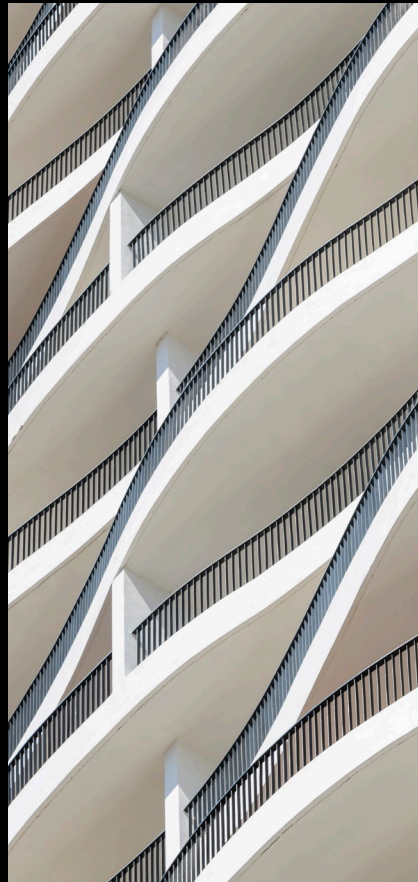


# See the Big Picture

2024 Generative AI Outlook:  
Big steps forward as challenges lie ahead



A look ahead to the key strategic trends and opportunities expected to drive Generative AI through 2024 and beyond.

# Table of contents

<b>Generative AI takes the spotlight in 2023</b>	<b>3</b>
Generative AI market revenue forecast	3
<b>The Take</b>	<b>4</b>
<b>Politics, regulation and society</b>	<b>4</b>
Growing proportion of respondents with “somewhat” or “mostly” negative views of AI’s likely near-term effects	4
<b>Where will value accrue?</b>	<b>6</b>
Total funding and valuations for foundation model providers	6
<b>Financial services to continue AI adoption</b>	<b>7</b>
Buy-side investors usage of AI	8
<b>Early promise, payoffs yet uncertain</b>	<b>8</b>

## Contributors

**Nick Patience**, Managing Analyst, Data, AI & Analytics, S&P Global Market Intelligence

**Alex Johnston**, Research Analyst, Data, AI & Analytics, S&P Global Market Intelligence

**Tony Lenoir**, Analyst, Renewable Energy, S&P Global Commodity Insights

**Thomas Mason**, Senior Research Analyst, S&P Global Market Intelligence

**Qian Shin**, Research & Analysis Executive Director, S&P Global Market Intelligence

# Generative AI takes the spotlight in 2023

Generative AI has been the technology story of 2023 within the technology industry and in daily conversations around the world.

