HARNESSING THE VALUE OF GENERATIVE AI
Top use cases across industries

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Executive Summary

Generative artificial intelligence (AI) is rapidly becoming an integral part of our private and professional lives. While the technology has been in existence for a number of years, it has gained widespread consumer interest only recently and has emerged as a critical strategic consideration. Our latest industry-focused research reveals that generative AI is on the boardroom agenda at 96 percent of organizations surveyed globally. While generative AI is in its infancy in terms of scaled adoption and implementation, nearly 60 percent of executives globally say their leadership is a strong advocate for generative AI and only 39 percent are taking a "wait-and-watch" approach to adoption.

Many organizations already see generative AI as a powerful tool that can accelerate growth, enhance capabilities, and unlock new opportunities without drastic restructuring of business models. Globally, about one-fifth (21 percent) of executives surveyed say generative AI will significantly disrupt their industries. Executives in high tech and industrial manufacturing – two industries that have long been shaped by AI technologies and have been at the forefront of generative AI – are most likely to agree with this statement.

The potential of generative AI to drive innovation and improve efficiency and productivity extends to nearly all functions and has applications across all industries. Use cases are wide-ranging, from creating unique content and automating and accelerating tasks, to creating personalized experiences and generating synthetic data. Our research reveals that generative AI has the greatest potential within IT, sales and customer service, and marketing functions. The high tech sector leads the way,

Executive Summary

with the greatest share of ongoing generative AI pilots. Executives in our survey also project efficiencies from generative AI in the next three years in the range of 7–9 percent.

As with any new technology, generative AI is not without risk. However, with proper planning and guardrails in place, there is potential to transform business operations, product and service development, and customer interaction. Nearly three-quarters of executives in our survey (74 percent) agree that the benefits of generative AI outweigh the risks. Given the carbon-intensive nature of training new generative AI models, it will also be important to weigh environmental considerations. The good news is that executives in our survey are aware of this dynamic and understand how to mitigate the

adverse impact of generative AI on the environment. Nevertheless, the net impact of generative AI on an organization's Scope 1, 2, and/or 3 emissions is currently difficult to forecast.

We conclude this report with a look at how organizations can start and/or accelerate their generative AI journeys. First, they must create a robust generative AI strategic and operational architecture. Organizations must also establish internal and external guidelines around the use of generative AI, adopt a human-centric approach to scaling the technology, and build user and consumer trust in the AI system. Given the high carbon emissions associated with generative AI trainings and queries, sustainable development and use of the technology should also be a high priority.

Introduction

Generative artificial intelligence (generative AI) is rapidly transforming the way we interact with technology. Machines are beginning to mimic creative human thought processes, synthesizing tailored content with significant implications for organizations and consumers.

This report is the second in a series of reports we have created around this topic. Our first report, Why consumers love generative AI, explored consumer perceptions of generative AI; consumer use of generative AI; and how the technology is shaping the future of customer experience.

In this report, we delve into the transformative potential of generative AI for organizations across industries, asking how the technology could kick-start the

innovating of organizations; highlighting the function- and industry-specific use cases we believe to have the greatest potential; and comparing adoption rates across industries.

To gauge executives' perceptions of generative AI and adoption of use cases, we conducted a global survey of 1,000 organizations across Australia, Canada, France, Germany, Italy, Japan, the Netherlands, Norway, Singapore, Spain, Sweden, the UK, and the US. We questioned executives from multiple industries, including automotive, consumer products, retail, financial services, telecom, energy and utilities, aerospace and defense, high tech, industrial manufacturing, and pharma and healthcare. For more details on the survey sample, please refer to the research methodology.

Introduction

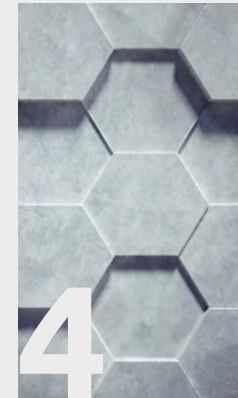## The report explores five broad themes:
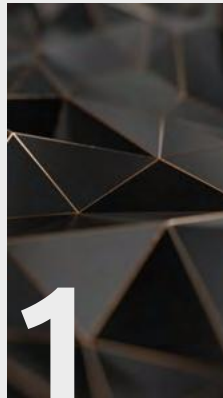
1 Organizations view generative AI not as a disruptor but as an accelerator

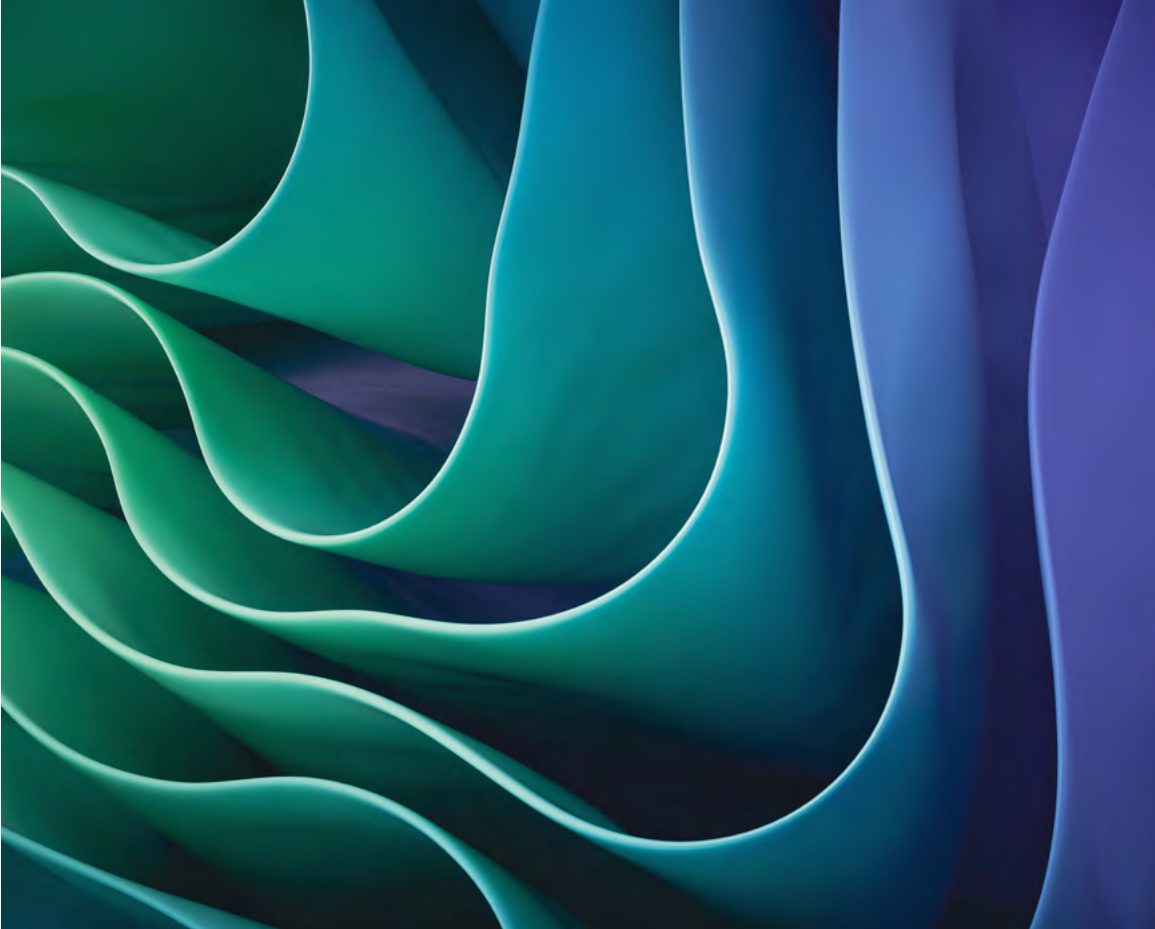**2** Organizations see more gain than pain in generative AI

3 Generative AI packs the most punch for IT, sales, and marketing

4 High tech leads in implementing generative AI

5 How organizations can kick-start their generative AI journeys

Who should read this report and why?

This report offers a comprehensive introduction to the transformative impact that Generative AI holds for large businesses in industries such as automotive, consumer products, retail, financial services, telecom, energy and utilities, aerospace and defense, high tech, industrial manufacturing, and pharma and healthcare. The report will help business executives identify use cases that will illustrate the pragmatic applications of Generative AI in IT, sales, and marketing, for example. The report leverages a comprehensive analysis of 1,000 industry leaders (ranked Director and above) across 13 countries, each at varying stages of Generative AI implementation. The report also offers actionable recommendations for business leaders to kick-start their organizations' generative AI journeys. This report is the second in our series of reports on Generative AI. Read the first report focusing on consumer reactions to Generative AI at
https://www.capgemini.com/insights/research-library/creative-and-generative-ai/

Generative AI applications across multiple formats

Defining generative AI

Generative AI has the capability to learn and reapply the properties and patterns of data for a wide range of applications, from creating text, images, and videos in different styles to generating tailored content. It enables machines to perform creative tasks previously thought exclusive to humans. The following table summarizes the top generative AI applications reported in our research and gives some indicative examples.

		Selected generative AI applications	Indicative examples
	Text	Summarizing and translating into multiple languages	OpenAI's GPT-4, Jasper[1]
	Images and video generation	Analyzing existing images/video to generate new content (e.g., video games, VR, animation)	Adobe Firefly,[2] Stable Diffusion, Midjourney
	Audio	Music generation and remixing, speech synthesis, sound effects, voice conversion, audio enhancement	Sonix.ai (a cloud-based audio and video-transcription solution)[3]
	Chatbots	Chatbots to provide automated customer service and advice	Google Bard,[4] OpenAI's ChatGPT
	Search	Enhanced search functions using natural language processing and machine learning	Perplexity AI[5]

Source: 1. TechTarget, "What is generative AI? Everything you need to know," March 5, 2023.
2. Adobe, "Adobe unveils Firefly, a family of new creative generative AI," March 21, 2023.
3. Sonix.ai, "Sonix releases the world's first automated transcription and generative AI summarization tool," December 14, 2022.
4. Cointelegraph, "What is Google's Bard, and how does it work?" May 10, 2023.
5. Kevin-Indig, "Early attempts at integrating AI in Search," January 10, 2023.

01

ORGANIZATIONS VIEW GENERATIVE AI NOT AS A DISRUPTOR, BUT AS AN ACCELERATOR

Fig.2

Generative AI is a topic for boardroom discussion at nearly all organizations

Generative AI is a top agenda item in boardrooms

Nearly all executives (96 percent) in our survey cite generative AI as a hot topic of discussion in their respective boardrooms (see Figure 2), making it probably the fastest new technology to garner such high-level interest. Pat Geraghty, CEO of GuideWell, a US-based mutual insurance organization, comments: *"Every single board meeting we've had this year has had a standing agenda item of AI and ChatGPT. We want to make sure we've got our board with us as we're thinking about where we're going."*[1]
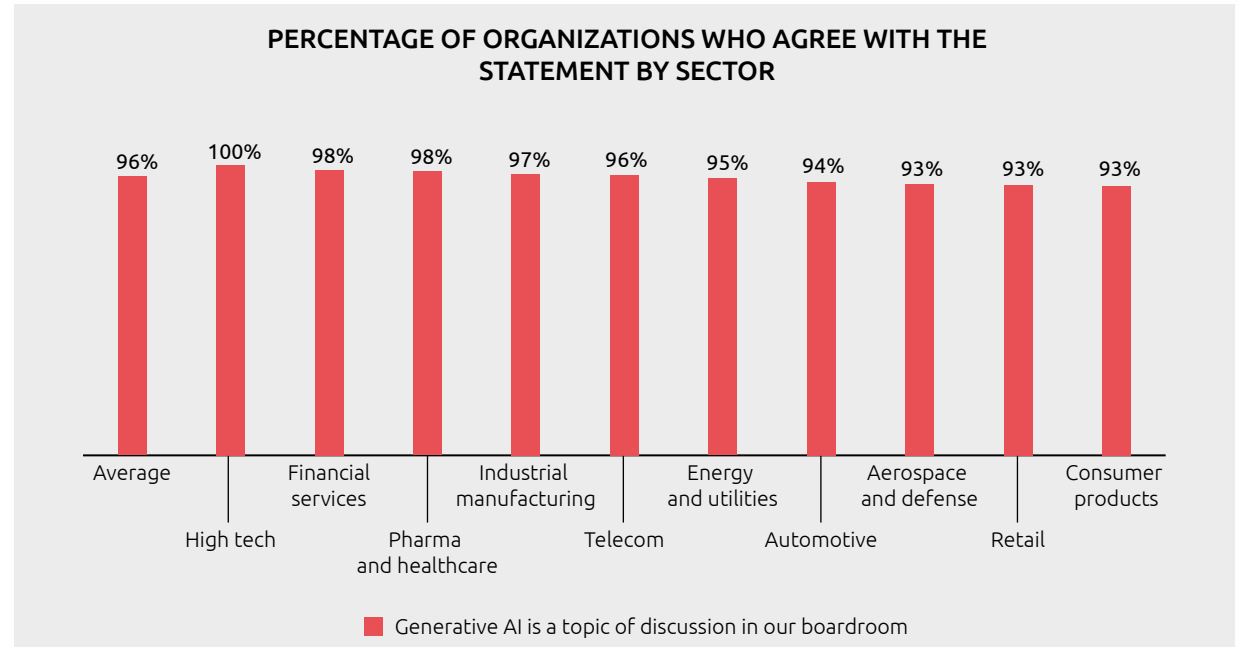
PERCENTAGE OF ORGANIZATIONS WHO AGREE WITH THE STATEMENT BY SECTOR

96%	100%	98%	98%	97%	96%	95%	94%	93%	93%	93%
Average	High tech	Financial services	Pharma and healthcare	Industrial manufacturing	Telecom	Energy and utilities	Automotive	Aerospace and defense	Retail	Consumer products

■ Generative AI is a topic of discussion in our boardroom

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations.

The leaders of most organizations are strong advocates of generative AI

PERCENTAGE OF ORGANIZATIONS WHO AGREE WITH THE STATEMENT BY SECTOR

- Our leadership is a strong advocate of generative AI
- Our leadership is taking a "wait-and-watch" approach to generative AI
- Our leadership is not convinced of / is divided on the potential of generative AI
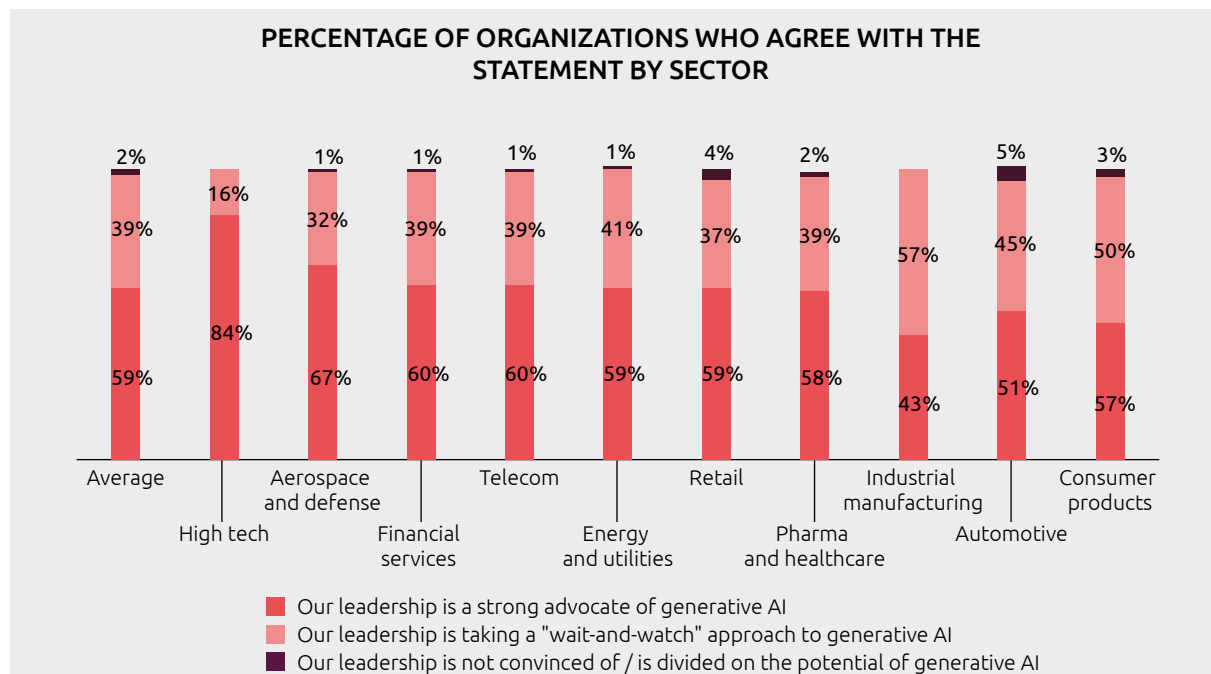
Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 766 organizations that cite generative AI as a topic of discussion in their respective boardrooms.

Top leaders are strong advocates for generative AI

Among the 96% of organizations that discuss generative AI in their boardrooms, over half (59 percent) of executives say their leadership are strong advocates for generative AI only six months after the technology hit the mainstream. This rises to 84 percent in the high-tech sector. Thirty-nine percent of executives say their leaders are taking a "wait-and-watch" approach to the technology and only 2 percent of executives globally say their leaders are not convinced or are divided by the potential of generative AI (see Figure 3).

