The Economic and Workforce Impacts of Open Source AI

Insights from Industry, Academia, and Open Source Research Publications

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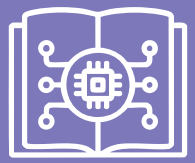
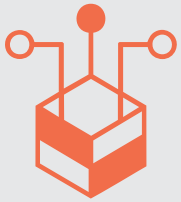
According to industry research, nearly all developers have experimented with open models and **almost two thirds (63%) of companies are using an open model.**





89% of organizations who have adopted AI **use open source AI (OSAI) in some form in their infrastructure.**

AI's 50%+ reduction in business unit costs, coupled with open source software's cost savings, suggests that **OSAI holds significant potential for revenue gains.**

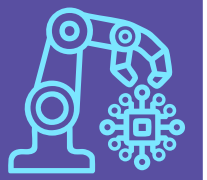
Two thirds of organizations report that **OSAI is cheaper to deploy than proprietary AI**, and nearly half choose OSAI because of their cost savings.

Open source positively impacts AI innovation: increased inter-organizational collaboration leads to faster development of high-quality models.

Smaller businesses are adopting OSAI at a higher rate than larger businesses.

OSAI will be foundational for **small models powering privacy-preserving edge applications** and **reasoning models with higher inference-time compute.**

OSAI is poised to have a high impact in manufacturing, where open models provide the flexibility needed to integrate AI directly into operational processes.



In healthcare, open models have proven to be on par with proprietary models, demonstrating that **institutions can adopt OSAI without sacrificing performance.**

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Executive summary

This study assesses and predicts the market impacts of open source artificial intelligence (OSAI) through a comprehensive analysis of prior academic and industry literature as well as empirical data from Linux Foundation (LF) Research. The research is global in scope, with U.S.- and Europe-specific insights where possible. The study first reviews the adoption rates of OSAI, finding that most businesses are already adopting AI: an LF study shows that 94% of surveyed organizations have already adopted AI tools and models, and 89% of those AI adopters use some form of open source in their infrastructure. In a review of the relationship between organization size and adoption, the literature shows that there is an inverse relationship between company size and adoption rates of OSAI in particular, with smaller companies prioritizing tools that are open source.

The review then analyzes existing evidence on the economic benefits of OSAI, including productivity growth, cost savings, and revenue gains. Findings from LF Research show that two thirds of surveyed organizations believe that OSAI is cheaper to deploy than proprietary AI, and nearly half cite choosing open source because of the cost savings. Research from the Harvard Business School on open source software (OSS) shows that the adoption of OSS leads to companies spending 3.5 times less than what they would if OSS didn't exist, along with increases in productivity and innovation. When aligned with evidence on AI's positive impacts on cost savings and productivity, the study provides some findings and predictions on OSAI's additional impacts on organizational costs and innovation.

AI's impact on the workforce and the potential for job creation over job replacement shows that in the short term, AI is not poised to displace workers. LF Research found that 95% of surveyed hiring managers over the past two years do not plan to reduce headcount due to AI. Even in the long term, AI will not necessarily lead to replacement: while AI may replace some jobs in supply chain/inventory management and customer service, most jobs will experience only partial exposure to AI automation, meaning it will become a job complement. In fact, holding skills in AI may increase workers' wages by over 20%.

Finally, examining the adoption and potential impacts of AI in healthcare, energy, agriculture, construction, and manufacturing, prior research predicts AI's value in the billions for each of these sectors. However, some sectors experience distinct impacts. For example, the energy sector is experiencing increased demands from data centers to meet the needs of AI, but AI can also bring significant advancements and efficiencies to the sector through monitoring energy consumption, predicting energy demand and supply, the design and deployment of new electric plants, autonomous operation and maintenance, emissions prediction, and identification of new materials. AI's potential in healthcare is also incredible—the productivity and resource savings could lead to $150-$260 billion additional value for the sector globally—while the privacy and financial constraints this sector faces make open source an attractive option.

The report concludes with recommendations for future empirical research to address evidence gaps and better understand the market impacts on OSAI.

Introduction

Open models are increasingly competing with—and in some cases, already surpassing—proprietary models across various capabilities. Perhaps no development captured this shift better than when DeepSeek's R1 model hit the headlines in January for demonstrating capabilities matching or exceeding industry-leading proprietary models on certain benchmarks for cents on the dollar.[1, 2] But this is not the only example. The open source flywheel is in full motion, with other open models topping benchmark leaderboards.[3] As Nathan Lambert from Ai2 articulated upon the release of OLMo 2 32B: ***"For a long time, people have asked for a truly open source version of ChatGPT, and we finally have it."***[4]

Quantifiable trends reflect this momentum. According to Stanford's 2024 AI Index Report, 66% of the 149 foundation models released in 2023 were open, a substantial increase from 44% in 2022 and 33% in 2021.[5] The 2025 AI Index Report shows that in 2024 alone, there was a 40% increase in the number of AI repositories on GitHub.[6] At the same time, the number of repositories on Hugging Face Hub—the central platform for collaboration among the OSAI community[7]—has skyrocketed, surpassing 1.5 million models and 350,000 datasets. Download data from platforms like Hugging Face Hub shows Meta's Llama models, Mistral's Mixtral models, and Alibaba's Qwen models have been downloaded millions, if not billions, of times.[8]

Defining OSAI

There is an ongoing debate about the definition of OSAI. Broadly speaking, it concerns the release of AI systems and their constituent components, such as software, data, model parameters (i.e., pre-trained weights and biases), tools, and documentation, under free and open source licenses that permit their use, study, modification, and redistribution.[9] In this report, when we use the term OSAI, we focus specifically on **open models in the domain of generative AI**, which we define as follows:

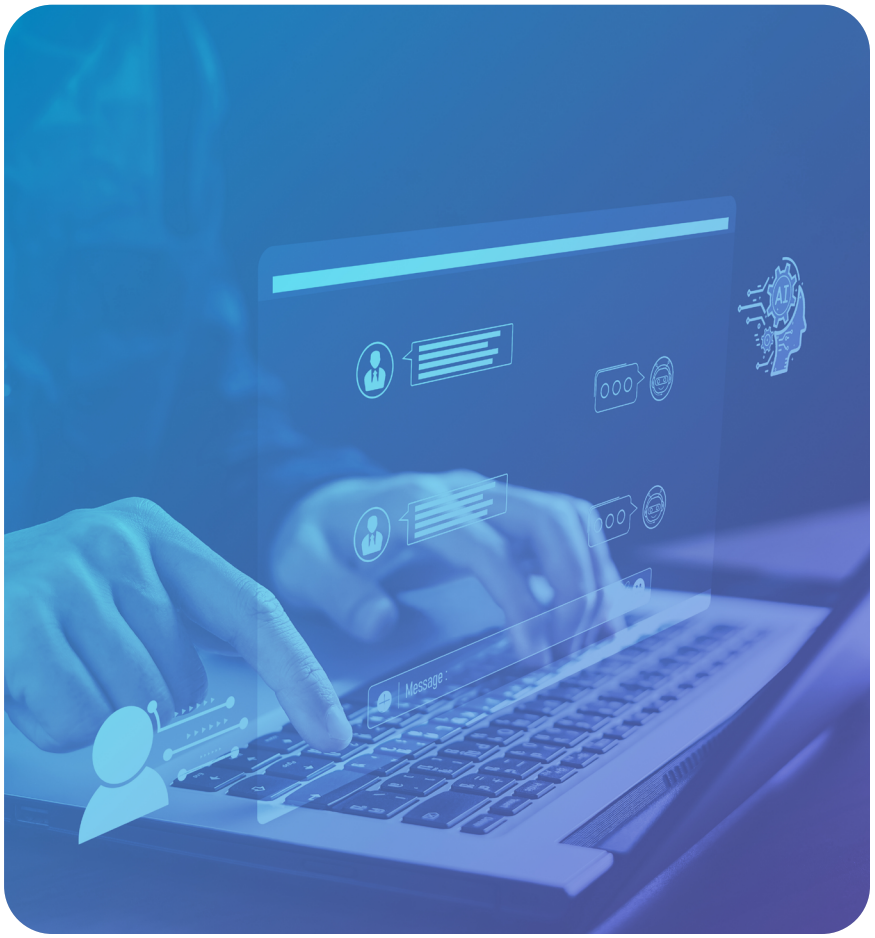
Open models are defined in the Generative AI Commons' Model Openness Framework as machine learning models whose architecture, parameters (i.e., pre-trained weights and biases), and documentation are released under permissive licenses that permit their use, study, modification, and redistribution.[10]

