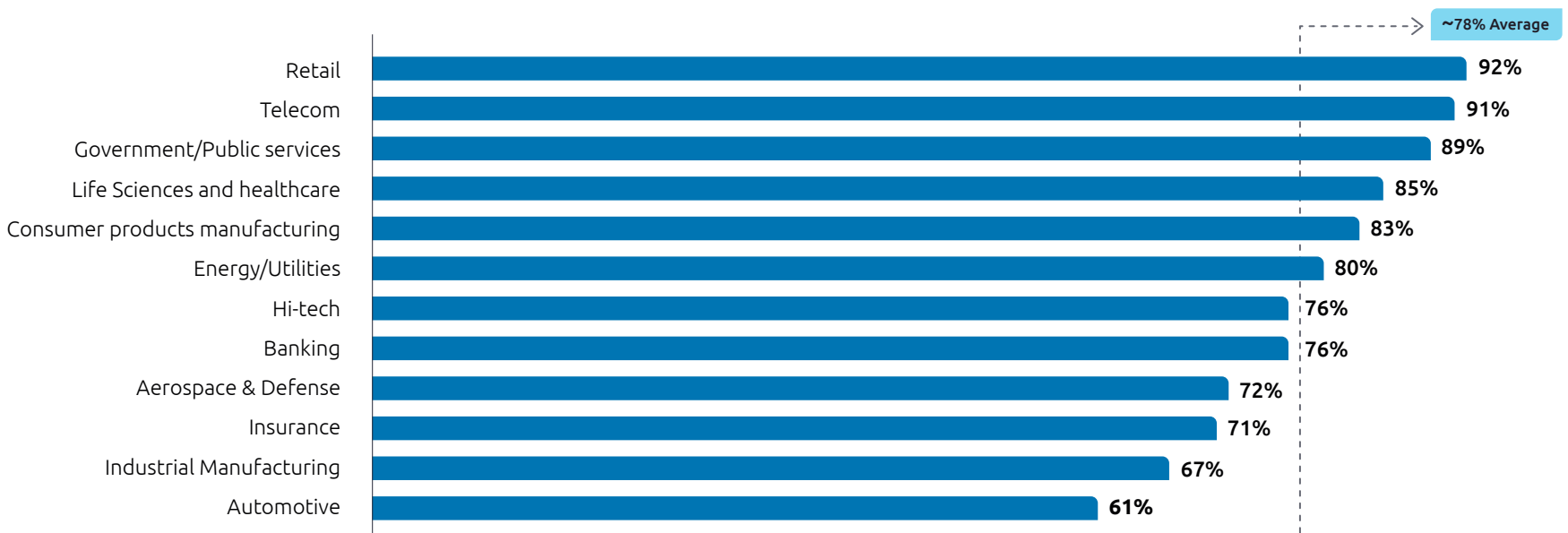
78%

A large majority of industry executives across sectors rank AI/Gen AI in cybersecurity among the top three technological trends for 2025 in the cybersecurity domain.

FIGURE 8.

Most executives across sectors believe AI and Gen AI in cybersecurity will be a top tech trend

Share of industry executivesa ranking AI or Gen AI in cybersecurity among top three trends in cybersecurity domain, by sector



Source: Capgemini Research Institute, Top Tech Trends in 2025 survey, October 2024, N = 693 executives following cybersecurity who answered the question.

Expected adoption in 2025

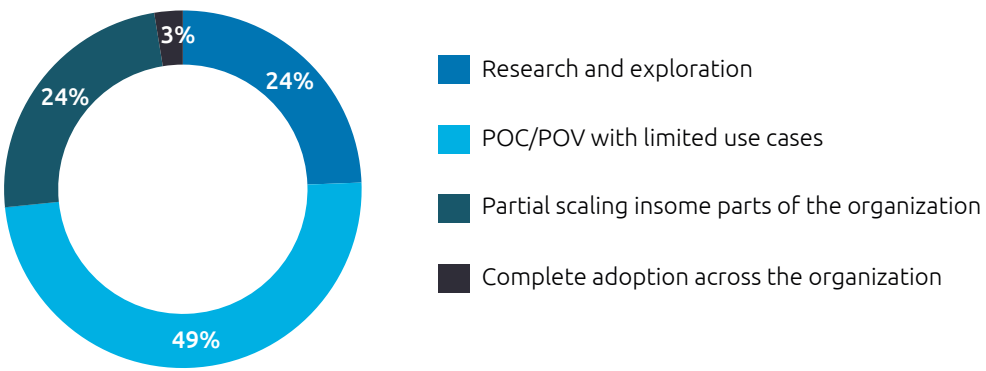
Our survey shows that more than 75% of executives following the cybersecurity domain will have either started implementing Gen AI in cybersecurity or have completely adopted it in 2025. A leading analyst comments: ***"From an enterprise perspective, it's clear that companies must keep investing in cybersecurity to counter new threats like attacks on Gen AI models. AI supports security specialists by recognizing data patterns, but the focus should be on making systems quantum-safe. Staying ahead of evolving threats, while using AI to enhance protection is the key."***

> *"In 2025, we expect that there will be a rapid escalation of the battle between cyber attackers and defenders, fueled by advancements in AI and Gen AI."*

FIGURE 9.

Over 75% of industry executives say their organization will implement AI and Gen AI in cybersecurity in 2025

Organizational maturity of Gen AI implementation in cybersecurity in 2025

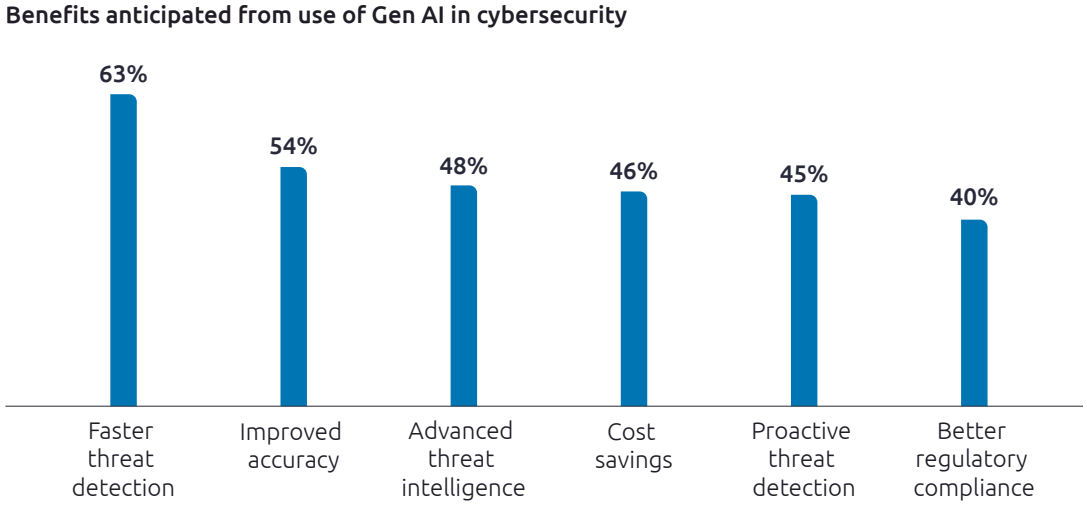


Source: Capgemini Research Institute, Top Tech Trends in 2025 survey, October 2024, N = 545 executives following cybersecurity who answered the question.

Organizations and, increasingly, governments are spending extravagantly to protect their databases and critical defense systems. Cybersecurity now constitutes 12% of overall technology budgets, up 3 percentage points from 2020.[16]

FIGURE 10.

More than 3 in five organizations anticipate faster threat detection with Gen AI



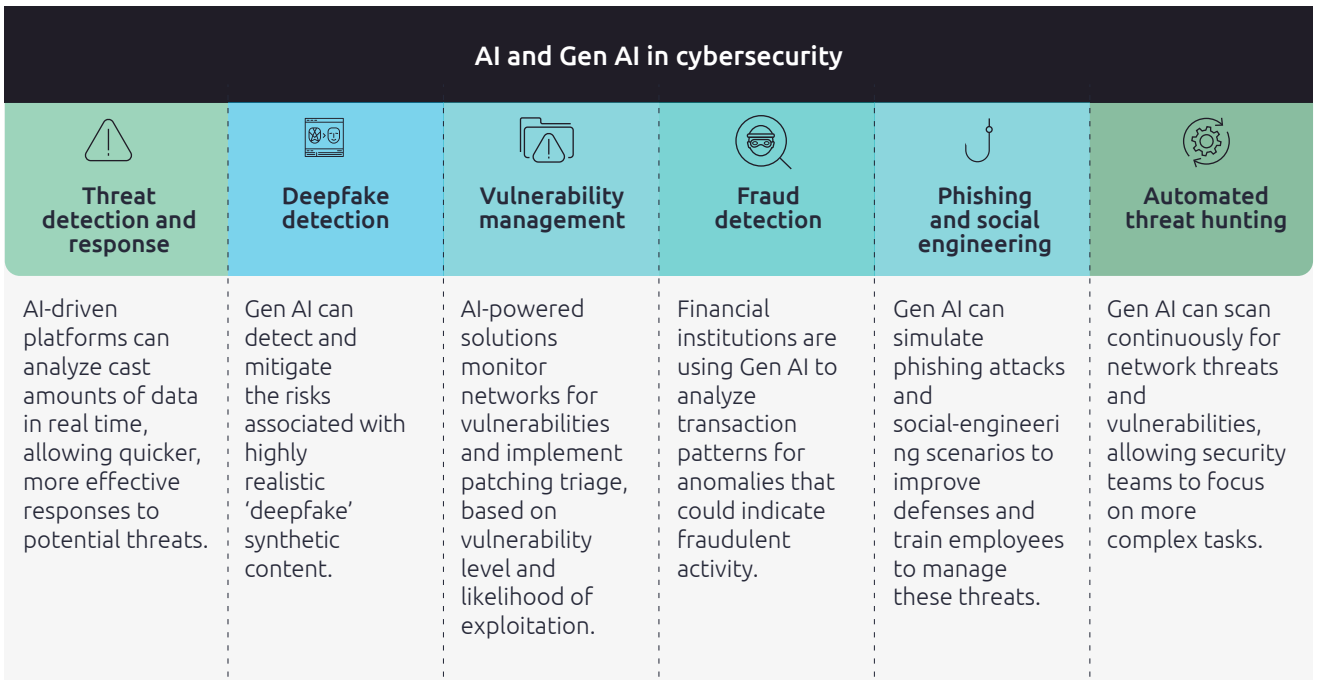
Source: Capgemini Research Institute, AI and Gen AI in cybersecurity survey, May 2024, N = 1,000 organizations.

"In 2025, we'll see rapid advancements in heathTech, finTech, and manufacturing tech. However, this also brings significant cybersecurity challenges. As bad actors exploit these tools and quantum computing emerges, we must modernize our cybersecurity measures to protect our digital infrastructure."

Joel Martin,
Executive Research Leader, HFS Research

FIGURE 11.

Some oganization-wide use cases of AI and Gen AI in cybersecurity



Source: Capgemini Research Institute analysis.

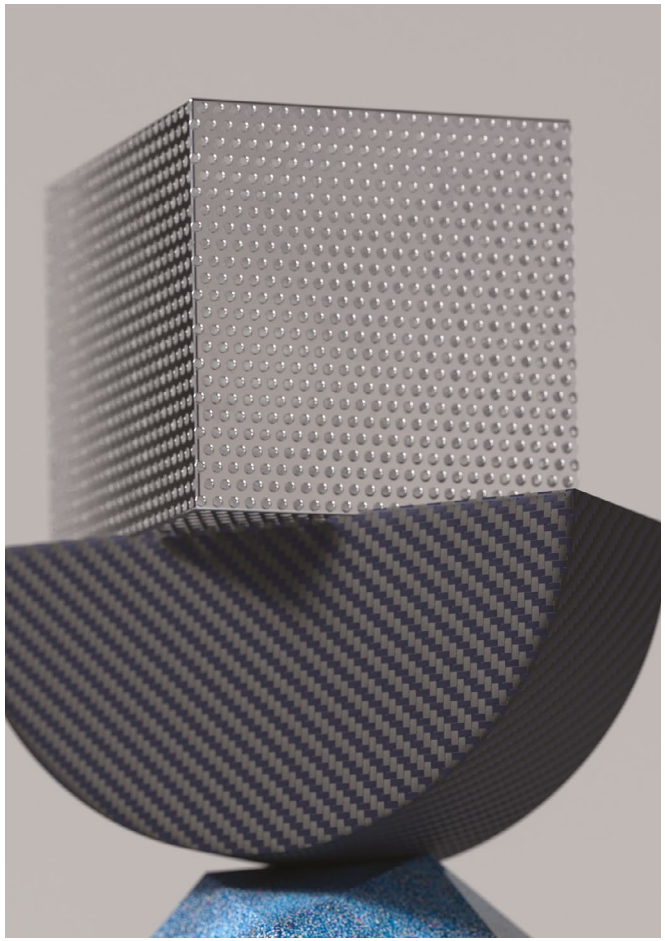
In 2025, we expect a rapid escalation of the battle between cyber attackers and defenders, fueled by advancements in AI and Gen AI.

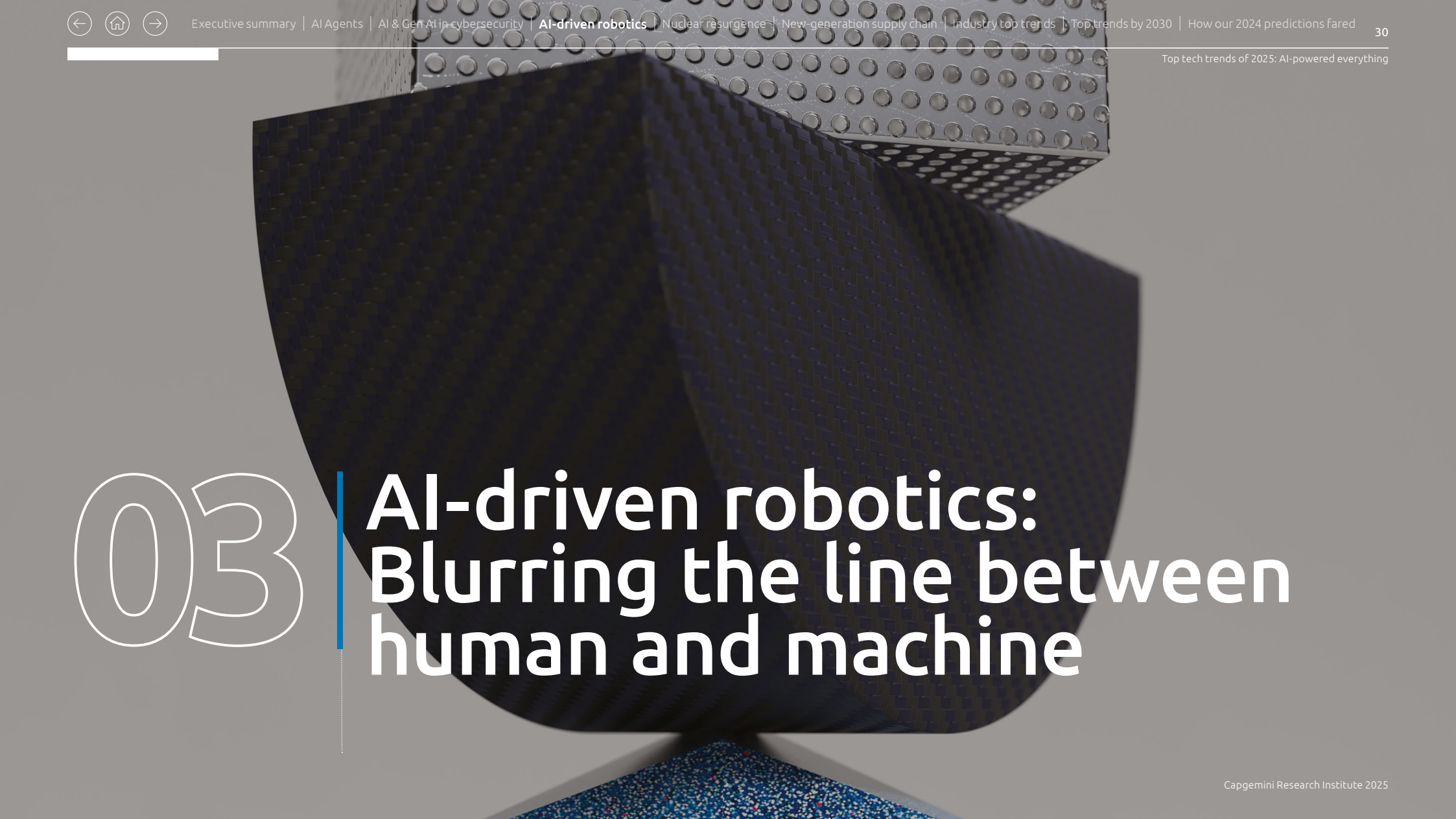
Organizations are increasingly adopting AI-driven strategies, with some using advanced deception technologies to trap attackers in controlled environments. For instance, companies such as Darktrace use AI to simulate realistic attack scenarios, helping security teams identify and address vulnerabilities proactively.[17] Some organizations are even turning the scammers' own weapons against them, such as the use of AI Daisy created by British phone company Virgin Media O2, which impersonates an elderly lady to make scammers spend time online with her instead of potential victims.[18]

What are the key barriers to adoption at scale

Despite its great potential, the adoption of AI and Gen AI in cybersecurity is not without its challenges. Several factors could limit the effectiveness and widespread implementation of these technologies:

- **Organizational constraints:** From technical integration issues to cost of integration, organizations are facing several barriers to full adoption.
  - » **Cost of implementation:** High initial set-up cost could strain organizational budgets.
  - » **Technical skills gap:** Organizations are facing a shortage of skilled cybersecurity professionals to manage evolving threats.
  - » **Issues around integrating AI:** The difficulty of integrating new tech with existing legacy systems make the latter susceptible to newer, more sophisticated attacks.
- **Regulatory challenges:** The evolving regulatory landscape poses significant hurdles to the integration of AI. In tightly regulated sectors like healthcare or financial services, organizations face significant regulatory hurdles in the implementation of Gen AI, especially for use cases related to cybersecurity. Some institutions, like the Monetary Authority of Singapore, have already published detailed papers highlighting the regulatory impact associated with the deployment of Gen AI in cybersecurity.[19]
- **Data privacy and security:** Handling vast amounts of sensitive data often poses security and privacy risks. Training AI algorithms requires extensive datasets that may contain confidential information, raising concerns about data exposure and potential breaches. AI must be trained on historical security incidents without posing a risk to individual user information. Further, the lack of normalization in security logs also deteriorates the data quality.
- **Algorithmic bias & fairness:** As Gen AI models learn from historical data that contain biases, these systems may lead to skewed threat assessments or unfair targeting (false positives), requiring tight control over the training data and regular audits to ensure fairness.





