DANIEL FLAX
Senior Research Analyst

KAYLA BROOKS TRAVERS
Research Analyst

Artificial Intelligence: The Engine That Could

Market volatility aside, development of this key technology shows no sign of slowing.

The introduction of the artificial intelligence application DeepSeek in January was a shock to both the tech and investment worlds, adding a new dimension to global competition and creating uncertainty around the bull thesis behind AI. Despite reported minimal capital outlays and U.S. limitations on cutting-edge technology exports, the Chinese-owned app was able to deliver results that rivaled more dominant, scaled providers at apparently a fraction of the cost. Even as questions arose as to whether DeepSeek had piggy-backed off of existing open-source models (such as Meta's Llama), markets questioned the growth of some chipmakers and the priorities of major tech companies, which have been spending billions of dollars to build increasingly complex AI models and data centers.

A seismic event? Perhaps, but we would be more apt to describe the DeepSeek news as an abrupt turn in the very eventful journey that is AI. From academic beginnings, it moved into commercial uses, including the addition of AI tools to data analysis and search, built up speed with the remarkable launch of Open AI's ChatGPT (or GPT-3.5) in 2022, and then accelerated even more as cloud computing companies raced to build out enough capacity to prepare for a new era where AI could be infused into practically everything around us.

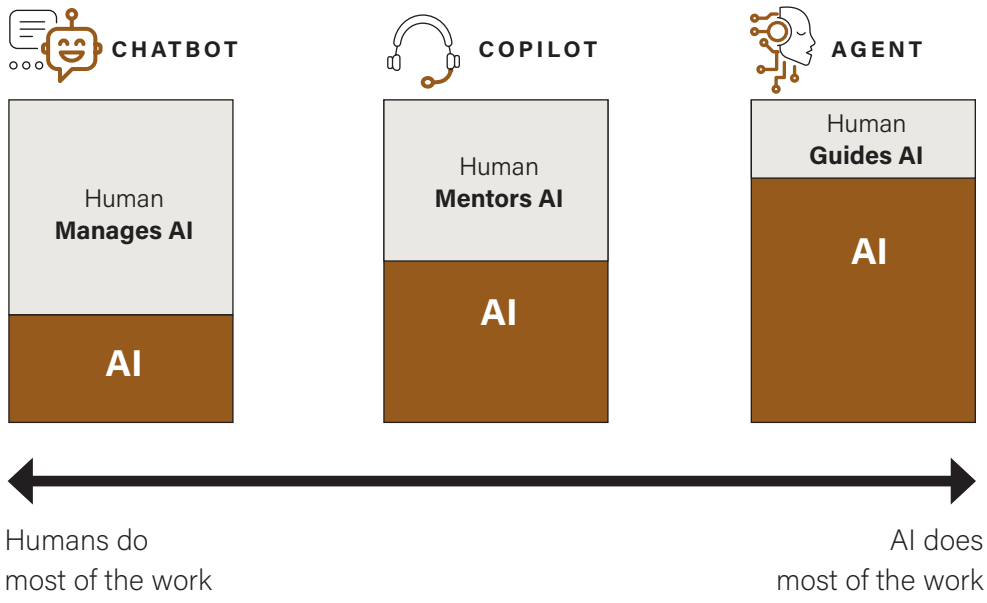
BUILDING THE AI ENGINE

The fast pace of innovation shows no signs of slowing:

Historically, **training** has been central to the development of successful AI models, in which scientists run data (proprietary or potentially from the open internet) through a model to train it. During training, the model continuously iterates outputs and gets feedback on their accuracy; the process takes massive computer power as the model is refined.

While training has received much attention, we believe the focus will increasingly shift to **inference.** Built on previous training, inference may use smaller, more efficient, data sets to make predictions, and has the potential to deliver actionable insights that can generate revenue or quantifiable cost savings. The economic benefits are among the reasons for current enthusiasm over the potential for inference.