Generative AI refers to AI systems and models that create novel outputs, such as text, images, audio, video, and/or code, by learning patterns and distributions from training data rather than following explicit programming. Generative AI includes but is not limited to: language models, which enable tasks such as text generation and summarization; vision models, which enable tasks such as image generation and modification; and multimodal models, which are trained on data of multiple modalities, such as text, images, and audio, and accordingly enable the generation of outputs across different modalities, such as text-to-image creation or image-to-text reasoning. Among these, foundation models, which are characterized by their large scale, training on diverse datasets, and adaptability to various downstream tasks, play a crucial role in the development and application of generative AI systems.[10]

OSAI has well-documented benefits for research and innovation, including enhancing reproducible research and promoting security through widespread scrutiny.[11,12,13,14] Now, the market impacts of OSAI are beginning to bubble to the surface, from challenging the dominance of industry leaders to enabling small and large businesses alike to build custom AI applications at accessible costs.[15] This trend is already evident across industries, as 60% of business decision-makers report significant cost savings associated with open source, and 81% of developers place growing professional value on experience with open source tools.[16]

The market impacts of OSAI, in particular open models, are less well understood, but may bear similarities to the impacts of open source software (OSS). Prior research shows the enormous economic impact of OSS, from business productivity and entrepreneurship to GDP contributions.[17,18] For example, the global supply-side value of widely used OSS is an estimated $4.15 billion, with demand-side value reaching $8.8 trillion, suggesting businesses would need to spend 3.5 times more on software if OSS didn't exist.[19] In the U.S., investment in OSS in 2019 was an estimated $37.8 billion, with a current-cost net stock of $74.3 billion.[20] Similarly, in the EU, companies invested around €1 billion in OSS in 2018, generating between €65 billion and €95 billion for EU GDP and a cost-benefit ratio above 1:4 for companies.[21] It has been well documented that choosing OSS over proprietary software contributes to cost savings, avoids vendor lock-in, and accelerates innovation through knowledge sharing, as will be discussed below.[21,22]

The rise of OSAI raises similar questions: How will value be created and captured? How will competitive dynamics in the AI industry shift? What new business models will emerge? This report examines the market impacts of OSAI by building on this established body of research while acknowledging the unique characteristics that distinguish AI from traditional software. After reviewing adoption rates of OSAI, this literature review turns to an analysis of market impacts of OSAI, how the technology is already impacting different sectors, and whether and to what extent it is impacting the workforce. The report concludes with an overview of key findings and a discussion on areas for further exploration.



Adoption rates of OSAI

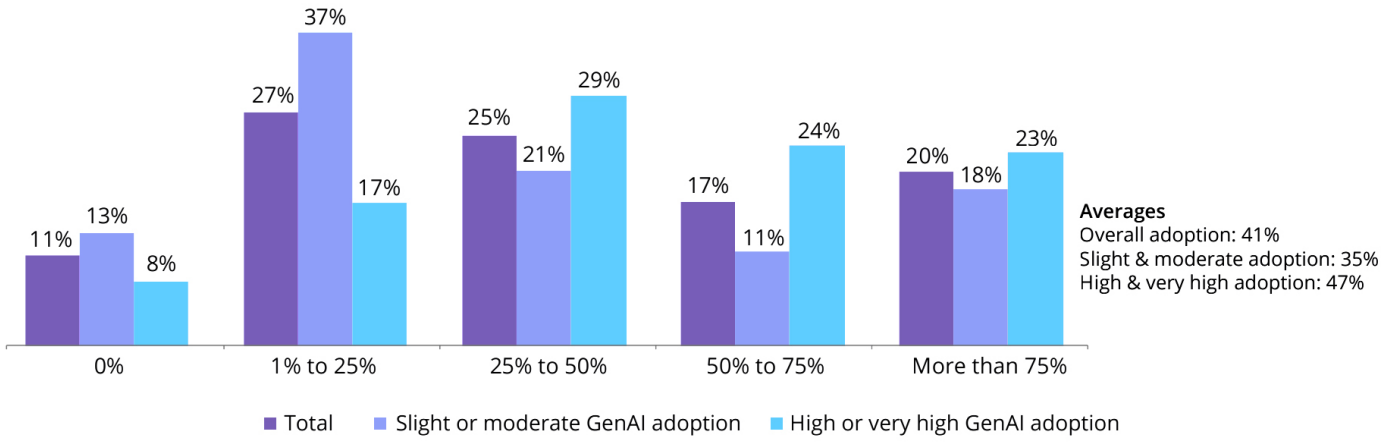
In software development, AI adoption is already ubiquitous. A 2024 study by GitHub that surveyed 2,000 software developers in the U.S., Germany, India, and Brazil revealed that 97% of respondents had used AI tools at some point in and outside of work.[23] Despite these high numbers, the survey found some hesitation in formalized organizational adoption, as companies have to reconsider certain processes, governance, and compliance activities, as well as build a culture that trusts the technology and produces measurable results.

Individualized use of AI increased beyond software developers. For example, a 2025 McKinsey report found that 53% of C-level executives use it regularly at work.[24] This report and others find its use concentrated in certain sectors, large enterprises, and startups.[25]

A 2024 Linux Foundation report by Lawson et al. found that, at the time of the survey, 94% of respondent organizations have some level of AI adoption.[26] More than half of these organizations were in the U.S. or Canada (55%), 18% in Asia-Pacific, and 17% in Europe. The report then investigated the extent to which those organizations that have adopted AI are using open source. Findings show that, on average, 41% of their code infrastructure is open source and **89% of adopters have at least some open source in their AI infrastructure** (see **FIGURE 1**).

FIGURE 1. AI ADOPTERS' SHARE OF AI INFRASTRUCTURE THAT IS OPEN SOURCE

Approximately how much of your organization's code infrastructure that supports generative AI initiatives is currently from open source? (select one) segmented by **To what extent does your organization adopt generative AI?** (select one)



Averages
Overall adoption: 41%
Slight & moderate adoption: 35%
High & very high adoption: 47%

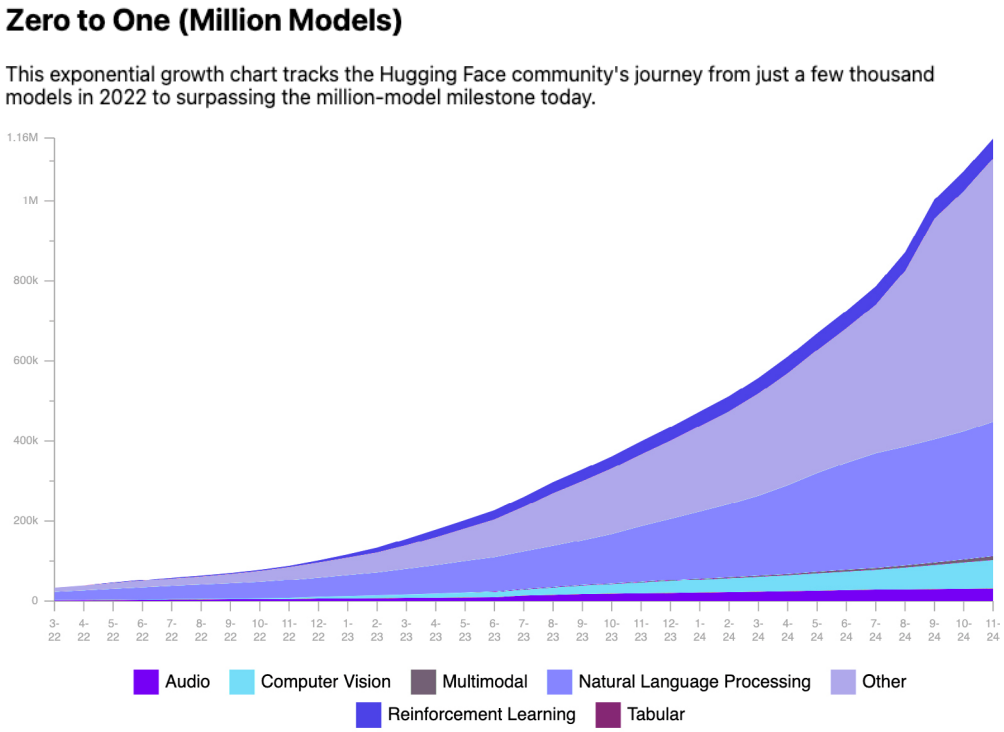
2024 GenAI survey, Q19, by Q7, Sample Size = 255, DKNS responses excluded from the analysis, answered by organizations who adopted GenAI in Q7

11% of all AI adopters responded that none of their AI infrastructure is open source; 25% responded that one-quarter to one-half of their infrastructure is open source; 17% responded one-half to three-quarters; and 20% responded more than three-quarters. Source: Lawson, A., Hendrick, S., Rausch, N., et al (2024 November). Shaping the Future of Generative AI: The Impact of Open Source Innovation. The Linux Foundation. https://www.linuxfoundation.org/hubfs/LF%20Research/lfr_genai24_111924.pdf

McKinsey, the Mozilla Foundation, and the Patrick J. McGovern Foundation recently published findings from their global survey fielded across 41 countries to over 700 technology leaders.[16] Similar to the findings above, they find that **nearly two thirds (63%) of respondent organizations are already using open models, and 76% expect their organization to increase its adoption of OSAI over the next few years**. They also find that organizations that view AI as important to their competitive advantage are more likely to use open models and tools. As Lawson et al. (2024) explain, open source is a differentiator for organizations with advanced AI capabilities that require the adaptability and control of open source, as well as the foundation for innovation and sustainability it provides.[26] ***"Open source communities continuously push the boundaries of model architectures, tools, and libraries,"*** the report states, by offering access to the latest developments in models, frameworks, and techniques.

