

GLOBAL X INSIGHTS

AI Infrastructure: Laying the Groundwork

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Date: February 3, 2025

Topics: [Thematic](#), [Charting Disruption](#), [Paradigm Shifting Technologies](#)

This piece is part of a series that dives deeper into the most prevalent themes of this year's iteration of our flagship research piece, [Charting Disruption](#). This feature focuses on defense technology, as part of a larger section on [Paradigm-Shifting Technologies](#), exploring a variety of innovations in this space. For additional insights from the project, please click [here](#).

The automation age, where software, machines, and systems learn from data and operate autonomously, is set to drive unprecedented productivity gains. But this revolution depends on trillions of dollars in digital infrastructure investments to meet AI's soaring processing demands. This includes AI clusters for training large-scale models, edge infrastructure to power AI applications, mobile and cellular networks to support surging data traffic, and upgraded consumer devices integrating AI. Parallely, chips are becoming more power efficient and cost effective, enabling nimbler processing infrastructure. Generative AI infrastructure alone is set to attract nearly \$1.3 trillion in annual spending by 2032, up from just \$110 billion in 2024.¹

In this report, we explore this multi-year transformation ahead of us and the opportunities it will likely unlock across the technology landscape.

Key Takeaways

- Generative AI could add \$16 trillion to global gross domestic product (GDP) by 2030.² Success hinges on the development of AI Infrastructure, which could be nearly a trillion-dollar industry by 2030.³
- Advancements in AI-optimized hardware, including graphics processing units (GPUs), application-specific integrated circuits (ASICs), and specialized chips, are fueling a boom in data center investments and construction. Heightened demand is leading to lower vacancy rates and higher rental rates, creating opportunities across the tech ecosystem.
- AI is poised to revolutionize multiple industries beyond data centers, from autonomous vehicles and robots to healthcare, with advancements in AI and accelerated computing driving new applications and accelerating innovation across sectors.

The CapEx Race Is on to Build out AI Infrastructure, Led by Big Tech

Previous technological paradigm shifts boosted productivity and drove economic growth, but generative AI appears on track to surpass even the advent of the internet, which took roughly 15 years to transition from innovation to productivity growth.⁴ Growing AI integration is also already showing signs of elevating corporate profitability, which has Big Tech's attention.

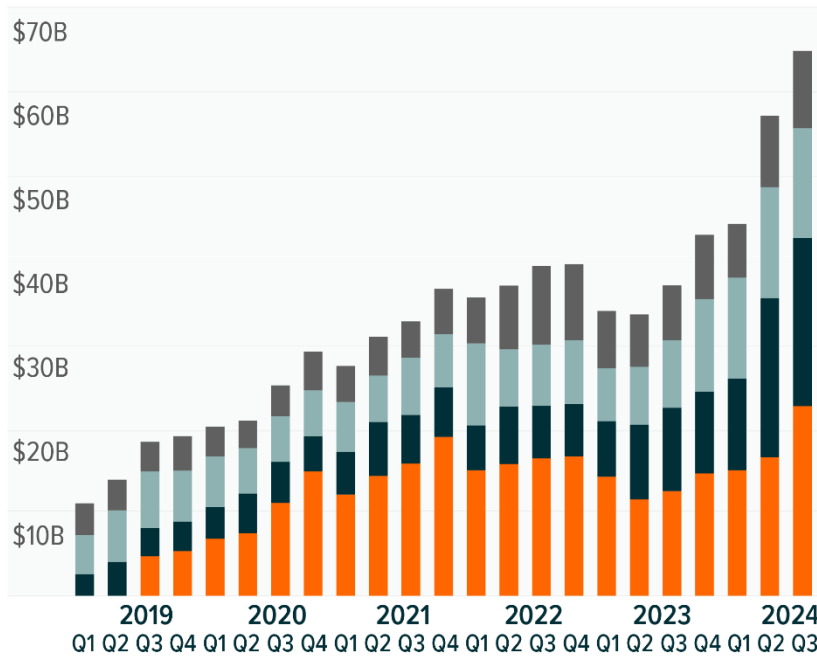
In 2024, Amazon, Google, Microsoft, and Meta are expected to have spent over \$213 billion on CapEx, primarily for AI Infrastructure, placing their investments on par with the peak CapEx levels seen in Big Oil and Telecom during their major buildout periods during 2000 and 2013, respectively.^{5,6} While 2024 CapEx handily exceed estimates, 2025 CapEx is likely to follow a similar growth trajectory, with key companies already expressing their willingness to invest even more aggressively. For example, Microsoft expects to spend \$80 billion on AI-enabled data centers in fiscal year (FY) 2025, while Meta intends to invest between \$60-\$65 billion on AI infrastructure, development, and hiring, in what it expects will be a defining year for AI.^{7,8}