96%

organizations say generative AI
is a topic of discussion in their
boardrooms

Fig.4

About one-fifth of organizations anticipate significant disruption from generative AI
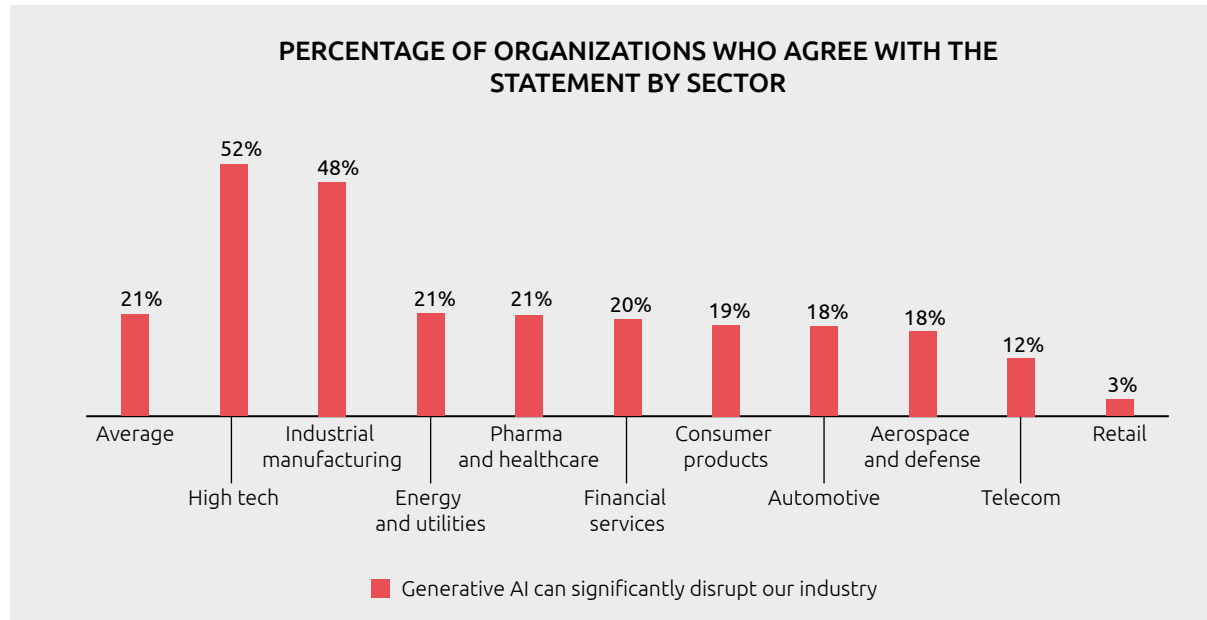
PERCENTAGE OF ORGANIZATIONS WHO AGREE WITH THE STATEMENT BY SECTOR

■ Generative AI can significantly disrupt our industry

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations.

Most organizations do not view generative AI as a disruptor

While twenty-one percent of executives anticipate a significant disruption in their respective industries from generative AI, 67 percent of executives disagree. That is, a majority of the executives do not see generative AI significantly disrupting their business models. However, executives within the high-tech and industrial manufacturing sectors expect significant disruption at 52 percent and 48 percent, respectively (see Figure 4). While this may be reflective of these executives' superior understanding of the technology's potential, the figures underline the widespread expectation that generative AI will boost business overall.

Fig.5

Relevance of generative AI platforms for organizations across different domains

Organizations are finding generative AI platforms increasingly relevant

Chatbots emerge as the most relevant generative AI application, with 83 percent of organizations citing it. Organizations can use generative-AI-driven chatbots to improve their customer service and also to enable improved internal knowledge management. Seventy-five percent of executives say that data applications can be used effectively in their organizations, and 71 percent believe this to be true of text-generating platforms such as ChatGPT (see Figure 5).

PERCENTAGE OF ORGANIZATIONS THAT FIND GENERATIVE AI PLATFORMS RELEVANT TO THEIR BUSINESS

Platform	Percentage
Chatbots (automating customer service and improving knowledge management: e.g., ChatGPT)	83%
Data (designing, collecting, or summarizing data: e.g., Jasper's Text Summarizer)	75%
Text (summarizing, automating, or translating content: e.g., ChatGPT)	71%
Search (AI-powered insights: e.g., Bing)	70%
Generating synthetic data (Capgemini's Artificial Data Amplifier)	61%
ML platforms (applications of machine learning: e.g., Slai)	54%
Code (testing and coding assistant e.g.,GitHub Copilot, converting code from one language to another e.g., Codex, Capgemini's A2B Translator)	50%
Images (generating images: e.g., DALL-E)	48%
Audio (summarizing, generating or converting text in audio: e.g., Sonix)	34%
Video (generating or editing videos: e.g., Pictory, Synthesys)	26%
Gaming (generative AI gaming studios or applications: e.g., Ludo AI)	4%

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations.
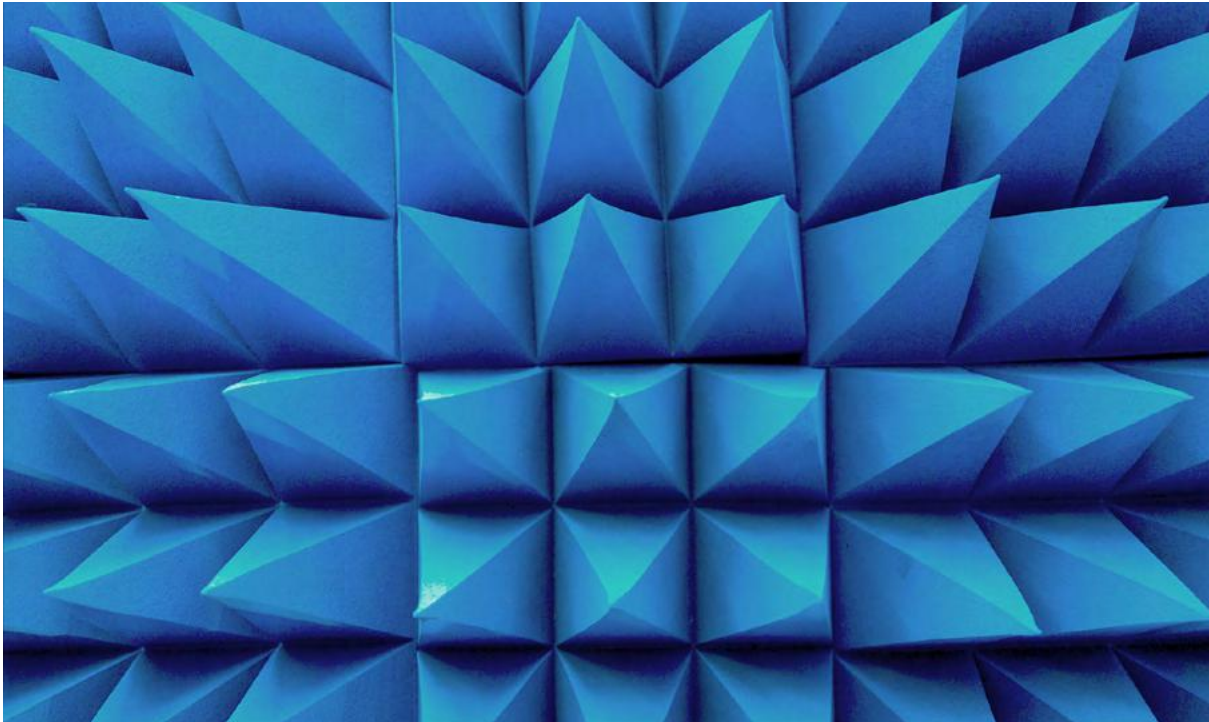
US financial services organization Morgan Stanley's vast library of investment strategies, market research, and analyst insights can be time-consuming and cumbersome for wealth-management advisors to sift through. To address this, Morgan Stanley is using GPT-4 to power an internal chatbot that provides instant access to any area of the archive. Jeff McMillan, Head of Analytics, Data, and Innovation, adds: *"You essentially have [access to] the knowledge of the most knowledgeable person in wealth management – instantly. Think of it as having our chief investment strategist, chief global economist, global equities strategist, and every other analyst around the globe on call for every advisor, every day. We believe that is a transformative capability for our company."*[2]

"You essentially have [access to] the knowledge of the most knowledgeable person in wealth management — instantly. Think of it as having our chief investment strategist, chief global economist, global equities strategist, and every other analyst around the globe on call for every advisor, every day. We believe that is a transformative capability for our company."

Jeff McMillan

Head of Analytics,
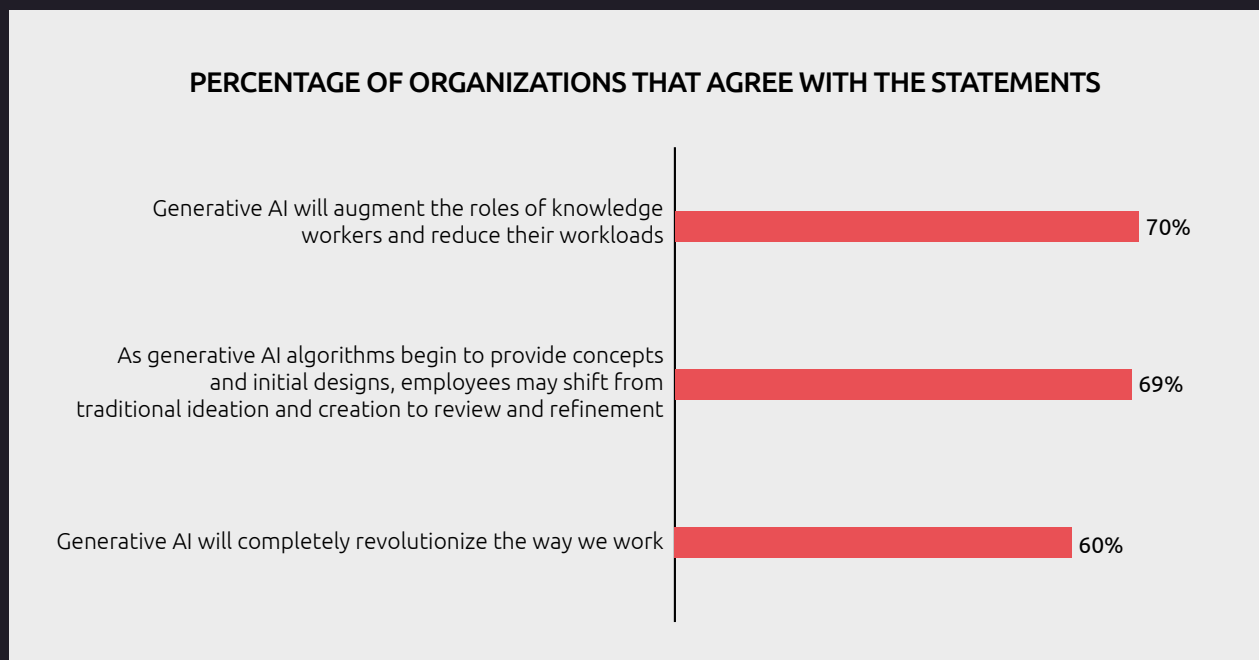Data, and Innovation,
Morgan Stanley.

The impact of generative AI on the workforce

Generative AI has the potential to transform work

Our consumer research on generative AI reveals that most consumers (70 percent) believe it will make them more efficient at work and will free them from routine tasks to explore more strategic aspects of their jobs.[3] Most executives concur with these consumer sentiments, with 70 percent agreeing the technology will allow organizations to widen the scope of the roles of knowledge workers (see Figure 6). Over half (60 percent) also mentioned that generative AI would completely revolutionize their way of working.

Fig.6

Most executives agree that generative AI will augment knowledge work

PERCENTAGE OF ORGANIZATIONS THAT AGREE WITH THE STATEMENTS

Generative AI will augment the roles of knowledge workers and reduce their workloads — **70%**

As generative AI algorithms begin to provide concepts and initial designs, employees may shift from traditional ideation and creation to review and refinement — **69%**

Generative AI will completely revolutionize the way we work — **60%**

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations.
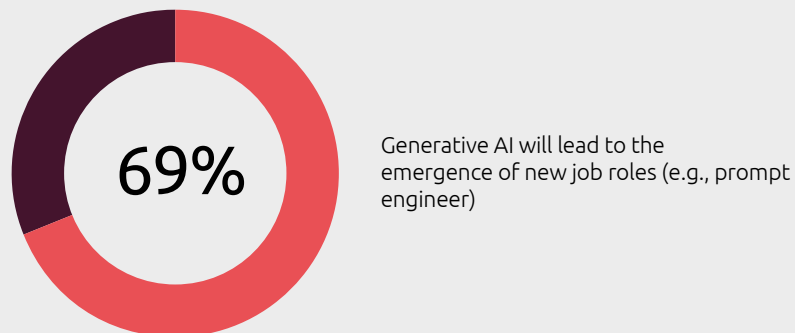
The rise of generative AI will create new roles

In our current survey, 69 percent of executives believe generative AI will lead to the emergence of new roles. In addition to prompt engineers, we may also see new roles such as AI auditors and AI ethicists emerge as the initiatives scale.

Fig.7

Most executives believe new roles will emerge from generative AI

PERCENTAGE OF ORGANIZATIONS WHO AGREE WITH THE STATEMENT

69%

Generative AI will lead to the emergence of new job roles (e.g., prompt engineer)

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N=800 organizations.

60%

believe that generative AI will completely revolutionize the way we work

Generative AI will demand upskilling and training initiatives

As well as opening up new job roles and requirements, as 68 percent of executives in our survey say will happen, the integration of generative AI into the workforce will require a significant investment in upskilling and cross-skilling of talent. In April 2023, in response to growing demand, Coursera, a large-scale US-based open online course provider, launched multiple new generative AI training courses, including ChatGPT Teach-Out from the University of Michigan, which introduces learners to large language models (LLMs) and chatbots and discusses the ethical use of generative AI and how the technology might be harnessed and regulated moving forward.[4]

02

ORGANIZATIONS SEE MORE GAIN THAN PAIN IN GENERATIVE AI

Most organizations believe the benefits of generative AI outweigh the risks

Our survey reveals that the majority of executives (74 percent) believe the benefits that generative AI brings outweigh the associated risks. The executives most strongly convinced that generative AI is a power for good work within the high-tech sector (84 percent); even at the other end of the list, a substantial 69 percent of executives within the energy and utilities and telecom sectors would bet on generative AI (see Figure 8).

74%

believe the benefits of generative AI
outweigh the associated risks

Fig.8

Most executives across industries say that the benefits of generative AI outweigh potential risks

PERCENTAGE OF ORGANIZATIONS WHO AGREE WITH THE STATEMENT BY SECTOR

Sector	Percentage
Average	74%
High tech	84%
Aerospace and defense	82%
Pharma and healthcare	80%
Industrial manufacturing	77%
Retail	76%
Financial services	74%
Consumer products	70%
Energy and utilities	69%
Telecom	69%
Automotive	66%

■ The benefits of utilizing generative AI outweigh the associated risks
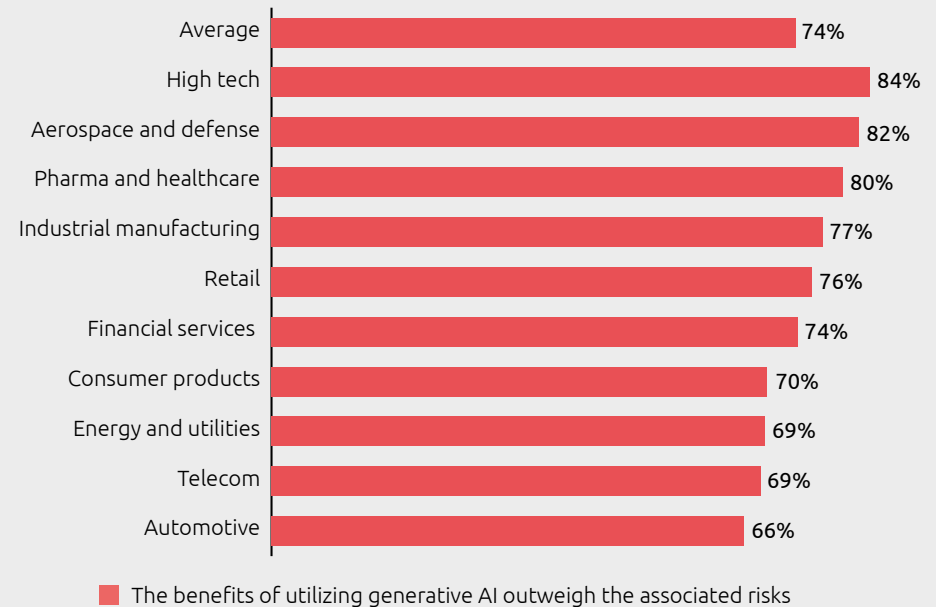
Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations.

Fig.9

Most executives say that generative AI will improve products/services and customer service

PERCENTAGE OF ORGANIZATIONS WHO AGREE WITH THE STATEMENTS

Generative AI will allow the design process to be more efficient and streamlined — **78%**

Generative AI can enable us to create products and services that are more accessible and inclusive, serving a wider range of customers with diverse needs and preferences — **76%**

Generative AI can enable us to create more interactive and engaging experiences for our customers — **71%**

Generative AI can be used to improve customer service by providing automated and personalized support — **67%**

Generative AI can improve internal operations and enhance facility maintenance — **65%**

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations.