GitHub's 2024 survey demonstrates how widespread OSAI really is, with nearly all survey respondents stating they have experimented with open models.[27] Hugging Face's Open Source AI Year in Review best demonstrates this ubiquity in their collection of data at the end of 2024 to capture a snapshot of the trends in OSAI.[8] Overall, its data shows the exponential growth in open models, increasing from a few thousand in 2022 to over a million in 2024 (see **FIGURE 2**).

FIGURE 2. GROWTH IN HUGGING FACE MODELS, FROM 2022-2024



Source: Hugging Face (n.d.). Open-source AI: year in review 2024. Retrieved April 22, 2025, from https://huggingface-open-source-ai-year-in-review-2024.static.hf.space/index.html

The report by McKinsey, the Mozilla Foundation, and the Patrick J. McGovern Foundation includes a country-specific view of OSAI adoption.[16] They find that India, the United Kingdom, and the United States are the countries with highest open model use, arguing that this is most likely due to the relative maturity of their respective technology sectors.

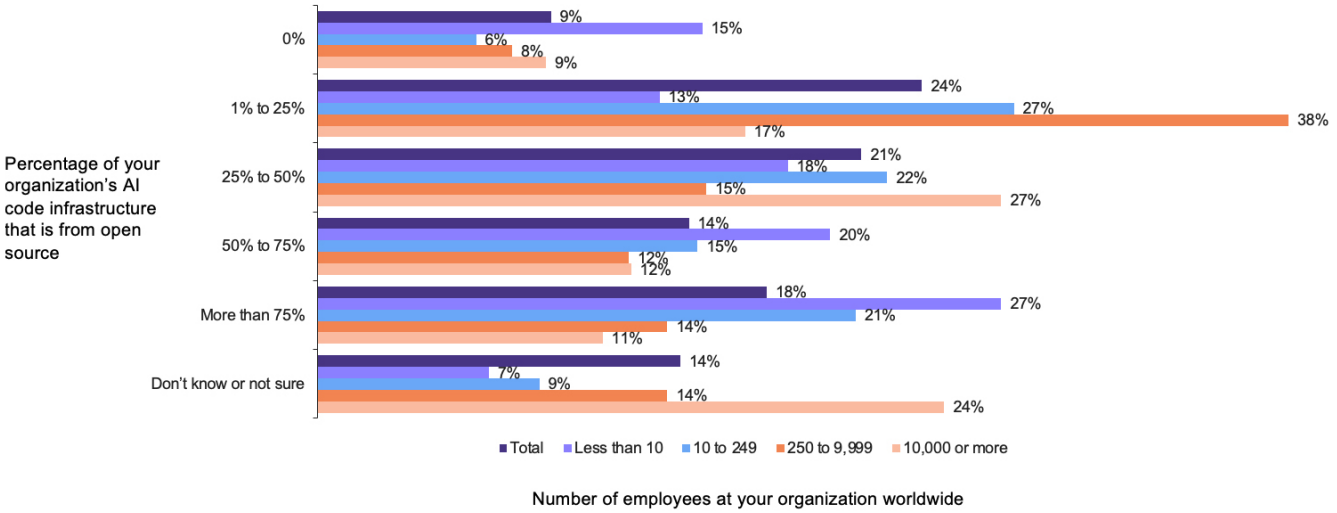
Comparing adoption by small and large businesses

As noted above, research into the adoption of AI has found that the size, industry, and geographic location of the organization are significant. An analysis from 2018 Annual Business Survey (ABS) data shows that larger businesses are higher adopters of AI, and adoption among small and medium-sized businesses is low.[25] However, when specifically examining startups, the researchers found that companies with high growth early in their inception tend to adopt and use AI, which they argue is the area that matters most for economic growth. As startups gain a foothold in the economy, this could fuel greater diffusion of AI and have a large influence over AI's market impact.

Five years later, a 2023 survey from the Small Business & Entrepreneurship Council found that three-quarters of small businesses (75%) are using AI.[28] The main drivers of AI use included research, time and cost savings, competitive pressures, and influence from peers. The survey found that the sample's median investment in AI tools per year is $1,800, with the vast majority planning to increase their investment in the following 12 months.

When looking specifically at OSAI, the Linux Foundation's 2024 survey on generative AI found an inverse relationship between company size and adoption rates (see **FIGURE 3**).[29] When segmenting OSAI adoption by company size, the findings show that smaller companies are adopting open source at a higher level, while larger companies are prioritizing it less. The findings also show that OSAI is more of a priority for small and medium-sized companies (see **FIGURE 4**). Larger enterprises may be adopting AI at a greater rate, but they appear less concerned with the openness of the model or tool. However, **the small and medium-sized businesses that are adopting AI are predominantly choosing open source for their environments**. As the McElheran et al. (2024) study points out, the innovation and high-growth potential of startups make them important for economic growth and dynamism.[25] Their prioritization of OSAI suggests a greater diffusion and impact of OSAI in particular.

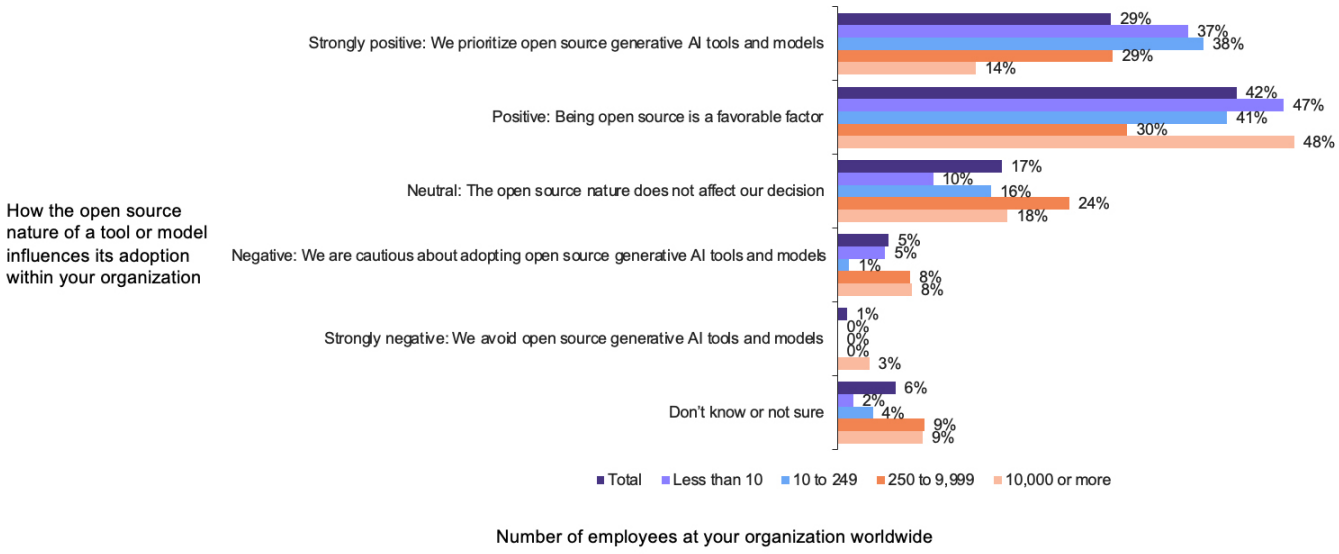
FIGURE 3. RELATIONSHIP BETWEEN COMPANY SIZE AND ADOPTION OF OSAI



Sample Size = 297, from the Linux Foundation's 2024 Generative AI Survey

The larger companies (250-10,000+ employees) have the highest representation in the 1%-50% range, while the smaller companies (1-249 employees) have comparatively higher representation in the 50%-75%+ range. Source: The Linux Foundation (2024). 2024 Generative AI Survey. Data.world. https://data.world/thelinuxfoundation/2024-generative-ai-survey