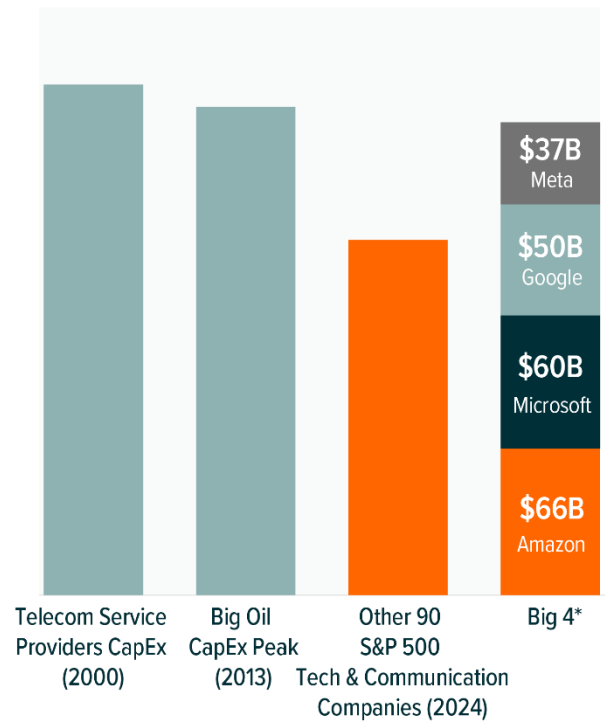
2024 BIG 4 CAPEX SPEND REACHED ALL TIME HIGHS, RIVALING TELECOM AND BIG OIL AT THEIR PEAKS

Big Tech Quarterly CapEx Spend

Amazon Microsoft Google Meta



Peak CapEx During Major Buildouts



* FY2024 Forecast

Sources: LHS: FactSet, n.d., accessed on 1 Nov 2024; RHS: Bloomberg, L.P., n.d., accessed on 1 Nov 2024; FactSet, n.d., accessed on 1 Nov 2024; MarketWatch, Jul 2024.

Note: On the RHS chart, the Telecom and Big Oil figures are adjusted for inflation.

AI Infrastructure Spending Growth Set to Benefit a Broad Data Center Ecosystem

Growing demand for AI, autonomy, and high-performance computing is creating major opportunities in the data center industry, which is critical to phase 1 of the AI infrastructure buildout. More specifically, the rapid acceleration of AI investments we're witnessing is set to benefit a broad data center ecosystem, including semiconductors that provide the necessary computing, data center real estate investment trusts (REITS), networking, storage, liquid cooling and power management, and even cloud providers at the abstraction layer.