Anticipated benefits of generative AI extend to product design and customer experience

Generative AI brings numerous transformative benefits to organizations, including enhanced decision-making, improved efficiency, personalized experiences, cost reductions, augmented innovation capacity, risk management, and predictive analytics. Most executives in our survey (78 percent) believe that generative AI will make product and service design more efficient and that it will help them design more inclusive, accessible products and services (76 percent). Seven in ten executives believe generative AI will help them improve the customer experience (see Figure 9).
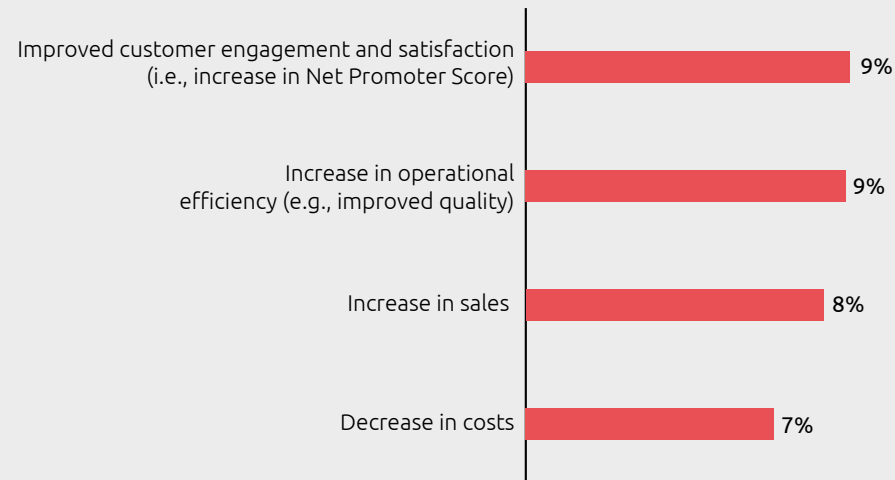
Executives are positive but realistic in their expectations of generative AI

We asked executives which organizational benefits they expect to see from generative AI within three years. Executives expect to see improvements of 7–9 percent across all industries (see Figure 10). Recent research from Stanford and MIT on the applications of generative AI in the workplace found that the productivity of tech-support agents who used conversational scripts improved as much as 14 percent at one organization,[5] suggesting such an estimate is realistic, if not conservative.

Fig.10

Generative AI implementation is expected to yield operational and customer benefits

EXPECTED FUTURE BENEFITS OF GENERATIVE AI IN THREE YEARS FROM TODAY, AVERAGE % PROJECTED INCREASE

Benefit	%
Improved customer engagement and satisfaction (i.e., increase in Net Promoter Score)	9%
Increase in operational efficiency (e.g., improved quality)	9%
Increase in sales	8%
Decrease in costs	7%

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations.
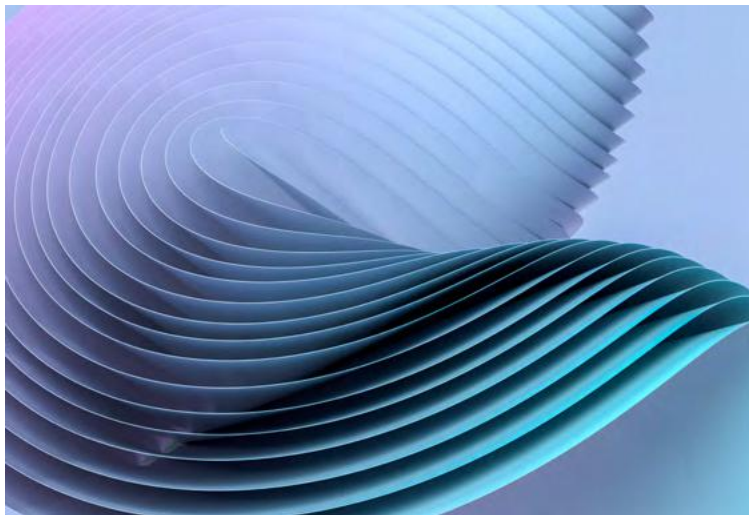
- **Customer engagement and satisfaction:** Organizations can use generative AI for personalization; real-time insights; intelligent customer service; predictive analytics; continuous improvement; and optimized customer journeys. These benefits ultimately lead to improved customer engagement, satisfaction, and loyalty.

KT telecom (South Korea's leading mobile operator) has built billion-parameter LLMs trained on the NVIDIA DGX SuperPOD platform and NeMo framework to power smart speakers and customer call centers. Its AI voice assistant, GiGA Genie, can control TVs, offer real-time traffic updates, and complete a range of other home-assistance tasks when prompted by voice commands. It has developed advanced conversational skills in the Korean language using LLMs – machine learning (ML) algorithms that can recognize, understand, predict, and generate human speech based on huge text datasets.[6]

- **Operational efficiency:** Organizations are already reporting significant efficiencies from generative AI; German biotech firm Evotec announced a phase-one clinical trial for a novel anti-cancer compound it developed with Exscientia, a UK organization that uses AI for small-molecule-drug discovery. By using Exscientia's Centaur Chemist AI design platform, the organizations identified the drug candidate in only eight months. For context, the average traditional discovery process takes 4–5 years.[7]

20–60%

reduction in weight achieved through generative design by German-based Claudius Peters

- **Sales:** By using generative AI to produce personalized marketing, pricing optimization, demand forecasting, improved customer experience, enhanced sales support, and data-driven decision-making, organizations can attract more customers, drive life-long content-driven conversations, and boost conversions.

  In an attempt to increase its sales, Italian consumer-products organization Ferrero worked with brand designer Ogilvy Italy to customize jars for its popular Nutella chocolate spread. Data scientists fed a database of patterns and colors to a generative AI algorithm, which rapidly produced 7 million distinct jar designs. These unique jars, branded as Nutella Unica, were sold all across Italy, reportedly selling out within a month. The design relied on the brand's highly recognizable lettering, around which other elements were customized.[8]

- **Costs:** By using generative AI to automate processes, optimize resources, implement predictive maintenance, optimize the supply chain, mitigate risks, and improve decision-making, organizations can achieve cost savings and enhance overall financial performance.

  Germany-based Claudius Peters produces processing equipment for cement, coal, alumina, and gypsum plants. Working with technology partner Autodesk, it used the Scrum project-management framework to reduce costs and product weights while shortening the engineering process. The generative design produced components with a remarkable 20–60 percent weight reduction while meeting performance requirements. Additionally, the design served as a re-engineering template for conventional manufacturing, resulting in a 30 percent lighter final design that lowered component costs.[9]

Fig.11

Organizations are prioritizing dedicated generative AI teams

Four in 10 organizations have already established teams and budget for generative AI

In just a few months of the public getting to know about the technology through the launch of ChatGPT in November 2022, nearly all (97 percent) of organizations in our survey have plans for generative AI. Our research reveals that 40 percent of organizations have established dedicated teams and budgets for generative AI, while another half (49 percent) are contemplating doing the same within 12 months. Only 8 percent of organizations are yet to develop a firm strategy for integration, and as little as 3 percent are currently unsure if or how they will integrate generative AI into their product- or service-development plans (see Figure 11).
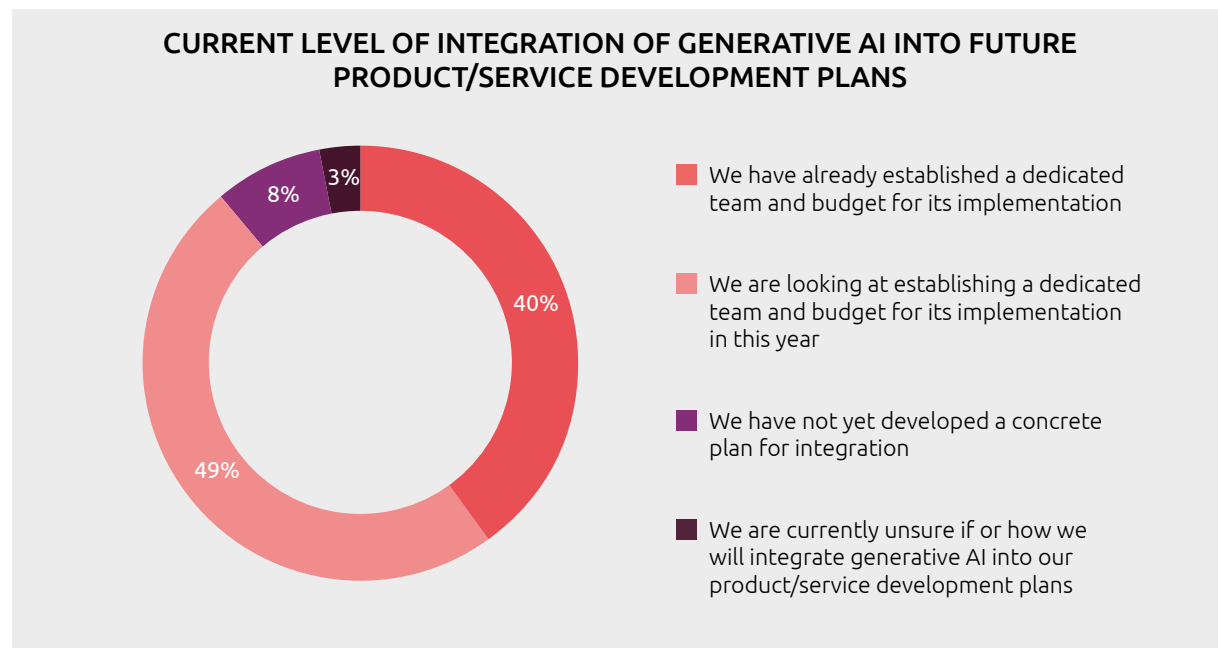
CURRENT LEVEL OF INTEGRATION OF GENERATIVE AI INTO FUTURE PRODUCT/SERVICE DEVELOPMENT PLANS

- We have already established a dedicated team and budget for its implementation
- We are looking at establishing a dedicated team and budget for its implementation in this year
- We have not yet developed a concrete plan for integration
- We are currently unsure if or how we will integrate generative AI into our product/service development plans

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations.

Fig.12

High tech and retail show the strongest commitment to integrating generative AI

PERCENTAGE OF ORGANIZATIONS THAT HAVE ESTABLISHED A DEDICATED TEAM AND BUDGET TO INTEGRATE GENERATIVE AI INTO FUTURE PRODUCT/SERVICE DEVELOPMENT PLANS BY SECTOR

Sector	Percentage
Average	40%
High tech	74%
Retail	62%
Aerospace and defense	52%
Pharma and healthcare	42%
Financial services	42%
Energy and utilities	39%
Telecom	36%
Automotive	30%
Consumer products	23%
Industrial manufacturing	19%

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations
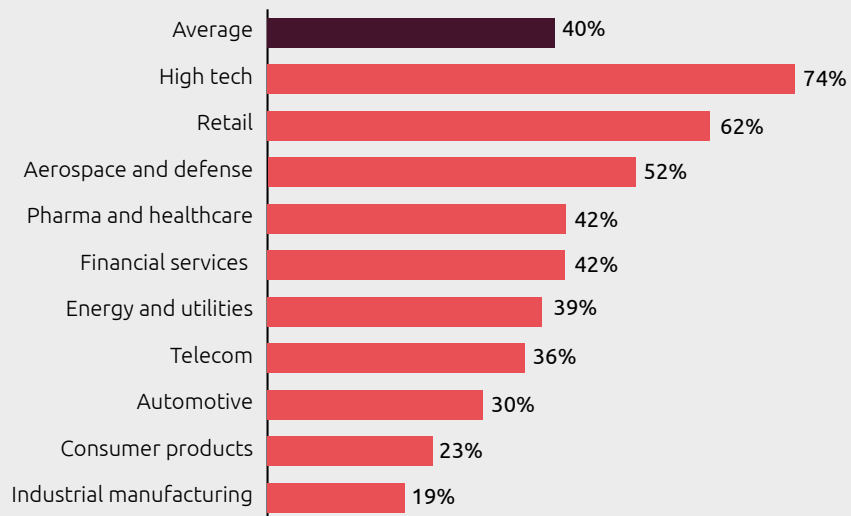
The majority (74 percent) of executives in the high tech sector say they have established dedicated teams and budgets for generative AI. Over 60 percent of executives from retail and 52 percent of executives from aerospace and defense say the same (see Figure 12). Within retail, while only 3 percent of executives believed generative AI to be disruptive to their industry (refer to Figure 4), 62 percent of retail executives say their organization has established a dedicated team and budget. This suggests that while the retail industry does not see this technology as a disruptor, organizations realize they will lose out if they fail to implement it.
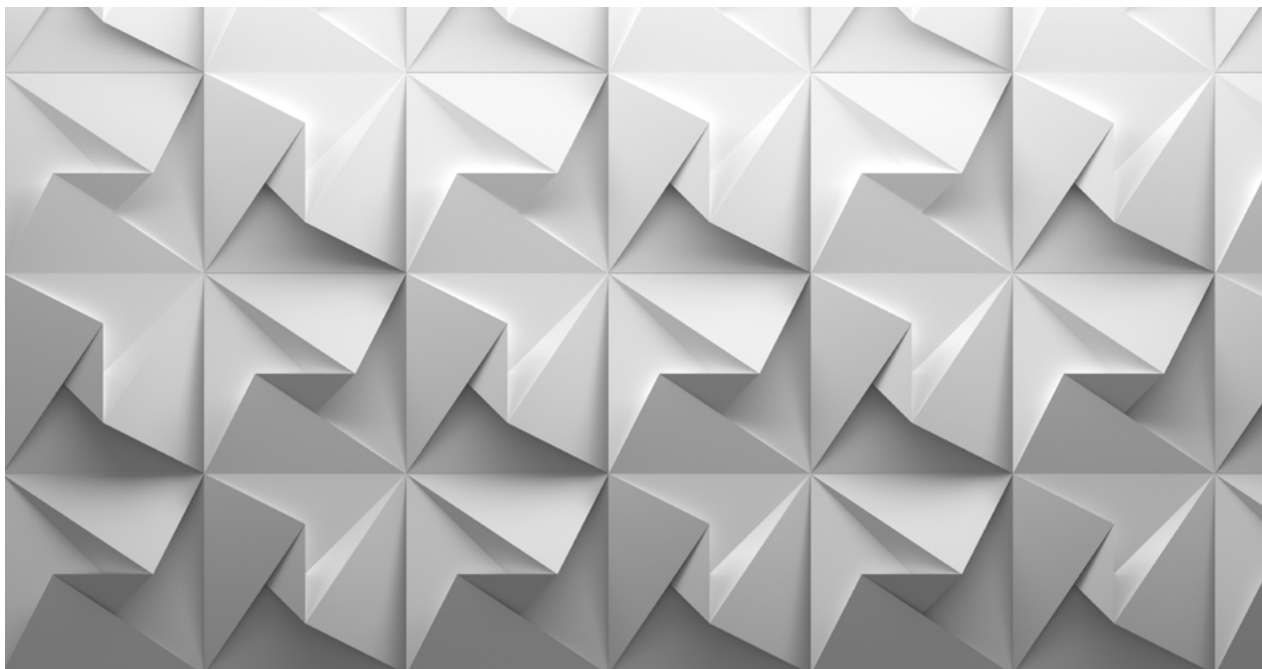
40[%]

of organizations have already established teams and budget for generative AI, while another half (49 percent) are contemplating doing the same within 12 months

Governing generative AI

Centralized funding for generative AI initiatives is currently the favored model

Of the 40 percent of organizations in our survey (320 companies) that have a dedicated budget for generative AI initiatives, 78 percent source it from their central budget, 16 percent from their overall AI budget, and 6 percent from their IT/digital department.

Organizations expect to partner with developers and IT vendors

The preferred partners for generative AI initiatives are developers (69 percent); IT vendors and consulting firms (66 percent); academic institutions (55 percent); and big tech (35 percent) (see Figure 13).

Fig.13

Most organizations are working/prefer to work with developers and IT vendors for their generative AI initiatives
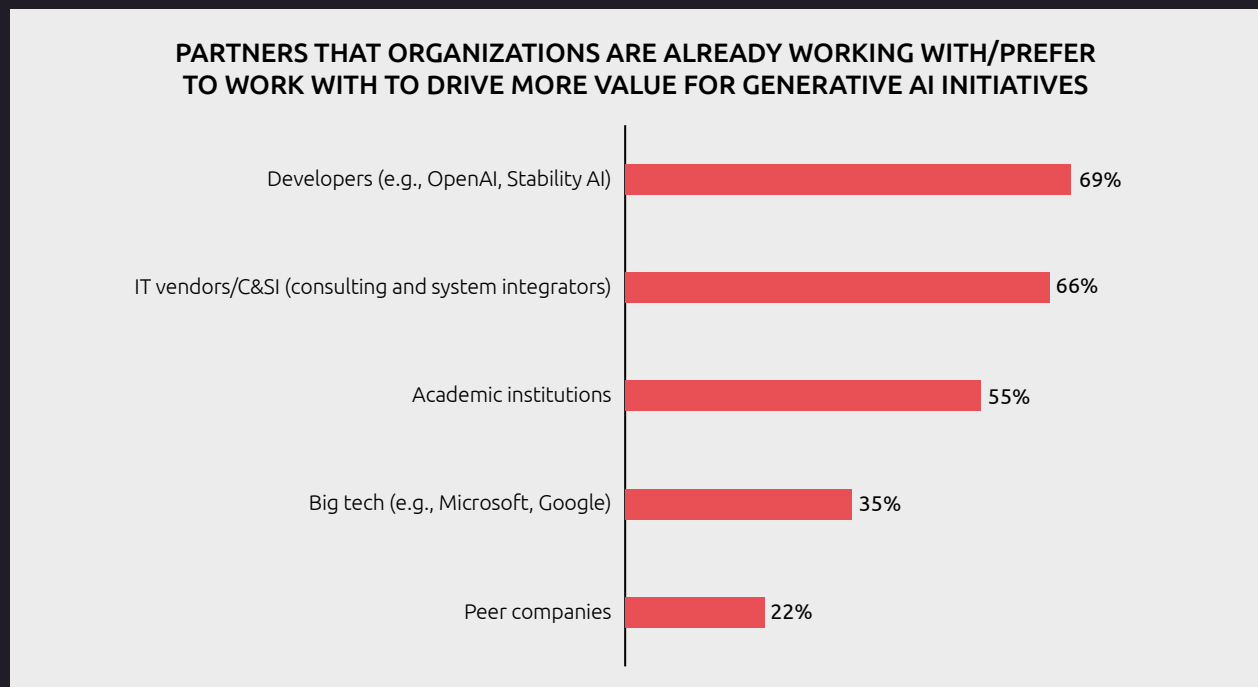
PARTNERS THAT ORGANIZATIONS ARE ALREADY WORKING WITH/PREFER TO WORK WITH TO DRIVE MORE VALUE FOR GENERATIVE AI INITIATIVES

Partner	Percentage
Developers (e.g., OpenAI, Stability AI)	69%
IT vendors/C&SI (consulting and system integrators)	66%
Academic institutions	55%
Big tech (e.g., Microsoft, Google)	35%
Peer companies	22%

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations.