FIGURE 4. RELATIONSHIP BETWEEN COMPANY SIZE AND THE CHOICE TO ADOPT OSAI



Sample Size = 297, from the Linux Foundation's 2024 Generative AI Survey

Respondents from small companies (1-249 employees) indicated strongly positive opinions around open source, as compared to respondents from mid-sized companies (250-9,999 employees), who felt positively about open source without making it a priority. The largest companies (10,000+ employees) indicated greatest neutrality around the choice to use OSAI. Source: The Linux Foundation (2024). 2024 Generative AI Survey. Data.world. https://data.world/thelinuxfoundation/2024-generative-ai-survey

Expert opinions from the open source community

When asked for his perspective on small business' adoption of OSAI, Frank Nagle, Assistant Professor at Harvard Business School, explained that *"prior research has shown that open source can substantially benefit small businesses and startups, particularly due to its lower costs than related proprietary software. OSAI will allow these resource-constrained companies to more fully benefit from cutting-edge technologies and will help them keep pace in competitive markets."*[30]

Matt White also sees evidence of this trend in his role as Executive Director of the PyTorch Foundation and General Manager of AI at the Linux Foundation. *"The data is clear that smaller businesses are embracing OSAI at higher rates than larger enterprises, and for good reason. For startups and small businesses operating with limited resources, open models provide sophisticated AI capabilities without the prohibitive costs of building from scratch or licensing proprietary solutions. This levels the playing field, allowing innovative smaller companies to compete based on their unique applications rather than being blocked by access barriers."*[31]

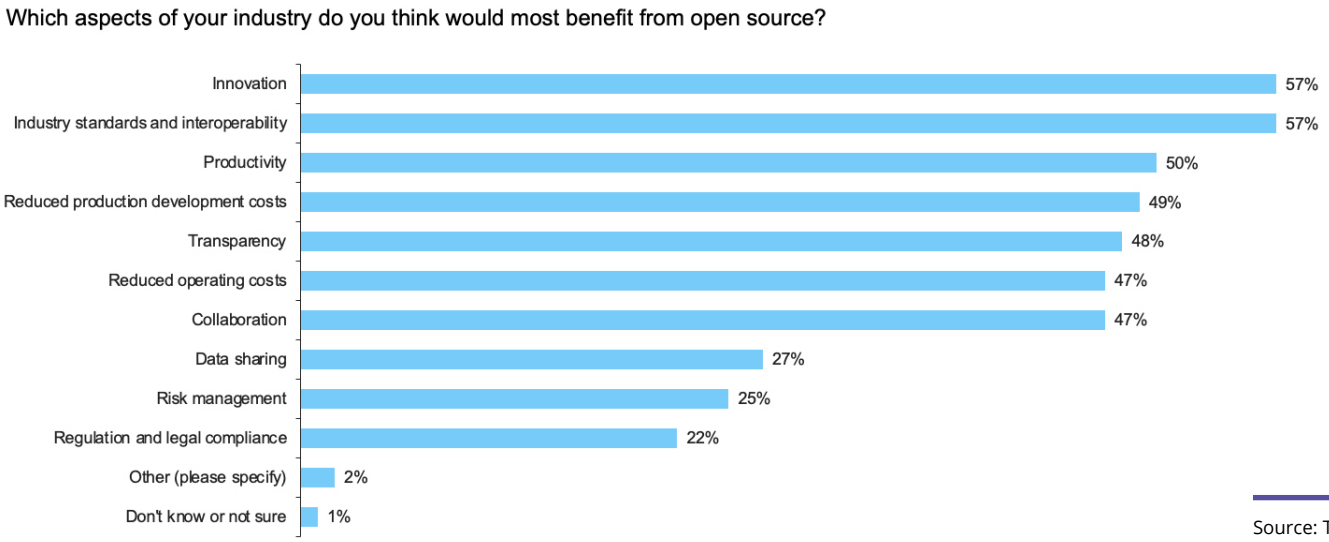
Economic benefits of OSAI

We first present research on the economic impacts of open source and then the impacts of AI to extrapolate the benefits of OSAI.

Economic impacts of open source

It is well documented that open source software (OSS) is widely used at the company level because of the cost savings, increased productivity, and innovation it affords. Linux Foundation Research's annual World of Open Source survey found that, in 2024, the community considered these three effects as some of the top benefits of OSS (see **FIGURES 5 & 6**).[32]

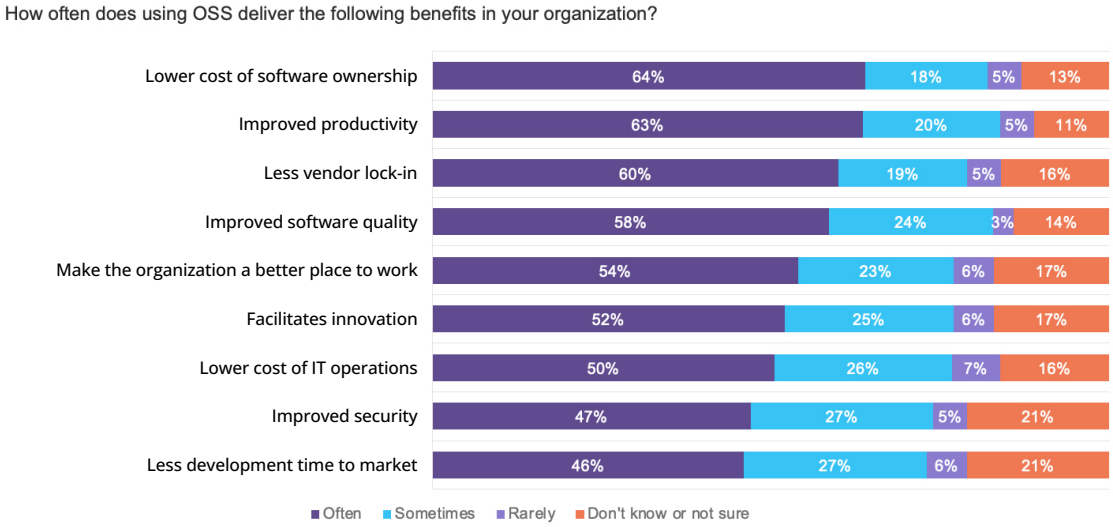
FIGURE 5. INNOVATION, PRODUCTIVITY AND REDUCED COSTS ARE TOP BENEFITS OF OPEN SOURCE



Sample Size = 1,065, from the Linux Foundation's 2024 World of Open Source Survey

Source: The Linux Foundation (2024). 2024 World of Open Source: Global Spotlight. data.world. https://data.world/thelinuxfoundation/2024-world-of-open-source-global-spotlight

FIGURE 6. THE EXTENT TO WHICH OPEN SOURCE LOWERS COSTS, IMPROVES PRODUCTIVITY, AND FACILITATES INNOVATION



Sample size 1,047, from the Linux Foundation's 2024 World of Open Source Survey

Source: The Linux Foundation (2024). 2024 World of Open Source: Global Spotlight. data.world. https://data.world/thelinuxfoundation/2024-world-of-open-source-global-spotlight

When it comes to OSS **cost savings**, a 2024 study by Harvard Business School valued OSS at $4.15 billion on the supply side (the cost to recreate widely used OSS once) and $8.8 trillion on the demand side (the cost for companies to replace each piece of OSS they use if OSS did not exist at all).[19] The researchers also found that, if OSS did not exist, companies would have to spend 3.5x more on software than they currently do. Using an alternate approach, Chesbrough (2023) surveyed business leaders about the benefits and costs of open source and asked respondents to calculate the cost of alternatives.[33] 46% of respondents said that it would have cost them at least two times the cost of OSS to write the code themselves. Korkmaz et al. (2024) applied a cost estimation model to GitHub development activity data across 7.6 million repositories to estimate OSS investment at $37.8 billion in 2019.[20]

Looking specifically at Europe, EU companies invested an estimated €1 billion in OSS in 2018, which had an impact of €65-€95 billion on the European economy.[21] Furthermore, an estimated 10% increase in OSS contributions would annually generate an additional 0.4% to 0.6% of GDP. Compared to the Korkmaz et al. (2024) findings, where the U.S. investment was $37.8 billion in 2019, the European investment was approximately 3% of the global investment (at the end of 2018, €1 billion = $1.14 billion).

According to BlackDuck's 2024 Open Source Security and Risk Analysis report, 96% of codebases have some open source components.[34] As open source becomes more prevalent in businesses, Nagle (2018) examined its impacts on **productivity** and found a statistically significant positive return for businesses with complementary capabilities, such as strong IT technical expertise, IT-intensive operations, or being in IT-producing industries.[17]

Open source can also enable **innovation**. In a 2023 study, Wright et al. measured the relationship between OSS and entrepreneurship by studying new venture founding and participation on GitHub.[18] The analysis found that an increase in participation on GitHub generates an increase in a country's new technology ventures in the following year. It also found that contributing to OSS leads to higher-quality and more mission-oriented ventures engaging in socially impactful activities. The evidence from this study indicates that OSS has a positive relationship with entrepreneurial activity.