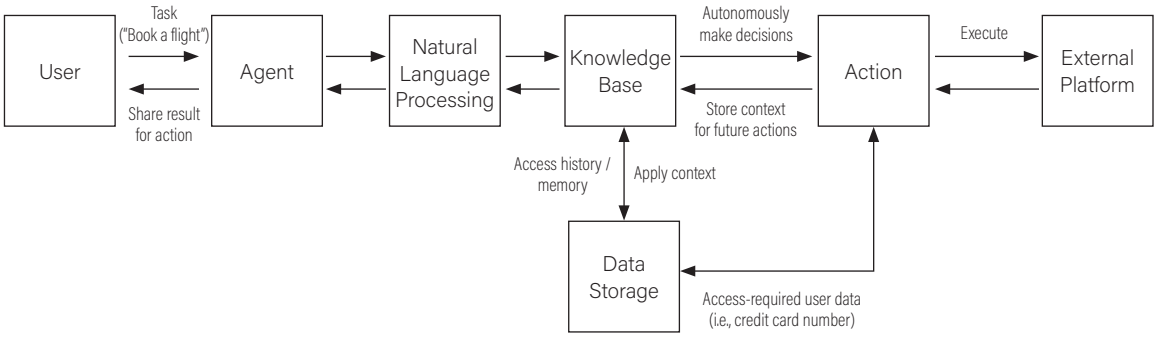
AI Is Taking More Off Your Plate



Source: Antara, Stifel Research. "Copilot" is Microsoft's AI tool, which is imbedded across the company's products to help improve efficiency within everyday workflows. While a chatbot simply responds to human inquiries or requests, Copilot works with humans on an ongoing basis. As discussed, an AI agent can take on multiple-part tasks as desired by the human involved.

How an AI Agent Could Book Your Flight

Hypothetical Workflow



Source: Stifel Research. Illustration is for discussion purposes only.

Reasoning models, which draw on inference, represent a major advance over the simple question and response chatbots that many are familiar with. Reasoning models are more complex, and often use more time and computing power to respond, but can come up with more nuanced, thoughtful answers to queries. While the costs can be higher, users may be willing to pay a premium for predictions that can deliver higher returns for their businesses.

Edge environments could also be highly important in the next phase of artificial intelligence. Here, AI moves beyond centralized servers in the cloud to personal devices, including computers and smartphones, and more dispersed locations, including cars and factories, where AI can be employed to achieve specific outcomes. In such cases, it may be possible to modulate the compute employed and thus the expense, making applications more cost-effective. We believe this proliferation of the technology into different environments has the potential to lead to an explosion in new use cases over time. **Robotics** will likely be a key part of the "edge," with robots in places such as factories, distribution centers and construction sites, performing discrete tasks informed by AI whose workloads do not go back to the public cloud, but remain on the edge.

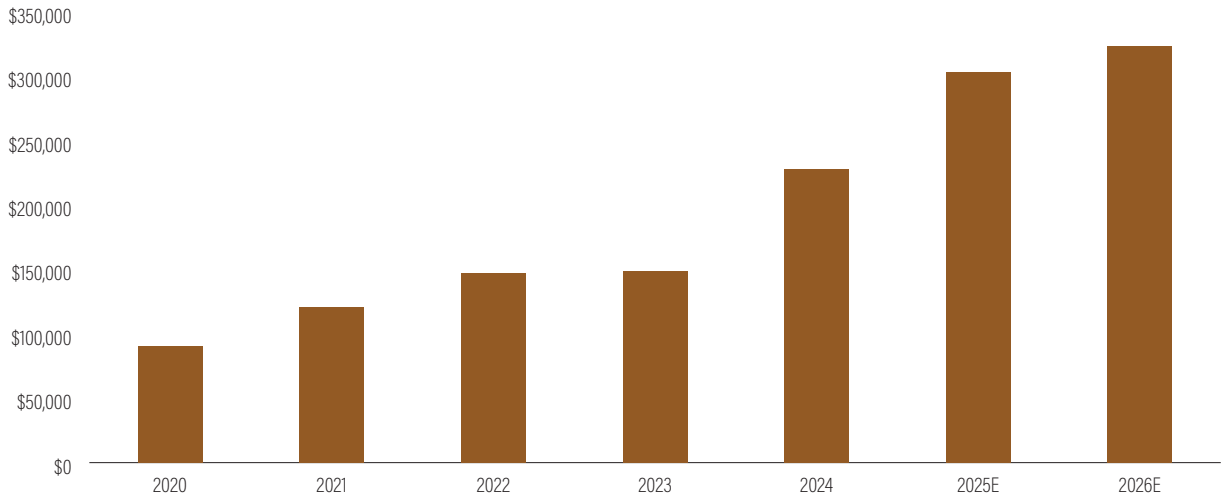
AI agents are becoming more visible to the general public, but remain a somewhat amorphous aspect of AI technology. An advance from chat-and-response type models, AI agents are software programs that use reasoning and planning to solve complex, multistep problems. These agents can interact with their environment, collect data and then choose actions to meet goals set by humans. If you called a customer service center, an AI agent might respond to your query with various questions, look up information and respond with a solution. At an online travel agency, an AI agent might book your hotel, airfare and rental car through the use of "contextual awareness" (the ability to remember your travel preferences, hotel and airline rewards memberships, credit card information and more). Multiple AI agents are increasingly being deployed together to respond to complex problems specific to various workflows across organizations.