03

GENERATIVE AI PACKS THE MOST PUNCH FOR IT, SALES, AND MARKETING

Fig.14

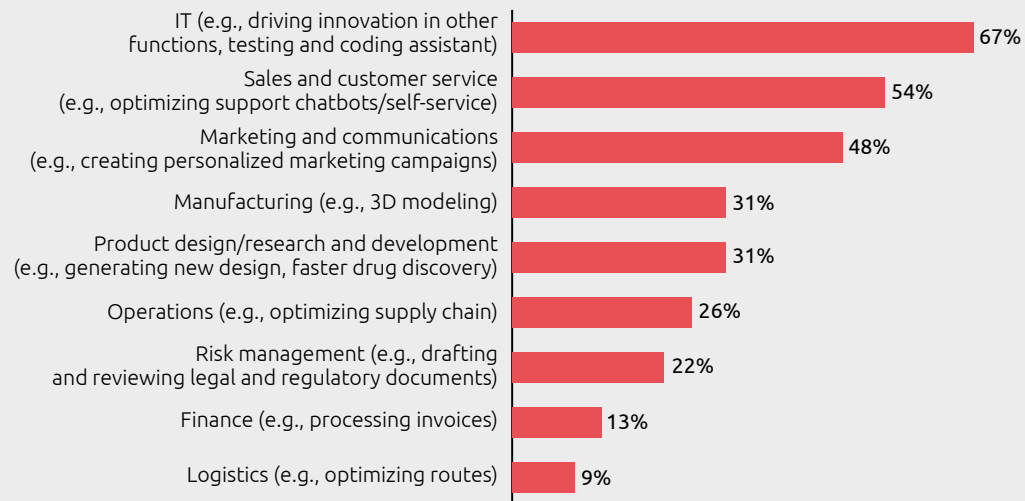67 percent of executives see the most potential for generative AI in the IT function

The greatest potential for generative AI lies in the IT function

Nearly 70 percent of executives see generative AI bringing the most potential value to IT within its role as an enabler for driving innovation across functions. Over half (54 percent) also see generative AI driving innovation for sales and 48 percent for marketing and communications (see Figure 14).

67%

of executives see generative AI bringing the most potential value to IT within its role as an enabler for driving innovation across functions

PERCENTAGE OF ORGANIZATIONS THAT SEE THE MOST POTENTIAL FOR GENERATIVE AI MODELS TO DRIVE INNOVATION AND CREATE VALUE FOR THEIR ORGANIZATION ACROSS BUSINESS FUNCTIONS

Function	Percentage
IT (e.g., driving innovation in other functions, testing and coding assistant)	67%
Sales and customer service (e.g., optimizing support chatbots/self-service)	54%
Marketing and communications (e.g., creating personalized marketing campaigns)	48%
Manufacturing (e.g., 3D modeling)	31%
Product design/research and development (e.g., generating new design, faster drug discovery)	31%
Operations (e.g., optimizing supply chain)	26%
Risk management (e.g., drafting and reviewing legal and regulatory documents)	22%
Finance (e.g., processing invoices)	13%
Logistics (e.g., optimizing routes)	9%

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations.
Question asked: In which business functions do you see the most potential for generative AI models to drive innovation and create value for your organization? Please select top three.

Fig.15

Organizations use or plan to use generative AI most frequently in IT

PERCENTAGE OF ORGANIZATIONS WHO USE OR PLAN TO USE GENERATIVE AI ACROSS BUSINESS FUNCTIONS

Business Function	Percentage
IT (e.g., driving innovation in other functions, testing and coding assistant)	54%
Sales and customer service (e.g., optimizing support chatbots/self-service)	47%
Marketing and communications (e.g., creating personalized marketing campaigns)	46%
Manufacturing (e.g., 3D modeling)	30%
Product design/research and development (e.g., generating new design, faster drug discovery)	28%
Operations (e.g., optimizing supply chain)	24%
Risk management (e.g., drafting and reviewing legal and regulatory documents)	21%
Finance (e.g., processing invoices)	13%
Logistics (e.g., optimizing routes)	8%

Source: Capgemini Research Institute, generative AI, Executive Survey, April 2023, N = 800 organizations.
*Question asked: In which business function(s) does your organization use or plan to use generative AI the most? Please select all that apply

Organizations most commonly use or plan to implement generative AI in IT, sales and customer service, and marketing

Over half (54 percent) of executives say their organization is using or plans to use generative AI in the IT function, and slightly less than half in sales (47 percent) and marketing (46 percent) (see Figure 15).

The top business function in which executives say their organization is using or plans to use generative AI varies by industry:

- Manufacturing (e.g., 3D modelling)

  – Automotive (73 percent)

  – Industrial manufacturing (65 percent)

- IT (e.g., testing and coding assistant)

    – High tech (86 percent)

    – Telecom (71 percent)

    – Aerospace and defense (69 percent)

- Product design/research and development (e.g., generating new design, faster drug discovery)

    – Pharma and healthcare (63 percent)

- Finance (e.g., processing invoices)

    – Financial services (72 percent)

- Sales (e.g., optimizing sales support chatbots)

    – Retail (62 percent)

    – Energy and utilities (52 percent)

- Marketing and communications (e.g., creating personalized marketing campaigns)
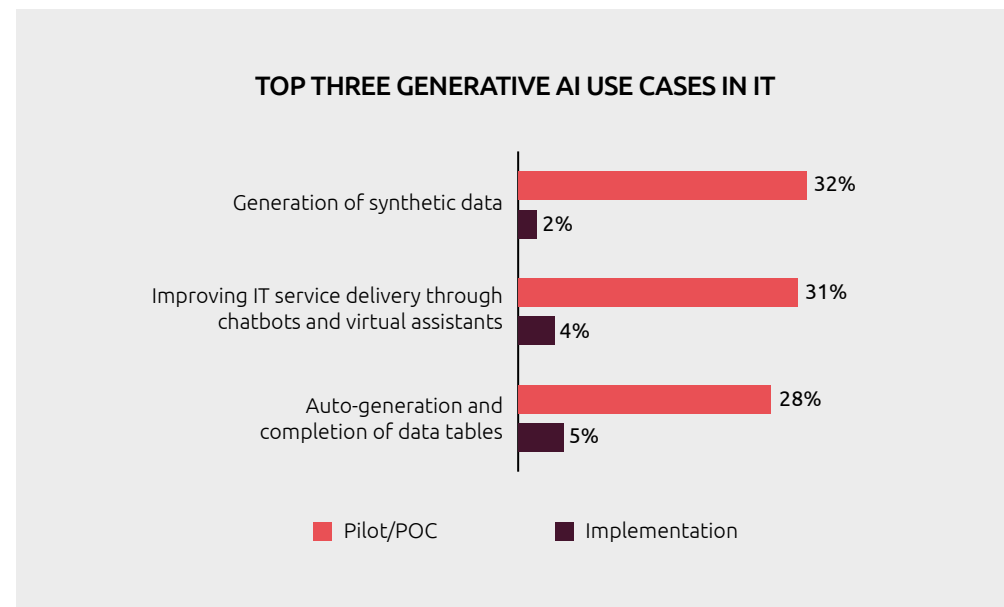
    – Consumer products (58 percent)

Generating synthetic data is the top use case in IT

Top use cases by business function

In our survey, we assessed 32 functional use cases for generative AI, asking executives what their organization's current stage of implementation was for each. In the following sections, we highlight the top three use cases for each function based on the percentage of executives saying their organization has ongoing pilots or proofs of concept (PoCs). We also discuss the value these use cases could bring to organizations.

Generative AI can help developers in a number of ways

Generative AI is transforming the world of IT, delivering increased productivity, faster development cycles, and improved accuracy and quality. Our survey reveals that 5 percent of organizations already use it for auto-generation and completion of data tables, 4 percent for chatbots in IT service delivery, and 2 percent for the generation of synthetic data (see Figure 16).

TOP THREE GENERATIVE AI USE CASES IN IT

Generation of synthetic data — 32%, 2%

Improving IT service delivery through chatbots and virtual assistants — 31%, 4%

Auto-generation and completion of data tables — 28%, 5%

- Pilot/POC
- Implementation

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N=314–384 organizations.

By using generative AI to generate and populate data tables, users can redirect time and effort towards strategic thinking. Google's platform harnesses natural language processing (NLP) and ML algorithms to do this. This feature allows users to organize and analyze their data quickly, enhancing productivity.[11]

Generative AI models can also create new programming code based on natural language prompts, assist in completing partially written code, and facilitate code translation between different programming languages. A director at a telecom company comments: *"The vast majority of our developers internally want to use the technology because they believe it will allow them to produce higher-quality code much more quickly."*

Duolingo, a renowned language-learning app, has adopted GitHub's generative AI tool, GitHub Copilot, to help its developers write and "ship" (deliver to the customer) code with unprecedented speed and accuracy, significantly reducing development cycles. Moreover, generative AI enables automated testing, ensuring software reliability and robustness while minimizing bugs and enhancing overall test coverage. Girish Mathrubootham, CEO of Freshworks, concurs: *"We use ChatGPT to write code. Software development used to take anywhere from eight to 10 weeks; now it can be done in less than a week."* [11]

Generative AI is also breaking through in synthetic data. By training algorithms with real-world data samples, the generative model learns patterns, spots correlations, and recognizes statistical properties. The synthetic data retains the same insights and correlations as the original, making it a reliable proxy.[12] Self-driving car organizations such as Cruise and Waymo use AI-generated synthetic data to train perception systems and prepare vehicles for real-world scenarios during operations.[13]

Organizations hope to optimize their sales operations and provide better customer service through chatbots

According to our survey, 6 percent of organizations are using generative AI to streamline sales operations; 6 percent to optimize sales-support chatbots; and 4 percent to enhance customer engagement through generative-AI-powered virtual assistants (see Figure 17). Mike Hales, product owner of a conversational AI platform at BT Group explains their interest in generative
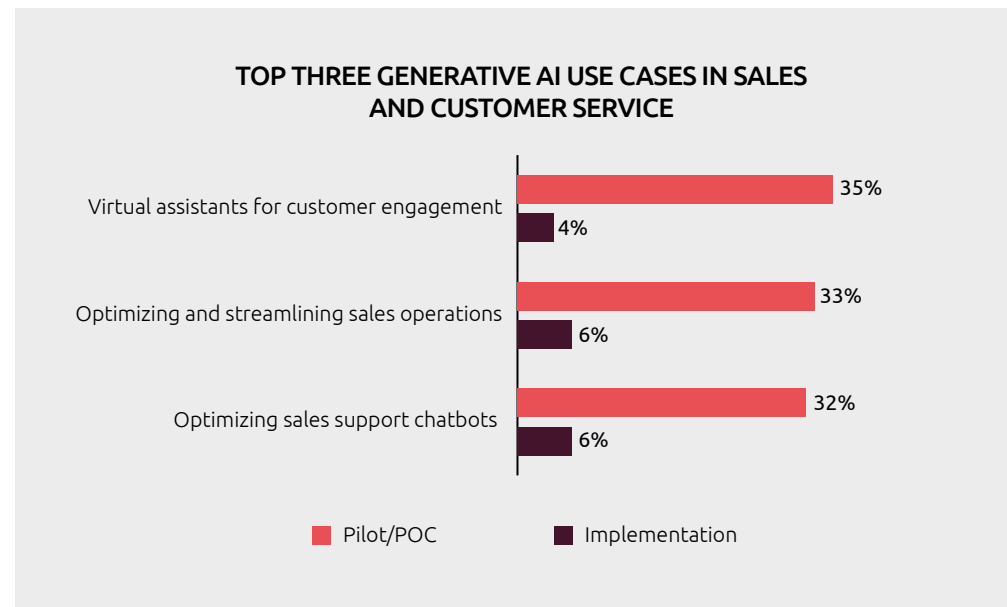
AI: *"Scripted conversations have a one-way flow and there is no deviation. Customers can go off in other directions. We are looking at generative AI to help wrap around these conversations and build conversations more quickly and efficiently."*

Generative AI automates tasks such as email generation and conversation summaries, saving time and effort and improving productivity for sales teams. This streamlining of operations allows sales teams to focus on high-value activities, such as building relationships with customers and closing deals. Additionally, organizations can use generative AI-powered chatbots to provide faster and more accurate customer service, leading to improved response times and stronger engagement.

Outreach, a leading sales-execution platform, introduced Smart Email Assist, which uses generative AI to auto-generate accurate and relevant email copy based on patterns detected in prior conversations between buyers and sellers. The organization also plans to add new capabilities to enhance seller productivity, improve conversion rates, and increase participation and attainment across teams.[14] Salesforce-owned enterprise chat app Slack has integrated ChatGPT to deliver instant conversation summaries, provide research tools, draft messages, and find answers in relation to various projects or topics.[15] Amazon is working on infusing generative AI into its shopping app. Amazon's intention is to improve the shopping experience by using LLMs to communicate more effectively with the customer.[16]

Fig.17

Using generative AI as a virtual assistant is the top use case in sales and customer service

TOP THREE GENERATIVE AI USE CASES IN SALES AND CUSTOMER SERVICE

|	
Virtual assistants for customer engagement	35% / 4%
Optimizing and streamlining sales operations	33% / 6%
Optimizing sales support chatbots	32% / 6%

■ Pilot/POC   ■ Implementation

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N=272–340 organizations.

"Scripted conversations have a one-way flow and there is no deviation. Customers can go off in other directions. We are looking at generative AI to help wrap around these conversations and build conversations more quickly and efficiently."

Mike Hales
Product owner of a conversational AI platform at BT Group
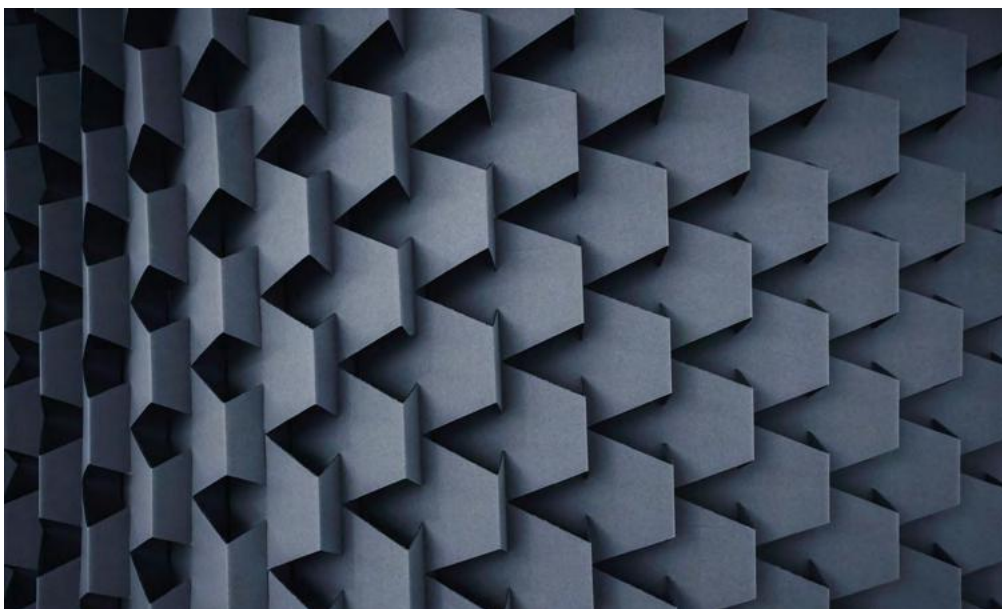
Generative AI could allow marketing and communications organizations to reach their customers more effectively
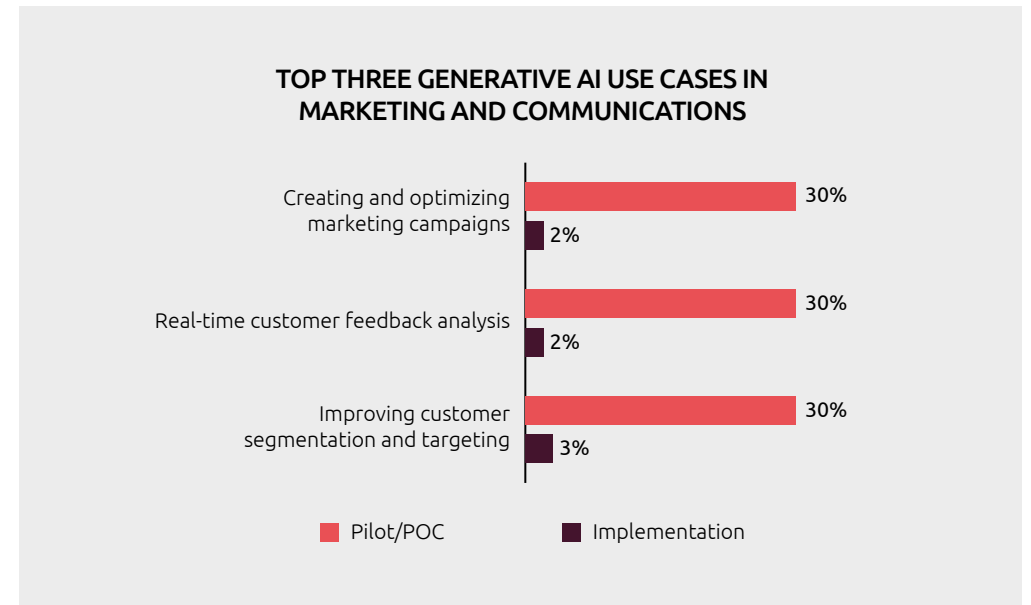
Organizations are piloting generative AI in marketing and communications to create and optimize their campaigns and also to improve their customer targeting (30 percent) (see Figure 18).

