

The high stakes of AI investment: Balancing innovation and operational efficiency

Research Pulse

Artificial intelligence (AI) is transforming industries by enhancing prediction accuracy and enabling data-driven decision-making. Despite its potential to drive growth, AI adoption faces challenges, including the need for complementary investments and long-term ROI uncertainties. Larger firms benefit disproportionately due to greater resources, while smaller businesses face barriers to entry. Operational inefficiencies and high costs, particularly for platform AI, remain significant obstacles. European firms can thrive by leveraging GDPR-compliant applications and open-source models, fostering collaboration and innovation despite US dominance in foundational AI technologies.

AI adoption and the complex path to ROI in a competitive landscape

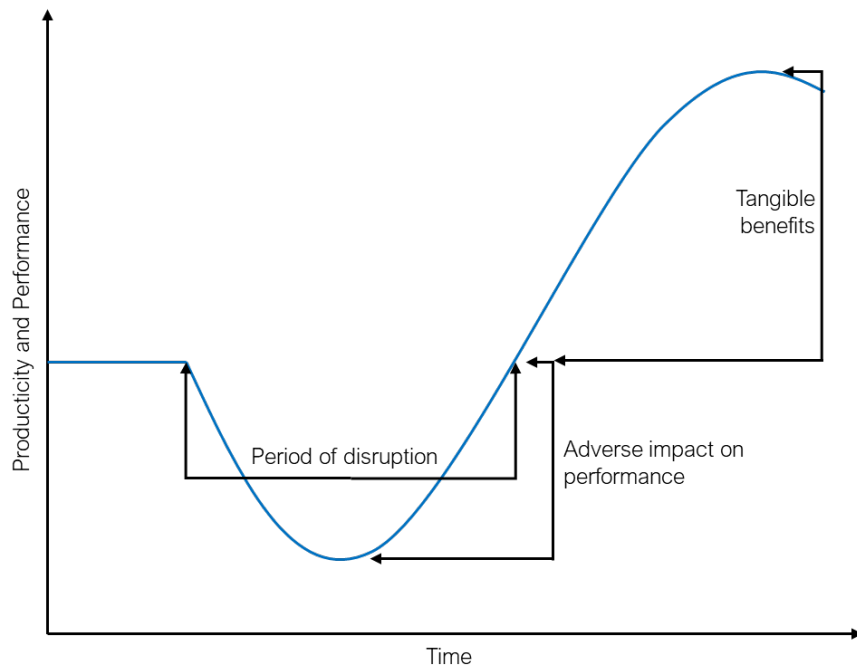
Artificial Intelligence (AI) refers to the field of computer science focused on creating systems capable of performing tasks that typically require human intelligence. Generative AI (Gen AI) is a branch of artificial intelligence that generates original content in response to user prompts or requests. This content can include a variety of forms, such as text, images, audio, video, or software code, produced autonomously by the AI system. Predictive AI combines statistical analysis with machine learning algorithms to identify patterns in data and forecast potential future outcomes.

AI enables firms to analyse vast amounts of data more effectively and efficiently, enhancing the accuracy of predictions. Firms investing heavily in AI achieve higher growth rates, as evidenced by increased trademark filings, product patents, and updates to product portfolios. However, the timeline required to realize such growth and the corresponding return on investment (ROI) remains uncertain, which introduces complexity into the process (Tania Babinay, 2024).

Robert Solow (1987) pointed out the "productivity paradox," observing that "a technological revolution, a drastic change in our productive lives," was paradoxically accompanied by "a slowing-down of productivity growth, not

by a step up.” Economists have often described this phenomenon as a J-curve, wherein productivity initially declines before later accelerating. In the short term, adopting new technologies may suppress productivity as organizations and employees adapt to new workflows and practices. Furthermore, these technologies can inadvertently contribute to inefficiencies, such as an increase in unproductive activities: how many unnecessary emails have you read today?

The J-curve effect observed in change



Additionally, general-purpose technologies like AI necessitate significant complementary investments, including the co-creation of new processes, products, business models, and the development of human capital. Such complementary investments increase the costs associated to investments in AI and depress returns (Yulia Sullivan, 2022).