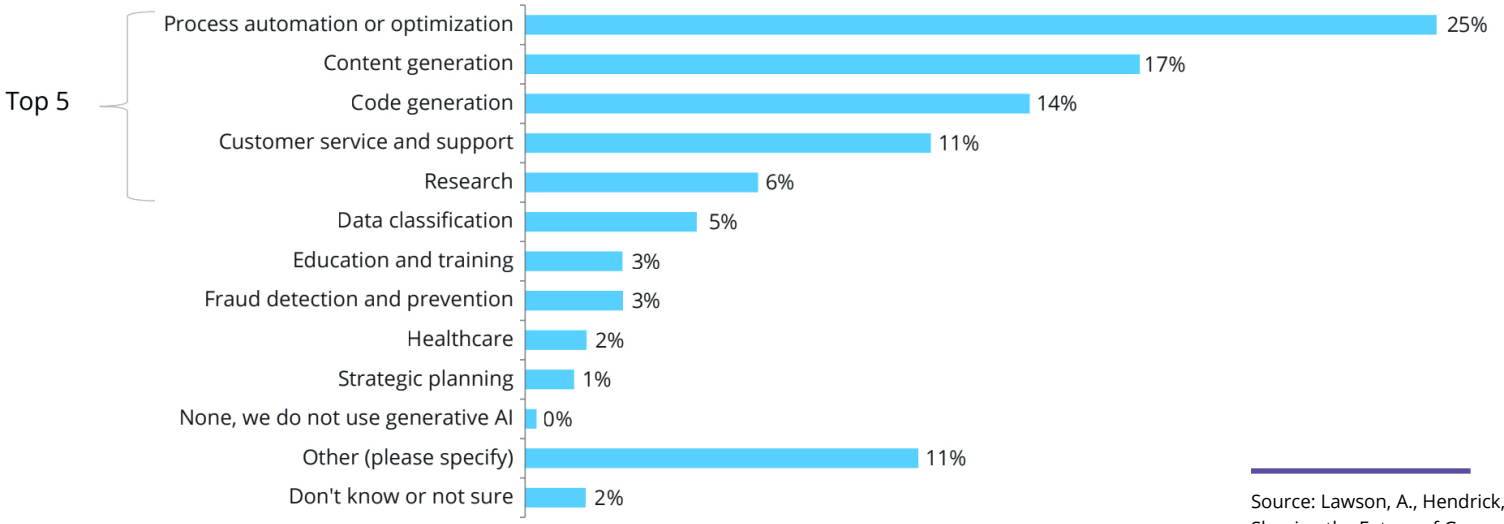
Economic impacts of AI

Using the same economic measures—cost savings, productivity gains, and increased innovation—the literature suggests that AI also has a meaningful impact on the market.

Academic and industry analyses have thoroughly measured AI's impact on **productivity**.[24,35-41] A 2024 PwC report found that global GDP will rise 14% by 2030 as a result of AI adoption, equivalent to $15.7 trillion.[42] It argues that this economic growth will be due in part to productivity gains from automating and complementing jobs. The Hatzius et al. (2023) report from Goldman Sachs finds a slightly smaller but similarly sizable impact, as it estimates AI's labor boost will cause an almost $7 trillion increase in global GDP over ten years.[43] A third report from McKinsey (2023) also predicts a multiple-trillion-dollar boost to the global economy due to productivity gains from AI.[37] The report reviews the impact annually across more than 60 use cases, finding a $2.6-$4.4 trillion addition to GDP per year. The researchers identify four main areas where AI will deliver value: software engineering, marketing and sales, customer operations, and research and development. Lawson et al. (2024) also found similar use cases for AI, including customer service, code generation, and research (see **FIGURE 7**).[26]

FIGURE 7. TOP USE CASES FOR AI

What's your organization's primary use case for generative AI? (select one)



2024 GenAI survey, Q13, Sample Size = 297, answered by organizations who adopted GenAI in Q7

Source: Lawson, A., Hendrick, S., Rausch, N., et al (2024 November). Shaping the Future of Generative AI: The Impact of Open Source Innovation. The Linux Foundation. https://www.linuxfoundation.org/research/gen-ai-2024

Focusing specifically on the impacts of AI on software development, various studies on GitHub Copilot demonstrate the productivity gains for software developers. A 2022 GitHub study found that, when using the tool, over 90% of developers complete tasks faster—55% faster than developers not using the tool, according to their study.[36] Copilot impacts more than developer speed—88% of developers feel more productive, and over half the respondents indicated that the tool allows them to feel more fulfilled, experience less frustration, and stay in a flow state.[36]

An independent analysis by Faros (2024) found similar productivity gains, citing that code merges 50% faster with Copilot and lead time to production decreased by 55% for those using the tool.[38] The analysis also found that code quality and security either increased or remained steady, concluding that ***"a 55% improvement in lead time with no collateral damage to code quality is a phenomenal ROI."***

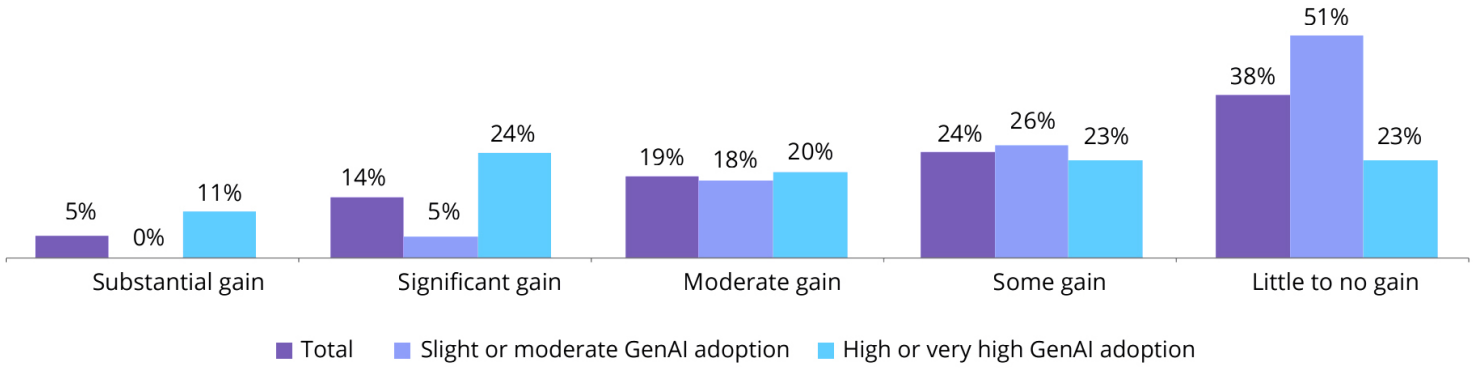
The 2024 GitHub survey findings from the previous section that found a 97% adoption rate also referenced multiple productivity benefits of using AI coding tools, including development efficiency, code-quality improvements, streamlined workflows, and faster upskilling and onboarding.[23] Increased productivity allows developers to re-invest the saved time into collaborative and system design tasks.

Looking beyond software developers, Noy and Zhang (2023) analyzed productivity gains from ChatGPT, sampling from mid-level, college-educated professionals.[39] In their experiment, they drew from a range of occupations—marketers, grant writers, consultants, data analysts, human resource professionals, and managers—and asked participants to complete 20- to 30-minute tasks relevant to their professions, which included writing press releases, short reports, analysis plans, and emails. Half the participants used ChatGPT. They found that, in comparison to the control group, the use of ChatGPT decreased the time it took to complete a writing task by 40% and the quality of the output rose by 18%.

The adoption of AI has also led to **cost savings** and revenue gains for businesses. The study by Lawson et al. (2024) asked respondents to estimate how much their investment in AI has converted to revenue gain.[26] Among those with higher adoption rates, 35% have seen substantial or significant revenue gain, and another 20% have experienced moderate revenue gain (see **FIGURE 8**).

FIGURE 8. RELATIONSHIP BETWEEN DIFFERENT LEVELS OF AI ADOPTION AND THE REVENUE GAIN FROM AI

How much of your organization's investment in generative AI has been converted into revenue gain?
(select one) segmented by **To what extent does your organization adopt generative AI?** (select one)



2024 GenAI survey, Q11 by Q7, Sample Size = 234 (DKNS and NA excluded)

Source: Lawson, A., Hendrick, S., Rausch, N., et al (2024 November). Shaping the Future of Generative AI: The Impact of Open Source Innovation. The Linux Foundation. https://www.linuxfoundation.org/research/gen-ai-2024

The 2025 McKinsey report found that organizational adoption of AI reduced costs across various business units.[24] Specifically, in the second half of 2024, respondents reported over 50% cost decreases across six of their business units: 61% in supply chain and inventory management, 58% in service operations, 56% in strategy and corporate finance, 56% in HR, 52% in software engineering, and 51% in risk, legal, and compliance.