Organizations can drive highly personalized marketing initiatives at scale and marketers can create tailored content, offer personalized product recommendations, and craft experiences that resonate with their target audiences. This heightened level of personalization boosts customer engagement, leading to higher conversion rates. Generative AI enables efficient processing of vast amounts of real-time customer feedback, uncovering patterns, sentiments, and valuable insights to refine marketing campaigns and improve overall customer experiences.

Fig.18

Personalizing content is the top use case in marketing

Synthetic messages as a percentage of all outbound marketing messages from large organizations are projected to increase to 30 percent by 2025, an impressive leap from the less than 2 percent recorded in 2022.[17] Jasper, a marketing-focused version of GPT-3, is capable of producing customer-facing content including blogs, social media posts, web copy, sales emails, and ads. The organization actively tests its outputs and fine-tunes its GPT-3 models (which can understand and generate natural language) using best outputs from its customers, resulting in substantial improvements over time. At VMWare, a cloud-computing organization, writers use Jasper to create original marketing content, spanning email campaigns, product promotions, and social media copy.[18] Adobe Firefly, a family of creative generative AI models, enables organizations to elevate their marketing and experience strategies by generating content in their own brand language and style. This allows organizations to create cohesive customer experiences and personalized interactions at scale.[19]
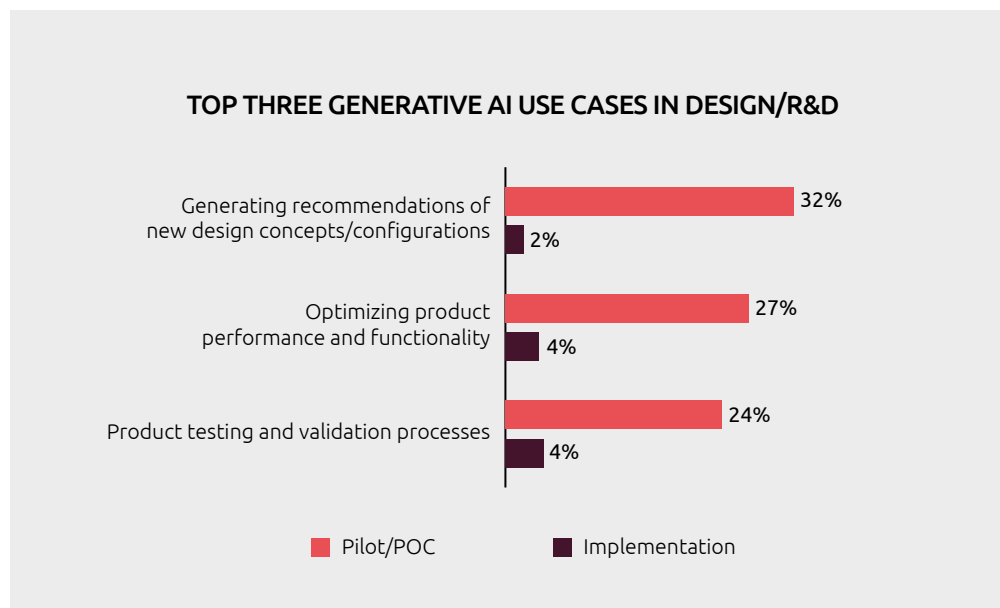
TOP THREE GENERATIVE AI USE CASES IN MARKETING AND COMMUNICATIONS

Creating and optimizing marketing campaigns — 30% / 2%

Real-time customer feedback analysis — 30% / 2%

Improving customer segmentation and targeting — 30% / 3%

■ Pilot/POC   ■ Implementation

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023 N=235–263 organizations.

Fig.19

Generating design concepts is the top use case in design/R&D

TOP THREE GENERATIVE AI USE CASES IN DESIGN/R&D

Generating recommendations of new design concepts/configurations — 32% / 2%

Optimizing product performance and functionality — 27% / 4%

Product testing and validation processes — 24% / 4%

Pilot/POC   Implementation

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N=279–325 organizations.

Generative design is opening up product R&D

Generative design can rapidly explore a range of design possibilities at the R&D phase. The models generate a number of variations in a short time span, including options that could be considered outside the natural range of human creativity. This is the use case generating most experimental interest among organizations we surveyed, at 32 percent, as seen in Figure 19. Organizations could rely on generative AI to proactively assess design directions of products based on predefined variables and criteria, conduct design iterations based on feedback sooner and develop multi-modal product experiences.
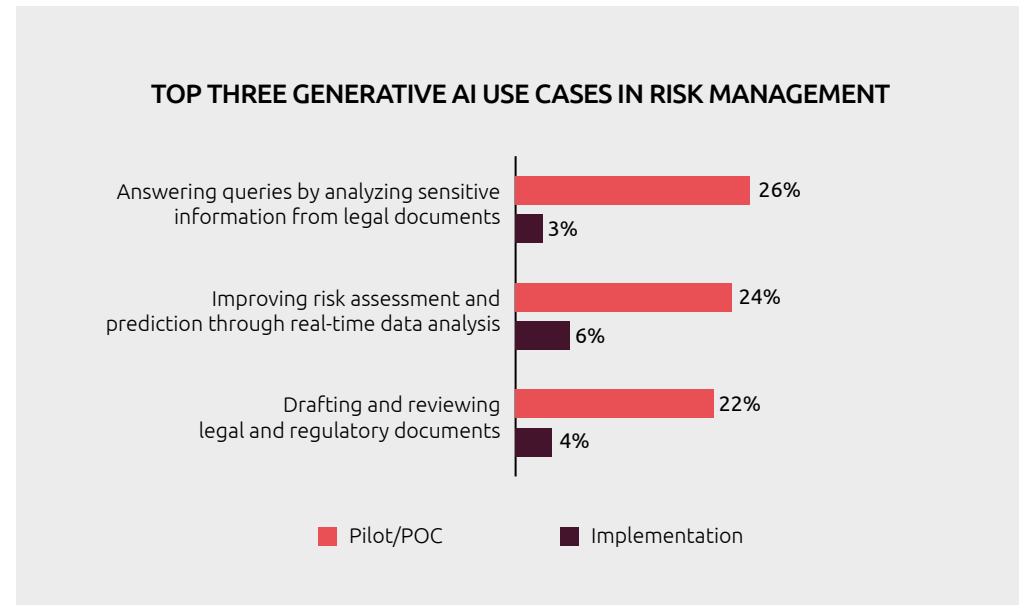
In an interesting application of generative AI, NASA developed mission hardware called "evolved structures," which will be used in space telescopes and scanners of the Earth's atmosphere, among other uses. Ryan McClelland, Research Engineer at NASA's Goddard Space Flight Center in Greenbelt, Maryland, elaborates: *"You can perform the design, analysis, and fabrication of a prototype part, and have it in hand in as little as one week."* He adds: *"We found it actually lowers risk. The parts generated by the algorithm have stress factors almost ten times lower than parts produced by human design."*[20]

Fig.20

Responding to queries is the top use case in risk management

Generative AI could offer a clearer view of risk

Our survey reveals that organizations are using generative AI to analyze, generate, extract information from, and review legal and regulatory documents and enhance risk assessment. Generative AI can then act as a virtual assistant, supporting risk officers in their roles. The Paladin Group, an InsurTech digital brokerage, and Dais Technology, an insurance technology provider, have collaborated to create UnderwriteAI, a generative AI tool with access to vast datasets that streamlines the underwriting process, delivering enhanced speed, efficiency, and accuracy. This specialized tool improves risk assessment, optimizes product pricing, and generates valuable insights for brokers and insurers.[21] Allen & Overy, an international law firm, has introduced an AI chatbot named Harvey, built using OpenAI's GPT technology. Harvey has undergone extensive testing since November 2022, specifically for tasks such as drafting merger and acquisition documents and client memos. The chatbot is now available to all of the firm's approximately 3,500 lawyers. This move marks the first known use of generative AI within the "Magic Circle" (a prestigious group of London-based law firms).[22]

TOP THREE GENERATIVE AI USE CASES IN RISK MANAGEMENT

Answering queries by analyzing sensitive information from legal documents	26% / 3%
Improving risk assessment and prediction through real-time data analysis	24% / 6%
Drafting and reviewing legal and regulatory documents	22% / 4%

■ Pilot/POC   ■ Implementation

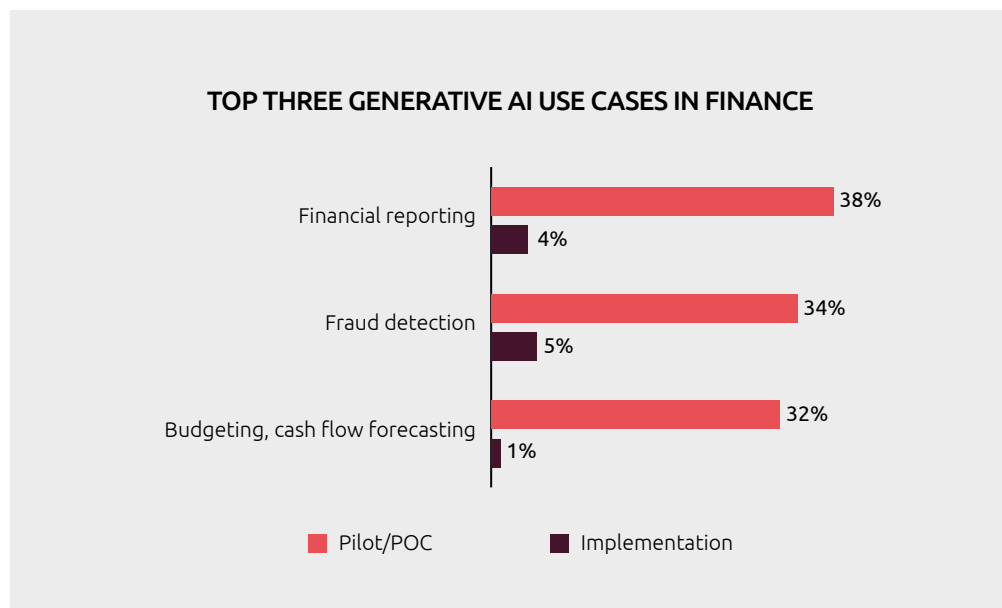Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N=97–1253 organizations.

9%

improvements expected in operational
efficiencies and customer satisfaction
in three years from now due to
generative AI

Conducting financial reporting is the top use case in finance

TOP THREE GENERATIVE AI USE CASES IN FINANCE

Financial reporting — 38% / 4%

Fraud detection — 34% / 5%

Budgeting, cash flow forecasting — 32% / 1%

■ Pilot/POC   ■ Implementation

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N=71–84 organizations.

Reporting and fraud detection are top finance use cases

Natural language generation (NLG) is a subset of generative AI that can translate structured financial data into simulated human speech or written language. This can be helpful for generating commentary on financial reports or to simplify complex financial concepts. Thirty-eight percent of organizations we surveyed are piloting this use case. Traders, analysts, fund managers, and others can access reports generated by NLG from the numerous data feeds conventionally used by financial-services organizations to inform decisions.[23] The Wall Street Journal partnered with Narrativa, a generative AI platform organization, to create a tool that captures data from application programming interfaces (APIs) and, using language from existing Wall Street Journal articles, creates drafts to assist reporters and editors, freeing them up to spend more time on analysis.[24] Nevertheless, it is important to understand that generative AI models such as GPT-4 tend to "hallucinate," (i.e., "…produce content that is nonsensical or untruthful in relation to certain sources"). So, while the technology may help in creating initial drafts, it is critical to ensure the correctness and accuracy, particularly for corporate reporting.

Fraud detection is the second-most commonly investigated use case (see Figure 21). Generative AI can be used to analyze patterns in credit-card transactions, identifying anomalies or unusual behaviors. Notably, generative AI synthetic data that resembles fraudulent transactions can be used to train analytical models.
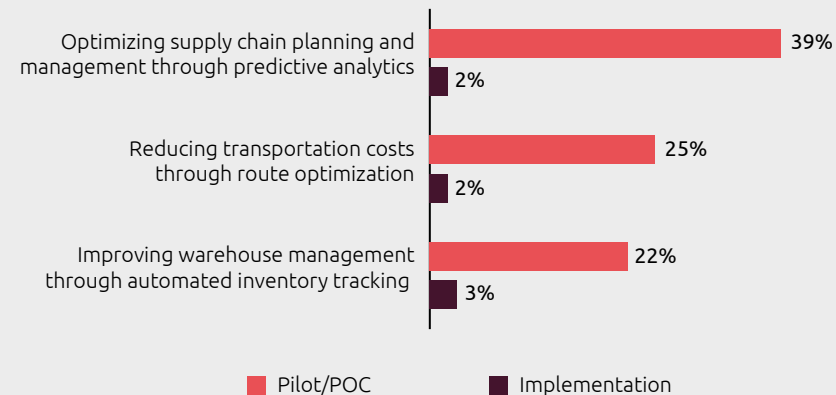
Fig.22

Using predictive analytics is the top use case in logistics/operations

Supply chains in line for a generative AI upgrade

Generative AI can help with transportation optimization, warehouse management, supply and demand planning, and supply chain troubleshooting. For instance, Inspecterio, a software as a service (SaaS) provider for supply chain, introduced a ChatGPT-driven generative AI tool that will extract data from an organization's ecosystem of suppliers to provide corrective and preventive actions to improve supply chain performance.[25]

Project44, an organization that provides supply chain visibility solutions, launched Movement GPT, a tool that invites users to submit data requests such as "Show me all of my shipments impacted by weather in northern Europe" or "Do I have more reliable routing options for my next shipment?" This then allows them to identify supply chain risks and respond or anticipate accordingly.[26]

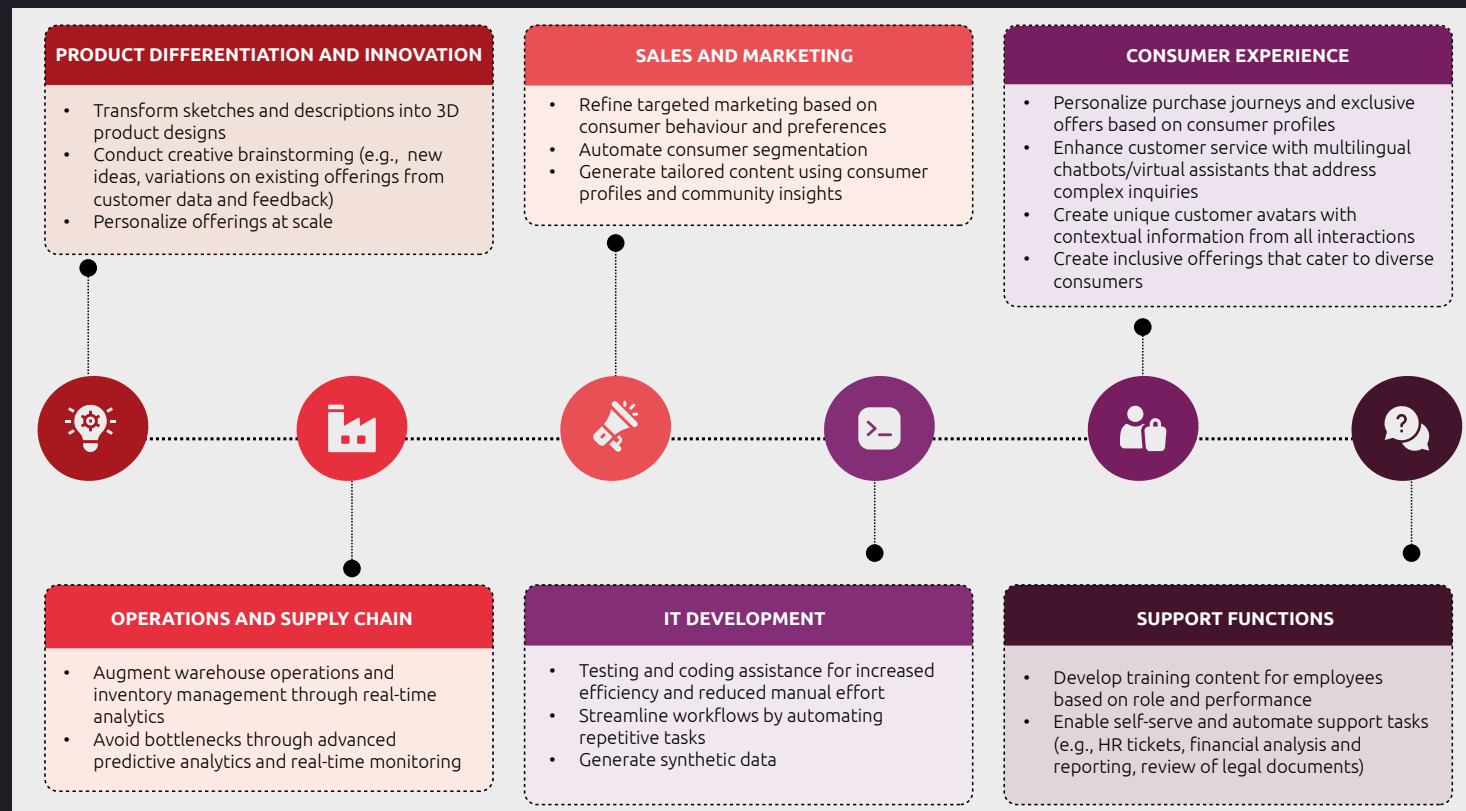**TOP THREE GENERATIVE AI USE CASES IN LOGISTICS/OPERATIONS**

Optimizing supply chain planning and management through predictive analytics
- 39%
- 2%

Reducing transportation costs through route optimization
- 25%
- 2%

Improving warehouse management through automated inventory tracking
- 22%
- 3%

■ Pilot/POC   ■ Implementation

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N=149–185 organizations.

Capgemini Research Institute 2023

Fig.23

The power of generative AI unleashed across the value chain

Generative AI is capable of impacting the whole organization

Generative AI has the potential to be a transformative force across all aspects of the value chain, as well as for customer and employee interactions.