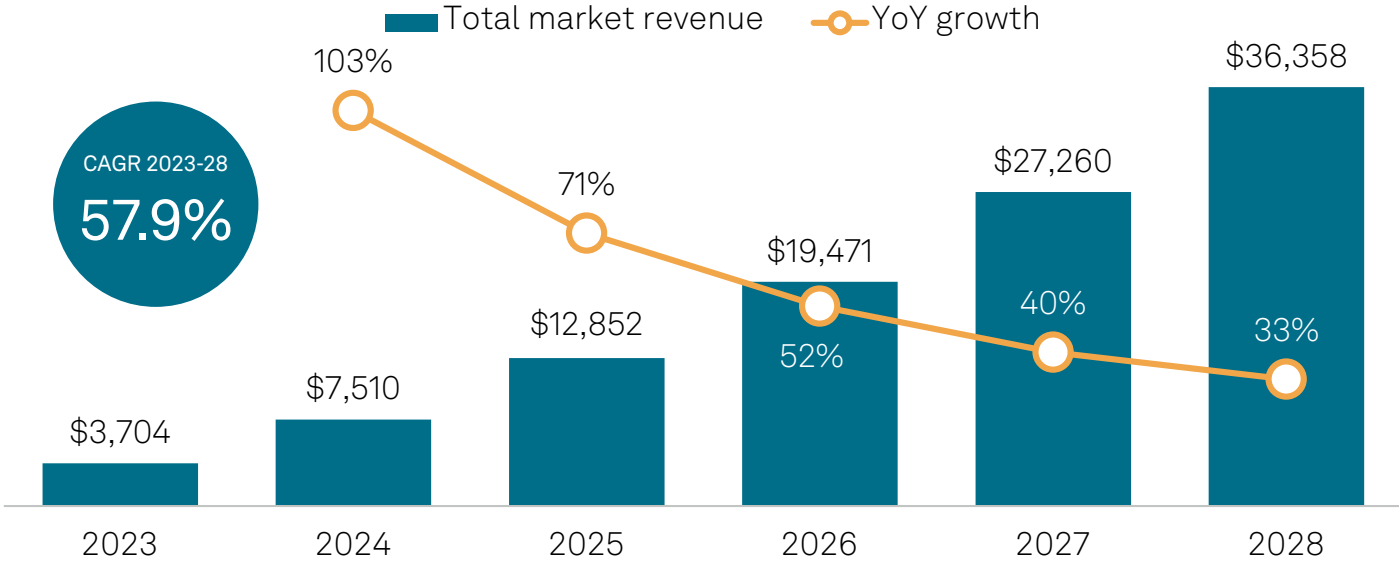
The release of OpenAI's ChatGPT interface in late November 2022 prompted national governments to rethink their technology and industrial strategies. It made some AI pioneers reconsider their life's work and even predict the end of humanity.

It also accelerated the rush to regulate AI and created a run on the high-performance chips known as graphics processing units (GPUs), which typically run AI workloads. NVIDIA, the company that dominates the GPU market, saw its market capitalization jump 137% from Nov. 30, 2022, to May 30, 2023.

According to a market forecast from S&P Global Market Intelligence's 451 Research Market Monitor, the software segment of the generative AI market alone is worth \$3.7 billion in 2023 and is set to rise to \$36.36 billion by 2028, a compound annual growth rate of nearly 58%. Factoring in the physical infrastructure upon which that software runs, both in the cloud and in enterprises' on-premises equipment, the total generative AI market figure is much larger.

Generative AI has also caught the attention of business leaders in a way that no previous wave of AI technology has. It is a significant concern for C-suite executives, causing many companies to rethink their attitudes toward the adoption of new and largely unproven technology amid a fear of missing out and being left behind by their peers. The influence of generative AI on the overall economy is impossible to gauge right now, but there are some areas where it is likely to have major effects.

## Generative AI market revenue forecast



Source: 451 Research's Generative AI Market Monitor 2023. © 2023 S&P Global.

# The Take

Opportunities and challenges abound for generative AI. While improvements to underlying AI models continue to impress with their ability to write code, produce startling images, parse text embedded within complex images and even write “poetry,” these are really features generated by a tool rather than full-fledged products. However, technology vendors are working on those products, and generative AI has the potential to fundamentally change the way humans interact with software of all kinds.

AI has taken a large step toward solving one of the great challenges in computing: the ability to appear to understand human communication of various types, not just written language, and generate more of it. This could open various tasks that historically required technical knowledge of programming languages and other proprietary notation systems to people who cannot code or write queries but know how to ask the right questions.