At the compute level, most traditional AI chips are costly and power-hungry, limiting adoption. However, newer generation chips like GPUs, ASICs, and AI inferencing chips are seeing growing demand as they are optimized for diverse workloads, reducing costs, and improving energy efficiency. By decade end, it's expected that the AI processor market will approach \$496 billion, up from \$68.6 billion in 2023.⁹ GPUs are expected to continue capturing most of this spending, growing at a 31% CAGR, benefiting top providers like Nvidia and AMD. However, custom accelerators and ASICs, such as Google's tensor processing units (TPUs), are also gaining momentum and are projected to grow at a 40% CAGR during the period.¹⁰

Driven by these advancements in AI chips and the supporting hardware ecosystem, U.S. data center construction continues to reach new records. For FY 2024, data center construction in primary U.S. markets was expected to have reached an estimated 3.5 gigawatts (GW), up from 0.5 GW in 2020.¹¹ Globally, hyperscale data centers topped 1,000 in 2024, with over half residing in the U.S. Hyperscale capacity is now also doubling every four years as cloud giants intensify their AI efforts.¹²

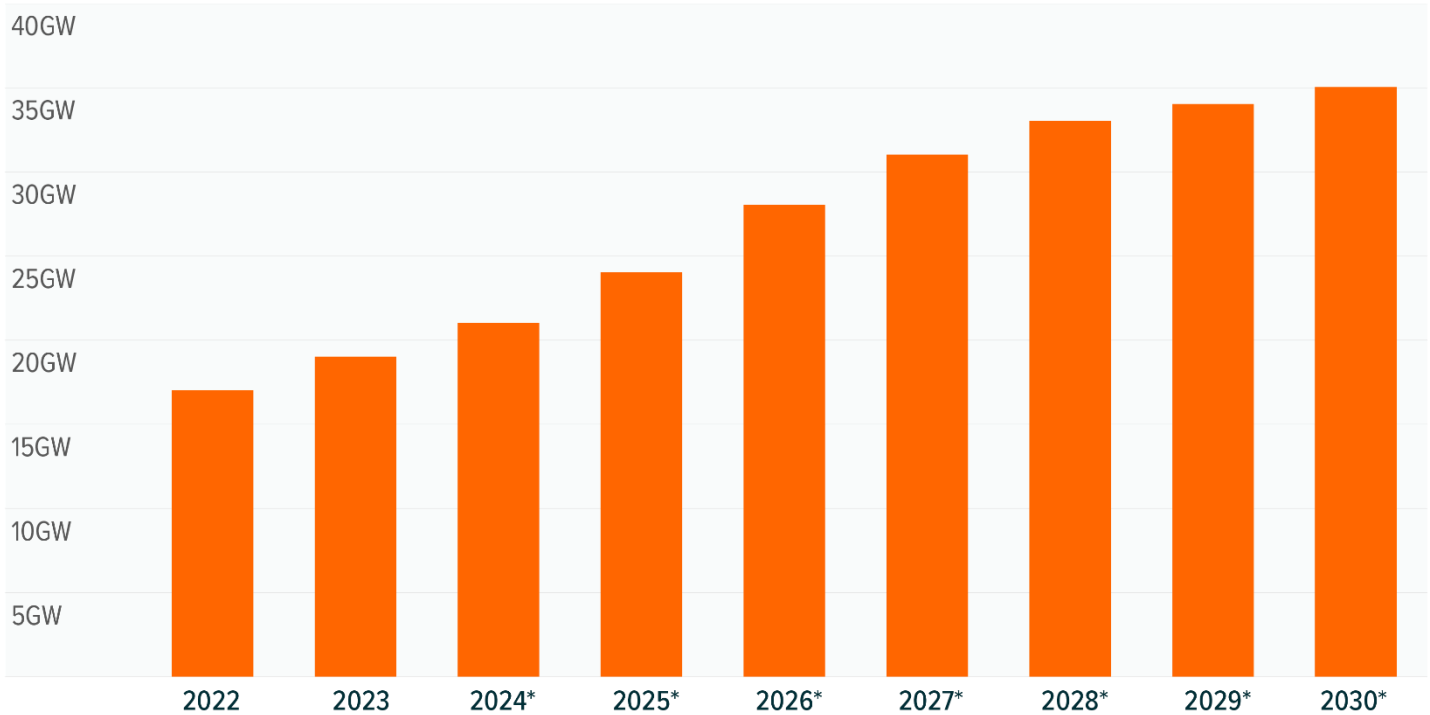
This rising data center demand and subsequent capacity crunch is serving as a strong tailwind for existing data center providers, as they can price their services at greater premiums. For example, existing colocation-based data center vacancy rates in primary U.S.