PRODUCT DIFFERENTIATION AND INNOVATION

- Transform sketches and descriptions into 3D product designs
- Conduct creative brainstorming (e.g., new ideas, variations on existing offerings from customer data and feedback)
- Personalize offerings at scale

SALES AND MARKETING

- Refine targeted marketing based on consumer behaviour and preferences
- Automate consumer segmentation
- Generate tailored content using consumer profiles and community insights

CONSUMER EXPERIENCE

- Personalize purchase journeys and exclusive offers based on consumer profiles
- Enhance customer service with multilingual chatbots/virtual assistants that address complex inquiries
- Create unique customer avatars with contextual information from all interactions
- Create inclusive offerings that cater to diverse consumers

OPERATIONS AND SUPPLY CHAIN

- Augment warehouse operations and inventory management through real-time analytics
- Avoid bottlenecks through advanced predictive analytics and real-time monitoring

IT DEVELOPMENT

- Testing and coding assistance for increased efficiency and reduced manual effort
- Streamline workflows by automating repetitive tasks
- Generate synthetic data

SUPPORT FUNCTIONS

- Develop training content for employees based on role and performance
- Enable self-serve and automate support tasks (e.g., HR tickets, financial analysis and reporting, review of legal documents)

Source: Capgemini Research Institute analysis.

04

HIGH TECH LEADS IN
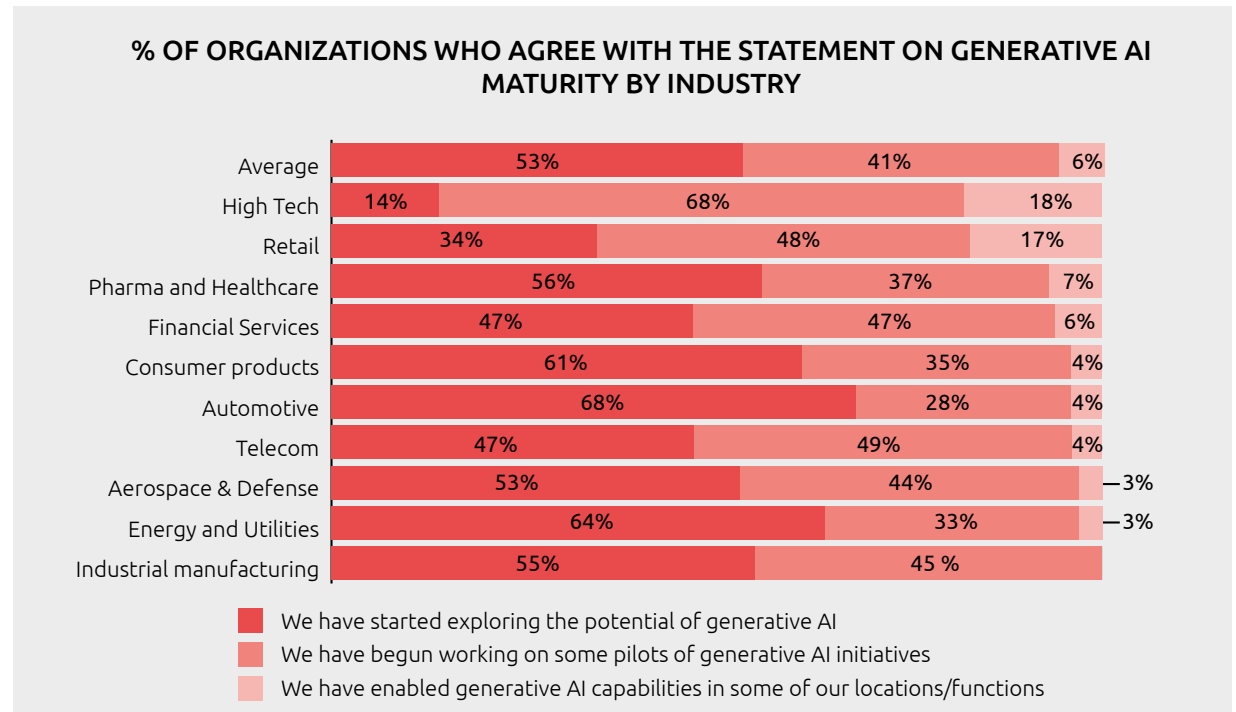# IMPLEMENTING GENERATIVE AI

Fig.24

High tech and retail lead in implementing generative AI initiatives

The high-tech sector leads in implementing generative AI initiatives

Nearly 70 percent of executives within the high-tech sector say they their organizations have ongoing generative AI pilots, and 18 percent say they have enabled generative AI capabilities in some locations or functions. Nearly half of executives in retail, financial services, and telecom have ongoing generative AI pilots, and 17 percent of retail executives say they have enabled generative AI capabilities (see Figure 24).

US quick-service restaurant Wendy's is working with Google Cloud on a generative AI solution, called Wendy's FreshAI, that will pilot in June 2023. The technology is transforming the Wendy's drive-through ordering experience with Google Cloud's generative AI and LLMs that have the ability to discern the billions of possible order combinations on the Wendy's menu.[27]

% OF ORGANIZATIONS WHO AGREE WITH THE STATEMENT ON GENERATIVE AI MATURITY BY INDUSTRY

Industry	Started exploring	Begun working on pilots	Enabled capabilities
Average	53%	41%	6%
High Tech	14%	68%	18%
Retail	34%	48%	17%
Pharma and Healthcare	56%	37%	7%
Financial Services	47%	47%	6%
Consumer products	61%	35%	4%
Automotive	68%	28%	4%
Telecom	47%	49%	4%
Aerospace & Defense	53%	44%	3%
Energy and Utilities	64%	33%	3%
Industrial manufacturing	55%	45 %	

■ We have started exploring the potential of generative AI
■ We have begun working on some pilots of generative AI initiatives
■ We have enabled generative AI capabilities in some of our locations/functions

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N=800 organizations; N=29–127organizations per sector.

Top generative AI use cases, by industry

In our survey, we assessed 38 industry-specific use cases for generative AI. We asked executives to specify their organization's current stage of implementation for each use case. In Figure 25, we highlight the top two use cases for each industry based on the percentage of executives saying their organization has ongoing pilots or PoCs. We also discuss the value these use cases could bring to organizations.

Fig.25

Top two generative AI use cases by industry*

Industry	Use case	% of organizations piloting the use case	% of organizations Implementing the use case
AEROSPACE AND DEFENSE	3D modeling to create detailed shapes	41%	4%
	Inverse design, composed entirely of new materials to capture specific physical properties (material science)	36%	0%
AUTOMOTIVE	Generating scenarios and testing them for safety and performance in a simulated environment	25%	1%
	Customizing vehicle features and configurations to individual customer preferences	24%	3%
CONSUMER PRODUCTS	Hyper-personalized, multi-sensory consumer experience	42%	0%
	Finding niche audiences to survey	30%	0%
ENERGY AND UTILITIES	Generation of synthetic data	33%	2%
	Inverse design, composed of entirely new materials to capture specific physical properties (material science)	24%	4%
FINANCIAL SERVICES	Generation of synthetic customer data	34%	6%
	Improved prospect profiling and customized product recommendations for account managers	31%	8%
HIGH TECH	3D modelling to create detailed shapes	58%	20%
	Predictive maintenance	58%	10%
INDUSTRIAL MANUFACTURING	Generative design of parts optimized to meet specific goals and constraints	30%	0%
	3D modelling to create detailed shapes	22%	4%
PHARMA AND HEALTHCARE	Advanced drug discovery and therapeutics	35%	2%
	Generate, predict, and understand biomolecular data	32%	2%
RETAIL	Efficient, self-optimizing real-time customer service chatbots	63%	11%
	Build creative marketing campaigns and visually appealing advertisements	36%	0%
TELECOM	Call-center analytics	36%	2%
	Restoration of old media	30%	0%

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations; N=19–99 organizations per sector.
*Top two determined by the percentage of organizations piloting the use case.

Generative AI is offering enhanced design capabilities for aerospace and defense and the high-tech sector

Forty-one percent of aerospace and defense organizations and 58 percent of high-tech organizations in our survey are piloting generative AI in 3D modelling. By employing generative AI algorithms, engineers and designers can optimize the design process, streamlining complex geometries and creating innovative structures

for aircraft, spacecraft, and defense systems. This technology enables the production of lightweight, highly efficient, and aerodynamically optimized components, improving performance and reducing cost. Researchers at Boeing are using generative AI models to explore new ways to optimize aircraft design. *"When humans design a structure, they tend to repeat existing patterns. However, when AI is tasked with generating a design from scratch, it doesn't necessarily follow the same patterns as human engineers. Because [AI] can put more complexity into its electronic brain than a human can, it can optimize over a broader space,"* explains Todd Citron, CTO at Boeing.[28]

High-fidelity 3D models are expensive to make and implement. Game developers and studios can harness generative AI to produce them efficiently at speed, reducing development costs. Nvidia, a US-based technology organization, recently unveiled new generative AI technologies to create exciting virtual worlds via their Omniverse platform.[29] Nextech3D.AI, a generative-AI-powered 3D model supplier for major e-commerce retailers such as Amazon, P&G, and Kohls, has launched technology enabling the generation of 3D materials from text prompts.[30]

The automotive industry sees generative AI pilots revolutionizing design and customization processes

In our survey, nearly one-quarter of executives in the automotive industry say their organization is piloting generative AI in the design and customization process. Generative AI enhances autonomous vehicle development, generating and testing scenarios for safety and performance, customizing vehicle features to customer preferences, optimizing parts design; enabling predictive maintenance, and streamlining automotive insurance processes. Audi's new AI network, FelGAN, uses a generative adversarial network (GAN, a type of ML framework) to generate new lightweight rim designs for their cars.[31] General Motors is working on developing an in-car assistant using ChatGPT. This tool will be used to integrate schedules, predict a need to open garage doors, and help the drivers understand their cars.[32]

Consumer products and retail leads use cases in customer experience

Generative AI technology can transform customer journeys, making them more efficient, effective, and engaging. Forty-two percent of consumer products organizations in our survey are piloting generative AI in the consumer journey to make it more personalized, and 63 percent of retail organizations say they are using generative AI to improve customer-service chatbots. Clothing-service company Stitch Fix already uses AI to make recommendations to customers, and is experimenting with DALL-E 2 to create visualizations of clothing based on requested customer preferences for color, fabric, and style.[33] With help from Microsoft's Azure Open AI Service, CarMax, a US-based automotive retailer, has streamlined the creation of text summaries for its car research pages, quickly providing customers with meaningful content that also boosts search-engine rankings.[34]

Energy and utilities and financial services use generative AI to create synthetic data

A third of executives in energy and utilities and a third in financial services say their organizations are piloting generative AI to produce synthetic data, which can shorten development timelines. Generative AI can learn the complex relationships in the original datasets and produce data that more reliably reflects these unique patterns. Synthetic data generation can also facilitate internal data sharing, especially in organizations that store high-volume, complex, and varied datasets (e.g., in energy and utilities or financial services). It can also safeguard against privacy concerns in regulated industries as it stores the relationships and patterns in the data without the need to store individual-level data.[35]

In the energy and utilities sectors, generative AI can also be used to track and predict energy utilization. A pilot project by US-based energy supplier Gridmatic and internet service provider EdgeConneX was launched using a 24/7 carbon-free energy (CFE) approach to boost and track clean energy sourcing and utilization. By forecasting and matching supply to demand on an hourly basis, Gridmatic's AI has enabled round-the-clock CFE for one Texas data center.[36]

Within financial services, generative AI can enable fraud detection, enhance credit scoring, and generate accurate financial forecasts and scenarios. Bloomberg has announced its fine-tuned generative finance model BloombergGPT, which is capable of sentiment analysis, news classification, and other financial tasks at a level comparable with that achieved by human analysts.[37] Swedbank AB trained GANs using Nvidia graphics processing units (GPUs) as part of its fraud and money-laundering prevention strategy.[38]

Industrial manufacturers are optimizing parts with generative AI pilots

Thirty percent of industrial manufacturing executives in our survey say their organization is piloting generative-optimized, tailored part design and predictive maintenance that can reduce overhead costs and expensive downtime. CUPRA, a high-performance Volkswagen brand, optimizes vehicle-component design and manufacturing using PTC Creo, which creates and tests 3D part prototypes before manufacture, significantly reducing time to market for new vehicles while achieving a 10 percent weight optimization of components, resulting in a cost reduction of around 15 percent.[39]

Pharma and healthcare set to accelerate R&D, with help from generative AI

Pharmaceutical and healthcare organizations in our survey are implementing generative AI for pilots in drug discovery and therapeutics (35 percent) and generating, predicting, and understanding biomolecular data (32 percent). Bio-tech organizations including Cradle, Basecamp Research, Arzeda, Biomatter Designs, Cambrium, and Absci are designing new proteins from scratch using generative AI.[40] Additionally, Profluent Bio, a US-based biotech organization, uses LLMs to design entire proteins.[41]

Telecom organizations are leading the charge for generative AI in call centers

Over a third (36 percent) of telecom executives in our survey say their organization is piloting generative AI in call-center analytics. Generative AI can play a pivotal role in the telecom sector by improving customer-service interactions; optimizing network design and architectures; restoring old media; and facilitating text-to-video generation for filmmaking, driving innovation and efficiency. Orange is exploring a next-generation contact center with Google Cloud, testing generative AI to transcribe calls, summarize customer interactions, and suggest follow-up actions.[42]

Generative AI's impact on sustainability

The carbon footprint of building generative AI is massive

As the race to build high-performance, generative-AI-powered tools and platforms intensifies, a pressing concern is the significant rise in computing power and subsequent impact on energy consumption and carbon emissions. The training of GPT-3, which forms the basis for ChatGPT, is estimated to have consumed 1,287 MWh of energy and resulted in over 550 tonnes of carbon emissions. This is around ten times higher than the emissions generated by an average car over its lifetime.[43]

However, the environmental impact extends beyond training. Serving millions of users with these models further amplifies the energy demands. Integrating generative AI into search engines such as Microsoft Bing, which handles about half a billion searches daily, requiring at least four times more computing power per search than in a standalone product.[44] Executives in our survey are aware of this; 78 percent agree that generative AI can have a larger carbon footprint than traditional IT programs (see Figure 26).

Fig.26

Most organizations understand that generative AI has a larger carbon footprint than traditional IT and the need to scale sustainably
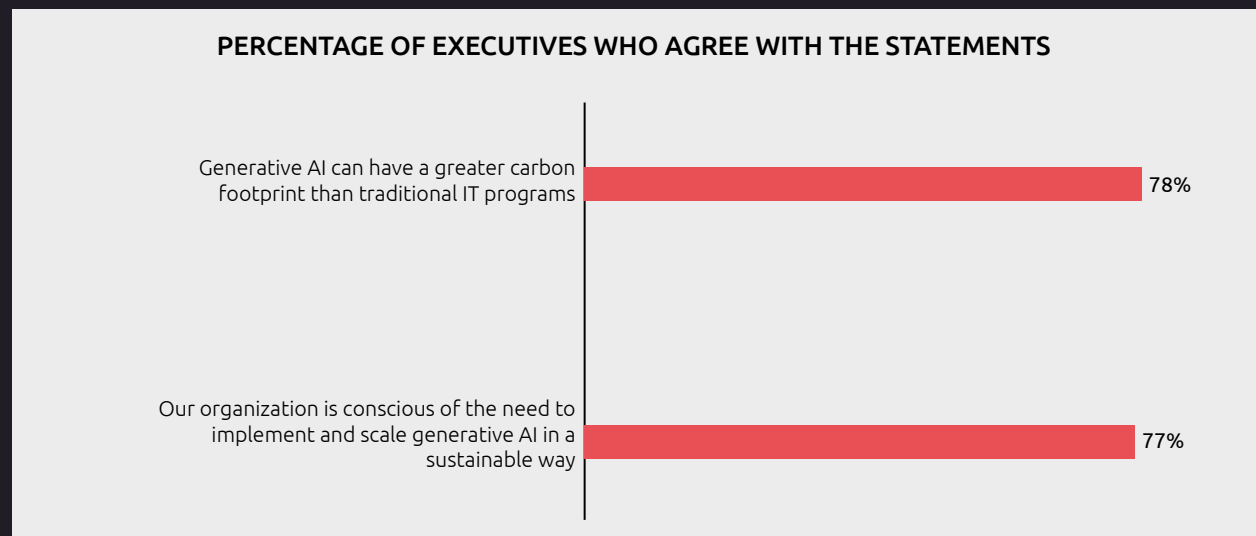
PERCENTAGE OF EXECUTIVES WHO AGREE WITH THE STATEMENTS

Statement	
Generative AI can have a greater carbon footprint than traditional IT programs	78%
Our organization is conscious of the need to implement and scale generative AI in a sustainable way	77%

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations.

Capgemini Research Institute 2023

Organizations recognize the need to implement and scale generative AI sustainably

Reassuringly, as Figure 26 shows, nearly 80 percent of organizations are conscious of the need to build generative AI in a sustainable way. Louis DiCesari, Global Head of Data, Analytics, and AI at Levi Strauss confirms: *"As the technology matures, we should be able to figure out more efficient ways of addressing sustainability concerns of organizations related to generative AI."*

Few organizations have a strategy to mitigate the environmental impact of training generative AI models

Only a small minority (8 percent) of organizations globally (i.e., only 64 organizations from the sample) in our survey plan to invest in training generative AI models from scratch. Of these, about half have taken steps to mitigate their environmental impact, such as investing in renewable energy and offsetting carbon emissions through carbon credits. The remaining half are exploring mitigation measures such as using more energy-efficient hardware and optimizing training algorithms.

Generative AI can lead to a smaller carbon footprint

Organizations also have high sustainability expectations of generative AI, including a projected 9 percent reduction in carbon footprints at organizational level within the next three years. Airbus uses AI algorithms in its generative design process to develop lighter-weight parts for its aircraft, resulting in lower fuel consumption and, consequently, lessened environmental impact. The initial design was 45 percent lighter than the traditional part and is projected to reduce Airbus's annual CO_2 emissions by nearly half a million metric tonnes (mt) if rolled out across its A320 fleet.[45] Currently, the net impact of generative AI on carbon emissions is unquantifiable, but we can nevertheless make a start on mitigating them (see recommendations).