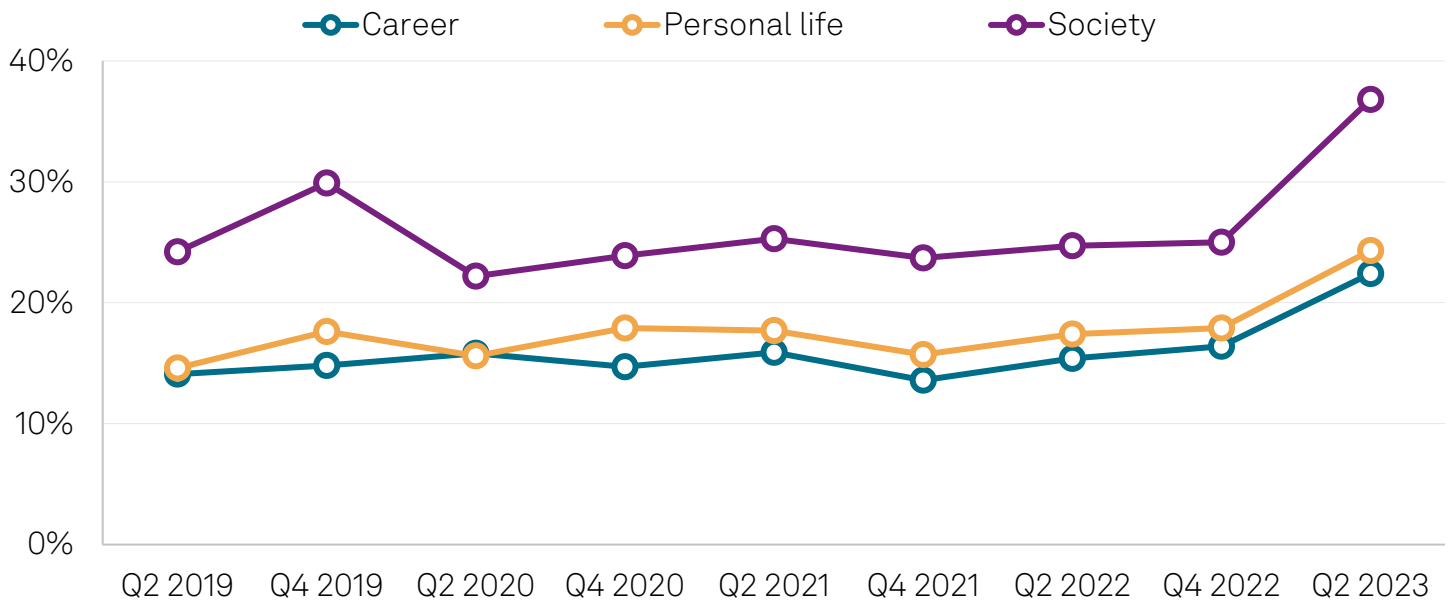
## Politics, regulation and society

Generative AI has meaningfully influenced the way much of the public perceives AI technology.

Views on the impact of AI shifted significantly between the fourth quarter of 2022 and the second quarter of 2023. AI is now seen as increasingly transformative,

but many are more concerned about the implications of this change on their careers, personal lives and society. Older generations are particularly ill-disposed toward AI’s potential societal impact — and this position appears to be hardening.

### Growing proportion of respondents with “somewhat” or “mostly” negative views of AI’s likely near-term effects



Q. Over the next two years, do you think AI/ML will have a positive or negative effect on career/personal life/society as a whole?

Base: All respondents (n=5,202).

Source: 451 Research's VoCUL: Connected Customer, Consumer Representative Survey, Q2 2023.

© 2023 S&P Global.

Growing career concerns likely reflect the changing automation scope of AI, which is being repositioned from pattern recognition to content production. Conversations about AI-driven role replacement have shifted from low-level administrative jobs to a wider array of positions, including those held by knowledge and creative workers. The tension can be seen among higher-educated respondents when it comes to AI's perceived impact on their careers, with this once-optimistic segment trending negatively. Concerns extend beyond employment, however, as the generative AI trend is also associated with issues around misinformation.

The rapid drive toward governance legislation worldwide is a further reflection of generative AI's impact. Some of these efforts have been multinational, with the topic of generative AI featured at the G7 Hiroshima Summit, for example, and multilateral AI talks being spearheaded by the African Union High-Level Panel on Emerging Technologies.

Degrees of progress differ significantly between individual jurisdictions. China sanctioned the first large language models (LLMs) that align with its AI regulatory framework, which took effect in August 2023. Passage of the EU's AI Act is slated for late 2023 or early 2024. The AI Act is expected to classify AI systems by risk and include transparency obligations.

Meanwhile, the US updated its strategic plan for AI research and development in May 2023 and held a closed-door "AI safety forum" in September, bringing prominent technology figures — including Open AI's Sam Altman and Meta's Mark Zuckerberg — together with US senators to discuss AI regulation.