Unsurprisingly, the benefits of AI-driven growth and investment tend to be concentrated among larger firms with substantial cash reserves and robust R&D capabilities. These firms are better positioned to absorb the prolonged development costs associated with AI adoption, thereby reinforcing industry concentration and fostering “winner-take-most” dynamics.

For smaller firms with limited budgets, the barriers to entry grow steeper, further widening the gap between industry leaders and lagging

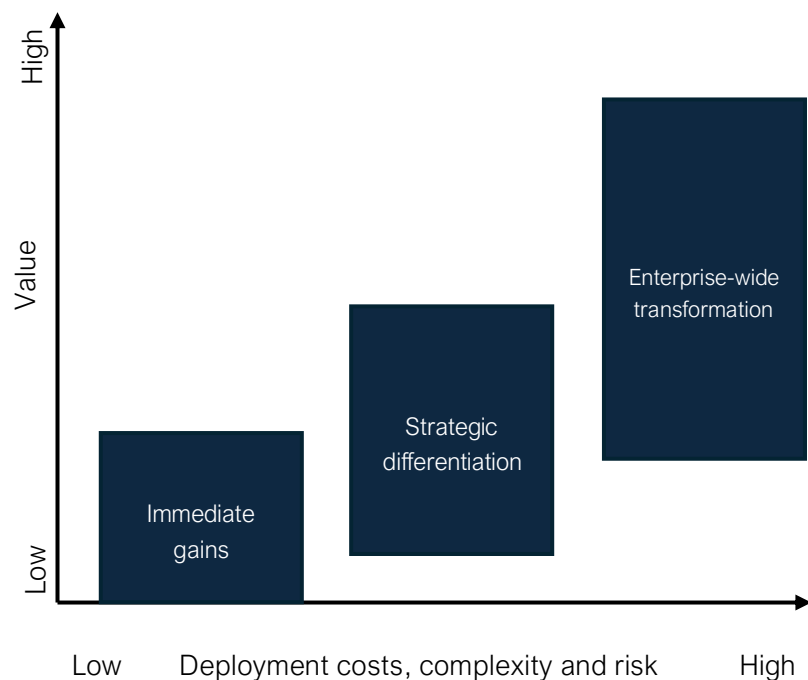
competitors. As AI becomes more central to economic and business strategies, this concentration effect raises concerns about fairness and market equity. Gartner identify three key use cases for AI, each with different ROI metrics and “adaptability” based on budget and firm-size (Jaffri, 2024):

Immediate gains: Businesses can achieve rapid productivity gains by leveraging straightforward AI productivity tools such as Microsoft Co-Pilot, Google Workspace, and ChatGPT. These solutions are cost-effective, easy to implement, and deliver immediate returns, making them an attractive starting point for AI adoption.

Strategic differentiation: These projects require a one-to-two-year investment and include more advanced AI applications such as predictive maintenance, supply chain automation, and AI-powered customer service. These initiatives enable businesses to leverage data to streamline processes, boost revenue, and enhance competitiveness.

Enterprise-wide transformation: These large-scale, high-risk projects should only be pursued after achieving success with the first two use cases. Examples include efforts to integrate data across an organization through data warehouses and analytics platforms.

Generative AI use cases categories



AI's economic potential vs. operational reality: Navigating high costs and depressed returns

Are AI providers benefiting from the AI boom? Not yet. In fact, the situation is quite the opposite. OpenAI, one of the most well-known AI providers with 300 million weekly users, reported a \$5bn loss in 2024, despite generating \$3.7bn in revenues. The company is under pressure to create a compelling narrative to sustain its funding momentum (Thornhill, 2025).

While AI could unlock up to \$15trn in economic value this decade, Gartner warns that 50% of custom AI initiatives will fail by 2028. This makes AI operational efficiency critical for survival. Tech firms specializing in AI are focusing on improving operational efficiency as they seek to commercialize their products and achieve profitability. Generative AI platforms, like ChatGPT, are among the most expensive to operate, it is estimated that each query costs 36 cents, and the company spends an average of \$700k per day to maintain its large language model (LLMs). Alphabet, Google's parent company, also emphasizes the need for better AI operational efficiency. Google Chairman John Hennessy told Reuters that AI LLMs "likely cost 10 times more than a standard keyword search." According to Morgan Stanley, search engines could face substantial cost increases if they switch to AI-driven responses instead of traditional search methods. It is estimated that Google may incur over \$6 billion in expenses in 2024 if half of its queries shift to the new AI functions.