Generative AI tools are driving conversations around sustainability

Generative AI tools can make corporate social responsibility (CSR) reporting easier for organizations. Using the data fed to them, they can create an initial draft that the teams can then refine to ensure it is aligned with reporting standards. C3 AI, for instance, uses generative AI to unify and store disparate ESG data and automate reporting.[46] In another interesting application, Ekimetrics, a French data and AI company, launched a chatbot that answers users' questions on climate such as: "Are humans responsible for climate change? What are the main principles of the Paris Agreement? Is climate change irreversible?" To ensure the reliability of answers, the chatbot is allowed to draw its information only from scientific reports by agencies such as the Intergovernmental Panel on Climate Change (IPCC).[47]

05

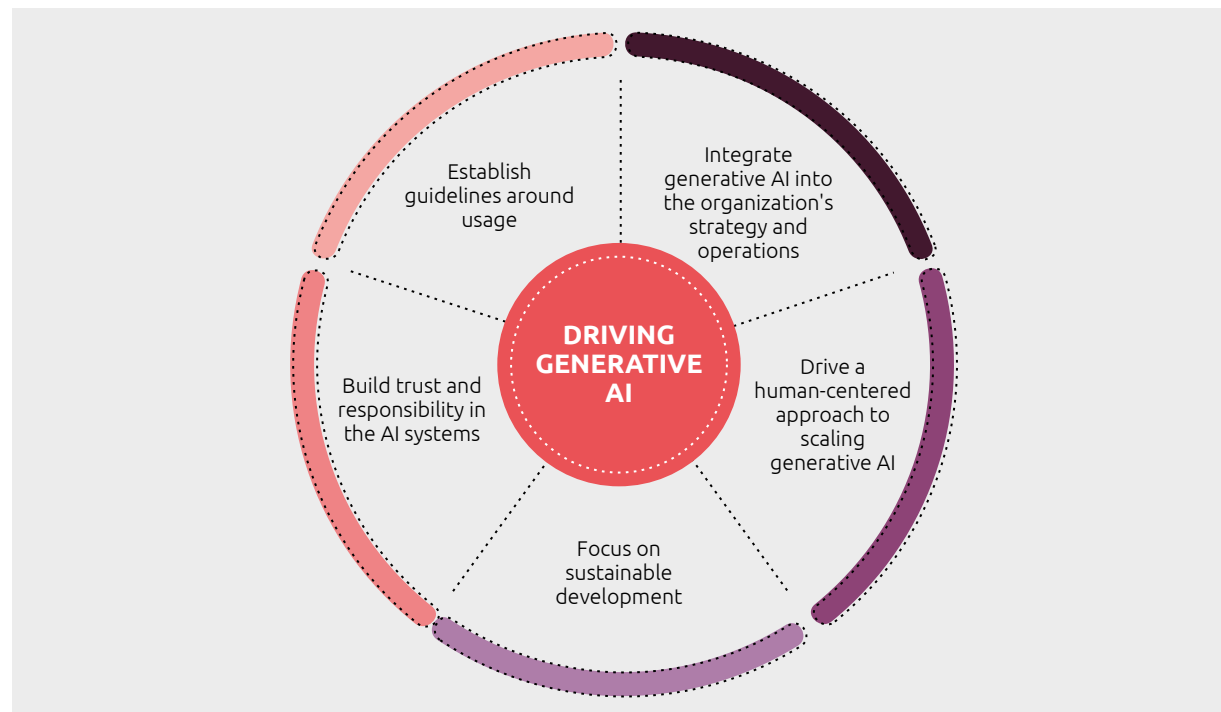# HOW ORGANIZATIONS CAN KICK-START THEIR GENERATIVE AI JOURNEYS

Fig.27

Key considerations for organizations to drive generative AI initiatives

We suggest a few key areas for organizations to focus on to accelerate their generative AI journeys (see Figure 27) amid a rapidly evolving application landscape.

Integrate generative AI into organizational strategy and operations

Amid strong interest in generative AI and the proliferation of applications, organizations must find answers to some key questions:

- **Customer:** Our consumer research highlighted how generative AI is transforming search and online buying behavior.[48] It also details how the technology could enrich the consumer experience; for example, a personalized avatar could represent the consumer over the lifetime of their relationship with the brand. It could act as a single touchpoint, fully informed

Establish guidelines around usage

Integrate generative AI into the organization's strategy and operations

DRIVING GENERATIVE AI

Build trust and responsibility in the AI systems

Drive a human-centered approach to scaling generative AI

Focus on sustainable development

Source: Capgemini Research Institute analysis.

by historical personal data, to guide the consumer through each purchasing journey. At the same time, it is important to invest in the initiatives that align with the values and the mission of the organization so that consumers can find consistency and connection to the brand.

- **Operations:** In our research on AI from more than three years ago, we found that over half of organizations had implemented AI technology at scale.[49] Many of these applications could be extended to generative AI use cases. However, organizations need to have a clear roadmap prioritizing use cases across functions. Once the use cases are identified, organizations should take the following steps.

Determine whether they can adapt an existing pre-trained model or build an original to their own specifications.

Choosing the right model: If a pre-trained model is selected, the optimal approach is to use the best-sized model, rather than opting for the model with the largest number of parameters.

Be aware of data-privacy requirements: Three-quarters of organizations from our research identified a lack of data privacy and protection as a major concern in realizing the full potential of generative AI. Italy, Spain, and Canada, among other countries, are looking into how OpenAI is collecting its training data.[50] When using OpenAI or other pre-trained models from the market, organizations may expose themselves to these liabilities.

Train or validate the model: In case of building from scratch, the AI model needs to be trained and, if using an available pre-trained model, organizations will still need to test the model to ensure its reliability.

Monitor and update the model based on feedback: Once the system is implemented, it must be monitored for potential issues or bias. It is also important to gather feedback from the users and update the model for new market conditions and changed user preferences or behavior.

- **Data readiness:** Improved data quality and effective data management will accelerate model deployment. For this, organizations must look into master-data management, build data pipelines that automate data flows from different sources to databases or data warehouses, implement data-cleaning techniques such as deduplication and outlier detection, and practice active data stewardship.

High tech and retail industries lead in implementing generative AI initiatives

Drive a human-centered approach to scaling generative AI

Generative AI tools are intuitive to use, as reflected by consumer uptake.[51] While the technology is expected to deliver productivity gains, there are also concerns around growing complexity and technical debt.[52] *"The potential for increased technical debt and orphan code is always a concern when delivery can be accelerated,"* confirms Tracy Daniels, CDO at Truist, a US financial-services organization.[53] As the programmer's job gets easier, CIOs will need to govern effectively. Overall, organizations must focus on a human-centered and human-augmented approach to scaling generative AI initiatives.

Focus on sustainable development

As seen in Figure 26, organizations are conscious of the need to implement and scale generative AI sustainably. As of 2021, the information communication technology (ICT) sector accounted for 1.8–3.9 percent of global greenhouse gas (GHG) emissions.[54] AI and ML are responsible for only a fraction of these emissions. However, as LLMs gain prominence, the contribution of these systems to the sectoral footprint will increase significantly. The training of GPT-3 was estimated to have resulted in more than 550 Mt of CO2, and Meta's Open Pre-trained Transformer (OPT) had resulted in more than 75 Mt of emissions.[55] The open-access BLOOM model, which is a similar size to GPT-3, has a much lower footprint of 25 Mt of CO_2 emissions.

Whether they choose to build their own or rely on pre-trained models, organizations must make a concerted effort to be more sustainable. Steps to reduce the carbon footprint of generative AI models include:
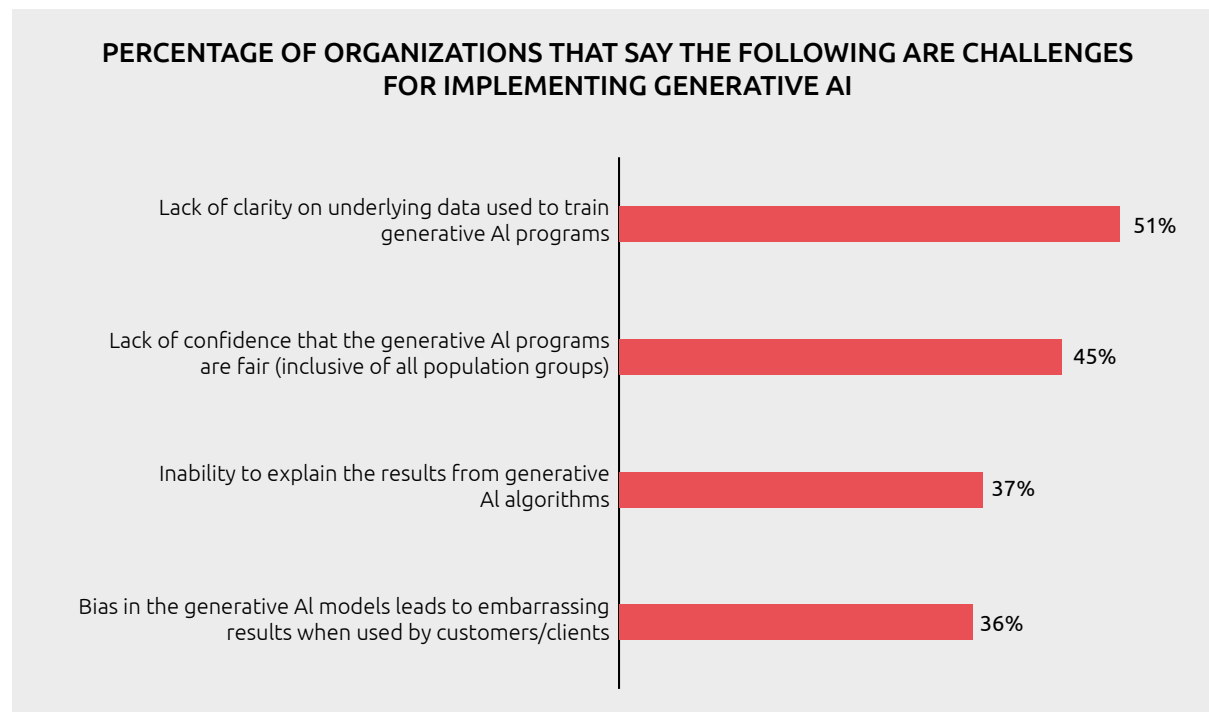
- Using an optimum model architecture

- Exploring model-compression techniques

- Using parallel and distributed computing

- Early stopping

- Increasing batch size

- Using energy-efficient hardware

- Using energy-efficient data centers

Fig.28

Organizations are concerned about underlying datasets and possible bias

Build trust and responsibility in AI systems

Generative AI inherits certain challenges from AI. Concerns around bias and an inability to explain results are significant issues cited by the executives in our survey (see Figure 28). In June 2023, the European Parliament approved the AI Act, which regulates the use of AI, moving one step closer to legislation. While the original proposal for this act did not contain any references to generative AI, with the advent and growing popularity of ChatGPT, the EU council amended the act to include "general purpose AI," "foundation models," and "generative AI."[56] These rules will require the developers of generative AI tools to submit their systems for review before releasing them commercially[57] and to publish what copyrighted data has been used to train their tools.[58]

PERCENTAGE OF ORGANIZATIONS THAT SAY THE FOLLOWING ARE CHALLENGES FOR IMPLEMENTING GENERATIVE AI

Challenge	%
Lack of clarity on underlying data used to train generative AI programs	51%
Lack of confidence that the generative AI programs are fair (inclusive of all population groups)	45%
Inability to explain the results from generative AI algorithms	37%
Bias in the generative AI models leads to embarrassing results when used by customers/clients	36%

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations. Note: By "embarrassing" results, we mean undesirable or socially unacceptable results.

In addition to these challenges, there are other risks of which organizations should be aware while using generative AI models:

- **Inherited risk –** Organizations may not have access to the datasets used to pre-train models. In such cases, these organizations will inherit the risks associated with these training datasets. These could be legal risks or reputational damage due to biased output.

- **Intellectual property –** Datasets that have been trained on copyrighted items could also lead to legal issues for downstream players.

- **Correctness –** Generative AI is known to produce "hallucinations,"[59] with tools often being unnervingly confident of their accuracy. In an example from the US, a lawyer relied on ChatGPT to prepare a brief. The tool shared multiple precedents, assuring the lawyer that the citations were reliable; however, six of these cases turned out to be hallucinations invented by the tool and the lawyer may consequently face sanctions.[60]

- **Data leakage –** Generative AI models developed from scratch could leak confidential data through unfiltered prompts.

Figure 29 highlights the key areas that organizations must consider when building trust and responsibility in AI systems.

51%

cite the lack of clarity on underlying data used to train generative Al programs as a challenge

Fig.29

Building trust and responsibility in AI systems

Transparent and Explainable AI

With outcomes that can be understood, traced, and audited as appropriate

Robust and safe AI

Including fallback plans when needed

Controllable AI with clear accountability

Enabling humans to make more informed choices and keep the last say

Sustainable AI

Developed being mindful of each stakeholder, to benefit the environment and all present and future members of our ecosystem, human and non-human alike, and to address pressing challenges such as climate change

CODE OF ETHICS FOR AI

AI respectful of privacy and data protection

Considering data privacy and security from the design phase, for data usage that is secure and legally compliant with privacy regulations

Fair AI

Produced by diverse teams using sound data for unbiased outcomes and the inclusion of all individuals and population groups

AI with carefully delimited impact

Designed for human benefit, with a clearly defined purpose setting out what the solution will deliver, to whom.

Capgemini Code of Ethics for AI

"As the technology matures, we should be able to figure out more efficient ways of addressing sustainability concerns of organizations related to generative AI."

Louis DiCesari
Global Head of Data, Analytics, and AI at Levi Strauss

Fig.30

Organizations are concerned about potential bias of underlying datasets

Establish guidelines for the use of generative AI in the organization

A few organizations are wary of generative AI tools, particularly those over which they have no control. In our research, 10 percent of organizations mentioned that they have either banned or are considering banning use of such tools for work (see Figure 30); Samsung, Verizon, and Northrop Grumman have imposed a blanket ban.[61] There are a few reasons for such a step: for example, concerns around data leakage through the prompts given to the tools, "hallucination" causing errors that may be overlooked by the users, and underlying data exhibiting biases or even having been sourced in unethical ways.

PERCENTAGE OF ORGANIZATIONS WHO AGREE WITH THE STATEMENTS
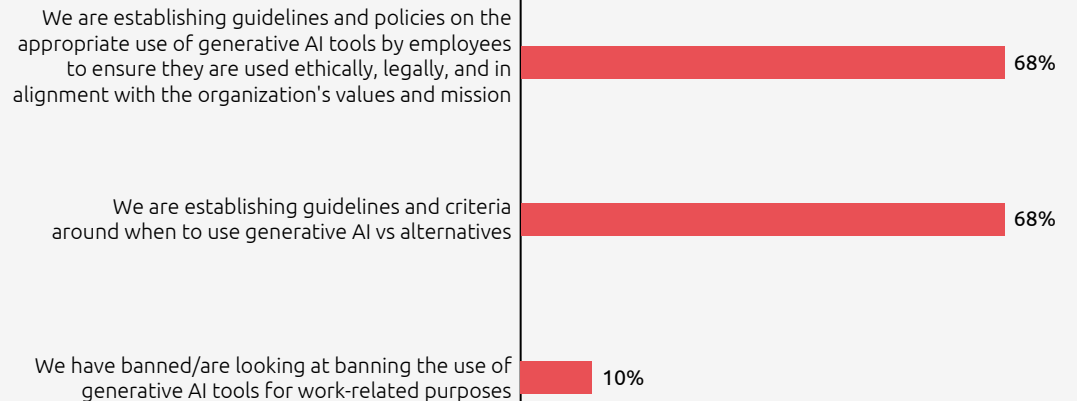
Statement	Percentage
We are establishing guidelines and policies on the appropriate use of generative AI tools by employees to ensure they are used ethically, legally, and in alignment with the organization's values and mission	68%
We are establishing guidelines and criteria around when to use generative AI vs alternatives	68%
We have banned/are looking at banning the use of generative AI tools for work-related purposes	10%

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 800 organizations.

The majority of organizations (68 percent) in our survey are looking at establishing employee guidelines for generative AI, including training around which data is permitted to be uploaded to the tools and safe usage, and validating outputs to eliminate bias. Organizations also need to establish sustainability guidelines, in particular around the carbon footprint of (highly carbon-intensive, albeit irregular) LLM training and the general use of generative AI. It is estimated that a single generative AI query can result in 4–5 times higher carbon emissions than a search-engine query.[62] With ChatGPT alone clocking 173 million users and 1.8 billion monthly visits in April 2023,[63] one can imagine the magnitude of aggregated emissions. Generative AI may not be the best solution to every problem, and organizations should provide employees with a framework or checklist to decide whether to implement it. Finally, in-house development under controlled conditions could avoid the types of issue that have led to blanket bans.

Regulators should safeguard consumer interest

The pace of change in generative AI technology is so rapid that regulators are struggling to catch up. The number of applications using the technology and of consumers adopting it is growing daily. The US Copyright Office, for instance, initially granted copyright for a comic book that included AI-generated images. However, later, the agency reviewed its decision and decided the writing and the original elements of the book are eligible for copyright but not the images, which are AI-generated.[64] Regulators in a few countries have started looking into OpenAI;[65] below are a few suggestions, as highlighted in our consumer-focused research on generative AI.[66]

- Requesting disclosures
- Draft/revisit policies
- Establishing accountability
- Provide more control to users
- Engaging in discussion with developers and academics

Conclusion

Generative AI has taken the world by storm and is undoubtedly top-of-mind for leadership across industries globally. The speed with which the technology has become mainstream is fascinating. Generative AI has applications across different functions and in different sectors. As a result, we have found many organizations experimenting with the various use cases. Nevertheless, organizations are hitting some roadblocks. Insufficient clarity on the underlying data of pre-trained models, possible biases, and a lack of inclusivity pose legal and reputational risks for organizations, as do "hallucinations" and the potential for data leakage, even with custom-built internal models. Organizations must also confront the carbon-footprint issue. As generative AI adoption grows, carbon emissions will multiply. Are organizations prepared to act?