Global regulatory discussions include concerns around the US-centric nature of the generative AI technology market. National governing bodies see investment in generative AI as important in terms of keeping domestic technology companies globally competitive, but they have concerns around the values or biases implicit in US corporations shaping AI model development.

---

**“[With generative AI], the big awareness is what happens in five years' time or 10 years' time to the job market, because it really makes the skills that we are teaching in education considerably less relevant...”**

— Survey respondent in Mid-Level Management, Education Industry (\$5 million – \$9.99 million in revenue).

Source: 451 Research's Voice of the Enterprise in-depth interview, July 2023.

Many regional foundation models are emerging, not just with the intent to improve performance related to a given language but also to align with regional values. Some prominent political bodies have voiced concerns about perceived cultural bias, including Japan's governing Liberal Democratic Party, which released a white paper in April encouraging domestic LLM development to address a supposed lack of accuracy in how Japan is represented by popular models.

A wave of litigation has emerged around text, image and code generation tools in the US. The Author's Guild has proposed a class-action lawsuit against OpenAI, with prominent authors John Grisham and George R.R. Martin joining the lawsuit. There has also been litigation against image generation providers and code generators.

The concern is pronounced enough that both Adobe and Getty Images, in recent generative AI product announcements, pledged to indemnify customers against any copyright infringement. Getty Images is currently involved in litigation with Stability AI, having taken the foundation model provider to court for allegedly using images from its site without permission.

# Where will value accrue?

As with any new technology, investors are keen to understand who the winners and losers will be and where value might accrue. In the case of generative AI, there is a clutch of startups offering foundation models of various kinds.

Those startups have attracted a lot of funding via traditional venture capital and strategic investments from other technology providers. The latter signals likely future M&A activity in this space.

The hyperscale cloud providers — including Amazon, Google, Microsoft and Tencent — have partnerships with some of these foundation model providers, but they are also competitors. There is also the open-source software ecosystem, which is where Hugging Face plays as a provider of a repository of open-source models. Companies including Meta and ServiceNow have contributed open-source foundation models and provide competitive alternatives to closed-source models from the likes of Anthropic, Cohere and OpenAI. Aside from the startups, the company that has accrued the most value in the immediate term is GPU provider NVIDIA. On the first day of trading in 2023, NVIDIA's shares opened at \$148.51. By late August, the stock approached \$500. The company's valuation has hovered at about \$1 trillion since late summer. Even before ChatGPT was released there was a scarcity of GPUs, the high-powered chips that NVIDIA pioneered, which are extremely good at the parallel operations required by large deep learning models.

## Total funding and valuations for foundation model providers

Name	Total Raised	Most Recent Valuation	Selected Investors
AI21 Labs	\$155M	\$1.4B	Alphabet, NVIDIA, Samsung
Aleph Alpha	\$142M	\$0.49B	SAP
Anthropic	\$7.66B	N/A	Amazon, Alphabet, Salesforce Ventures, Zoom Ventures
Cohere AI	\$425M	\$2.1B	Index Ventures, Tiger Global Management
Hugging Face	\$395M	\$4.5B	Salesforce Ventures, Alphabet, NVIDIA, Intel, AMD, QUALCOMM, IBM, Amazon
InflectionAI	\$1.53B	\$4.0B	Microsoft, NVIDIA, Greylock, Horizons Ventures
OpenAI	\$11.3B	\$86B**	Microsoft, A16Z, Khosla Ventures, Sequoia Capital
Stability AI	\$151M	\$4.0B	Sound Ventures, Lightspeed Ventures

\*\*Rumored valuation for upcoming round, according to media reports.

N/A = not available.

Source: S&P Global Market Intelligence.

© 2023 S&P Global.

The explosion of interest in LLMs and a growing awareness of the computational power required to train LLMs and other types of foundation models have driven the spike in NVIDIA's valuation and allowed it to maintain high prices for its chips. When NVIDIA announced its results for the first fiscal quarter of 2024 in late May, its guidance for the upcoming quarter surprised investors so much that the company added more than the entire value of its rival Intel to its market capitalization in just one day. The fiscal second quarter then delivered revenue of \$13.51 billion, more than double what it reported a year earlier.

