GLOBAL X INSIGHTS

Paradigm-Shifting Technologies: Advancing the Automation Age

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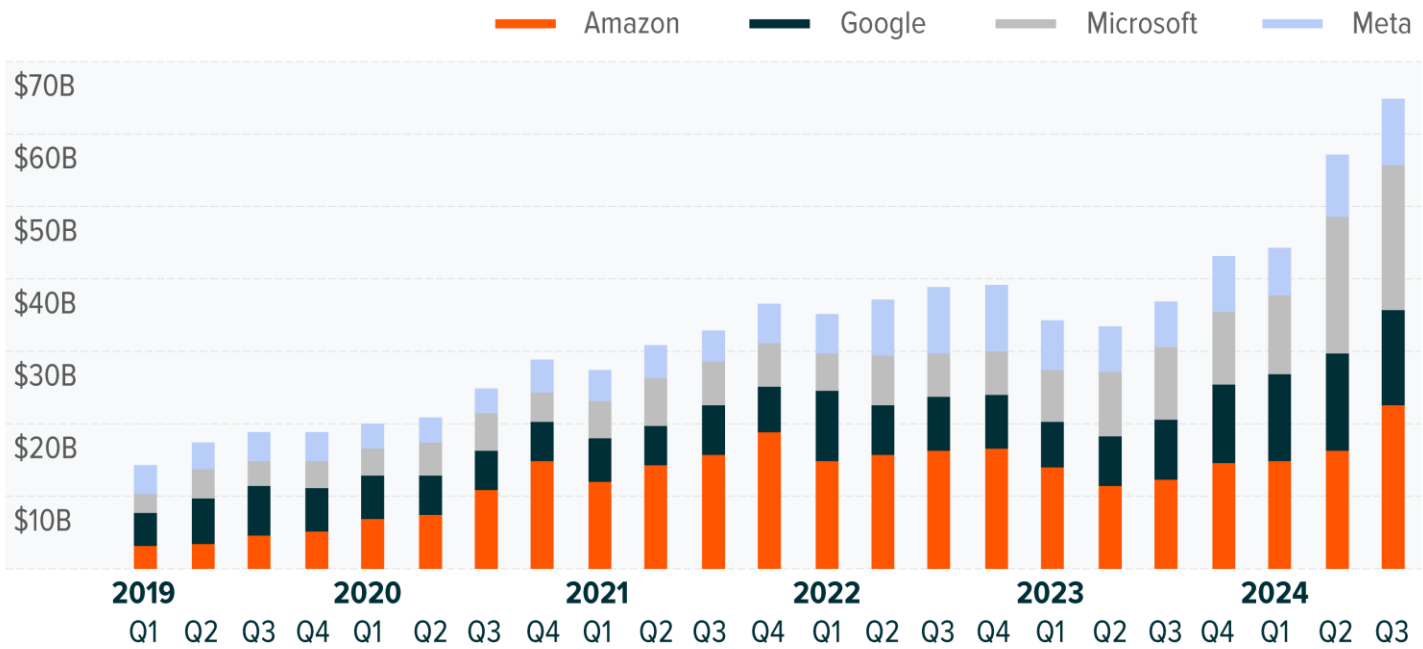
This piece is part of a series that dives deeper into the most prevalent themes of this year's iteration of our flagship research piece, Charting Disruption. The Paradigm-Shifting Technologies section focuses on artificial intelligence (AI) infrastructure, robotics, and defense technology. For additional insights from the project, please click here.

The internet revolutionized access to data and information, defining the Information Age over the last three decades. Going forward, artificial intelligence (AI) may drive a new transformation—the Automation Age—where software, machines, and systems can learn from data and increasingly operate autonomously with minimal human input. This era could enhance productivity, allowing individuals and companies to accomplish more with fewer resources and potentially amplifying corporate profitability. In this report, we'll dive into the infrastructure opportunities fueling this transformation, highlighting the industries that stand to benefit imminently from AI's rapid integration.

BIG TECH QUARTERLY CAPEX SPEND



Sources: Global X ETFs with information derived from: FactSet. (n.d.). AMZN, GOOGL, MSFT, META Financial Data. Data accessed on November 1, 2024.

Key Takeaways

- Generative AI could add $16 trillion to global gross domestic product (GDP) by 2030.[1] Success hinges on the development of AI Infrastructure, which could be nearly a trillion-dollar industry by 2030.[2]
- Generative AI advancements could spur innovation in robotics, advancing applications across a range of industrial, services, and domestic use cases.
- AI stands to transform defense and military strategy, potentially resulting in data-driven decision making, better economics, and saved lives.

AI Infrastructure: Foundational to the Automation Age

AI is driving a profound shift in computing, comparable to the disruptive impacts of the internet or mobile computing revolutions. AI builds upon the disruption caused by the internet, leveraging widely accessible data and networks to automate and enhance decision-making processes. This “Automation Age,” as we call it, will likely unfold over the next 30 years.