While developers such as Open AI and Google and other players look for workarounds, organizations must also find answers to key questions, chief among which is whether pre-trained or custom models should take precedence. Both have pros and cons, but each requires a high-level architecture. They must also be driven by a human-centered approach to deployment, embedding human oversight and user feedback, and training employees. It is also advisable to develop a set of guidelines around when to use generative AI and how to use it safely. Building trust in the systems is critical.

As the technology evolves, organizations' expectations are bound to change. Can generative AI disrupt industries? And what will be its impact in the long term? Will benefits fall short of, meet, or exceed expectations? How can the challenges around hallucination, data leakage, sustainability, and legal and reputational issues be overcome? And what role will regulators play in this evolving market? It is not yet clear how all these elements will unfold. What is clear is that generative AI technology is part of the future and organizations should start to prepare for it.

Research methodology

We carried out a targeted survey of 1,000 organizations. All of these organizations are interested in exploring generative AI. Further, 80 percent have already started exploring the technology. The global survey took place in April 2023. In addition to the online survey, we conducted in-depth interviews with 10 industry executives to understand the potential of generative AI, the challenges they foresee, and the capabilities required to deploy the technology. The study findings reflect the views of the respondents to our online questionnaire for this research and are aimed at providing directional guidance. Please contact one of the Capgemini experts listed at the end of the report to discuss specific implications.
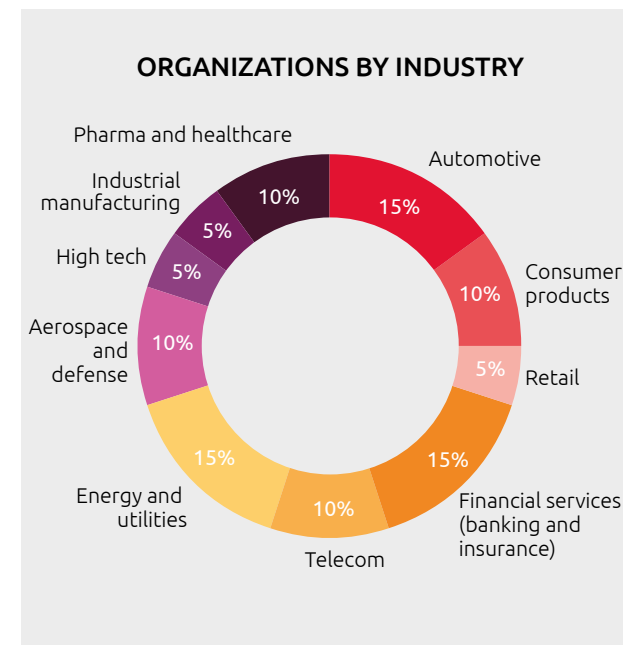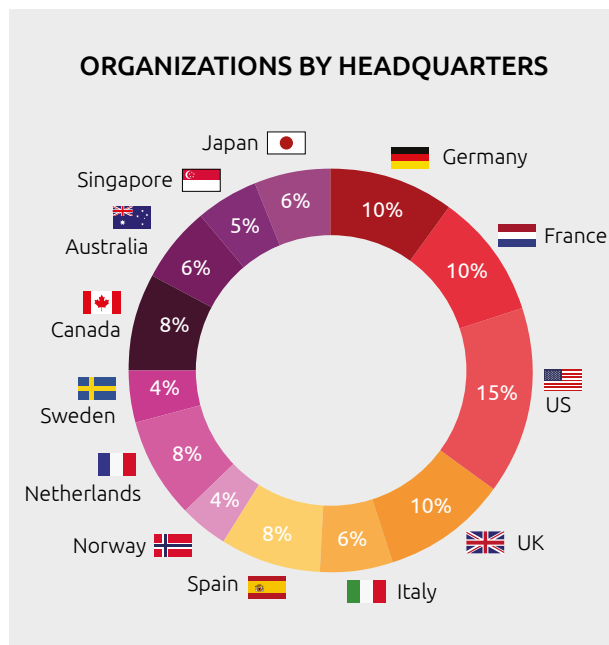
ORGANIZATIONS BY HEADQUARTERS

Japan 6%
Singapore 5%
Germany 10%
France 10%
US 15%
UK 10%
Italy 6%
Spain 8%
Norway 4%
Netherlands 8%
Sweden 4%
Canada 8%
Australia 6%

ORGANIZATIONS BY INDUSTRY

Pharma and healthcare 10%
Industrial manufacturing 5%
High tech 5%
Aerospace and defense 10%
Automotive 15%
Consumer products 10%
Retail 5%
Financial services (banking and insurance) 15%
Telecom 10%
Energy and utilities 15%

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 1,000 organizations.

ORGANIZATIONS BY ANNUAL REVENUE
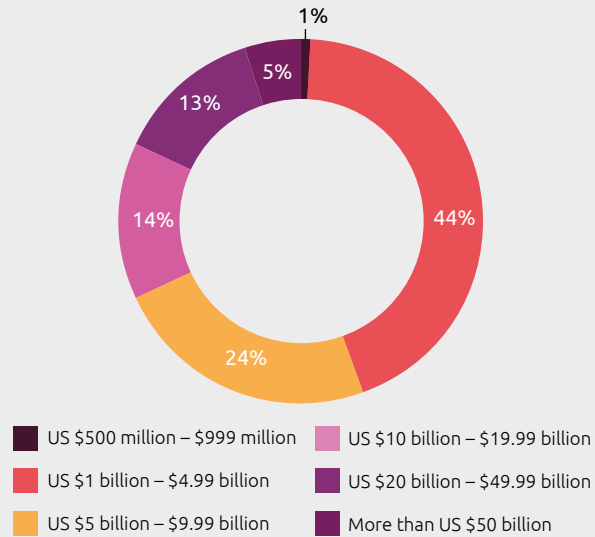
- US $500 million – $999 million
- US $1 billion – $4.99 billion
- US $5 billion – $9.99 billion
- US $10 billion – $19.99 billion
- US $20 billion – $49.99 billion
- More than US $50 billion

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 1,000 organizations.

ORGANIZATIONS BY STAGE OF GENERATIVE AI IMPLEMENTATION
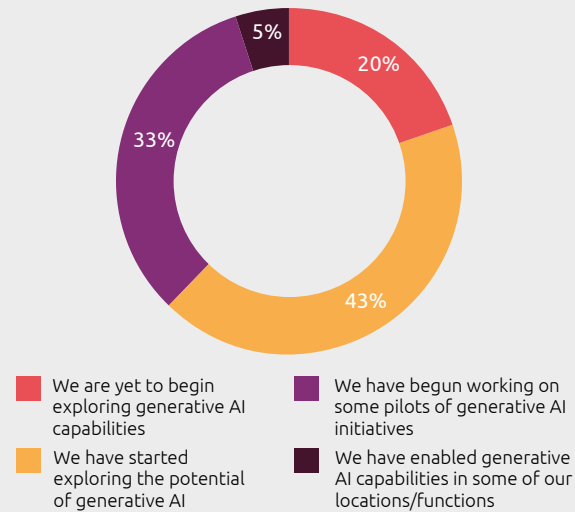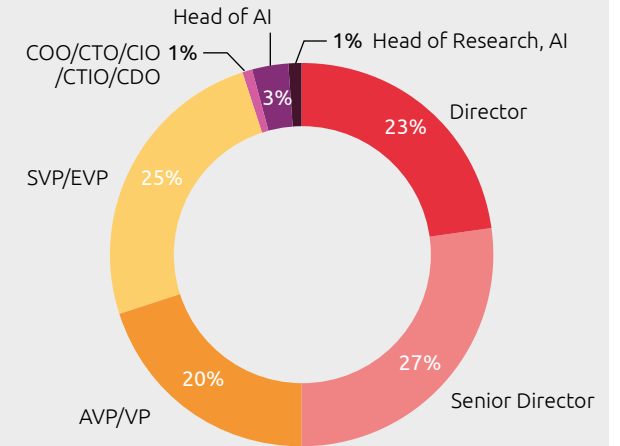
- We are yet to begin exploring generative AI capabilities
- We have started exploring the potential of generative AI
- We have begun working on some pilots of generative AI initiatives
- We have enabled generative AI capabilities in some of our locations/functions

RESPONDENTS BY TITLE

Head of AI
COO/CTO/CIO /CTIO/CDO 1%
3%
1% Head of Research, AI
Director 23%
SVP/EVP 25%
27% Senior Director
AVP/VP 20%

Source: Capgemini Research Institute, Generative AI Executive Survey, April 2023, N = 1,000 organizations.

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Capgemini's dedicated Generative AI Lab to deliver concrete business impact

Capgemini has been working with clients on AI and generative AI for years to respond to their specific business needs, particularly in the areas of life sciences, consumer products and retail, and financial services. Through its Generative AI Lab, Capgemini focuses on developing tailored solutions for clients, enabling them to leverage the potential of generative AI in a trusted, secure, and ethical framework to deliver concrete business impact.

The Generative AI Lab is a dedicated team of experts specialized in artificial intelligence from various Capgemini teams around the world who are focused on following the evolutions of the technology as well as researching and applying the most relevant use cases in generative AI for clients. The Generative AI Lab creates and delivers assets, education, and awareness to further enrich Capgemini's expanding expertise in this field and the value it delivers to its clients.

For more information, visit
http://www.capgemini.com/aifutures

Create
the impossible
With custom generative AI for enterprise

According to Gartner, full maturity of generative AI is expected in 2–5 years, but the market is already shifting to bring generative AI closer to business use cases as 70% of global organizations currently explore generative AI.

BUT... for business, there are many problems behind publicly available generative AI large language models, as they are:

TOO DISJOINTED FROM BUSINESS REALITY

Generative AI tools bring technology but do not answer questions on how to address new requirements for risk, privacy, and business controls.

TOO UNIVERSAL AND NOT COMPANY-SPECIFIC

They are difficult to tune for real business scenarios at scale. They do not have your business knowledge and cultural context.

TOO UNCONTROLLABLE

Without training, you cannot control the quality and suitability of the output.

TOO RISKY FOR DATA AND PRIVACY

Many available tools have complex licenses or T&C fine print allowing third parties to read and learn from your data, or even forbid commercial use.

TOO DIFFICULT TO ADOPT AND SCALE

Both closed-source tools like ChatGPT and open-source alternatives do not have a built-in and enterprise-scale-ready technology stack.

Therefore, CXOs need to understand how to leverage generative AI, in a safe, secure, and controlled manner, to fit their business reality
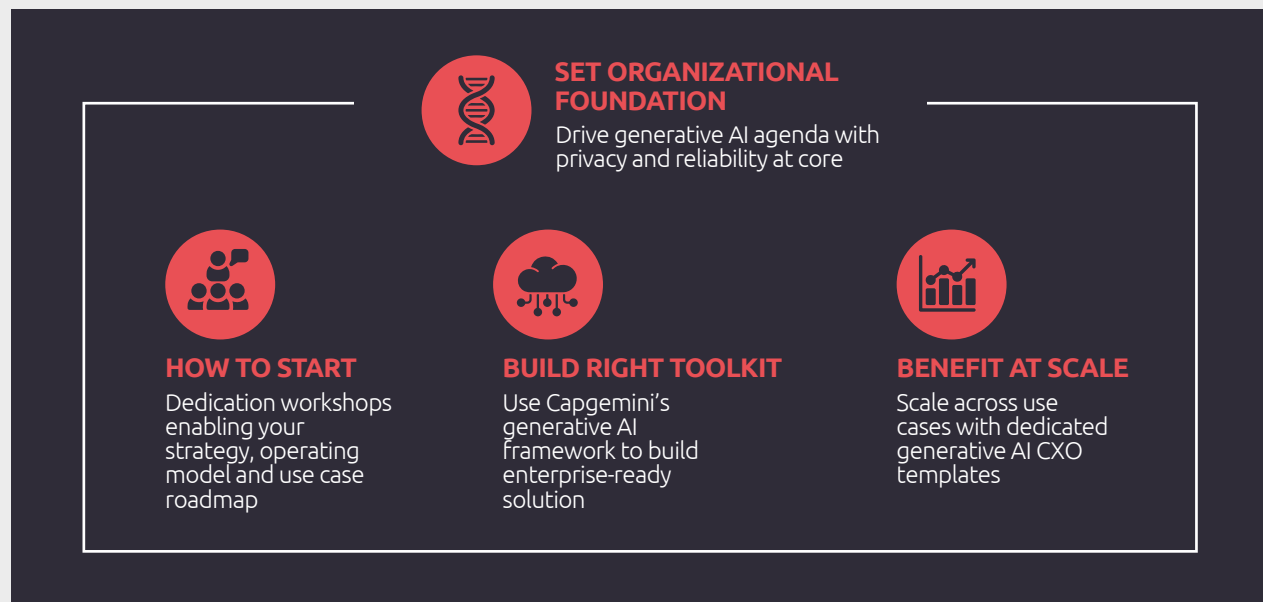
We help you change the DNA of your work through generative AI

With **Custom Generative AI for Enterprise**, we help CXOs move from a standard risked usage of generic public large language models to **a tailored and trusted solution based on the use of their data and their company knowledge**, with reliable outputs creating significant tangible outcomes.

We leverage our proven framework to build secure, privacy-protecting, and reliable high-scale generative solutions.

Custom Generative AI for Enterprise acts as a "one-stop-shop" for enterprise-ready data, tools, and use cases to address business and technology needs and share a reusable, secure, and company-approved generative toolkit.

Capgemini helps you drive and deliver successfully your generative AI initiatives through four building blocks:

SET ORGANIZATIONAL FOUNDATION
Drive generative AI agenda with privacy and reliability at core

HOW TO START
Dedication workshops enabling your strategy, operating model and use case roadmap

BUILD RIGHT TOOLKIT
Use Capgemini's generative AI framework to build enterprise-ready solution

BENEFIT AT SCALE
Scale across use cases with dedicated generative AI CXO templates

Selected client projects and engagements

We have been working with clients on Generative AI for the last 3 years to respond to their specific business needs, in particular in the areas of Life Sciences, Consumer Product & Retail and Financial Services. We have worked for clients across industries (consumer goods, healthcare/pharma, tech/IT, etc.) in use cases such as content personalization at scale, knowledge management and search, customer experience assistants, as well as a software development assistants.

Amongst recent use cases:

- In life sciences: in 2020, we delivered a client project on resequencing of DNA with the help of Generative AI and Deep Learning.

- ADA (Artificial Data Amplifier): using Generative AI to create synthetic data (Sogeti), used in particular by the Swedish Social Insurance Agency

- We have supported various banks on code conversion in combination with software migration projects: using Generative AI to propose translations of software from "old" languages to modern languages

- We worked on Product Blueprint analysis with Generative AI for a client managing all documentation for highly complex engineering products

- We delivered the "Intelligent Document Query Assistant" for a leading insurance company located in more than 50 countries, enabling non-technical executives to ask questions in natural language and get accurate answers much faster

- We are currently working with a large consumer product Group on a Generative AI content creation engine. It automatically generates several options for Name, Features and Description (automatically search-optimized), making it easier to achieve content completeness and quality.

For more information, please visit:

https://www.capgemini.com/solutions/custom-generative-ai-for-enterprise/

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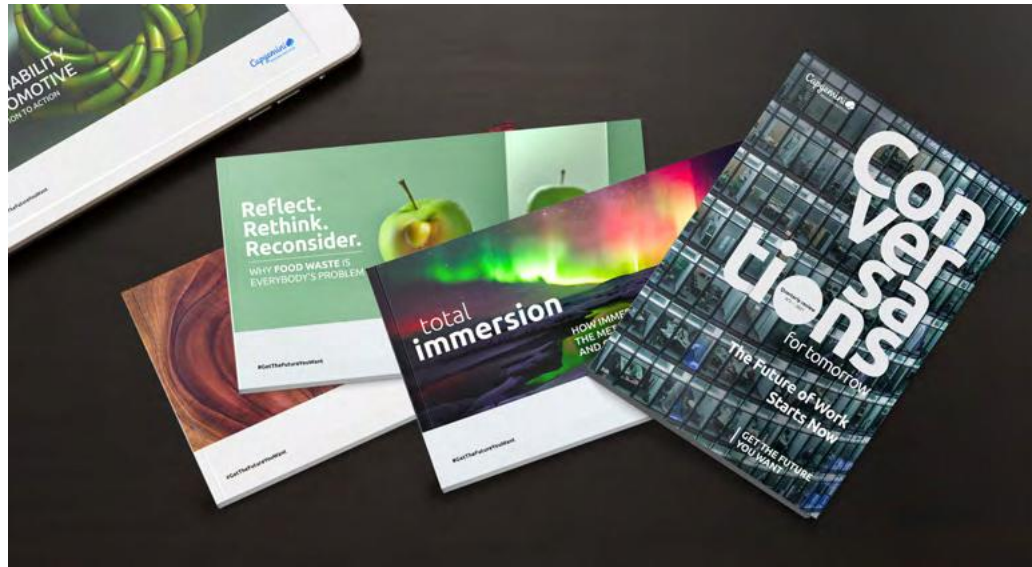**A World In Balance: Why Sustainability Ambition Is Not Translating To Action**

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Capgemini is a global leader in partnering with companies to transform and manage their business by harnessing the power of technology. The Group is guided everyday by its purpose of unleashing human energy through technology for an inclusive and sustainable future. It is a responsible and diverse organization of 360,000 team members in more than 50 countries. With its strong 55-year heritage and deep industry expertise, Capgemini is trusted by its clients to address the entire breadth of their business needs, from strategy and design to operations, fueled by the fast evolving and innovative world of cloud, data, AI, connectivity, software, digital engineering and platforms. The Group reported in 2022 global revenues of €22 billion.

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