Beyond NVIDIA's valuation, chip scarcity has broader and more serious implications. It has effectively shed light on the supply chain, from the design and manufacture of chips to testing and inserting them into computing devices. It is a highly complex system

with key single points of failure. For example, the Dutch company ASML is the world's only supplier of extreme ultraviolet (EUV) lithography machines, capable of making chips on a minute scale.

Geopolitical concerns persist for Taiwan Semiconductor Manufacturing Company, which produces a majority of the entire world's chips, including those for AMD, Apple and Qualcomm. Significantly for the generative AI market, TSMC is responsible for manufacturing all of NVIDIA's high-end GPUs.

Given that NVIDIA is by far the market leader in GPUs, any significant disruption to its supply chain would constrain the development of new foundation models. Barring a new major global conflict, the chip scarcity should eventually subside, and other producers will no doubt attempt to seize some market share.

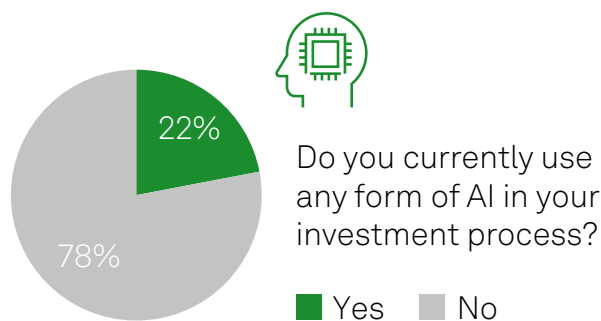
## Financial services to continue AI adoption

The financial services sector has embraced breakthroughs in AI in many areas. The industry is well suited to its adoption, having made great strides to offer online methods for most transactions that were previously done on paper or in person. AI and machine learning aided those efforts, accelerating the process of document ingestion and data extraction and improving the customer experience through more intelligent chatbots and quicker approval processes. Equally important is the upgrading of bank and insurance companies' back-end operations, with AI being adopted in areas including customer service, cybersecurity and fraud detection.

Financial services regulation can be a barrier to the adoption of advanced technologies. In the insurance industry, US state regulators require detailed explanations from actuaries of the assumptions they made and the models they used to determine premium pricing. That hurdle is far from insurmountable, though, and insurers have been adopting technology to better explain how their AI models come to their decisions.

One group that is skeptical of the value of AI is buy-side investors. According to the S&P Global Market Intelligence Investment Manager Index survey, a significant majority of buy-side investors (78%) do not currently use any form of AI within their investment processes. However, more than half of those surveyed (56%) expect AI to play a larger role in their investment processes over the next 12 months.

## Buy-side investors usage of AI



Source: S&P Global Investment Manager Index US Equities Special Report, June 2023.  
© 2023 S&P Global.

Aside from lingering doubts on the buy side, the banking industry is likely to embrace generative AI just as it has previous waves of AI innovation. The changes will be incremental, but in areas like customer communications, information retrieval and code generation, generative AI will find a significant role in the industry.

**“I don’t particularly use AI in the investment process. But, before AI, 10 out of 10 searches would be Google searches. Now, maybe 9.5 searches are Google searches, and the remaining 5% become a use case for AI. I don’t see myself using it for idea generation, or prompting what stocks would be good to own in a certain sector. But I was looking at proxies earlier today. There was one board member where I felt the bio on the proxy wasn’t complete enough, and the person didn’t have a LinkedIn profile. I asked ChatGPT what can you tell me about that person? Then I asked for sources. That accelerated my Google search. That’s just one example of a use case where it can be helpful.”**

– North American investor,  
Mutual fund, >\$50 billion EAUM.

Source: S&P Global Market Intelligence Investment Manager Index survey.