03 AI-driven robotics: Blurring the line between human and machine

48%

Almost half of organizations plan to deploy PoC/ PoV with limited use cases of AI-powered robotics in 2025.

89%

of investors ranked AI-powered robotics among the top three trends for 2025 in the industry and engineering domain.

Why AI-driven robotics will be a top trend in 2025

LLMs are transforming robotic capabilities and have accelerated the development of next-gen robotics to handle complex, interconnected tasks, enhancing operational efficiency, personalizing customer experiences, and improving decision-making across industries.

At Capgemini, we believe the global AI robotics market will see significant growth, driven by industrial automation, labor shortages, and the need to reduce safety risks and demands on human workers. Estimates suggest that the collaborative robot market is worth $2.3 billion in 2024 and experts expect it to reach $10.4 billion by 2035.[20] The global humanoid robot market is projected to increase by a startling CAGR of 154% between 2024 and 2027, backed by increased investment in the US and Chinese markets.[21] Collaborative Robotics, for example, has now raised over $140 million in less than two years.[22] Agility Robotics, which specializes in creating and manufacturing robots for logistics and warehouse environments, announced a successful funding round of $150 million in the first half of 2024.[23]

Micheal Brown, CEO, North America, SupplyChainWise, adds, ***" The growth of AI-powered robots, or cobots, is expected to accelerate in 2025. As organizations move from analytics and insights to actionable steps, cobots provide a practical solution to automate tasks and reduce the burden of information overload. Leveraging automation through cobots to execute logic is an effective way to streamline operations and enhance efficiency."***

All forms of robots are experiencing a surge, including cobots. Unlike traditional industrial robots, which operate in isolation, collaborative robots or 'cobots' are equipped with advanced sensors and AI capabilities, allowing them to interact safely and efficiently with human workers. AI-powered robots can perform complex tasks, learn from their environments, and adapt to new situations, making them suitable for various industrial uses. For instance, Electrolux Group boosted productivity by 60% in its refrigerator production line using cobots.[24] Similarly, a metal fabricator company, Raymath, boosted its productivity an impressive 200% on welding and 600% on machine tending.[25]

Moreover, countries such as China are rapidly advancing in robotics, exemplified by the rise of 'dark factories', fully staffed by robots. According to the International Federation of Robotics (IFR), China has surpassed Germany and Japan in the ratio of robots to factory workers, taking third place in the world in 2023.[26] China's robot density has reached 470 per 10,000 employees.

"The integration of AI-powered robots and cobots in the manufacturing industry is a natural evolution of decades-long automation practices and is poised to grow significantly. The idea now is to define the scope, control, and business rules for these systems to ensure effective human-robot collaboration."

Gard Little
Research VP at IDC

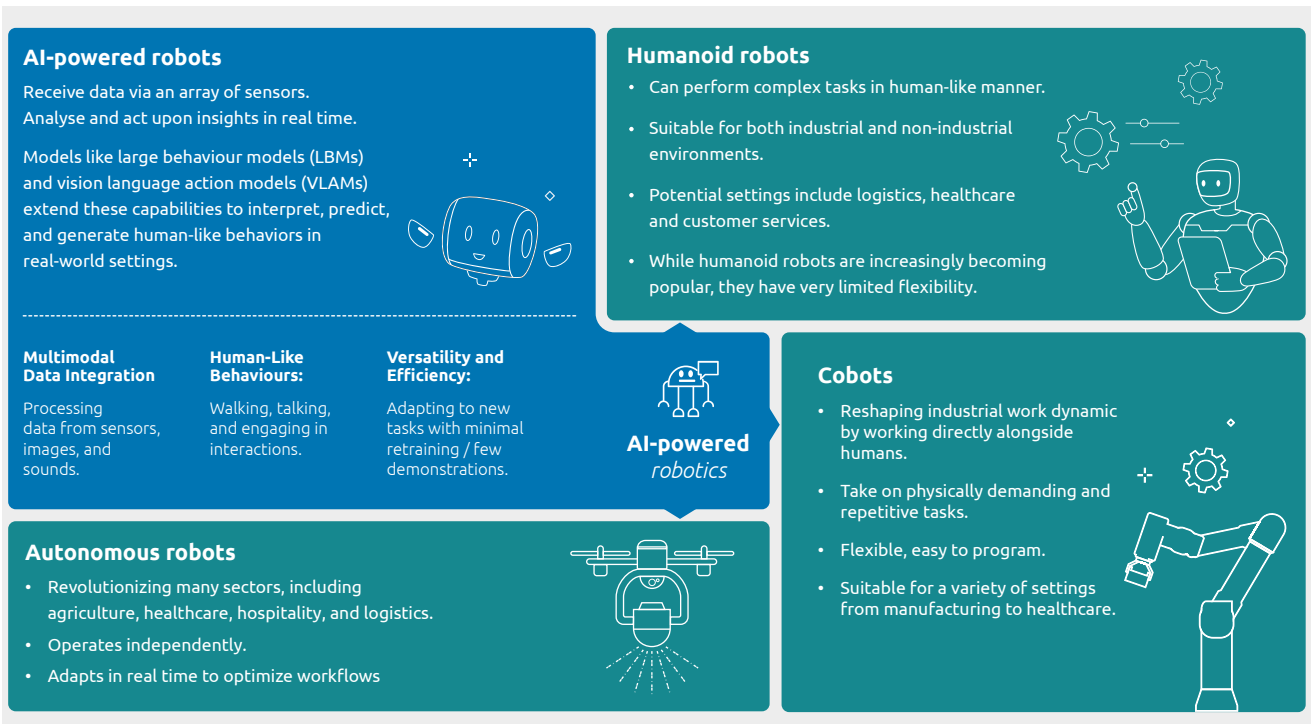
Elisabet Svensson, Head of Technology Academy at Sweden SKF Group, comments: ***"I believe AI-powered robots will be a major trend by 2025 and beyond, driven by advancements in AI and robotics. The future of work will see closer collaboration between humans and robots, with collaborative robots playing a vital role in creating more agile, flexible, and efficient work environments."***

David Nahon, Head of Immersive Experience Innovation at Dassault Systèmes, adds: ***"AI will power robots to learn individual preferences, adapt to unexpected human interactions, and share knowledge, making their interactions feel natural. The field is set for significant advancements next year, as robots begin to learn from real-world experiences and handle challenging situations."*** Recent advancements in AI and robotics have also attracted substantial strategic investment and acquisitions from leading hyperscalers and technology conglomerates.

- Tesla's Optimus and Agility Robotics' Digit are creating machines capable of collaborating at a new level of sophistication with humans.
- In November 2024, Microsoft inaugurated its first AI and robotics R&D center in Tokyo, Japan.[27]
- NVIDIA is planning to launch its AI-powered humanoid robot Jetson Thor in the first half of 2025.[28] The company is also building a comprehensive AI platform for leading humanoid robot companies.
- In August 2024 OpenAI-backed 1X Technologies introduced the NEO Beta AI humanoid robot for household chores.[29]

FIGURE 12.

AI-powered robotics is reshaping how we view the role of automation



Source: Capgemini Research Institute analysis.

"We're convinced that in 2025 the advances in natural language processing (NLP) and machine vision will boost robot capabilities to take on ever more complex roles within the modern workforce."

But while humanoid robots are capturing the headlines due to their familiarity to the public, they only represent a small fraction of robotics today (between 1-4% of industrial robots globally).[30] The majority of robots deployed today are non-humanoid, tailored for specific industrial tasks such as manufacturing, logistics, and service applications. The recent advancements in AI however are driving a renewed surge in interest in humanoid robots, making them the fastest growing domain of robotics in 2025 and beyond.

"For all the buzz around humanoid robots, it's still unclear whether they will make any large business impact. If we look at Star Wars, C3PO is cute, but is he more useful than R2D2? As robots become more human-like, such as C3PO, people's attitude toward them starts to become unfavorable. This plunge in people's emotional response — the 'uncanny valley'— is what AI will have to avoid if it were to lead to mass adoption in human-robot collaboration.

Nevertheless, I predict greater impact on business will come from niche players in the autonomous vehicle space and medical domain, where there are clear boundaries between humans and robots. AI-powered robotics is poised to become a strategic play that's likely to drive global competition."

Sally Epstein
Chief Innovation Officer at Cambridge Consultants, part of Capgemini Invent

What organizations and investors are saying

In the manufacturing sector, AI-powered robots automate assembly lines while, in healthcare, robots can surpass human surgical precision. The adaptability and high productivity of AI-powered robots make them suitable for a wide range of industry applications. For instance, logistics firm DHL's Dorabot assists with material handling, and another cobot, Carter, assists with picking activities.[31] AI can also be used to optimize production planning by detecting and predicting potential production constraints and simulating scenarios to minimize downtime and bottlenecks and improve sustainability.

Philippine de T'Serclaes, Chief Sustainability Officer at Dassault Systems agrees, ***"Combining AI and robotics on shop floors automates quality inspection, cutting defects and scrap, thus enhancing quality and sustainability. Future advances in sensors and computer vision will help robots interact more intuitively with the real world. I look forward to seeing sustainability more systematically embedded, optimizing resources, and improving energy efficiency in operations."***

Investors are sharing excitement in AI-powered robotics. Our survey found Investors focus on infusing capital in AI-powered robots (see Figure 13) in the engineering and industry domains. Overall, the Funding community is maximizing on consumer trends, retail, automotive, energy and utilities, and industrial manufacturing rank AI-powered robotics among the top five trends for 2025 (see appendix).

Increased financial backing is boosting AI robotics. However, executives are yet to completely realize its potential. In our survey, we found that only 65% of executives have ranked AI-powered robotics among the top three trends in 2025 in the industry and engineering domain, as opposed to investors, where almost 90% have ranked it among the top three trends in 2025.

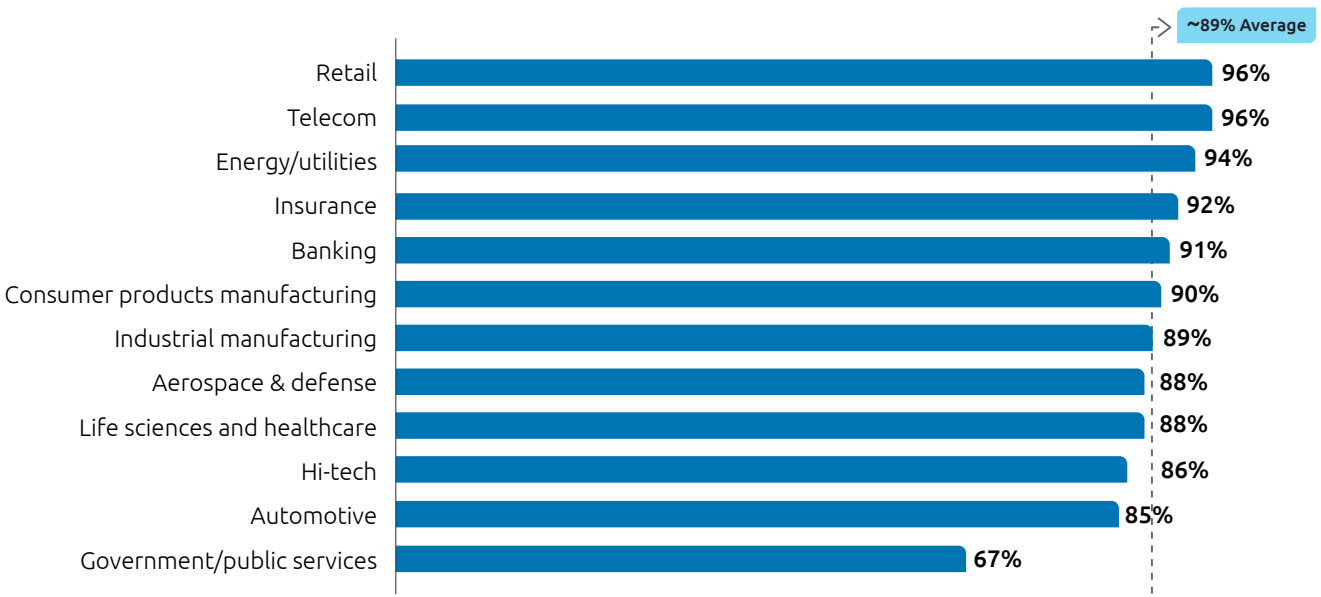
"Recent improvements in machine learning and vision enable robots to detect and manipulate objects safely and flexibly, fostering new opportunities for human-robot collaboration that were not possible in the past."

Lars Kunze
Professor in Safety for Robotics and Autonomous Systems at UWE Bristol

FIGURE 13.

Majority of VCs (investors) across sectors are focusing on AI-powered robotics

Share of VCs ranking AI-powered robots among the top three trends in the industry and engineering domain



65%

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Source: Source: Capgemini Research Institute, Top Tech Trends in 2025 survey, October 2024, N = 211 VCs (Investors) who answered the question.

"Combining AI and robotics on shop floors automates quality inspection, cutting defects and scrap, thus enhancing quality and sustainability. Future advances in sensors and computer vision will help robots interact more intuitively with the real world. I look forward to seeing sustainability more systematically embedded, optimizing resources, and improving energy efficiency in operations."

Philippine de T'Serclaes,
Chief Sustainability Officer at Dassault Systems

"I believe AI-powered robots will be a major trend by 2025 and beyond, driven by advancements in AI and robotics. The future of work will see closer collaboration between humans and robots, with collaborative robots playing a vital role in creating more agile, flexible, and efficient work environments."

Elisabet Svensson
Head of Technology Academy at Sweden SKF Group

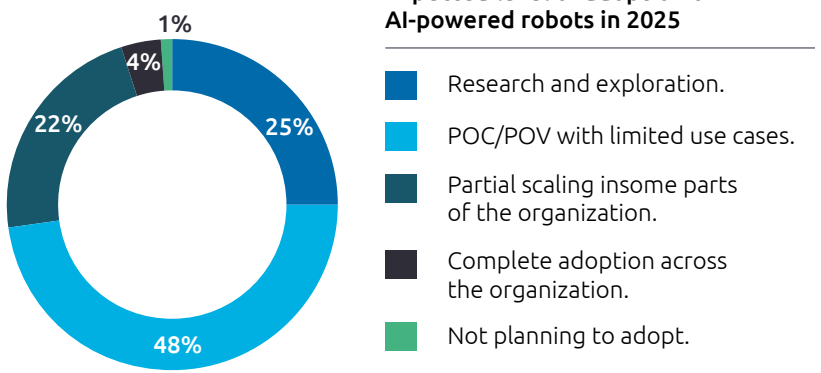
Expected adoption for 2025

In 2025, advances in natural language processing (NLP) and machine vision will boost robot capabilities to take on ever more complex roles within the modern workforce. More than one-quarter of executives (26%) in our survey plan to implement AI-powered robots partially or completely across their organization in 2025 (see Figure 14).

Lars Kunze, Professor in Safety for Robotics and Autonomous Systems at UWE Bristol, says: ***"Recent improvements in machine learning and vision enable robots to detect and manipulate objects safely and flexibly, fostering new opportunities for human-robot collaboration that were not possible in the past."***

FIGURE 14.

One-quarter of organizations will deploy partial or full-scale AI-powered robots in 2025



Source: Capgemini Research Institute, Top Tech Trends in 2025 survey, October 2024, N = 392 executives who answered the question.

- The retail sector reports the highest expected level of adoption with partial or complete scaling in 2025 at 39%, followed by automotive and industrial manufacturing, at 36% and 35%, respectively. Sectors that exhibit a high volume of repetitive tasks and labor shortages are actively exploring potential applications for improved efficiency.
- Despite low levels of implementation, sectors such as high tech and aerospace are experimenting with AI-powered robotics, with a view to standardizing workflows and processes, which would open the door for more widespread implementation.

What are the key barriers to adoption at scale?

To work effectively alongside robots, companies must invest in training and reskilling employees, which can be daunting. Integration difficulties with existing systems and limited AI adaptability, not to mention cost, are drags on adoption. Nearly half (43%) of our industry executives report inadequate technology and tooling infrastructure. Regulatory and safety issues also pose challenges, and without extensive, well-maintained datasets and proper data-collection protocols, AI systems can produce inaccurate or biased outputs, potentially leading to waste and quality issues in production environments.

Many organizations struggle to move past the POC phase, with 65% of executives from the industry and engineering domain citing insufficient budget as a major hurdle. Additionally, 45% of executives express concerns about uncertain return on investment, which contributes to stagnation at POC phase. There is also a need for specialized networking infrastructure, as metallic surfaces can limit network bandwidth.

Cultural and local resistance to automation by unions and workers further complicates the adoption of AI systems, as will the challenge of gaining social acceptance for the sinister-sounding dark factories concept. Despite concerns about job displacement, AI-powered robots are more likely to assist than replace human workers. South Korea, which has the highest robot density globally, still maintains a very strong manufacturing sector, demonstrating how technological innovation can complement human workforce capabilities – if implemented ethically and wisely.

65%

Many organizations struggle to move past the POC phase, with 65% of executives from the industry and engineering domain cite insufficient budget as a major hurdle.