The high cost of training and running large language models presents a structural challenge that differs from previous computing booms. Even after the software is built or trained, it requires massive computing power to process billions of calculations every time a response is generated. Currently, AI firms, often backed by venture capital and Big Tech funding, are absorbing these costs as they focus on expanding their market share and attracting new customers. However, as these companies reach market saturation, they will likely pass on the substantial costs of AI to consumers in order to meet profitability goals and investor expectations. By 2025, growth in 90% of enterprise deployments of GenAI will slow as costs exceed value (Jaffri, 2024).

How European start-ups can thrive on AI platforms from US giants

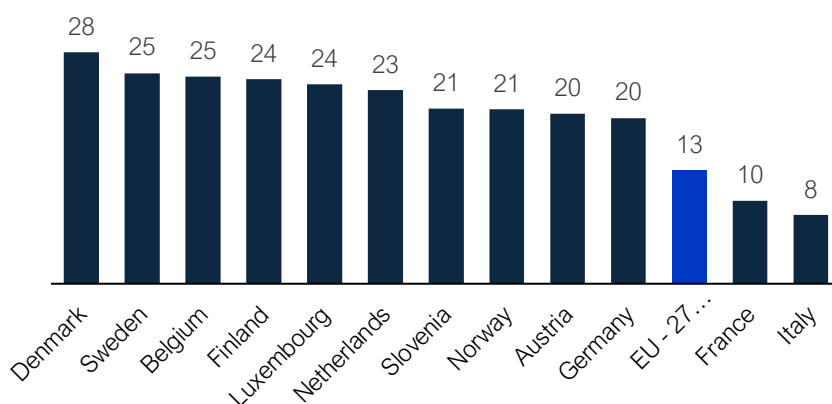
AI start-ups attracted 37 per cent of the global total of \$275bn of VC funding last year, up from 21 per cent in 2023. A report by venture firm Accel, published in October, found that US investment into generative AI reached almost \$48bn in 2023 and 2024 combined, more than five times as much as in Europe, where funding in the sector totalled about \$9bn. Much of the US total is driven by start-ups developing so-called "foundation" models, the costly and complex AI systems underpinning general-purpose chatbots such as OpenAI's GPT.

There is concern that Europe may once again fall behind the deep-pocketed groups in Silicon Valley in the race for a transformational new technology, with significant implications for the region's competitiveness and national security. However, there is still a path for European start-ups to thrive e.g. by developing applications that are built on top of AI platforms run by US-based company. This reflects the success observed in the mobile and cloud industries, where a limited number of major cloud providers support thousands of businesses. Specifically, European firms hold a competitive edge in developing applications that integrate GDPR compliance, a critical requirement for companies operating within the EU. As noted by Niklas Zennström, one of Europe's most successful tech entrepreneurs and investors in an interview with FT on January 8th "It's not necessary for every company to develop a large language model—value can be created by focusing on application development" (Bradshaw, 2025). Additionally a general-purpose infrastructure may eventually become a cost-driven commodity, potentially even evolving into a regulated utility. However, a specialized tool designed for specific use cases, built on top of this infrastructure, has the potential to differentiate itself within a niche market and command premium pricing.

In addition, unlike many major US AI companies, European AI start-ups tend to favour open-source models that promote greater collaboration and wider access to the technology. They believe this approach will give them a competitive advantage in applying AI across various sectors of the economy.

Enterprises using AI technology in EU in 2024

data in %



Source: Eurostat

In 2024, 13% of enterprises in the European Union (EU) with 10 or more employees incorporated AI technologies into their business operations. The highest adoption rates were recorded in northern European countries, with Denmark, Finland, and Luxembourg nearly doubling their levels from the previous year. A similar trend was observed in Italy and France, despite their initial adoption rates being below the EU average. Yet, as with previous general-purpose technologies, such as railways and electricity, it can take decades for AI to realize its potential in boosting productivity. New infrastructure must be developed, new workflows must be adopted, and new products and services must be launched.

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