## Early promise, payoffs yet uncertain

Generative AI has had a profound impact on the global economy in a short period of time. Even if it has not yet created vast streams of new revenue for many of the technology companies promoting it, it has driven new waves of capital investment by these vendors as they prepare for what they expect to be widespread adoption. It has also forced governments to rethink their technology strategies, businesses to adjust their attitudes toward advanced technology adoption and the public to reconsider its feelings toward AI overall.

However, generative AI remains in the very early stages of development, and while it has the potential to transform some industries, looming regulation to guard against potential misuse may temper some of the initial excitement. Investors of all types are watching the space very closely, with startups and established technology vendors alike vying for market share. Generative AI will change business operations, alter work and leisure habits, drive intense regulatory discourse and redefine investment strategies.



## CONTACTS

**Americas:** +1 800 447 2273

**Japan:** +81 3 6262 1887

**Asia-Pacific:** +60 4 291 3600

**Europe, Middle East, Africa:** +44 (0) 134 432 8300

[www.spglobal.com/marketintelligence](http://www.spglobal.com/marketintelligence)

[www.spglobal.com/en/enterprise/about/contact-us.html](http://www.spglobal.com/en/enterprise/about/contact-us.html)

Copyright © 2023 by S&P Global Market Intelligence, a division of S&P Global Inc. All rights reserved.

These materials have been prepared solely for information purposes based upon information generally available to the public and from sources believed to be reliable. No content (including index data, ratings, credit-related analyses and data, research, model, software or other application or output therefrom) or any part thereof (Content) may be modified, reverse engineered, reproduced or distributed in any form by any means, or stored in a database or retrieval system, without the prior written permission of S&P Global Market Intelligence or its affiliates (collectively S&P Global). The Content shall not be used for any unlawful or unauthorized purposes. S&P Global and any third-party providers (collectively S&P Global Parties) do not guarantee the accuracy, completeness, timeliness or availability of the Content. S&P Global Parties are not responsible for any errors or omissions, regardless of the cause, for the results obtained from the use of the Content. THE CONTENT IS PROVIDED ON "AS IS" BASIS. S&P GLOBAL PARTIES DISCLAIM ANY AND ALL EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, FREEDOM FROM BUGS, SOFTWARE ERRORS OR DEFECTS, THAT THE CONTENT'S FUNCTIONING WILL BE UNINTERRUPTED OR THAT THE CONTENT WILL OPERATE WITH ANY SOFTWARE OR HARDWARE CONFIGURATION. In no event shall S&P Global Parties be liable to any party for any direct, indirect, incidental, exemplary, compensatory, punitive, special or consequential damages, costs, expenses, legal fees, or losses (including, without limitation, lost income or lost profits and opportunity costs or losses caused by negligence) in connection with any use of the Content even if advised of the possibility of such damages.

S&P Global Market Intelligence's opinions, quotes and credit-related and other analyses are statements of opinion as of the date they are expressed and not statements of fact or recommendations to purchase, hold, or sell any securities or to make any investment decisions, and do not address the suitability of any security. S&P Global Market Intelligence may provide index data. Direct investment in an index is not possible. Exposure to an asset class represented by an index is available through investable instruments based on that index. S&P Global Market Intelligence assumes no obligation to update the Content following publication in any form or format. The Content should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors and/or clients when making investment and other business decisions. S&P Global keeps certain activities of its divisions separate from each other to preserve the independence and objectivity of their respective activities. As a result, certain divisions of S&P Global may have information that is not available to other S&P Global divisions. S&P Global has established policies and procedures to maintain the confidentiality of certain nonpublic information received in connection with each analytical process.

S&P Global may receive compensation for its ratings and certain analyses, normally from issuers or underwriters of securities or from obligors. S&P Global reserves the right to disseminate its opinions and analyses. S&P Global's public ratings and analyses are made available on its websites, [www.standardandpoors.com](http://www.standardandpoors.com) (free of charge) and [www.ratingsdirect.com](http://www.ratingsdirect.com) (subscription), and may be distributed through other means, including via S&P Global publications and third-party redistributors. Additional information about our ratings fees is available at [www.standardandpoors.com/usratingsfees](http://www.standardandpoors.com/usratingsfees).