"AI will power robots to learn individual preferences, adapt to unexpected human interactions, and share knowledge, making their interactions feel natural. The field is set for significant advancements next year, as robots begin to learn from real-world experiences and handle challenging situations."

Joel Martin,
Executive Research Leader, HFS Research

04 The surge in AI is driving nuclear resurgence

The energy sector is transforming at an unprecedented pace, driven by mounting pressure to respond to the climate crisis and supported by innovation across sectors, from renewables and biofuels to low-carbon hydrogen and beyond. Nuclear energy stands out as a focal point for 2025, having been propelled up the business agenda by the urgent need for clean, dependable, and controllable power that can support the rising energy demands of AI and other high-energy technologies.

> *"We believe that the rising energy demands of AI and other high-energy technologies create an urgent and rising need for nuclear energy, leading to its resurgence"*

Why nuclear energy is a top tech trend in 2025

Global energy demand is rising rapidly. The US Energy Information Administration's (EIA) 2023 *International Energy Outlook* predicts (with some uncertainty) it will increase by 30-76% by 2050, with most of that demand met by zero-carbon technologies, including nuclear.[32] Further, net-zero targets and climate pledges are putting pressure on energy and utilities organizations to decarbonize power generation while expanding their generation capacity. IAEA estimates that, by 2025, global nuclear capacity is expected to reach between 514 GW(e) in the low case and 950 GW(e) in the high case which are respectively 1.4x to 2.5x increase over the current capacity of 372 GW(e) as of the end of 2023.[33]

From 18% in its heyday in the 1990s, nuclear power's share of global electricity generation has halved to 9% today. But nuclear is a virtually carbon-free energy source that, unlike solar, wind, or wave energy, is independent of climatic conditions. As the second-largest source of clean energy (following hydropower, which generates 14% of global electricity), nuclear could power the large-scale transition toward low- and zero-carbon sources.

Nuclear's key role in reaching net zero received a major fillip in 2023 as described by Dr. Sama Bilbao y León, Director-General of the World Nuclear Association (WNA): ***"At COP28, 25 countries signed a declaration to triple global nuclear capacity by 2050. Excitingly, there are new reactors coming online and plans for new construction in a diverse range of countries."***[34]

Organizations recognize nuclear energy's potential to provide safe and stable, low-carbon power. Moreover, a global survey conducted in 2023 found that 46% of respondents supported the use of nuclear energy.[35]

Nuclear power generated by new plants has been rising steadily since 2015, with over 60 new reactors across 15 countries under construction globally at the time of writing. These projects will increase global nuclear power capacity by over 15% from current levels.[36]

In September 2024, 14 of the world's largest banks and financial institutions, including Bank of America, Morgan Stanley, and Goldman Sachs, came together to pledge their support for the goal to triple global nuclear energy capacity by 2050.[37] More than 20 countries, including Ghana, Poland, and the Philippines, are developing policies to enable construction of their first nuclear power plants.

From the technology perspective, SMRs offer scalable, cost-effective, and quicker-to-build alternatives to traditional reactors.

"If data is king, nuclear is queen – the power behind the throne. We believe that organizations must boldly invest in nuclear technology today to power our world tomorrow, including powering the advancements in AI that will reshape our future."

Paul Shoemaker
Nuclear Transformation Director, Capgemini

What organizations and investors are saying

Rising demand for clean energy from tech giants Microsoft, Google, and Amazon is one of the biggest factors driving interest in nuclear power today. Exponential growth in demand for AI and Gen AI services, and the data centers that power them, has sent big tech carbon emissions levels soaring. Earlier in 2024, Microsoft reported that its emissions had grown by 29% since 2020, while Google's emissions rose 49% between 2019 and 2023.[38] The past few months of 2024 have seen several major announcements:

- Microsoft signed a 20-year deal to purchase power from a plant in Pennsylvania that is scheduled to reopen in 2028 following renovations.[39] Announcing the deal, Bobby Hollis, Vice-President of Energy at Microsoft, said: ***"This agreement is a major milestone in Microsoft's efforts to help decarbonize the grid in support of our commitment to become carbon negative."***
- Google has announced plans to purchase electricity generated using SMRs developed by California-based Kairos Power.[40]
- Meta has announced an RFP for 1-4 GW of new nuclear.[41]
- Amazon has signed three agreements to support the development of nuclear energy projects, including the construction of several SMRs, which is much quicker and can be carried out much closer to the grid than with conventional reactors.[42]
- Oracle has announced that it is designing a data center that will require more than 1 GW of electricity from three SMRs.[43]

Key nuclear technologies that are poised for strong growth are:

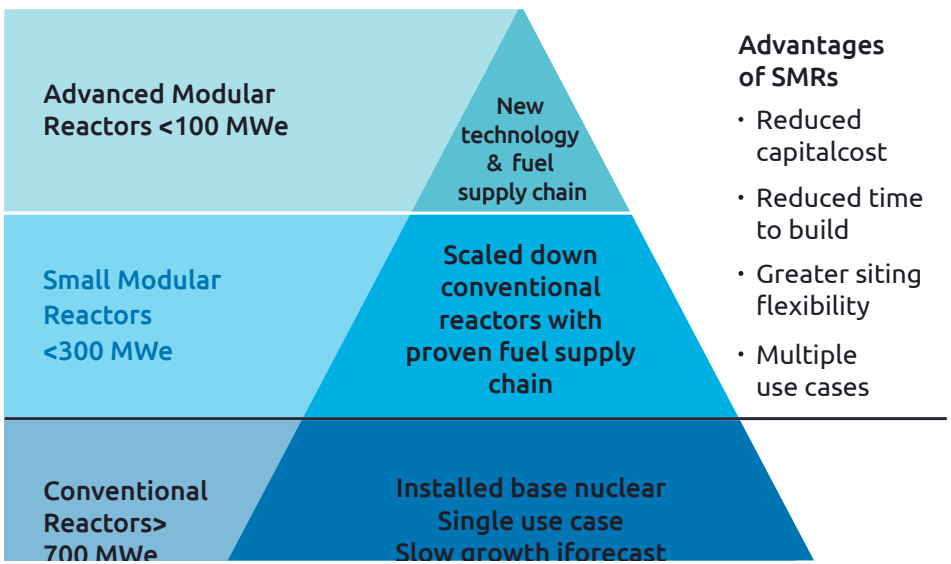
- **SMRs, based on proven tech and light water reactors** offer safe, scalable, and more cost-effective alternatives to traditional reactors. SMRs are based upon proven commercial nuclear technology and/or naval reactor technology (with hundreds of naval reactors developed), and a 70+ year operational history that could speed up the regulatory approval process. Furthermore, the segment boasts an established fuel supply chain and does not require ultra-heavy forging capacity.
- **Advanced modular reactors (AMRs):** Also known as Generation IV reactors, these use innovative fuels, coolants, and technology to generate low-carbon electricity and/or heat. They are intrinsically safe and can be quite compact, even portable, allowing for a multitude of use cases. However, it should be noted that this technology and supply chain are still in development.
- **Fusion energy breakthroughs:** The coming years may witness significant advances in fusion energy, with projects such as the International Thermonuclear Experimental Reactor (ITER) and startups such as Helion Energy making strides toward producing limitless supplies of clean power.

Over **60**

new nuclear reactors across 15 countries are under construction at the time of writing.

FIGURE 15.

SMRs will lead the way for new nuclear as they are poised for rapid industrialization



Source: Capgemini.

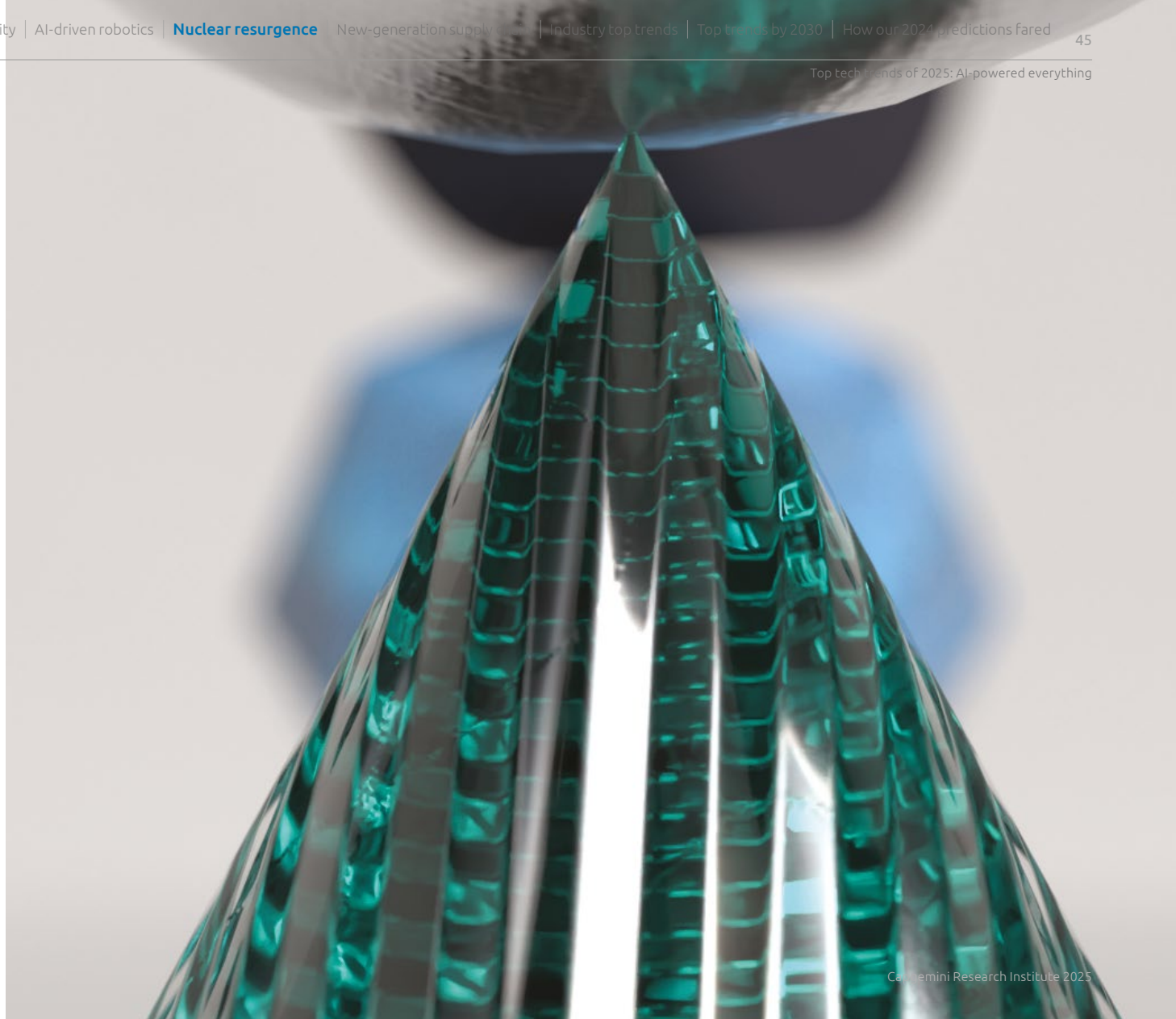
In addition to the strong market demand for nuclear energy, we at Capgemini believe that two key advantages will propel the adoption of SMRs: short time-to-market and low cost per unit.

Time-to-market can be reduced by employing advanced design and project-management practices, including digital twin technology and AI-driven simulations, to optimize assembly schedules. Achieving both the reduction in installed cost and a quicker time-to-market requires advanced digital continuity and data-centric technologies to maximize efficiency, ensure collaboration across all stakeholders, and manage a complex build process. Additionally, digital technology will enable the implementation of innovative Gen AI solutions, further driving industrialization.

Expected adoption for 2025

Although very few executives and investors in our surveys conducted in October 2024 globally identified SMRs as a top three sustainability technology for 2025, we believe that SMR and AMR technology development will accelerate in 2025. The product director at a leading commercial nuclear business agrees: ***"Nuclear is in the best place it has been in the past 20 years. Many of the customers, such as hyperscalers, have the money to invest in nuclear now. In 2025, I expect to see a lot of Memoranda of Understanding and tangible progress in supply chain groups to bring together providers of forgings and other commercial nuclear components."***

Such large-scale investments are expected to further accelerate innovation in reactor technology and waste management, as the tech sector acknowledges that renewables alone cannot sustain its energy demands. 2025 will be a critical year for nuclear energy as we wait to see whether recent hyperscaler projects announced in the US will take off.



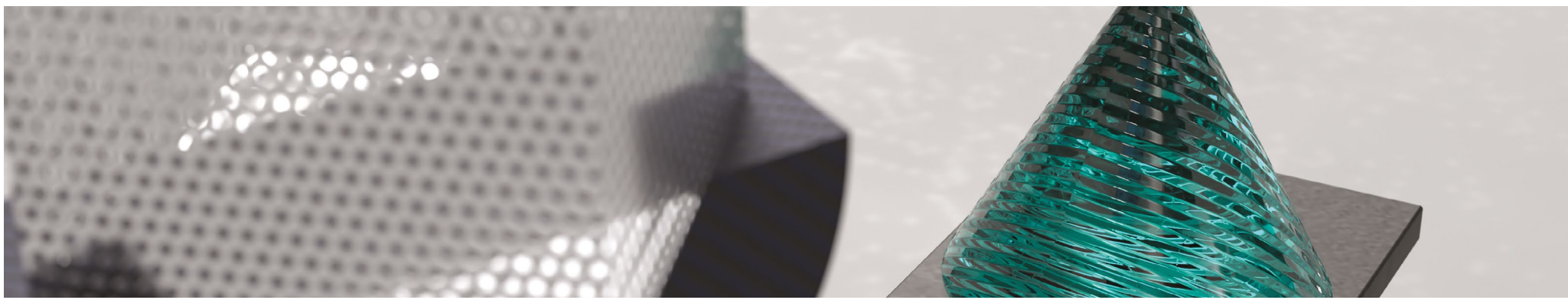
What are the key barriers to adoption at scale?

One of the barriers to adoption of SMRs is scaling and related aspects of project performance and financing. However, as investment pledges in proven technology, best practices, and resources increase, this will become less daunting. Moreover, modularization will yield advantages with scale. The US Department of Energy estimates firm orders for 10 units will be enough to kickstart scaling. A firm order for 10 units is well within the financial and risk profile of a hyperscaler, whereas this would be a challenge for many utilities, whether private or public, for a variety of reasons.

Ultimately, we believe AMRs represent the future of nuclear – albeit a future that is still some way off. They have a broad scope of use cases stemming from a compact, intrinsically safe design, high-temperature output, and an innovative commercial model (based on selling electricity, rather than units). But owing to the wide variety of designs in use, their fuel supply chain is still developing. This diversity also means there are a range of regulatory requirements. In the longer run, though, we expect AMRs to thrive in an improved regulatory environment, permitting deployment at scale.

There are approximately 80 SMRs, including AMRs under development in 18 countries, from design to construction. However, design failure and fuel supply chain development issues will lead to market rationalization. This should not be taken as the failure of nuclear but rather a refining of approaches.

More importantly, even as SMR technology gains credibility, scaled adoption will prove challenging. An important question is, beyond the hyperscalers, will there be broad-scale acceptance by regional and local governments, and by the public?



"Based on our experience with the digital continuity and digital twin journey of similar, highly regulated industries such as aircraft manufacturing, we believe that digital has the potential to significantly improve nuclear design/build efficiency. Organizations need to accelerate making investments in digitalization of nuclear and the associated AI strategy."

Laurent Bromet
Global Head of Sustainability and Climate Tech,
Capgemini Engineering

05 New-generation supply chains: Agile, greener, and AI-assisted

85%

of CTOs, heads of innovation/CIOs, and heads of R&D, engineering, and product agree that 'new-generation supply chains' is among the top three technology trends for 2025 (across more than 60 trends in our survey).

Executives from six out of 12 sectors surveyed ranked new-generation supply chains as the top trend for 2025;

70%

of executives put it among the top three trends for 2025 within the industry and engineering domain.

Why new-generation supply chains will be a top trend in 2025

Capgemini expects new-generation supply chains to create a big impact in 2025. Geopolitical tensions, from US-China trade friction and the Russia-Ukraine conflict to Middle East instability, are leading companies to prioritize supply chain resilience, diversifying sourcing locations, and reducing single-region reliance. This often involves nearshoring or friend-shoring production to politically aligned countries.

Sustainable supply chains and product passports enable transparency and accountability in sourcing and production. By harnessing cutting-edge technologies such as digital twin and AI-powered algorithms, businesses can simulate various scenarios to optimize operations for agility and resilience. ***"Supply chains are shifting production from China to countries like Vietnam, Indonesia, Malaysia, and India. Organizations must improve forecasting and adopt AI-based solutions to enhance accuracy and efficiency,"*** adds Alan Boehme, former CTO, H&M Group.

These advancements empower companies to adapt swiftly to market dynamics, enhancing efficiency and meeting growing consumer demand for eco-friendly practices.

> *"We believe that the perpetual state of crisis in global supply chains will drive the evolution of new-generation supply chains that are agile, sustainable, and AI-assisted."*

Michael Brown, CEO, North America, SupplyChainWise, adds: ***"The new generation of supply chains focuses on AI-driven automation in seven key areas: demand forecasting & planning; supply & procurement management; smart manufacturing (predictive maintenance, automation, etc.); warehouse & transportation automation; sustainability & circular supply chains; risk & disruption; and workforce enablement."***

"We are facing a multifaceted global supply chain crisis, with pandemic-related disruptions, container shortages, energy crises, geopolitical tensions, and climate events like droughts and floods that can halt production instantly. This is why we believe that a paradigm shift is needed in traditional supply chains to not only make them more resilient, but also more sustainable."