A 2022 study by Lee et al. investigated the relationship between AI adoption intensity and revenue growth.[44] They found that a business's revenue only increases after a certain level of investment in AI. Investments in cloud computing and database systems, as well as the pursuit of R&D strategies that are specific to the venture, positively impact the relationship between AI investment and revenue. These findings show that the level of commitment to AI plays a role in AI's impact on the business. Additionally, and similar to the Nagle (2018) study,[17] complementary technologies play an important role in revenue growth.

Due to its ability to increase the speed and quality of production, AI is also seen as a key technology for **innovation**. A 2024 Deloitte survey found that 46% of respondents cited ***"new ideas"*** and ***"innovation and growth"*** as key benefits of AI.[45] More specifically, some of AI's applications, such as deep learning, could lead to ***"changes in the very nature of the innovation process within those domains,"*** according to Cockburn, Henderson, and Stern (2018).[46] From an R&D perspective, the authors discuss how AI automates the process of discovery while also expanding the feasibility of research questions and the scope to address them. With these capabilities, they argue,

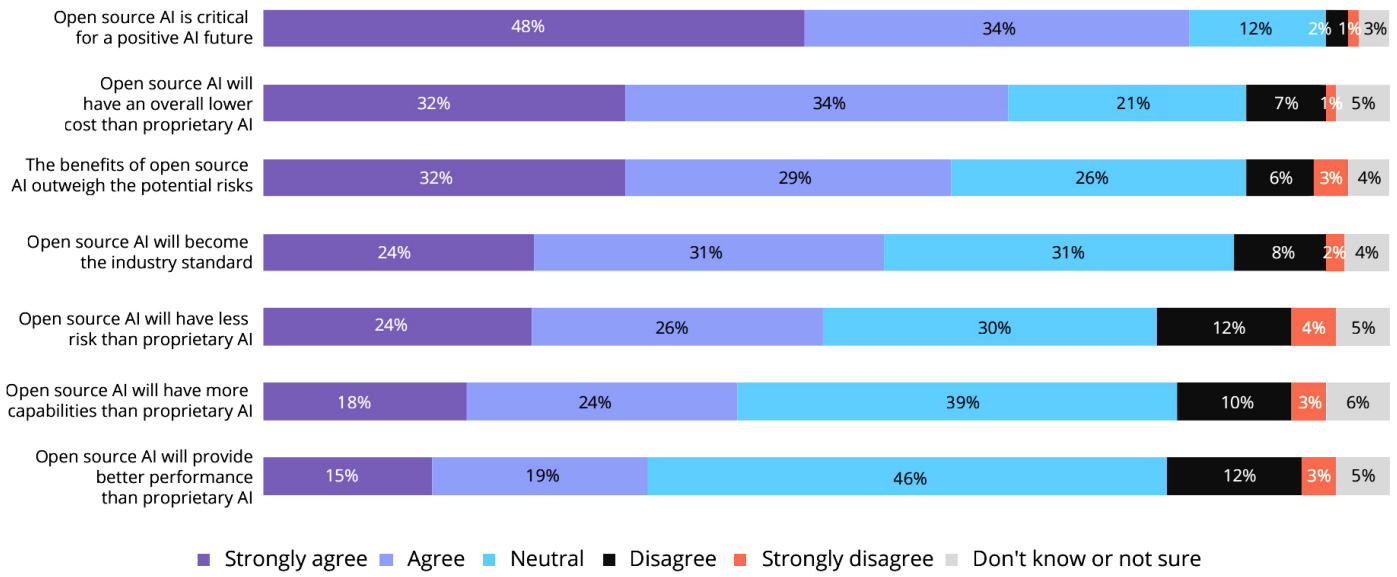
AI tools will entirely change research methods, allowing a transition from labor-intensive and routinized practices to the use of prediction algorithms on large datasets. Increasing and broadening research products in this way will lead to greater and faster innovation.

Economic impacts of OSAI

There is some literature discussing the economic impacts of OSAI. A handful of studies have analyzed the impact of open source on an organization's costs when adopting AI. Lawson et al. (2024) asked respondents about the cost savings of OSAI in two different ways.[26] **First, 66% of survey respondents agreed that OSAI has a lower overall cost than proprietary AI** (see **FIGURE 9**). Second, the survey asked whether the open source nature of a tool or model influences the adoption decision and why; **46% stated cost efficiency as the justification for adopting open source** (see **FIGURE 10**).

FIGURE 9. AGREEMENT AROUND THE BENEFITS OF OSAI

To what extent do you agree with the following statements? (one response per row)

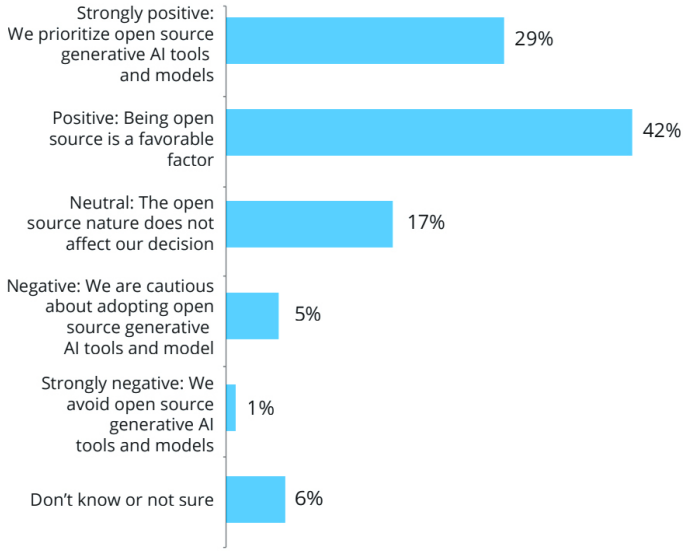


2024 GenAI survey, Q28, Sample size = 311-314, not all rows required

Source: Lawson, A., Hendrick, S., Rausch, N., et al (2024 November). Shaping the Future of Generative AI: The Impact of Open Source Innovation. The Linux Foundation. https://www.linuxfoundation.org/research/gen-ai-2024

FIGURE 10. HOW OPEN SOURCE INFLUENCES ADOPTION DECISIONS

How does the open source nature of a tool or model influence its adoption within your organization? (select one)



2024 GenAI survey, Q22, Sample Size = 297, answered by organizations who adopted GenAI in Q7

Which options justify your answer to the above question? (select all that apply)

Intelligent Power Plant Operations	52%
Cost Efficiency	46%
Security	32%

2024 GenAI survey, Q23, Sample Size = 297, Valid Cases = 297, Total Mentions = 1,286, answered by organizations who adopted GenAI in Q7

Source: Lawson, A., Hendrick, S., Rausch, N., et al (2024 November). Shaping the Future of Generative AI: The Impact of Open Source Innovation. The Linux Foundation. https://www.linuxfoundation.org/research/gen-ai-2024

McKinsey, the Mozilla Foundation, and the Patrick J. McGovern Foundation (2025) found similar benefits related to OSAI implementation.[16] In their global survey, respondents rated cost savings as the greatest benefit of using OSAI, and over half of the decision-makers in the survey found they had lower implementation and maintenance costs than with proprietary AI. This same group also said that OSAI performed better and was easier to use than proprietary tools. GitHub's 2024 survey also found cost savings to be an important factor in survey respondents' choice to use open models.[27]

Other studies have investigated OSAI's impacts on innovation. The report from McKinsey, the Mozilla Foundation, and the Patrick J. McGovern Foundation (2025) described how collaboration around open models provides an environment for accelerated innovation that diminishes redundant development and allows for collective momentum.[16] Open sourcing a model may impact the speed of innovation, as greater community collaboration accelerates the development and quality of a product.[47] As found in the Linux Foundation's 2025 report on open standards, engagement in open, collaborative activities is a better indicator of innovation than patents.[48]

Through a case study on Meta's contribution of the deep learning framework PyTorch to the Linux Foundation, Yue and Nagle (2024) examine the effects of governance changes in OSAI software projects on innovation and collaboration when they transition from unilateral governance under one company to open governance under a non-profit foundation.[49] They found three trends: there was a significant decrease in contributions from Meta; there was a large increase from external companies, especially from the developers of complementary technology, such as chip manufacturers; and there was no change in participation from PyTorch users, such as app developers. This evidence shows that open governance promotes broader participation and increased contributions and decreases the dominance of any single company in the development of industry-leading OSAI software.