COMPETITION: ROLLING INTO THE FOG

How are companies going to handle the emerging AI landscape, and who may succeed? In the past, we have seen a handful of companies capture inflection points in technology development to achieve dominant leadership, but staying in the lead is difficult. If they do not have the right technology assets and growth drivers coming out of this period, today's industry leaders may not be able to survive in their current form for the next wave of growth.

BIG TECH IS SPENDING BIG MONEY ON AI

Cloud Capex ($ Millions)



Source: Company reports, FactSet consensus. Reflects sum of capital expenditures by Amazon, Alphabet, Microsoft and Meta Platforms.

Challenges at Some 'AI Stalwarts'

Apple. Investors are worried that the company's "Apple Intelligence" tools have been slow out of the gate. The perception is that they lack a "wow factor," that people aren't getting much value from them, and that the company is relying on outside vendors (e.g., OpenAI) for key capabilities. That said, Apple has historically been hyper-focused on the user experience, and is being very deliberate in attempting to get things right.

Google. The controversy here is that Google's high market share in "search" could be disrupted by emerging AI technologies, and that it could be unable respond fast enough to ensure strategic relevancy. Regulatory issues are also a worry, with the U.S. Department of Justice looking to change Google's search distribution agreements and force the company to sell its popular Chrome browser, among other measures, potentially hampering its ability to compete.

Microsoft appeared to be an early AI leader two years ago with its OpenAI investment, the Microsoft Copilot AI app, and rapidly growing Azure cloud business; however, while it has generated excitement, Copilot still needs to prove its worth, while relatively slower cloud growth has some investors concerned.

Amazon. Issues at the retailing/technology giant may be more related to the consumer and tariffs, but a key question is whether the company is well positioned for AI and can sustain its leadership in the cloud market, which it helped to pioneer through its AWS service.

Nvidia. Moderating growth and intensifying competition, particularly from low-cost AI models, are worrying investors, as are new restrictions on sales to China (including of H20 chips developed to avoid previous export limitations). That said, Nvidia appears to be executing well on its key product cycles (including the Blackwell platform) and continues to attract developers to its vibrant ecosystem.

As noted, large technology platform and cloud computing companies are spending significant amounts on datacenter capacity and AI servers to avoid missing the moment. Thus far, many companies have been unable to generate enough revenue to justify the costs, yet they continue to invest meaningfully ahead of such revenue generation. Market bears argue that these companies may actually be overspending, driven by fears of missing out. A similar argument applies to software providers, which are adding AI capabilities (and agents) to generate more dollars per user (while some of their customers are shrinking headcount) with the hope of gaining more traction over time.

Does current disruption have parallels to the dot-com era? Yes and no. The drive to spend without a clear revenue payoff is similar, but today's spending by some of the major companies appears less speculative, and they can employ their new AI computing capacity in existing core businesses; if revenue growth slows, they will still likely have real free cash flow and growth prospects. That said, many startups and AI model companies are burning cash and therefore appear more vulnerable.

GEOPOLITICS, REGULATION AND TRADE

If the technological shifts weren't enough, AI players are facing uncertainty tied to the new U.S. president's commercial and regulatory regime, complicated by strategic concerns. Donald Trump's decision to champion the U.S. as a global AI leader via initiatives such as Stargate may be a good thing, but it remains early. While the new administration is focused on restructuring trade agreements and raising tariffs, if domestic companies can't effectively compete, those in countries without as many restrictions could forge ahead and build meaningful competitive advantages. Antitrust and trade issues remain top-of-mind for corporate leaders, who have been mapping out multiple scenarios around tariffs and their impact on sourcing, supply chains and manufacturing locations.

FULL SPEED AHEAD

We believe that advances in AI will likely continue at a breakneck pace regardless of the level of tariffs or restrictions on information flow—the implications for productivity, standards of living and geopolitical advantage are just too compelling to ignore. That said, technology remains a cyclical business, and the AI trend is unlikely to "protect" stock portfolios from the cyclical patterns that inevitably affect earnings and stock prices.

To work through such potential headwinds, we believe technology companies that can innovate, develop distinct or differentiated intellectual property, and execute on their product roadmaps should be able to drive growth and free-cash-flow generation over time. For other sectors, the name of the game will be to effectively adapt to the AI era, revamping business models to adapt to the growing abilities of AI while determining where humans fit into the mix. Finally, from an investment standpoint, the spread of AI across the economy at large will require particular vigilance in research and stock selection as a new landscape unfolds.

NEUBERGER BERMAN

1290 Avenue of the Americas
New York, NY 10104–0001
www.nbprivatewealth.com