Emmanuelle Bischoffe-Cluzel
Vice President and Sustainability Lead,
Global Automotive Industry, Capgemini

AI technology is redefining supply chain management. New-generation supply chains integrate AI and IoT to enhance efficiency, reduce waste, and support sustainability goals. In the retail sector, Amazon's next-generation fulfillment center in Shreveport, Louisiana, features innovations such as the Sequoia AI inventory system and advanced autonomous robots such as Proteus. This 3-million-sq-ft facility accelerates order processing by 25%, enhances safety through ergonomic design and reduces packaging waste.[44]

Data and AI enhance supply chain visibility by enabling real-time tracking and predictive analytics, leading to improved decision-making, reduced costs, and increased responsiveness to market changes. This transformation drives efficiency and resilience in new-generation supply chains. We expect a supply chain revolution that's not just smart but spectacular, harmonizing speed, transparency, and resilience across industrial landscapes.

"The new generation of supply chains focuses on AI-driven automation in seven key areas: demand forecasting & planning; supply & procurement management; smart manufacturing (predictive maintenance, automation, etc.); warehouse & transportation automation; sustainability & circular supply chains; risk & disruption; and workforce enablement."

Michael Brown
CEO, North America, SupplyChainWise

What organizations and investors are saying

Among the 1,500 industry executives we surveyed, about 70% picked new-generation supply chains as a major tech trend for 2025, making it the top trend within the industry and engineering domain (see Figure 16).

Executives from six out of 12 sectors surveyed ranked new-generation supply chains as the top trend for 2025: 80% of energy and utilities industry executives, 78% of retail industry executives, and 75% of telecom executives ranked it among the top three tech trends for 2025.

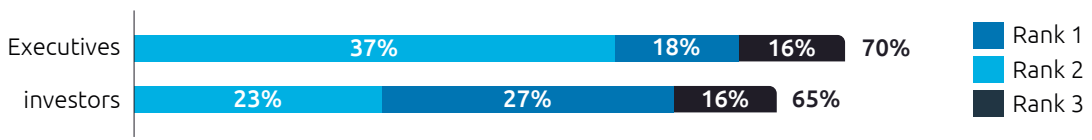
70%

of executives say new-generation supply chains is among the top three trends for 2025 within the industry and engineering domain.

FIGURE 16.

70% of industry executives say new-generation supply chains is among the top three trends for 2025 within the industry and engineering domain

Share of industry executives from organizations and investors that expect new-generation supply chain to create a major impact in 2025



Source: Capgemini Research Institute, Top Tech Trends survey; October 2024, N = 1,500 executives, and N = 500 VCs (Investors); N = 603 executives following industry and engineering domain, new-generation supply chains selected among top three ranks; N = 425 executives who answered the question.

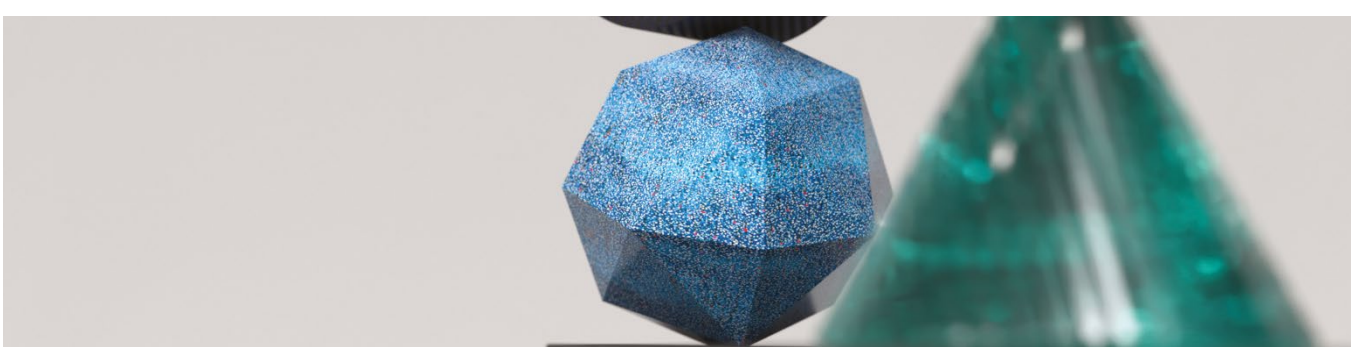
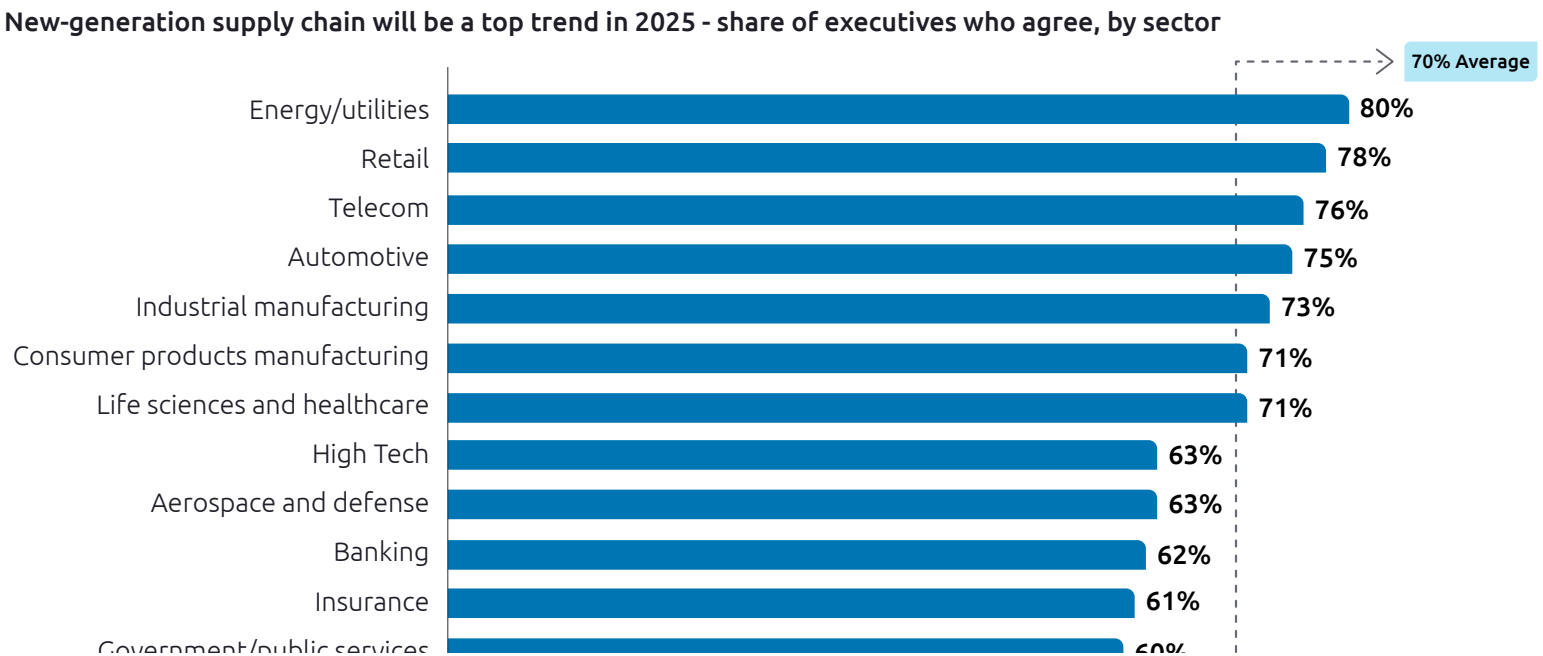


FIGURE 17.

New-generation supply chain is a top tech trend across sectors for 2025



Source: Capgemini Research Institute, Top Tech Trends survey; October 2024, N = 1,500 Executives, and N = 500 VCs (Investors), N = 603 Executives following industry & engineering domain, new generation supply chains selected among top 3 ranks N = 425 executives who answered the question.

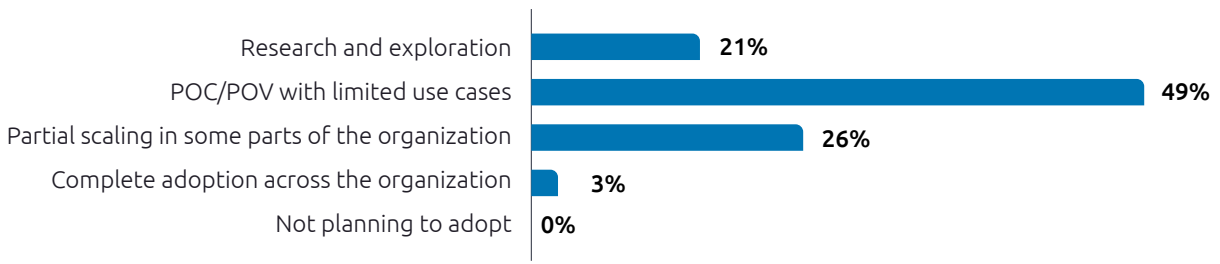
Expected adoption for 2025

Currently, 49% of organizations are at the PoC stage, exploring limited AI use cases to enhance supply chain responsiveness (see Figure 18 below). AI algorithms can analyze vast datasets to forecast demand and optimize inventory, and 26% of organizations are partially scaling these technologies, reflecting a shift to data-driven decisions. However, only 3% expect full adoption of sustainable practices by 2025, highlighting the challenges to growth potential.

FIGURE 18.

More than 75% of executives say their organization is at the PoC/PoV stage with new-generation supply chains, with limited use cases

Organizations' expected level of adoption in 2025: "New-generation supply chain"



Source: Capgemini Research Institute, Top Tech Trends survey; October 2024, N = 1,500 Executives, and N = 500 VCs (Investors), N = 603 Executives following industry & engineering domain, new-generation supply chains selected among top three ranks N = 425 executives who answered the question.

In 2025, about 20% of investment in the industry and engineering domain will go exclusively to new-generation supply chains, representing a projected increase of 9% from 2024.

Tech giants AWS and Intel are intent on transforming AI-driven supply chains. Their groundbreaking, multi-year, multi-billion-dollar partnership to develop custom AI chips should enhance the performance of AI applications while strengthening the domestic AI supply chain.[45]

Expected trend adoption by sector/industry:

- **Consumer products manufacturing**: 19% of executives report partial scaling of this trend
- **Industrial manufacturing:** 30% of organizations are in the research and exploration phase
- **High tech:** 8% expect full adoption by 2025
- **Automotive:** 36% are working on PoCs, but only 7% foresee full integration
- **Energy/utilities:** 36% are in the exploration phase
- **Aerospace and defense:** 48% are in the PoC phase, with just 1% expecting full integration by 2025, due to complexity and regulations

Nearly seven in 10 executives across sectors in the sustainability domain say sustainable supply chain (including product passports) will be the top trend in 2025. This includes more than 80% of executives from the energy/utility, life sciences/healthcare and retail sectors. It is worth noting that, from July 2024, the new Ecodesign for Sustainable Products Regulation (ESPR) will come into force across the EU, replacing the Ecodesign Directive.

In 2027, batteries will become the first product group for which digital product passports (DPPs) are mandatory. Batteries play a central role in sustainable transport and energy transition, powering electric vehicles (EVs), as well as storing energy from renewable sources. More broadly across many other industries, DPPs have the potential to enhance transparency, traceability, and sustainability, ensuring efficient resource management and compliance with regulations. Liz Bacelar Executive Director Global Tech Innovation, The Estée Lauder Companies, highlights the impact of DPPs from the beauty industry's perspective, ***"As we approach 2025, the adoption of DPPs in Europe promises to revolutionize the beauty industry. Using QR codes and NFC (Near Field Communication, for short-range low-payload data sharing) technology, these passports will enable luxury products to share their unique stories while ensuring authenticity. DPP has the potential to redefine not just the luxury cosmetics market but multiple industries, serving as a pivotal innovation in combating counterfeiting and strengthening consumer trust."***

7 in 10

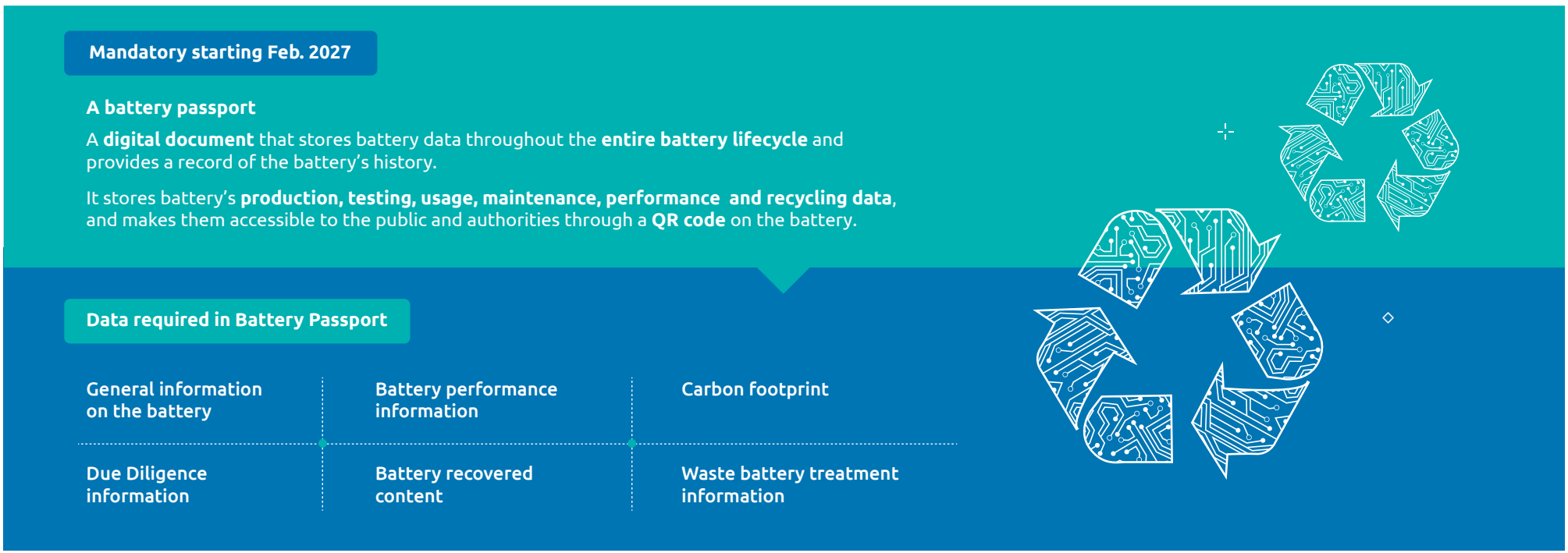
Nearly seven in 10 executives across sectors in the sustainability domain say sustainable supply chain (including product passports) will be the top trend in 2025.

"As we approach 2025, the adoption of DPPs in Europe promises to revolutionize the beauty industry. Using QR codes and NFC (Near Field Communication, for short-range low-payload data sharing) technology, these passports will enable luxury products to share their unique stories while ensuring authenticity. DPP has the potential to redefine not just the luxury cosmetics market but multiple industries, serving as a pivotal innovation in combating counterfeiting and strengthening consumer trust."

Liz Bacelar
Executive Director Global Tech Innovation,
The Estée Lauder Companies

FIGURE 19.

The battery passport aims to increase transparency and spur collaboration between value chain players, enabling circularity.



What are the key barriers to adoption at scale

Key roadblocks to adopting new-generation supply chains in 2025 include:

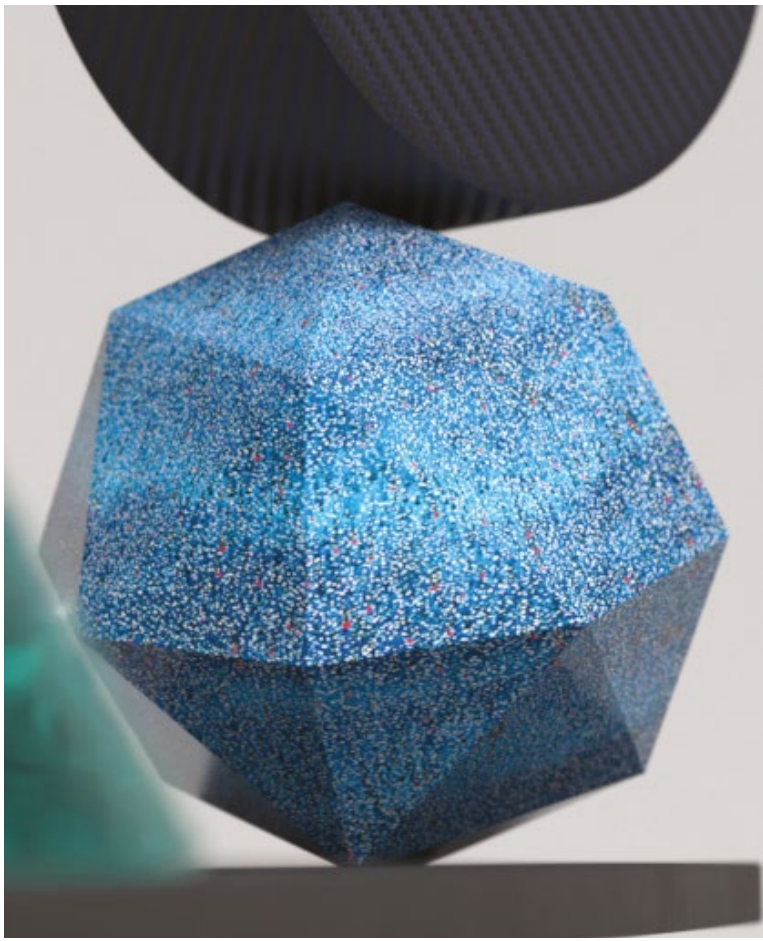
- High implementation costs
- Lack of skilled workforce and less data-driven culture
- Data security concerns
- Supplier/third-party data transparency
- Resistance to change within organizations

In modern supply chains, key regulatory concerns include compliance with data privacy, environmental sustainability, labor standards, and human rights. As AI and automation integrate into complex global networks, robust data security and ethical sourcing practices will be essential. For instance, the EU's Corporate Sustainability Reporting Directive (CSRD), including emissions in the supply chain, among other aspects, was followed in July 2024 by the EU's new flagship supply chain law, the Corporate Sustainability and Due Diligence Directive (CSDDD).