It is important to remember that while the field of AI is extensive, AI developers are currently focused on a narrow subset of applications such as Generative AI. Expanded proliferation of Generative AI is expected to accelerate innovation, initially automating a wide array of manual and laborious tasks, as well as routine creative functions. This integration of AI could add nearly $16 trillion to global GDP by 2030.[3]

For Generative AI to fully realize its potential, the infrastructure development is critical. This includes chips and ancillary hardware, construction and operation of large-scale data centers, software-infrastructure to support AI workloads, and applications designed to work natively using AI. Generative AI infrastructure alone is expected to be a $1.3 trillion business by 2032, up from $110 billion in 2024.[4]

This infrastructure buildout to enable the shift to an "Automation Age" will likely unfold in phases, driven by advancements in several interdependent areas:

- **Efficient Chip Design:** Current AI chips are costly and power-hungry, limiting adoption. The next generation must focus on optimizing chips for diverse workloads, reducing costs, and improving energy efficiency.
- **Large-Scale Data Centers:** As AI chips and the supporting hardware ecosystem advance, the expansion of large-scale data centers is expected to accelerate. These facilities are crucial for training increasingly complex AI models and running inference infrastructure to support real-time applications.
- **Widespread Access to AI Devices:** Consumer devices with on-device AI capabilities are likely to accelerate 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.
- **Upgraded Cellular Networks**: Advanced cellular networks, such as 5G and beyond, are foundational to AI’s scalability. These networks are critical to delivering the low latency and high bandwidth required for real-time AI processing and interactive experiences.

As the AI infrastructure build out progresses, we expect AI to drive specific boosts to a select few industries in the next few years—primarily Robotics and Defense Technologies.

Robotics: Automating the Physical World

Robotics represents the physical application of artificial intelligence, bridging the digital and real world. While robots have existed for decades, the availability of efficient chips, training data, and research and development (R&D) capital hints at accelerating progress in the coming years.

Currently most applications to date have centered on industrial robotics—a trend that is likely to persist, driven by an increasingly de-globalized economy and initiatives such as reshoring manufacturing. In 2023, nearly 44,300 industrial robots were installed in the U.S., up 12% YoY with another 10% growth expected in 2024.[5] Industrial robotics set ups are mostly fixed robots, and the improving sophistication of AI systems, along with the availability of faster chips and more training data, could make these robots faster, more precise, and increasingly effective.

With the cost of robots decreasing, the adoption of robotics and automation systems is set to accelerate. Simultaneously, manufacturing wages are growing, tilting the economics of production in favor of automation.[6]

Advances in AI technology could expand robotics applications beyond industrial use, paving the way for their integration into the services sector. This includes the use of robots in areas such as healthcare, where better patient outcomes and shorter hospital stays are driving demand for surgical robotics.[7] Services also include robotics applications in the retail segment, where use cases could expand from a robot’s ability to better understand and process human input.

Lastly, AI’s most transformative impact on Robotics may lie in advancing humanoid robotics, which are autonomous machines designed to replicate human actions, reasoning, and functions and operate in spaces designed for human beings. By 2036, global sales of humanoids are projected to exceed 100 million units.[8]

Defense: AI Could Act as a Force Multiplier

The global geopolitical landscape remains complex, with ongoing conflicts in Ukraine and the Middle East escalating trade tensions and increasing economic fragmentation challenging international stability. This is fueling a steady rise in global defense spending, which is projected to exceed $3.4 trillion by 2030, growing at an annualized rate of 5%.[9] A significant portion of this increase is being channeled toward advanced technological solutions, with artificial intelligence playing a pivotal role.

AI is capable of reshaping modern warfare by enhancing weaponry, situational awareness, and decision making. The progress and potential impacts from AI have resulted in evolving priorities of militaries worldwide, which now emphasize investments in foundational digital infrastructure for AI integration, as well as growing research and development spend towards autonomous systems, predictive analytics tools, and security software.

The proliferation of drones, for instance, underscores how AI-enabled attack systems can level the playing field for financially constrained armies.[10] The drone market, expected to be valued at over $30 billion by 2030, highlights this shift.[11] Beyond drones, AI-powered platforms in unmanned ground vehicles (UGVs) and robotic combat vehicles (RCVs) are gaining traction.

As AI continues to mature, its integration into defense could not only potentially transform the economics of warfare but also redefine geopolitical strategies, creating opportunities and challenges for global stakeholders.

Conclusion

The transformation through the Automation Age has only begun. Building the infrastructure necessary for the integration of artificial intelligence across our digital and physical products will likely emerge as a core driver of technology and IT spending growth in this decade, potentially presenting investors with numerous secular growth opportunities. Beyond that, AI integration across sectors is expected to present more opportunities, specifically in accelerating adoption of automation and in advancing defense priorities.

Footnotes

1. PwC. (n.d.). Sizing the Prize. Accessed on November 20, 2024
2. Global X ETFs estimate with information derived from Bloomberg, (March 8, 2024). Generative AI races toward $1.3 trillion in revenue by 2032
3. PwC. (n.d.). Sizing the Prize. Accessed on November 20, 2024
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5. International Federation of Robotics. (2024, April 30). U.S. Companies Invest Heavily in Robots – IFR Preliminary Results.
6. Global X Estimates with information derived from Trading Economics, United States Average Hourly Wages in Manufacturing accessed on November 20, 2024
7. Science Advisor. (2024, October 30). Augmented dexterity: How Robots Can Enhance Human Surgical Skills.
8. Global X ETFs forecast with information derived from: Goldman Sachs. (2022, November 15). Humanoid Robots: Sooner Than You Might Think.
9. Global X ETFs forecast with information derived from: Stockholm International Peace Research Institute (SIPRI). (2024, April 22). Global Military Spending Surges Amid War, Rising Tensions and Insecurity.
10. Wall Street Journal. (2024, March 12). Drone Swarms Are About to Change the Balance of Military Power
11. Global X ETFs forecast with information derived from: Fortune Business Insights, Nov 2024, accessed on November 20, 2024.