Extrapolating general open source software benefits to the AI landscape: Predictions

As Hoffmann, Nagle, et al. (2024) found, companies would have to spend 3.5 times more on software if open source software (OSS) didn't exist.[19] Applying this to the AI market, OSAI could contribute to similar savings in business costs. While AI is already reducing the costs of some business units by over 50%, coupling this with the savings from OSS could mean that adopting OSAI leads to even higher savings than Hoffmann, Nagle, et al.'s estimate for OSS. Looked at another way, AI increases a business' revenue gains. It is possible that revenue gains from productivity increases are even higher with OSAI due to its lower costs than proprietary AI.

Expert opinions from the open source community

When asked about the economic impacts of OSAI, Frank Nagle pointed to the broad and large economic impact of OSS in his existing research. He argued that *"as AI becomes more prevalent and more impactful than standard software, the economic impact of OSAI is likely to be substantially larger than traditional OSS."*[30]

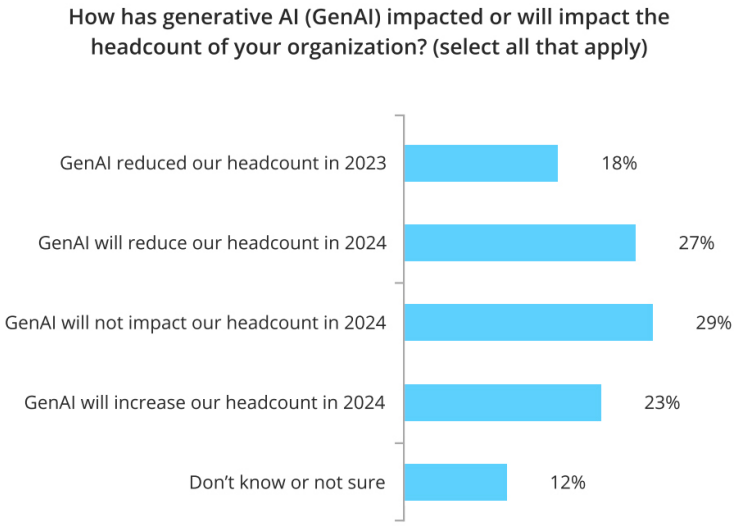
In his response, Matt White also compared known OSS impacts to OSAI. *"The economic impact of open source software gives us a compelling preview of OSAI's potential. Research shows companies would spend 3.5 times more on software if open source didn't exist, and a similar multiplier effect is emerging with open models, where organizations are already reporting cost efficiencies of over 60% compared to proprietary alternatives. OSAI is democratizing access to technology that would otherwise remain financially out of reach for many organizations, especially startups and research labs."*[31]

As for innovation, open source will undoubtedly play a significant role in the diffusion and adoption of AI, as we have seen in other technology domains. The report from McKinsey, the Mozilla Foundation, and the Patrick J. McGovern Foundation (2025) predicts OSAI will have an impact in two key areas: small language models powering privacy-focused edge applications and reasoning models with higher inference-time compute.[16] Open source's role in advancing these technology domains may lead to greater AI adoption overall, as both are key to widespread use.

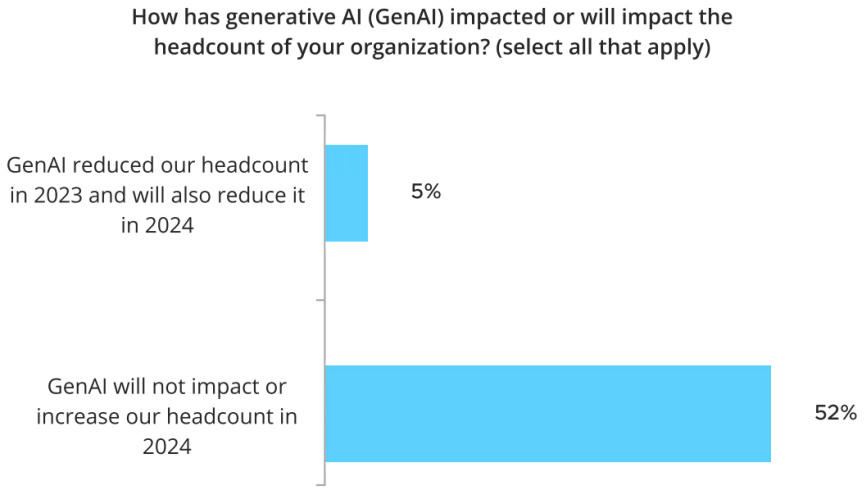
Impact on the workforce

There has been significant speculation that AI will cause widespread job displacement through automation. However, research has demonstrated that this is not necessarily the case—or at least, that the picture is more nuanced than that.[50] Looking at the nearer term, the Linux Foundation's 2024 study on technical talent surveyed hiring managers around the world and found that AI reduced organization headcounts for only 5% of respondents in 2023 and 2024.[51] **In fact, these respondents predicted that AI would have little impact on headcount in the next year or may actually increase headcount as hiring managers prioritize AI as an area for staffing** (see **FIGURES 11 & 12**). The latest data from the 2025 survey shows a continuation of this trend, where more organizations are hiring than downsizing due to AI.[52]

FIGURE 11. AI'S IMPACT ON ORGANIZATIONAL HEADCOUNT



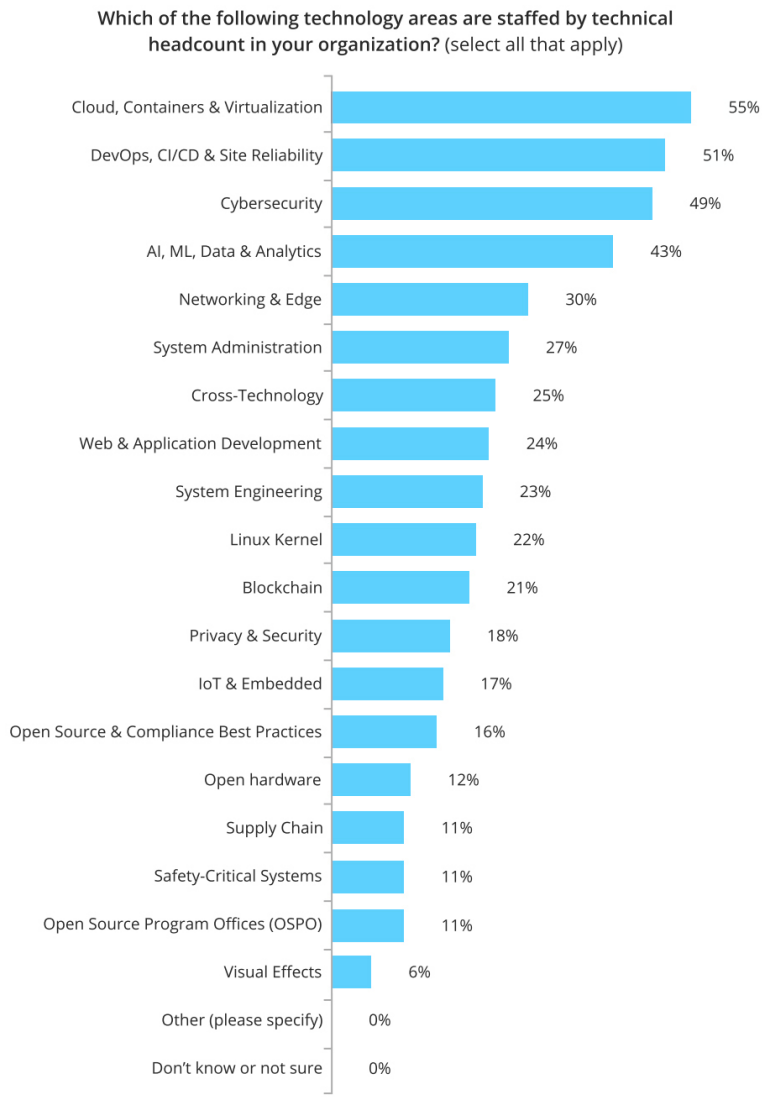
2024 Tech Talent Survey, Q23, Sample Size = 418, Valid Cases = 418, Total Mentions = 455



2024 Tech Talent Survey, derived from Q23 source data, Sample Size = 418

Source: Lawson, A. (2024, April). 2024 State of Tech Talent Report: Survey-Based Insights into the Current State of Technical Talent Acquisition, Retention, and Management Globally. The Linux Foundation. https://www.linuxfoundation.org/research/open-source-jobs-report-2024

FIGURE 12. AI IS A TOP STAFFING PRIORITY



2024 Tech Talent Survey, Q22, Sample Size = 418, Valid Cases = 418, Total Mentions = 1,965

Source: Lawson, A. (2024, April). 2024 State of Tech Talent Report: Survey-Based Insights into the Current State of Technical Talent Acquisition, Retention, and Management Globally. The Linux Foundation. https://www.linuxfoundation.org/research/open-source-jobs-report-2024