Our survey reflects some of the key concerns of executives focusing on the industry and engineering domain to scale new-generation supply chains technologies:

- Constraints in planning, funding, or leadership backing (65%)
- Unclear ROI (45%)
- Regulatory/compliance concerns (44%)
- Policy shifts under the new US administration may impact green initiatives, creating uncertainty around sustainability-focused supply chain investments. Also, increased localization could strain global supplier relationships, requiring supply chain to adapt to diverse standards and regional complexities.

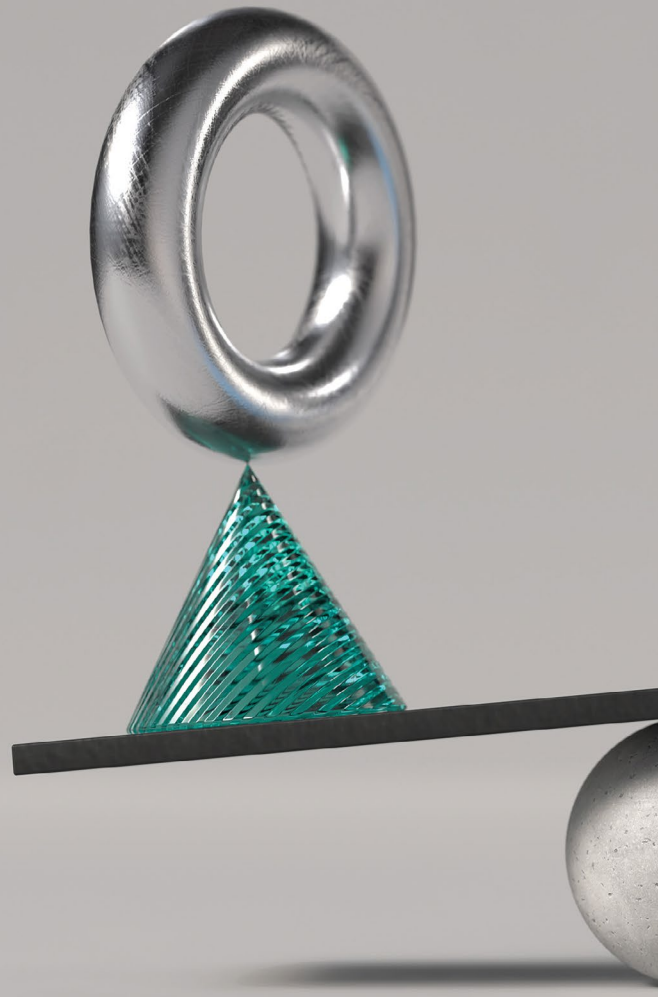
Additionally, integrating advanced technologies with existing systems can pose significant challenges, hindering seamless transitions and scalability. Addressing issues such as these are crucial to successful adoption.

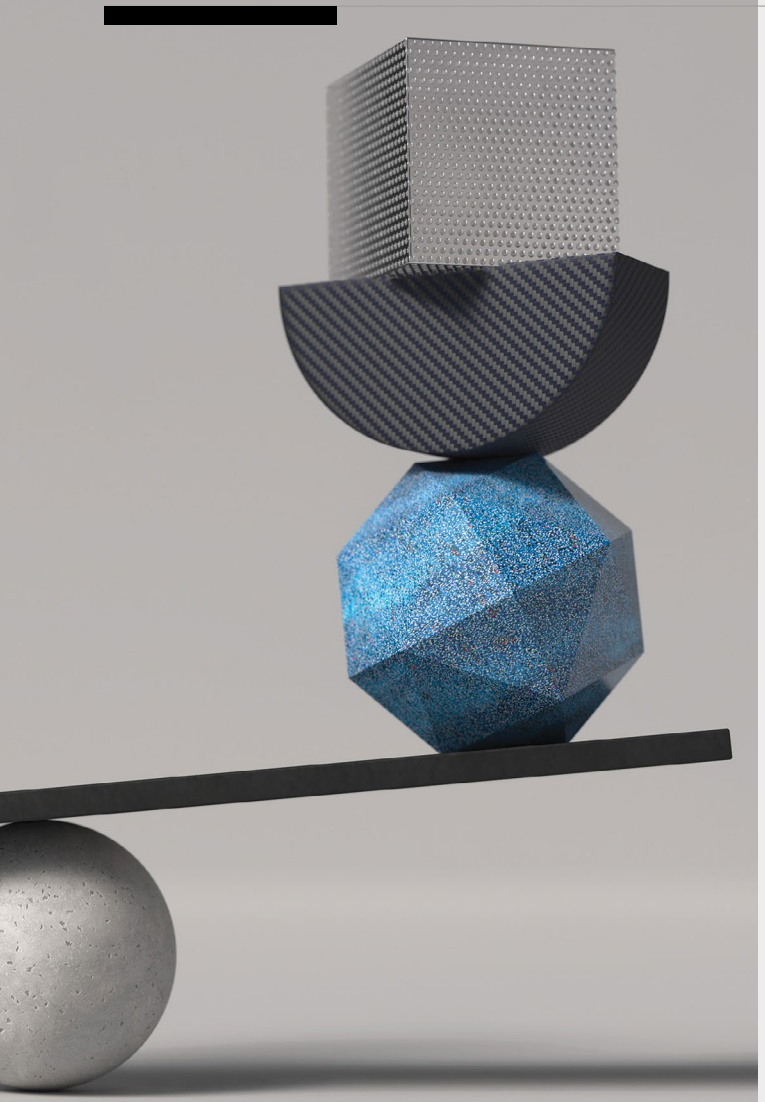


"Supply chains are shifting production from China to countries like Vietnam, Indonesia, Malaysia, and India. Organizations must improve forecasting and adopt AI-based solutions to enhance accuracy and efficiency."

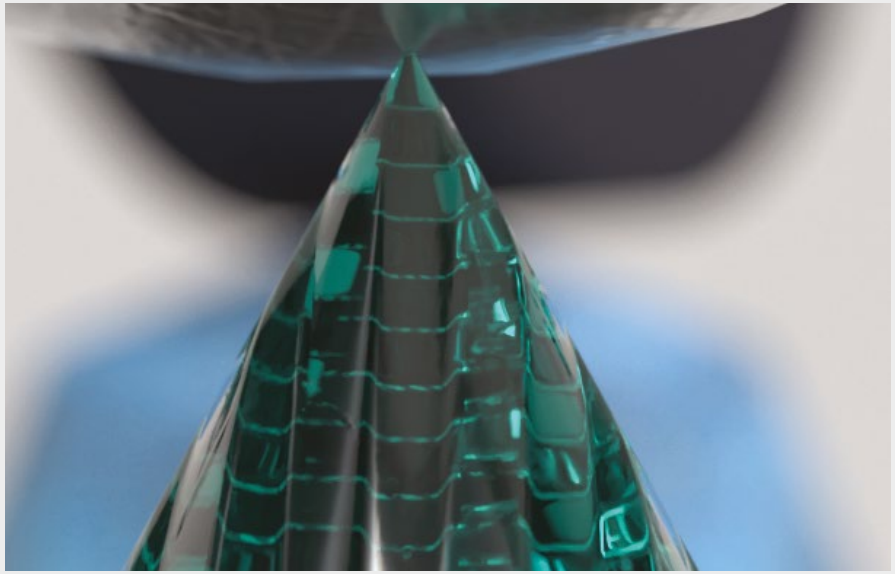
Alan Boehme
Former CTO , H&M Group

II. What are industry executives' top tech trends for 2025?





In 2025, industries worldwide will arrive at the crossroads of transformation, driven by technological breakthroughs reshaping innovation, efficiency, and sustainability. The top trends suggest a future where cutting-edge technologies converge with industry-specific demands, unlocking unparalleled opportunities. Below, we summarize the top 5 tech trends of 2025 as specified by executives from each sector we surveyed in our research. Notably, there is some divergence from Capgemini's and investors' views. The highlighted in blue are those that appear in the top 5 across all sectors in Capgemini's view.



Automotive

Top five tech trends to watch in 2025

New-generation supply chain:
Agile, greener, and AI-assisted

AI agents:
Autonomous intelligent systems performing specific tasks without human intervention

AI in software engineering:
Use of AI and Gen AI in all aspects of software engineering, e.g., coding, testing, and documentation, among others

Industry clouds:
platforms that offer specific solutions for different industries

Multimodal AI:
AI that can process multiple types of data at once e.g., text, audio, images and generate better solutions

We observe that automotive CxOs are distinctly preoccupied with the resilience of their supply chains, undoubtedly in large part as a symptom of post-COVID trauma.

We also notice the growing importance of digitization in auto, driving a keen interest for the potential of AI in software development

Industry examples:

- General Motors (GM) integrates sustainability into its supply chain through its BrightDrop platform for EV logistics, sustainable sourcing practices, and advancements in EV technologies.[46]

- AI dominates all aspects of software engineering. For instance, BMW has deployed AI and Gen AI solutions to help software developers review and optimize cloud architecture, saving valuable computing resources and lowering cost. BMW uses AI-driven robotics in its assembly lines to ensure each vehicle meets its exacting standards.[47]

Aerospace and defense

Top five tech trends to watch in 2025

AI in software engineering:
Use of AI and Gen AI in all aspects of software engineering, e.g., coding, testing, and documentation, among others

AI & Gen AI in cybersecurity:
Enhancing cyber threat detection, automated response, and vulnerability prediction using AI & Gen AI

Green software engineering:
Making software engineering more sustainable

Communication futures:
6G, Edge or Fog computing, Open RAN

Advanced endpoint security:
Protecting devices like laptops and phones from threats using detection and response tools

In aerospace and defense, it is notable how executives attribute strong importance to endpoint security, cybersecurity, and networking (including decentralized and edge networking), for both civilian and military use cases.

Industry examples:

- Airbus launched a company-wide working group that harnesses LLMs and base models. This includes Gen AI for cyber threat and risk analysis.[48]

- One of the FutureG office's top priorities is a direct outgrowth of the 5G Challenge called OCUDU, which stands for 'open centralized unit, distributed unit.' OCUDU focuses on implementing a fully open software model for 6G that meets the needs of industry, the research community, and the Department of Defense. The office is exploring how the military could use 6G for sensing and monitoring.[49]

Life sciences and healthcare

Top five tech trends to watch in 2025

Gene editing and CRISPR technology:
Editing genetic material for disease research and treatment among other uses

New-generation supply chain:
Agile, greener, and AI-assisted

Cell and gene therapy:
Targeting specific genes to treat genetic diseases at source

AI agents:
Autonomous intelligent systems performing specific tasks without human intervention

Multimodal AI:
AI that can process multiple types of data at once e.g., text, audio, images and generate better solutions

As expected, CxOs in life sciences and healthcare pay very close attention to technology trends highly specific to their respective sectors, with particular focus on the promising fields of gene therapy and gene editing.

Beyond these sector-specific trends, life sciences executives are interested in the potential of AI for a variety of use cases (drug discovery, supply chain optimization, etc.).

Industry examples:

- Pfizer is using AI to optimize its supply chain, enhance drug development, clinical trials, and vaccine distribution. AI-driven analytics have been key in predicting and managing supply chain challenges, particularly during rollout of COVID-19 vaccines.[50]
- Kahun, a pioneer in medical knowledge structuring, has introduced a new AI agent specifically for the pharmaceutical industry. The AI agent is designed to bridge the gap between medical knowledge and patient context, providing professionals with reliable and accessible drug-related information.[51]
- Moon Surgical has developed the Maestro, a collaborative robot that improves precision during surgical procedures. The system, powered by NVIDIA Holoscan, has already treated over 200 patients.[52]

Energy and utilities

Top five tech trends to watch in 2025

New-generation supply chain:
Agile, greener, and AI-assisted

AI agents:
Autonomous intelligent systems performing specific tasks without human intervention

Multimodal AI:
AI that can process multiple types of data at once e.g., text, audio, images and generate better solutions

AI in software engineering:
Use of AI and Gen AI in all aspects of software engineering, e.g., coding, testing, and documentation, among others

AI & Gen AI in cybersecurity:
Enhancing cyber threat detection, automated response, and vulnerability prediction using AI & Gen AI

In energy and utilities, we see a focus on digital transformation, operational resilience, and sustainability. The interest in supply chains and AI agents reflect a need for efficiency and adaptability in managing renewable integration and decentralized systems.

Multimodal AI and AI in DevOps focus on harnessing advanced data analysis and IT/OT integration, while interest in Gen AI for cybersecurity underscores the priority of protecting critical infrastructure as digitalization increases complexity and attack surfaces.

Industry examples:

- Shell's Fleet Decarbonisation Report highlights how supply chain leaders can use fleet data to meet net zero goals. By utilizing telematics and AI, businesses can assess operations, optimize energy solutions, and drive sustainability through electrification and alternative fuels.[53]
- Siemens Energy uses its AI-based service Managed Detection and Response (MDR), which recognizes potential attacks and stops them before they occur.[54]
- For utilities, nuclear energy provides a base load that helps stabilize the grid during large fluctuations in power input or output. Micro-modular reactors – small SMRs up to 15 MWe – can power remote communities, light industry, and electrically underserved markets. Their simplified design drives down both installation and operating costs, making them attractive to emerging economies.

Industrial manufacturing

Top five tech trends to watch in 2025

New-generation supply chain: Agile, greener, and AI-assisted

AI in software engineering: Use of AI and Gen AI in all aspects of software engineering, e.g., coding, testing, and documentation, among others

AI agents: Autonomous intelligent systems performing specific tasks without human intervention

Industry clouds: platforms that offer specific solutions for different industries

Specialized silicon/ Embedded silicon: for instance, specialized embedded silicon chips designed specifically for autonomous driving

In 2025, CXOs in industrial manufacturing will harness AI in DevOps and design to drive innovation and efficiency. New-generation supply chains and industry clouds will provide the agility needed to respond swiftly to market demands.

AI agents will enhance decision-making processes, while specialized silicon will offer tailored solutions for complex manufacturing challenges, ensuring a competitive edge.

Industry examples:

- Honeywell's IntelliTrace unit and its partnerships with firms such as Hai Robotics allow it to enhance warehouse automation via robotics and software solutions. Honeywell continues to make strategic investments for warehouse automation with new generation tools.[55]
- Bosch recognizes the potential of an AI Orchestration Platform and the substantial need to invest in AI Agents for streamlining daily tasks.[56]
- Schneider Electric uses fully integrated AI-powered autonomous robots for machine-part maintenance, transportation, and inventory management.[57]
- With regards to use of nuclear energy, heavy industries are also considering SMRs, including mining, to transition away from carbon-intensive power sources such as diesel generators at large, remote mines.[58] Advanced high-temperature reactors can provide both process steam, critical to many industrial processes, and electricity, which makes them ideal as a platform to decarbonize.

Government/public services

Top five tech trends to watch in 2025

AI & Gen AI in cybersecurity: Enhancing cyber threat detection, automated response, and vulnerability prediction using AI & Gen AI

Biomanufacturing: Manufacturing processes that use biological systems to produce viable biofuels, biochemicals etc.

New-generation supply chain: Agile, greener, and AI-assisted

MobilityTech: Innovations in transportation systems, vehicles, and mobility solutions for smarter, sustainable travel

Green software engineering: Making software engineering more sustainable

CxOs in government/public services are favoring trends that balance security, innovation, and sustainability. Gen AI in cybersecurity and new-generation supply chains address operational resilience, while biomanufacturing and MobilityTech highlight investments in sustainable and societal advancements.

Green software engineering reflects a broader commitment to sustainability, making these trends key enablers for addressing public-sector challenges.

Industry examples:

- The government of Singapore, uses AI to detect and respond to security threats in real time, including using algorithms to analyze network traffic and identify potential threats. It also uses AI to enhance its Government Cybersecurity Operations Centre (GCSOC).[59]
- The UK government's Critical Imports and Supply Chains Strategy with Data Analytics enhances resilience against global disruptions, ensuring access to essential goods such as medicines and semiconductors.[60]

Banking and insurance

Top five tech trends to watch in 2025

AI in software engineering:
Use of AI and Gen AI in all aspects of software engineering, e.g., coding, testing, and documentation, among others

AI & Gen AI in cybersecurity:
Enhancing cyber threat detection, automated response, and vulnerability prediction using AI & Gen AI

AI agents:
Autonomous intelligent systems performing specific tasks without human intervention

FinTech:
Digital innovations reshaping financial services, payments, and banking systems

Multimodal AI:
AI that can process multiple types of data at once e.g., text, audio, images and generate better solutions

In financial services, we see a strong focus on AI across multiple domains.

The focus on AI in DevOps, cybersecurity, and software development highlights efforts to strengthen resilience, enhance operational efficiency, and safeguard against threats. Interest in AI agents and FinTech underscores the drive to automate processes and embrace innovation, ensuring a competitive edge in a highly dynamic and regulated industry.

Industry examples:

- Zetaris launched customizable AI agents tailored to perform specialized roles such as brokers, bankers, risk analysts, and more.[61]

- Mastercard uses Gen AI-based predictive technology to protect future transactions against emerging threats by doubling detection rate of compromised cards; reducing false positives during card fraud detection by up to 200%; and increasing speed of identification of at-risk/ compromised merchants by 300%.[62]

Telecom and high tech

Top five tech trends to watch in 2025

AI & Gen AI in cybersecurity:
Enhancing cyber threat detection, automated response, and vulnerability prediction using AI & Gen AI

AI in software engineering:
Use of AI and Gen AI in all aspects of software engineering, e.g., coding, testing, and documentation, among others

Industry clouds:
platforms that offer specific solutions for different industries

Multimodal AI:
AI that can process multiple types of data at once e.g., text, audio, images and generate better solutions

Communication futures:
6G, Edge or Fog computing, Open RAN

The telecom/high tech sector prioritizes trends that enhance security, scalability, and connectivity, with a strong emphasis on using AI for operational efficiency and cybersecurity.

The focus on industry clouds and communication highlights the sector's vision for a connected future, while multimodal AI reflects the need for innovative data solutions to support increasingly complex telecom ecosystems.