markets reached record lows of 2.8% in 2024 and, as a result, asking rental rates for U.S. data centers reached 10-year highs of \$163/kilowatt in 2024 and are expected to have grown 13% YoY for the full year 2024. ^{13,14,15}

U.S. DATA CENTER CAPACITY IS EXPECTED TO GROW TO 35 GIGAWATTS (GW) BY 2030

Data Center Power Load



Sources: Global X ETFs forecast with information derived from: Utility Dive, May 2024.

*Forecast

Demand for Accelerated Computing Expands Beyond Data Centers and Generative AI

As the AI infrastructure buildout progresses, advancements in AI and accelerated computing are likely to drive specific boosts to a handful of industries far beyond the data center. For example, autonomous applications like self-driving vehicles, robotics, and drones are likely to be key beneficiaries. Similarly, medical research stands to benefit as drug discovery and genomics utilize accelerated computing for complex calculations.

Consumer devices with on-device AI capabilities are also likely to see accelerated adoption. Features like native AI assistants in smartphones, wearables, and IoT devices enable real-time intelligence at the edge, unlocking new use cases for everyday users, which could spur a personal device upgrade cycle and boost smartphone sales. Advanced cellular networks, such as 5G and beyond, which are foundational to AI's scalability, are also likely to see upgrades. These networks are critical to delivering the low latency and high bandwidth required for real-time AI processing and interactive experiences.

Conclusion: Automation Age Needs Extensive Digital Infrastructure Upgrade

Major advancements in AI-optimized hardware, such as next-generation GPUs, computer processing units (CPUs), and accelerators are enabling more powerful and efficient large language models. This is driving a rapid evolution in the data center industry, where providers are investing in capacity expansion and infrastructure upgrades, as well as meeting increased power and energy demands to manage growing AI workloads. Modernized AI infrastructure is critical to fostering the widespread adoption of generative AI applications across industries. The benefits extend beyond data centers, with AI integration also enhancing autonomous applications, cellular infrastructure, Internet of Things (IoT) devices, and consumer electronics.



Footnotes

1. Global X ETFs estimate with information derived from Bloomberg. (March 8, 2024). Generative AI races toward \$1.3 trillion in revenue by 2032.
2. PwC. (n.d.). Sizing the Prize. Accessed on November 20, 2024.
3. Global X ETFs estimate with information derived from Bloomberg. (March 8, 2024). Generative AI races toward \$1.3 trillion in revenue by 2032.
4. Global X ETFs estimates with information derived from J.P. Morgan. (2024, 16 July). How AI Can Boost Productivity and Jump Start Growth.
5. FactSet, n.d., accessed on 1 Nov 2024.
6. Bloomberg, L.P., n.d., accessed on 1 Nov 2024.
7. CNBC. (2025, Jan 3). Microsoft expects to spend \$80 billion on AI-enabled data centers in fiscal 2025.
8. New York Times. (2025, Jan 24). Meta to Increase Spending to \$65 Billion This Year in A.I. Push.
9. Global X ETFs forecast with information derived from: IDC. (2024, February). Outlook for AI Semiconductors and Storage.
10. Ibid.
11. CBRE Group, Inc. (2024, March 7). CBRE Report: North American Data Center Pricing Nears Record Highs, Driven by Strong Demand and Limited Availability.
12. Synergy Research Group. (2024, April 17). Hyperscale Data Centers Hit Thousand Mark; Total Capacity Is Doubling Every Four Years.
13. CBRE. N.d. Data Centers – U.S. Real Estate Market Outlook 2025.
14. Global X ETFs forecast with information derived from: CBRE. (2024, August 19). North America Data Center Trends H1 2024: Cloud & AI Providers Drive Demand.
15. Ibid.

Information provided by Global X Management Company LLC.

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