Industry examples:

- Vodafone is partnering with Google to offer business customers improved cyber protection through its upcoming cloud-native cybersecurity solution, which harnesses Google's cloud-based Gen AI tools.[63]
- Korean telco LG Uplus said it recently tested the All-Photonic Transport Network, which is a key technology designed to reduce power consumption in the era of future 6G networks.[64]
- Bell Canada has built customizable contact-center solutions with AI-powered agents and Agent Assist, which offers suggestions and 'sentiment analysis' to human agents. Estimates suggest that AI has saved $20 million across customer operations.[65]
- LG's AI agent boasts robotic, AI, and multi-modal technologies that enable mobility, active learning, and engagement with complex conversations. It can manage smart-home devices without user oversight; patrol empty homes; monitor the well-being of pets; and enhance domestic security and improve energy efficiency.[66]

Retail/consumer product manufacturing

Top five tech trends to watch in 2025

AI & Gen AI in cybersecurity:
Enhancing cyber threat detection, automated response, and vulnerability prediction using AI & Gen AI

Multimodal AI:
AI that can process multiple types of data at once e.g., text, audio, images and generate better solutions

AI in software engineering:
Use of AI and Gen AI in all aspects of software engineering, e.g., coding, testing, and documentation, among others

AI agents:
Autonomous intelligent systems performing specific tasks without human intervention

New-generation supply chain:
Agile, greener, and AI-assisted

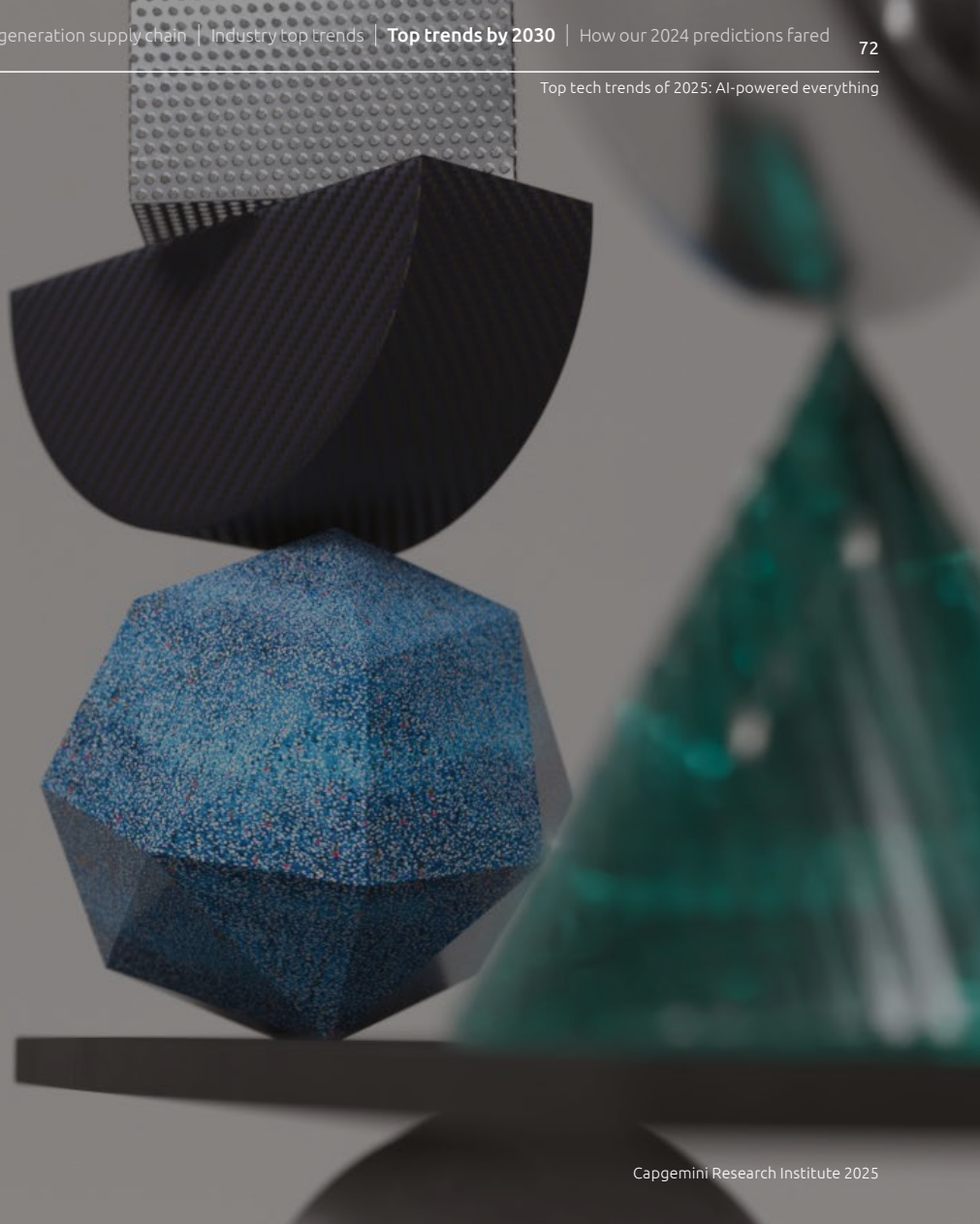
In the retail and consumer products manufacturing sector, Gen AI will enhance cybersecurity measures, protecting sensitive data. Multimodal AI will provide deeper customer insights, improving personalization. AI in software development will drive innovation, creating more efficient processes.

AI agents will streamline operations, reducing costs and increasing productivity. New-generation supply chains will offer greater agility and resilience, enabling quicker responses to market changes.

Industry examples:

- Amazon has set-up a next-generation fulfillment center with AI powered robotics that assists employees and improves safety and sustainability.[67]
- Procter & Gamble's Supply Chain 3.0 harnesses AI, automation, and data analytics to enhance resilience, optimize truck scheduling, and minimize idle time.[68]
- PespsiCo harnesses Gen AI to analyze customer feedback, which it uses to refine shape design and flavor of its Cheetos branded snack, boosting market penetration by 15%.[69]
- Brazilian beauty retail and cosmetics, Grupo Boticário, employs real-time security models to detect, prevent, and respond to potential fraud.[70]

III. Top trends by 2030 and beyond



Our crystal ball shows an exciting technological future in store. By 2030, several groundbreaking trends are poised to revolutionize our lives. Topping the list is artificial general intelligence (AGI), which could redefine how we interact with machines that are as versatile as humans. Meanwhile, advancements in molecular assembly and genomic therapies promise to transform sectors from healthcare to manufacturing, enabling innovations that were once the stuff of science fiction.

68%

of industry executives who follow computing and networking say quantum computing is still in research/exploration, PoV/PoC phases, with limited use cases.

Here are some key insights from the survey results from both industry executives (technology and innovation leaders) and VCs (investors):

Programmable new materials: Materials that are engineered to change their properties, such as shape or color, at molecular assembly level in response to external stimuli or programming. This involves directly rearranging atoms and molecules with precision, allowing for the creation of highly specialized and efficient nanostructures and materials, leading to innovations in smart materials and adaptive systems. A total of 37% of executives say it is a key technology trend for 2030 and beyond. For businesses, this trend hints at a future where precision manufacturing could unlock new realms of innovation and efficiency.

For consumers, there is excitement around materials that can adapt their properties on command – imagine clothing that changes color or customizable furniture! Companies such as BASF are integrating programmable features into their advanced materials portfolio, focusing on applications in construction and automotive industries.

Quantum computing: Quantum computing uses the unique properties of tiny particles to solve problems much faster than classical computers can, helping with tasks such as encryption, optimization, and simulations. By 2030, this technology is expected to revolutionize fields such as cryptography, drug discovery, and climate modeling. The key question is: When will the quantum leap happen, and who will master it?

Christophe Dufour, Global Head of Digital Precision Healthcare at AstraZeneca, adds: ***"By 2030, quantum computing will not only help us discover new data but also enable the creation of new molecules from scratch using molecular models. This technology promises to revolutionize drug discovery, reducing development time from years to months."***

Around 68% of industry executives who follow computing and networking say quantum computing is still in research/exploration, PoV/PoC phases, with limited use cases. ***"Quantum computers have the potential to break traditional encryption methods in the next 5 years, which has led to the development of quantum and post-quantum cryptography (PQC). While quantum cryptography uses the principles of quantum physics, PQC uses advanced mathematics-based algorithms to secure data in transit and at rest, making it safe against attacks from quantum computers. Keeping this in mind, several organizations have already adopted or are in the process of adopting quantum-safe/resistant solutions to protect their data with long shelf life,"*** says Sunil Gupta, Co-founder and CEO of QuNu Labs, a quantum cryptography-based products and solutions provider. Organizations such as Microsoft and SAP are exploring this technology: while SAP is integrating quantum[71] into its vehicle space optimization component as a PoC, Microsoft is working on the deployment of quantum-safe cryptography.[72]

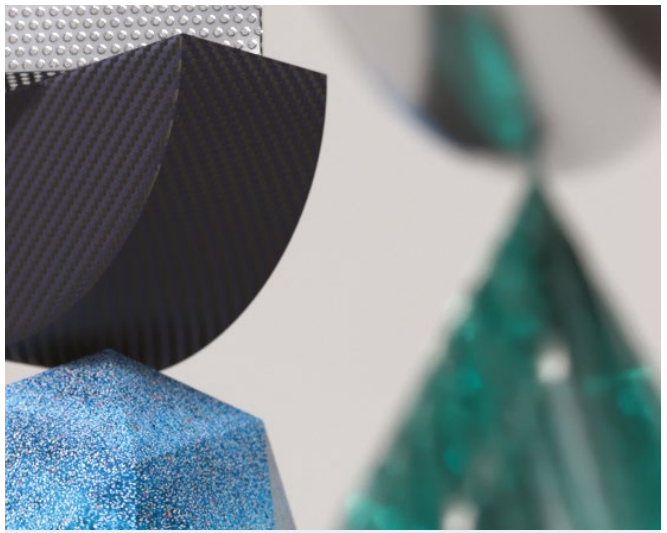
Genome therapy: This involves modifying an individual's genetic material to treat or prevent disease, potentially offering cures for genetic disorders and personalized medicine tailored to an individual. On average, 35% of executives see this as a key technology trend for 2030 and beyond, showcasing a hopeful outlook for transformative medical treatments. Over half (56%) of executives from life sciences and healthcare say they believe genome therapy will reach maturity by 2030.

The prospect of modifying genetic material to combat disease could redefine healthcare. For instance, in May 2024, gene therapy restored vision in patients with specific types of inherited blindness by delivering corrective genes directly to retinal cells.[73]

AGI: AGI can understand, learn, and apply knowledge across a wide range of tasks at a human level, enabling and allowing machines to potentially perform many intellectual tasks that a human could do; though it is a tall claim, seems likely to be a reality by 2030. Around 60% of industry executives believe AGI to be a key technology trend for 2030 and beyond. A high 86% of executives from the aerospace and defense sector – the highest among all industries surveyed, followed by 77% of executives from the high tech industry say they believe AGI will reach maturity by 2030. This confirms a widespread belief in AI's thrilling potential to revolutionize how we work and interact, bringing machines close to human levels of understanding to ally with their incredible capabilities. Can AGI produce complex inventions or produce great works of art? It's hard to say so today with any measure of certainty, however, the tech world does seem to be excited about AGI's possibilities.

Some activity around this trend is starting to become visible. For instance, OpenAI has announced a plan to achieve AGI within five years (2029). Similarly, Meta is planning to use 350,000 NVIDIA AI chips to develop AGI that will surpass human intelligence.[74]

Hyperconnectivity: This offers a seamless combination of terrestrial and non-terrestrial networks to facilitate communication and collaboration on a global scale, enhancing connectivity and integration across platforms and devices. Some 32% of executives say it will be a key technology trend for 2030 and beyond. Notable developments include satellite internet initiatives such as SpaceX's Starlink satellite internet, which has accrued over 4 million global subscribers since its beta launch in October 2020.[75] The service operates through a vast constellation of nearly 6,000 satellites, providing internet to users in almost 100 countries, including expanding into previously underserved regions including Africa and the Pacific islands.



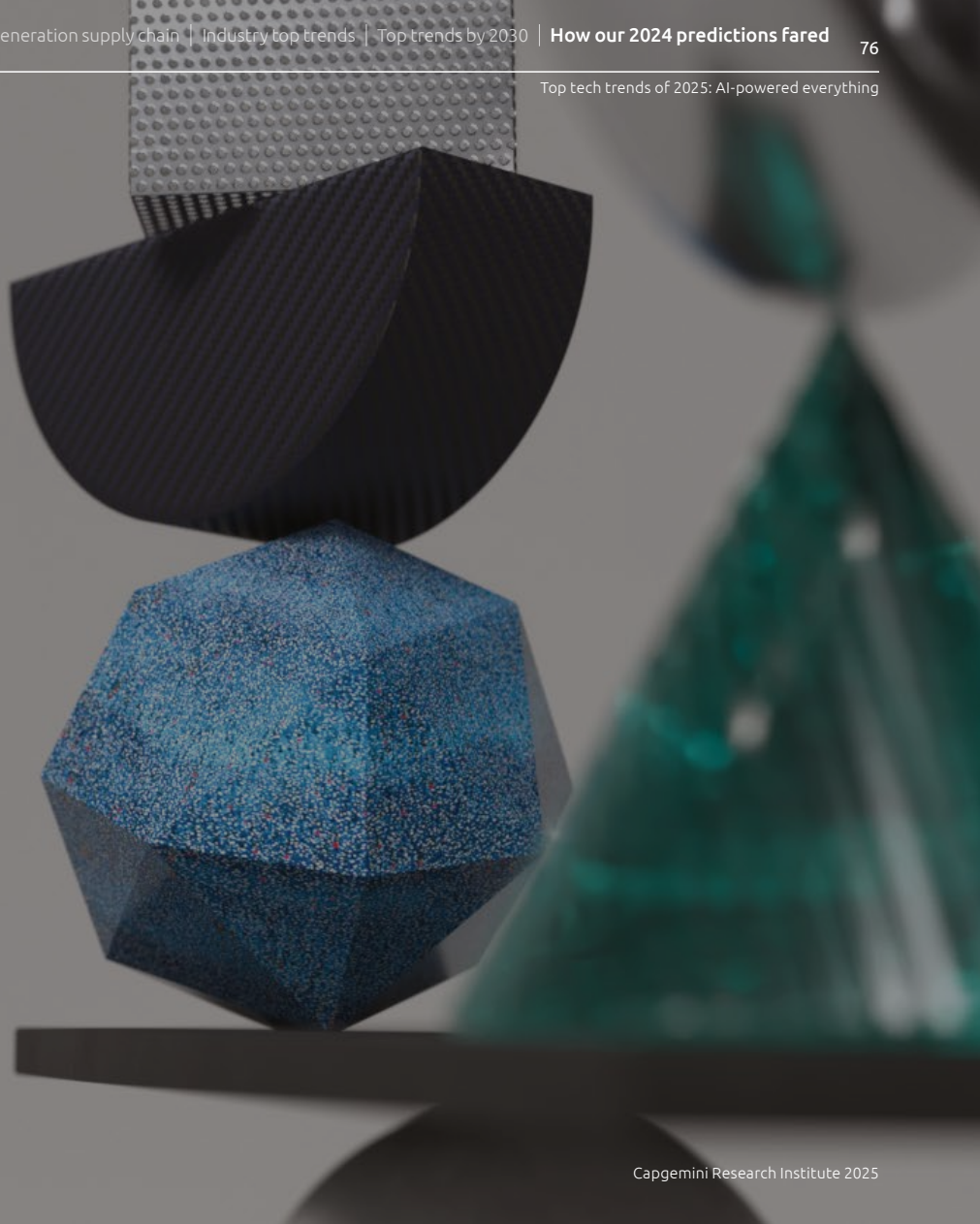
60%

of industry executives believe AGI to be a key technology trend for 2030 and beyond.

"Quantum computers have the potential to break traditional encryption methods in the next 5 years, which has led to the development of quantum and post-quantum cryptography (PQC). While quantum cryptography uses the principles of quantum physics, PQC uses advanced mathematics-based algorithms to secure data in transit and at rest, making it safe against attacks from quantum computers. Keeping this in mind, several organizations have already adopted or are in the process of adopting quantum-safe/resistant solutions to protect their data with long shelf life."

Sunil Gupta
Co-founder and CEO of QuNu Labs

IV. How our 2024 predictions have fared



Generative AI: Small will be the new big

What we got right

In 2023, we predicted that, while current LLMs will continue to thrive, there is an increasing need for smaller, more cost-efficient, specialized models. These smaller models can run on low-footprint installations with limited processing capabilities, including on the edge or smaller enterprise architectures. In 2024, this trend played out as expected. Smaller, task-specific language models have reshaped AI deployment, emphasizing efficiency, scalability, and accessibility. These models, despite their reduced size, deliver robust performance tailored to specific applications, particularly in finance, healthcare, and customer service. Advances in model compression and quantization have further accelerated this trend, maintaining high accuracy in compact systems.

In June 2024, Apple introduced smaller, on-device language models as part of Apple Intelligence. These can run on iPhones and iPads.[76] NVIDIA also launched a series of models that are significantly smaller than their larger counterparts, with compute cost savings of up to 1.8x and state-of-the-art accuracy.[77] Other notable efforts include Stanford's Alpaca and Vicuna; Bloomberg's financial model, Claude 3 Haiku; and Google's Gemma 2B.

Where our predictions didn't materialize

This prediction has fully stood up to our expectations. Smaller models have just witnessed a year of tremendous growth, which shows no signs of stopping. What remains to be seen is how effectively these models will be deployed in industrial and commercial applications.

Quantum technology: When cyber meets quantum

What we got right

In 2023, we predicted that 2024 would be a pivotal year for post-quantum cryptography (PQC) due to the advances in technology and regulatory pressure. 2024 did see the emergence of new standards: the US National Institute of Standards and Technology (NIST) finalized quantum-resistant algorithms, standardizing PQC and signaling the need for immediate adoption.

In July 2024, the US government outlined its strategy. The threat of actors using data harvested now to be decrypted once quantum computers learn how to break current encryption algorithms, means that the migration to PQC standards must begin. Google claims its latest quantum chip, Willow, can perform a task in five minutes that would take a supercomputer longer than the current age of the universe.[78] It is being hailed as a major technological breakthrough, but its usefulness to solve real-world problems is yet to be proven.

Where our predictions didn't materialize

2024 didn't witness an inflection point in terms of the adoption of PQC by industries globally. As PQC algorithms have already been available (pre-standardization), tech giants Apple, Google, AWS, and Microsoft have already integrated quantum-safe encryption into their services, setting a benchmark for other industries. While financial services and healthcare, have moved quickly to adopt PQC, other sectors lag, perhaps underestimating the required urgency. The gradual adoption highlights the challenge of preparing for a quantum-safe future. The US government estimates that the cost of transitioning the government's priority information systems to PQC will be $7.1 billion in 2025-35.[79]

● Trend where we got most of our predictions right ● Trend where some of our predictions didn't materialize

We also predicted that 2024 would see various organizations claim a narrow quantum advantage in specialized tasks within larger conventional computational workflows. Google's computer chip breakthrough with Willow appears to be a step in that direction. Another such claim of quantum advantage found that it is theoretically possible for a quantum computer to perform a specific type of calculation – material energy estimate – in only ten hours that would take a classical computer five years.[80] However, these are still specific types of calculations and we're yet to see practical examples of quantum hardware being used to solve specialized tasks in larger workflows.

Semiconductors: Moore's Law isn't dead, but it's changing

What we got right

We correctly predicted that Moore's Law[81] is not obsolete but rather undergoing a metamorphosis. In 2024, there was a notable shift toward software optimizations to unlock new hardware potential, particularly in AI and high-performance computing, exemplified by NVIDIA's robust software and hardware ecosystem. Its new Blackwell Superchip promises substantial performance gains over its predecessor, Hopper.

In exploration of non-silicon materials, a breakthrough was achieved with the world's first functional semiconductor made entirely of graphene – making possible the development of faster and smaller electronic devices.[82] Advanced materials such as silicon carbide (SiC) and gallium nitride (GaN) gained popularity for their high efficiency.

Another prediction that stood the test of time was that the semiconductor industry saw a surge in manufacturing projects, with over 90 new initiatives in the US utilizing the benefits of the US CHIPS Act and the launch of the European Semiconductor Manufacturing Company (ESMC) to boost Europe's production capabilities.

Where our predictions didn't materialize

Although semiconductor companies made significant strides in developing smaller, faster, and more efficient chips, such as 5-nanometer and 3-nanometer chips with over 4 billion transistors, research into 1-nanometer chips is still under way. Looking ahead to 2025, we anticipate further advancements in chip packaging and high-speed interconnects, driving the next generation of semiconductor performance and shaping the future of computing systems.

Batteries: The power of chemistry

What we got right

In 2024, battery technology has advanced significantly, driven by innovations in chemistry and materials science. Our predictions highlighted innovations such as solid-state batteries, lithium-iron phosphate (LFP) chemistry, and sodium-ion batteries that have tackled challenges such as increasing energy density, reducing costs, and improving sustainability. These technologies are central to the future of electric mobility and energy storage.

As we expected, there has been meaningful progress in these areas, particularly in solid-state batteries. Volkswagen and Stellantis announced plans to launch EVs powered by solid-state batteries in the coming 2–3 years.[83]

LFP batteries now dominate short-term energy storage due to their affordability and safety. Importantly, variants such as lithium iron manganese phosphate (LFMP) are developing rapidly, offering higher energy density while retaining cost and safety benefits. Despite technological progress, over 80% of lithium-ion battery production remains concentrated in China, highlighting the need for diversified supply chains.

Trend where we got most of our predictions right Trend where some of our predictions didn't materialize

Where our predictions didn't materialize

While we correctly predicted that the demand for battery energy storage systems (BESS) would be a primary driver for certain battery chemistries, we did not predict the staggering 136% growth that the BESS market experienced in the past year.

Among regulatory developments, we did not predict the increasing regulatory push and market acceleration in the development of the digital battery passport. By enabling manufacturers and stakeholders to track the origins and sustainability of materials, this innovation fosters greater environmental accountability, transparency, and efficiency. Overall, 2024 has been a year of progress and challenges, confirming the critical role of batteries in a sustainable energy future.

SpaceTech: Addressing the Earth's challenges from outer space

What we got right

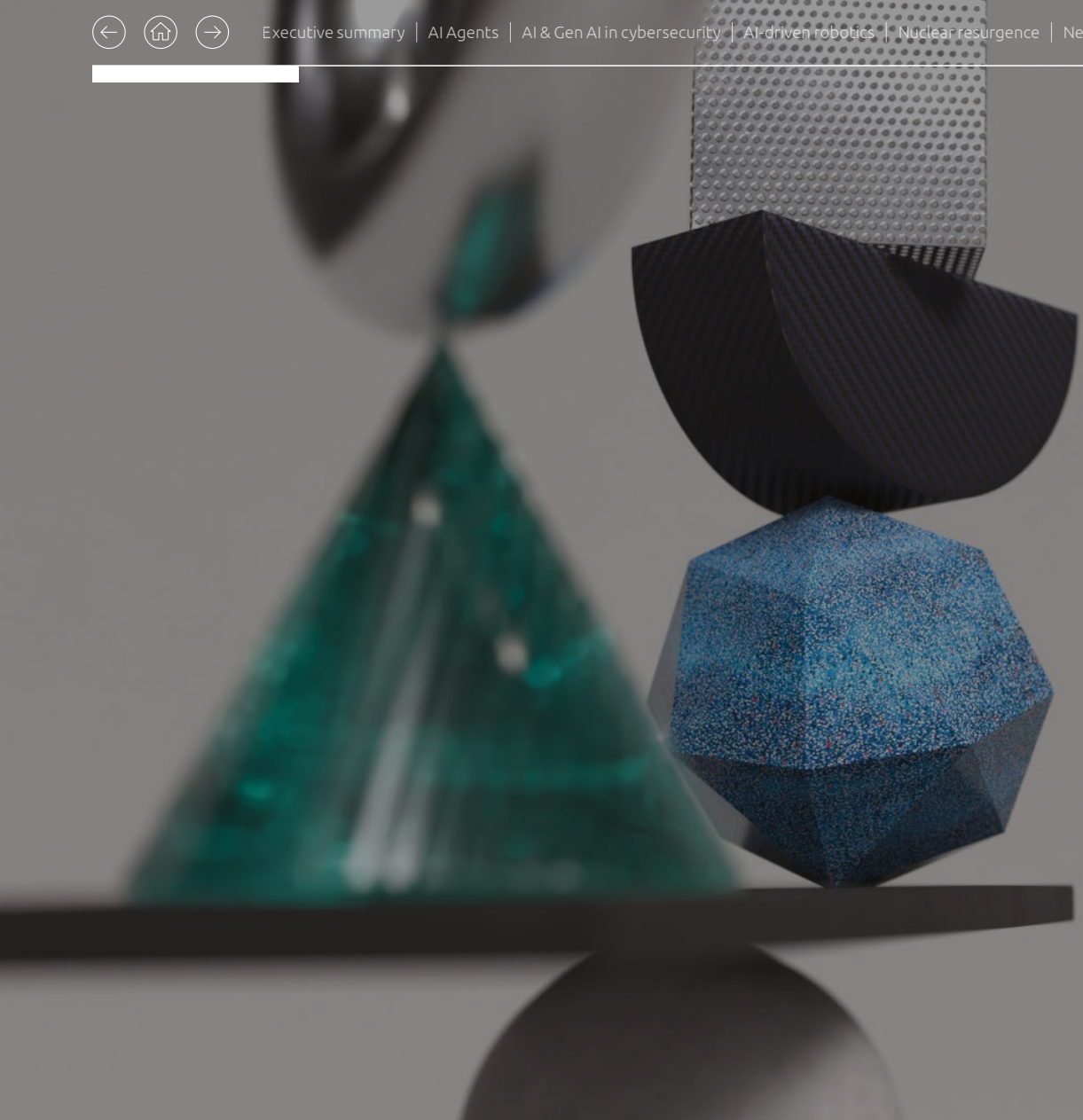
In 2024, we predicted that the field of space communications and networks would see a wave of exciting projects and seamless 5G connectivity from space. This prediction has certainly held its ground with the expansion of low Earth orbit operations such as SpaceX's Starlink, which expanded global internet access. In January 2024, the Starlink team successfully sent and received text messages through their new direct-to-cell satellites.[84] As of September 2024, it has over 4 million subscribers and is available to 99.6% of US households (according to FCC data).[85] The service is proving particularly useful for rural customers and in disaster-relief measures.[86] A number of airlines, from United and Qatar to Air France, have announced plans to offer in-flight internet connectivity to their passengers, in partnership with Starlink.[87]

Aside from satellite communications, AI-driven satellite analytics improved Earth observation, addressing environmental challenges. Commercial satellite constellations are heralding a new era of IoT. Starlink has a fleet of around 6,700 functional satellites in its constellation,[88] whereas Amazon's Project Kuiper has announced plans to launch a mega-constellation of over 3,000 satellites starting in 2025.

Where our predictions didn't materialize

Some of our predictions, such as lunar exploration kicking off, didn't manifest exactly as expected. NASA's Artemis II mission was delayed to 2025. Quantum key distribution (involving satellite communication) remains in the early stages, highlighting the challenges of scaling new technologies. Some projections around sustainable space practices, such as debris reduction, progressed slower than hoped, despite promising initiatives such as ClearSpace. Overall, 2024 reaffirmed SpaceTech's transformative potential and the unpredictability of innovation.

Trend where we got most of our predictions right Trend where some of our predictions didn't materialize



Conclusion

In 2025, the tech landscape will be radically remodeled by advancements in AI and Gen AI, cybersecurity, robotics, nuclear energy, and next-generation supply chains. These trends, driven by AI's transformative potential, promise to revolutionize industries, enhance efficiency, and foster innovation. Along with emerging domains such as edge AI, digital twin, AI in software engineering, and industry-specific clouds, these advancements reflect a shared trajectory of the growing interdependence of technologies. It's clear that radical shifts are more likely to occur when several technologies converge seamlessly and solve specific problems.

Embracing these trends will be crucial to achieving sustainable growth and maintaining a competitive edge in an increasingly dynamic market. Businesses that harness this interconnected future will not only lead in 2025 but also set the path for years to come.

Appendix

Technology domains considered in this research

For this research, we identified eight broad domains that we think will make an impact in 2025. Within these domains, we identified a few sub-trends:

- **AI and data**
  - i. Multimodal AI
  - ii. AI Agents (autonomous intelligent systems performing specific tasks without human intervention)
  - iii. Hybrid AI, edge AI
  - iv. Machine learning with quantum
  - v. AI-driven automation and robotics
  - vi. AI-driven personalization
  - vii. AI-driven user interface (immersive-reality, spatial computing, XR, conversational interface, haptic)
- **Software**
  - i. AI in software development
  - ii. AI in DevOps, design and architecture
  - iii. Green software engineering
  - iv. Software-defined everything
- **Computing and networking**
  - i. Industry clouds
  - ii. Communication futures such as edge computing and 6G
  - iii. Quantum computing, neuromorphic computing
  - iv. Photonic computing
  - v. Green computing
  - vi. Digital sovereignty
  - vii. Decentralized ecosystems (such as DEPIN)
- **Industry and engineering**
  - i. New-generation supply chains
  - ii. Cobots and AI-assisted robots
  - iii. Digital twins, physical-digital convergence (including industrial metaverse)
  - iv. Specialized silicon/embedded silicon
  - v. Sustainable engineering practices
  - vi. Advanced materials and smart coatings

- **X-Tech**
  i. SpaceTech
  ii. HealthTech
  iii. AgriTech
  iv. FinTech
  v. EdTech
  vi. MobilityTech (mobility technology)
  vii. GovTech (civic technology)
  viii. FoodTech (food technology)
  ix. AutoTech
- **Cybersecurity**
  i. Generative AI in cybersecurity
  ii. Zero-trust architectures
  iii. Secure access service edge (SASE)
  iv. Advanced endpoint security (EPP, EDR, XDR)
  v. Post-quantum cryptography
  vi. Quantum key distribution (QKD)
  vii. Cybersecurity mesh
  viii. Privacy enhancing computation (PEC)
- **Engineering Biology**
  i. Gene editing and CRISPR technology
  ii. Cell and gene therapy
  iii. Biomanufacturing
  iv. Agricultural biotechnology
  v. Engineered biomaterials
  vi. Synthetic genomics
  vii. Bioinformatics
  viii. Cellular Agriculture
- **Sustainability**
  i. Sustainable supply chains and product passports
  ii. Carbon capture, usage and storage (CCUS)
  iii. Smart grids
  iv. Battery storage
  v. Sustainable fuels, renewables
  vi. Electric and autonomous vehicles
  vii. Green hydrogen production
  viii. Advanced Nuclear Reactors (Small Modular Reactors - SMRs)

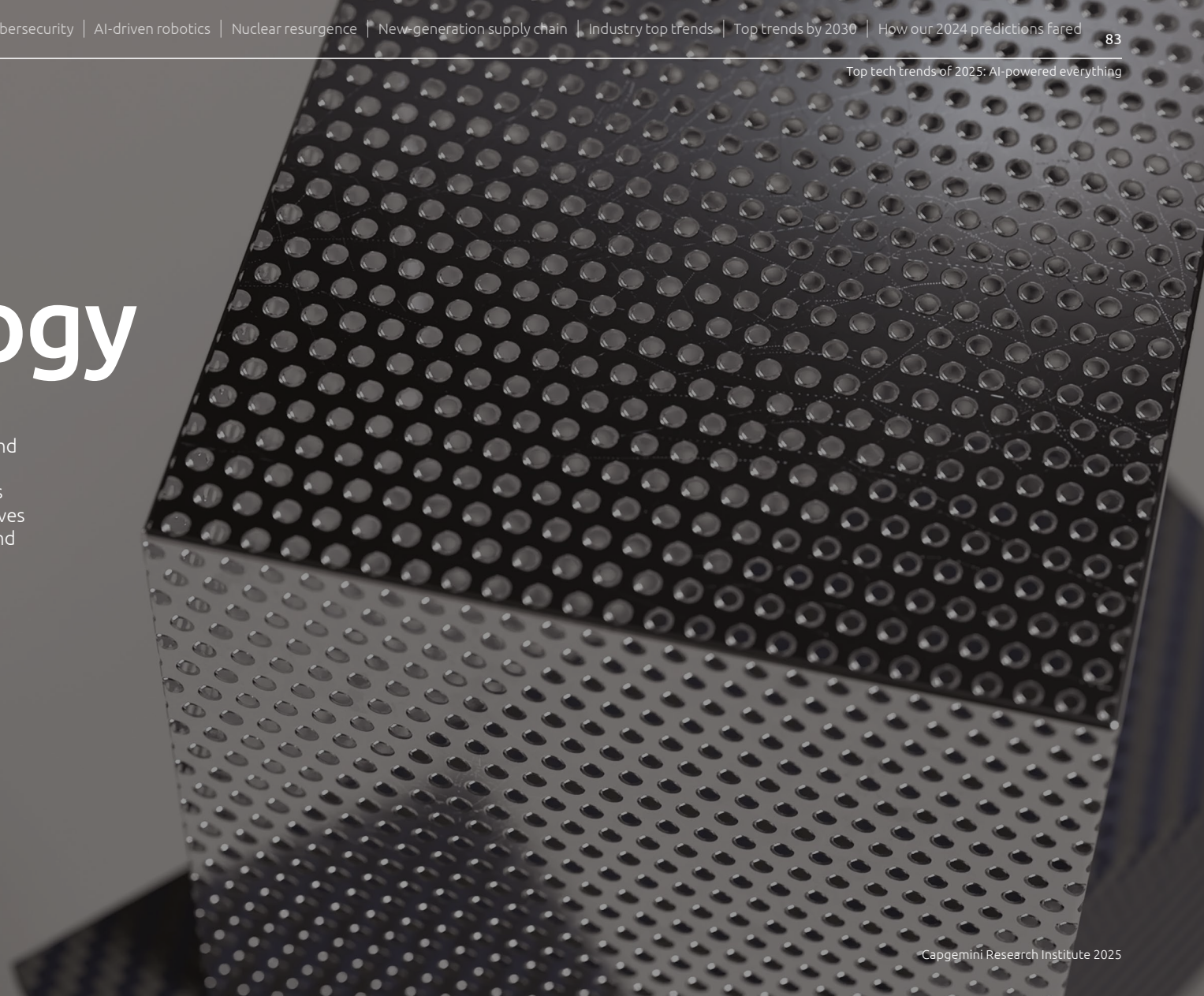
What do we mean by ‘impact’?

Throughout the report, we aim to uncover the top trends that will have a significant impact in 2025.

By 'impact' we mean one or more of: widespread adoption; significant economic growth; improved quality of life; increased efficiency; solutions to major global challenges; and substantial investment.

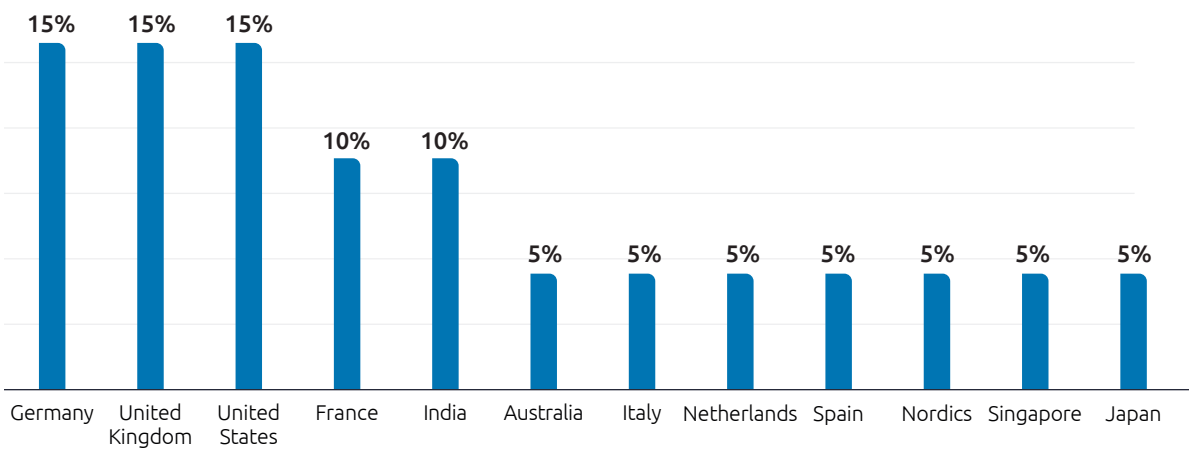
Research methodology

We surveyed 1,500 senior executives (C-suite executives and innovation leaders) from large organizations with annual revenue exceeding $1 billion and 500 investors with assets under management (AUM) above $1 billion. These executives are based in 12 countries across North America, Europe, and Asia-Pacific. The global survey took place in October 2024.

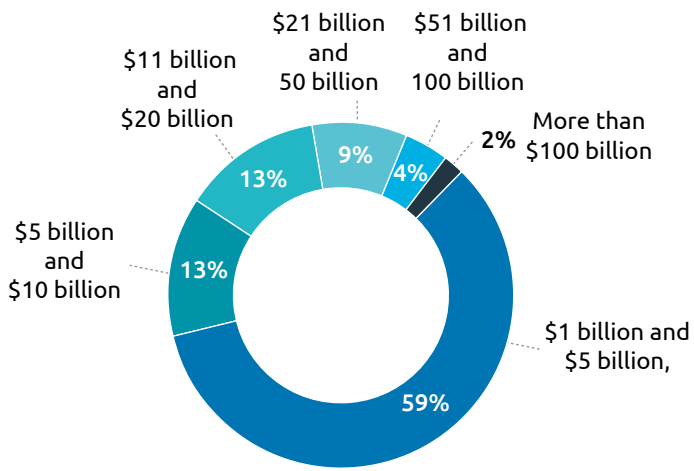


The distribution of executives and their organizations is provided in the following figures.

Executives by country

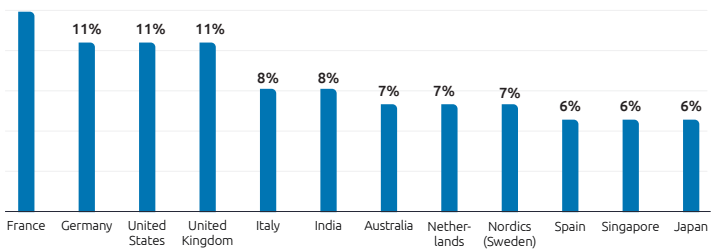


Executives by sector

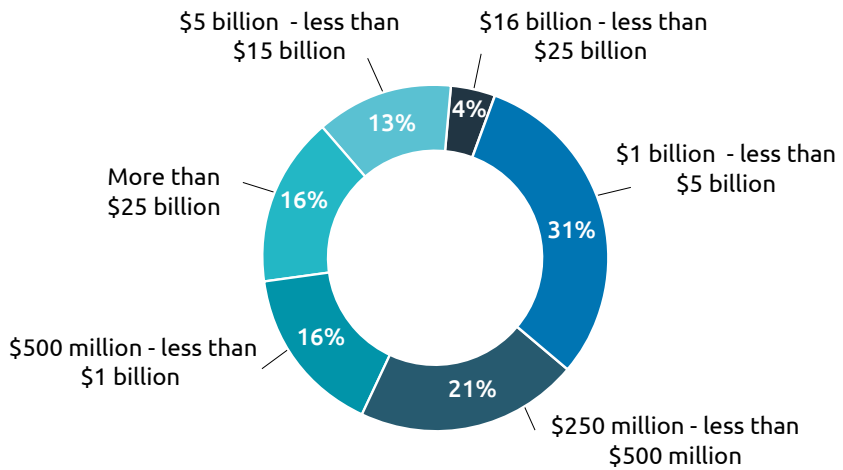


Source: Capgemini Research Institute, Top Tech Trends in 2025 survey, October 2024, N = 1,500 executives.

Executives by organization revenue (annual)



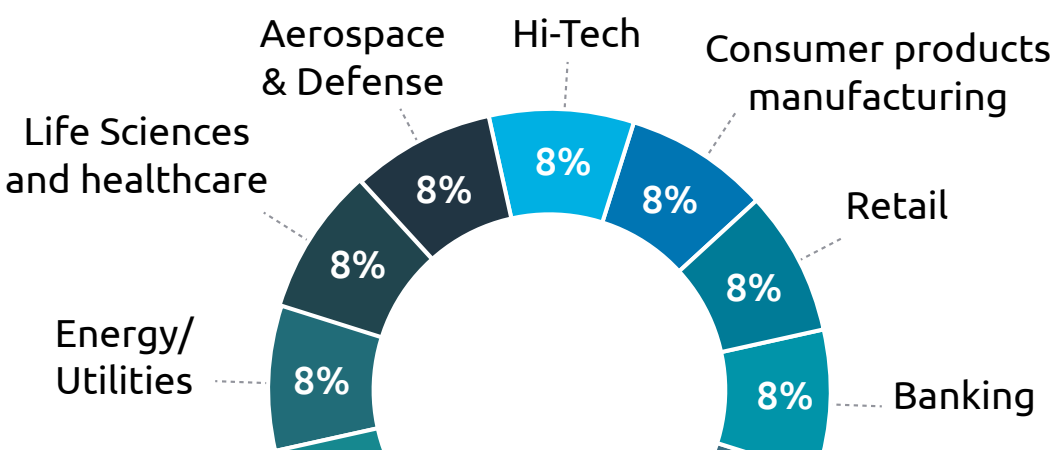
Executives by job title



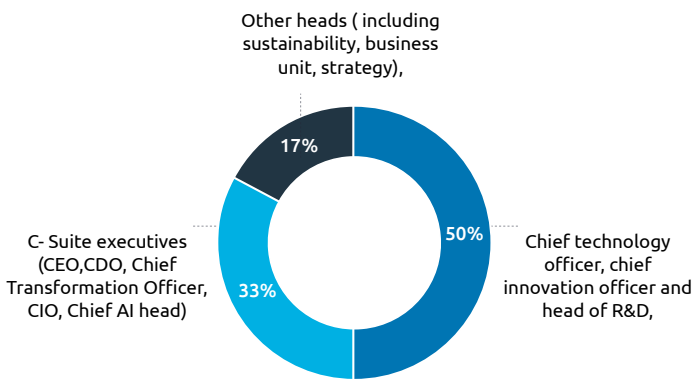
Source: Capgemini Research Institute, Top Tech Trends in 2025 survey, October 2024, N = 1,500 executives.

We also conducted a global survey of 500 professionals from the investor community – Venture Capital, Private Equity, and commercial banks. This cohort is distributed as follows:

Respondents by country

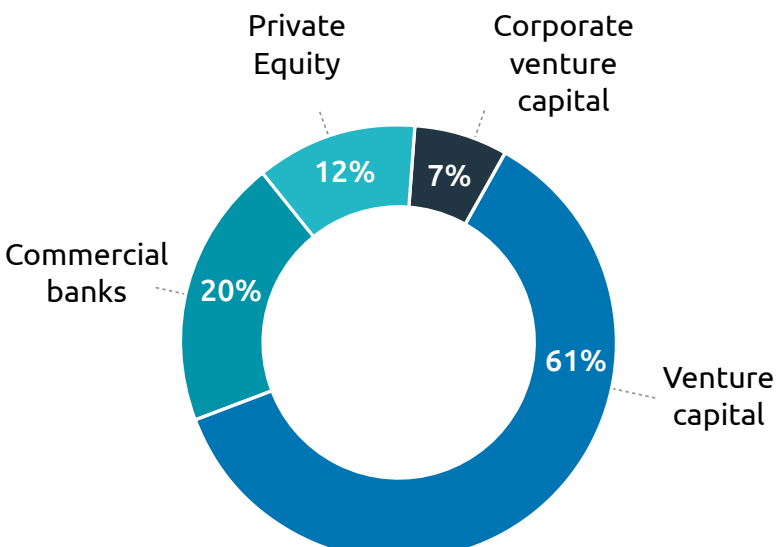


Respondents by investment approach

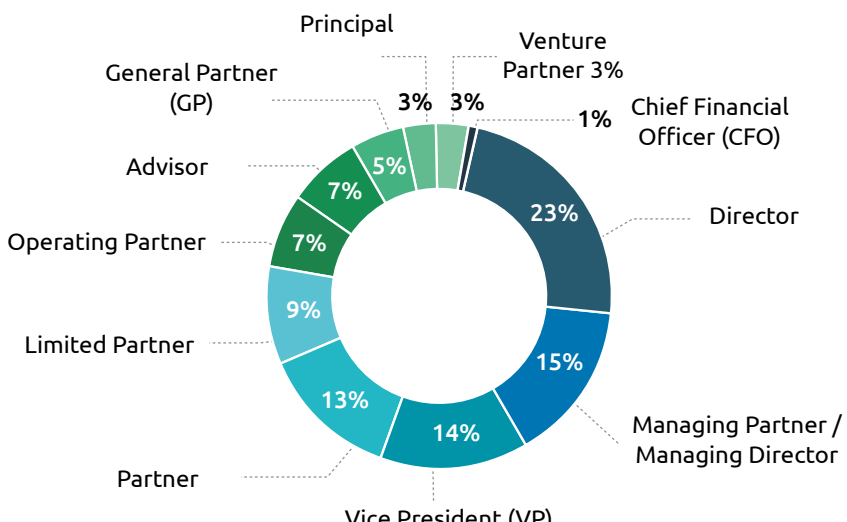


Source: Capgemini Research Institute, Top Tech Trends in 2025 VC (Investors) survey, October 2024, N = 500 executives.

Investors by assets under management



Respondents by job title



Source: Capgemini Research Institute, Top Tech Trends in 2025 VC (Investors) survey, October 2024, N = 500 executives.

We also conducted 24 in-depth discussions with industry executives, investors, analysts, and academics. We would like to thank the participants from the following organizations for this research:

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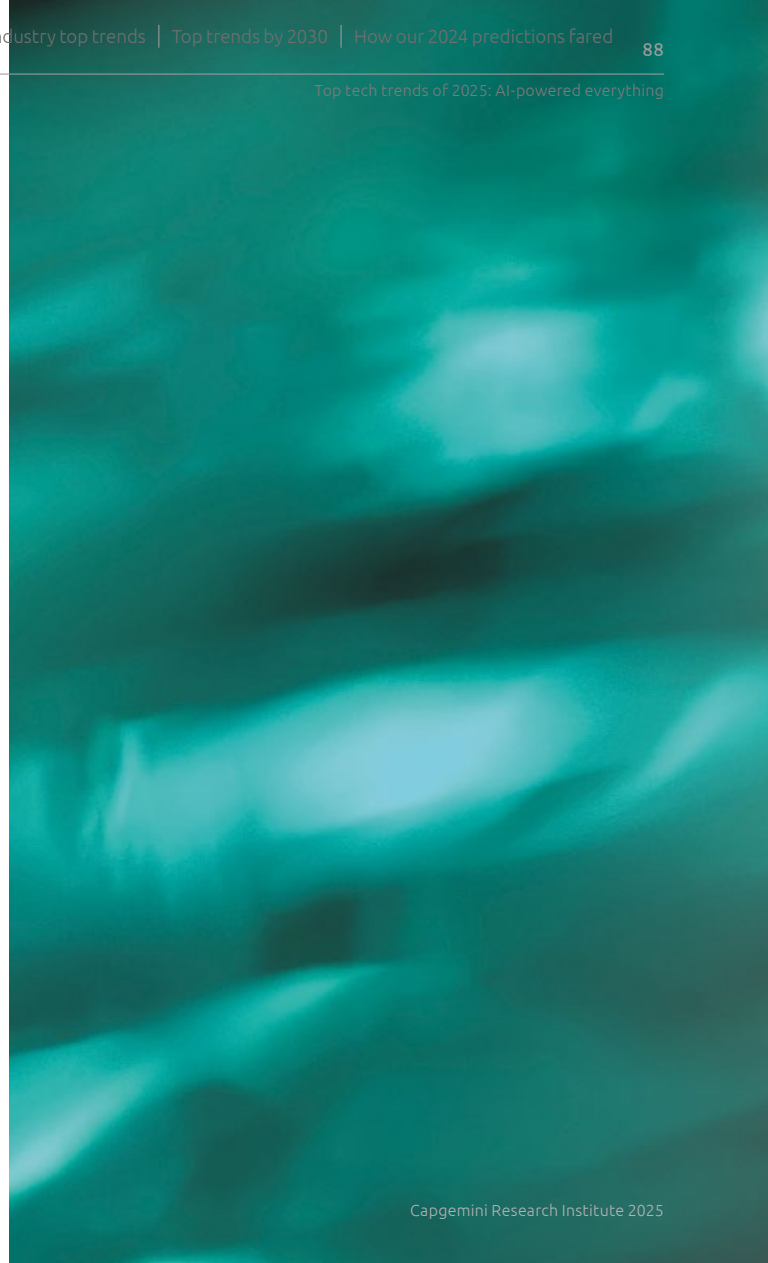
- XPS Group
- IDC
- HFS
- Forrester
- SupplyChainWise
- Blue Clay Health
- Bank of America
- SKF Group



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Pascal Brier is the Group Chief Innovation Officer and member of the Group Executive Committee at Capgemini, a role he has held since 2021 after a long career in leadership positions at Microsoft, AT&T and NCR. In his current position, Pascal oversees Technology, Innovation and Ventures for the Group worldwide. His efforts center on tracking analyzing, and implementing more than 1,000 emerging technologies annually. Under his guidance, the company constantly strives to be at the forefront of technological innovation, making significant impacts on the world of business and wider society.

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Alex Bulat coordinates Capgemini's Group Technology and Group Tech labs operations, closely working with Chief Technology & Innovation Officers across Capgemini to build a strategic outlook, promote innovation and thought leadership. In this capacity Alex also spearheads the TechnoVision program: "the heartbeat of Capgemini's tech strategy", of which the Top Tech Trends initiative is a part, bringing together many experts from across the globe to share technology trends and insights addressing business issues. Alex is a well rounded technology leader and has held multiple global technology roles, like CTIO of Capgemini SAP division, he has been part of startup boards.

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Sally is a leading expert in innovation, utilizing her deep tech expertise to drive transformative solutions. With a strong background in AI and deep tech, she has successfully led Cambridge Consultants' deep tech incubator, fostering investments in quantum, human-machine understanding, and photonics. Sally is dedicated to championing new approaches and promoting talent diversity while leading strategic technology investments. Her vision is to harness cutting-edge technologies to solve complex global challenges and create a sustainable future.

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Paul has over 39 years of industry experience, the majority of which is in nuclear power. His background includes certification as a Professional Nuclear Engineering Officer in the US Navy, and 17 years at Framatome, a NSSS vendor, for Engineering, Nuclear Services, and fuel, including leading Framatome's development of Asset Management Services for Nuclear New Builds and the fleet. For 8 years he consulted for large scale IT projects, primarily in support of Constellation Energy, the largest US nuclear operator prior to joining Capgemini.

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Marco previously served as Chief Product and Strategy Officer at Trustwave, and Global Head of Strategy, Operations, and Product Management for Cybersecurity at DXC. Earlier in his career, he also held senior roles at HP, Wipro, and NTT Data. Marco holds a bachelor's and a master's degree in Information Systems and Computer Engineering, an MBA, and several leading industry cybersecurity certifications, including CISSP, CCSP, CISM, CISA, and ISO 27001 Lead Auditor.

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Emmanuelle spent 30 years with a global automaker and a supplier of green steel automotive products. Senior roles including design, manufacturing, sourcing, procurement, finance and business development. She gained four patents for inventions to improve engine assembly, including the use of aluminum components. She holds engineering diplomas from the Ecole Nationale Supérieure de Mécanique et d'Aérotechnique and from RWTH Aachen University.

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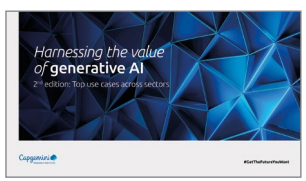

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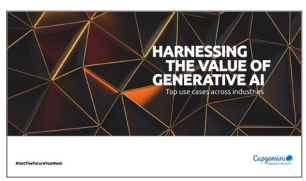

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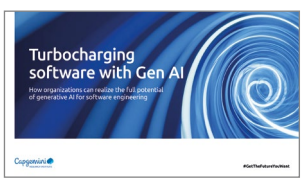

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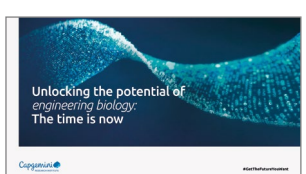

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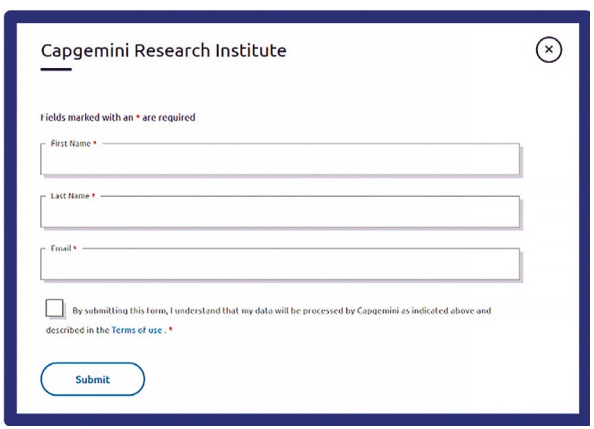

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