As adoption rates increase and AI moves more into the core infrastructure of organizations, various studies indicate that ***"AI has the potential to change the anatomy of work."***[37] The automation of activities will impact some jobs and skill sets more than others. The 2025 McKinsey report found that over the next three years, AI will decrease headcount in specific areas, including service operations and supply chain.[24] Similarly, Hatzius et al. (2023) estimate that AI could automate one-fourth of current work duties, with the greatest impact in administrative and legal jobs and a lower impact in construction and other trades occupations.[43] Eloundou et al. (2023) show that 19% of workers in the U.S. may see 50% or more of their tasks affected by AI, and employees could complete about 15% of all tasks in the U.S. significantly faster while maintaining the same level of quality when using an LLM.[53]

However, those areas with greater AI exposure will not necessarily lead to workforce displacement and instead will augment work.[54] PwC's 2024 AI Jobs Barometer found that in the sectors with greater AI penetration, productivity growth is increasing steadily, and jobs that require AI skills have up to a 25% wage premium.[55] Those workers in these sectors need to learn how to use AI to stay relevant and build these new skills on the job.[56] As Stephany and Teutloff (2024) find, AI skills are valuable because they have high skills complementarity—in that workers can combine them with a high and diverse number of other valuable skills—and they find that **having these skills will increase worker wages by an average of 21%**.[57] Hatzius et al. (2023) found that most jobs will only be partially exposed to AI, meaning that AI will help complete the job instead of replacing the worker.[43]

A recent study by the OECD, Boston Consulting Group, and INSEAD (2025) surveyed 1,007 enterprises around the world and identified a scarcity of skills and specialized talent needed for greater AI adoption.[58] In the survey, 76% of respondents indicated that information on accreditation schemes would be helpful in the adoption of AI, as enterprises face challenges in understanding the specific skills they seek in their employees for successful and sustainable AI adoption. According to the

report, existing academic certifications are not sufficient in providing this information, and new qualification frameworks are needed to describe candidates' competencies. Moving forward, public-private collaborations are key to address these gaps by creating relevant training and certification. One existing example is the practitioner certification program from scikit-learn, a widely used OSS for machine learning.[59]

Looking at the long term, Hatzius et al. (2023) predict through modeling that AI's labor cost savings, new job creation, and productivity boost will lead to a labor productivity boom similar to that of historic technologies such as the personal computer.[43] They estimate global productivity will increase by 1.4% over a ten-year period. MicKinsey's 2023 report calculates an annual labor productivity growth of 0.1% to 0.6% through 2040, depending on adoption rates and redeployment of workers.[37]

Looking specifically at software developers, Hoffmann, Boysel, et al. (2024) studied the individual-level effects of GitHub Copilot on task allocation.[60] They found that the use of this tool allowed developers to shift away from project management, with these activities decreasing by 10%. Instead, they could focus on core coding tasks, increasing this activity by 5.4%. They also found that Copilot increased developers' exposure to new programming languages, which opens up opportunities to command a higher salary. As discussed in the previous section, the productivity gains for other workers using tools such as ChatGPT could lead to a shift in task allocation, with more time available for higher-impact work.[39]

Market impacts of AI by industry

An industry-specific analysis of AI is useful to acknowledge its widespread but asymmetric impacts on the global economy. For example, in their analysis of the 2018 ABS, McElheran et al. (2024) found that American manufacturing, information, and healthcare sectors have the highest rates of AI use, as each sector has 11%-12% of businesses reporting some use of AI.25 On the lower end of the scale, construction businesses were at 4%, and agriculture, mining, and utilities were grouped together at under 6%.

The 2025 McKinsey report found the highest AI workplace adoption in 2024 in technology (88%), professional services (80%), advanced industries (79%), and media and telecom (79%).[24] On the lower end were healthcare (63%) and energy and materials (59%). Comparing the 2018 ABS data with the 2024 data provides insight into how AI adoption has evolved and shifted from 2018 to today. Importantly, AI adoption has significantly increased across all sectors.

In the following section, we review the market impacts of AI across five sectors: healthcare, agriculture, construction, manufacturing, and energy. This study chose these sectors for in-depth analysis because of their role in providing critical everyday goods and services and their significant share of the global economy. Combined, these sectors represent 44% of global GDP and employ approximately 1.5 billion people around the world.

Healthcare

It is well established that AI promises significant productivity gains for the healthcare sector.[61] However, it appears that its use remains more of a promise than a fact in the clinical domain. A 2024 Tebra survey found that only 10% of healthcare professionals use AI in their work, with 50% planning to adopt it in the future.[62] The use of AI in healthcare will free up clinical resources, save costs, and potentially increase efficiency through its ability to automate tasks and decision support, aid in diagnoses and detection of other symptoms, and predict clinical outcomes such as hospital wait times and ICU transfers.[62,63,64] The 2023 McKinsey report found that the global healthcare sector stands to gain $150-$260 billion in value from AI by applying it across business functions, with supply chain and operations, marketing and sales, and customer operations representing the top three areas.[37]

When it comes to the value of OSAI in healthcare, some research exists. Lawson (2024a) found that, in healthcare in particular, AI and ML stand to benefit the most from open source, ahead of other technology realms such as cybersecurity and the cloud (see **FIGURE 13**).[65]

FIGURE 13. KEY OPEN SOURCE TECHNOLOGIES IN HEALTHCARE

Most benefit from open source	Greatest uses of open source	Most OSS contributions
1. AI / ML **(37%)**	1. Operating systems **(45%)**	1. AI / ML **(22%)**
2. Cybersecurity **(34%)**	2. Cloud / containers **(40%)**	2. Analytics / Data science **(17%)**
3. Analytics / data science **(27%)**	3. DevOps / GitOps **(40%)**	3. Web & app dev **(15%)**
4. Operating systems **(25%)**	4. CI / CD **(40%)**	4. Cloud / containers **(13%)**
5. Cloud / containers **(24%)**	5. Database management **(38%)**	5. Database management **(13%)**

2024 World of Open Source Survey, Q14, Q29, Q36, Sample Sizes = 59, 58, 54 Respectively

[1] Healthcare expenditure represented 10% of global GDP in 2022 and the sector employed 65 million workers worldwide in 2020; Agriculture represented 4% of global GDP in 2023 and employed 892 million people worldwide in 2022; Current data suggests that construction represents 13% of global GDP and employs more than 100 million people worldwide; Manufacturing represented 15% of global GDP in 2023 and employs 400 million people worldwide as of 2025; Energy rents (oil, natural gas, and coal) represented 2.1% of the world's GDP in 2021 and employed 41 million people across the globe in 2019

Source: Lawson, A. (2024, December). 2024 Global Spotlight Insights Report: The Role of Open Source in Uniting Innovation, Collaboration, and Resilience Across Regions and Industries. The Linux Foundation. https://www.linuxfoundation.org/research/world-of-open-source-global-2024

OSAI is particularly attractive in settings with limited resources, where free and flexible tools are important.[66] In August 2024, Buckley et al. (2024) ran an analysis of the Llama 3.1 model against OpenAI's GPT-4 and found the results of Llama 3.1 on par with GPT-4.[67] In their discussion, they defined Llama as an open model and argued that, given their findings, institutions may be able to start adopting open source solutions when building their own custom models to run locally, without sacrificing privacy or performance.

An editorial from Springer Nature discusses the benefits of OSAI in healthcare settings, using DeepSeek's DeepThink (R1) as an example.[68] The authors developed 12 key aspects of open models, including cost efficiency, scalability, and fine-tuning abilities. Combined with AI's clinical productivity gains in automation, detection, and prediction, the ability to rely on open models to produce customized, cost-effective, and privacy-preserving solutions trained on local data increases revenue gains and model accuracy. On top of these organization-level gains, the open source nature of a model such as DeepThink allows for continuous learning by integrating with publicly available datasets. These models can stay up to date on the latest scientific research and advancements in healthcare, enhancing the model's performance. Demonstrating these capabilities, the author indicates that this leads to faster, lower-cost discoveries. Therefore, OSAI provides cost-saving opportunities within the healthcare process while also accelerating the science of medicine.

Agriculture

The 2023 McKinsey report analyzed AI's impacts on the agriculture sector.[37] The report found that AI could add $40-$70 billion in value to the sector when companies primarily apply it in marketing and sales, software engineering, and supply chain and operations. The PwC report ran a modeling exercise in 2020 that scored the impact of key AI use cases across a few different sectors, including agriculture.[69] The report identified key applications, such as robotics, precision monitoring of environmental conditions, land use management, and crop monitoring. It found that these applications in combination have the potential to increase global GDP by 0.2% to 0.3%.

DeClerq et al. (2024) studied the use of AI in the agriculture sector and found that AI could have an impact on global food production challenges by providing on-demand advice and training to farmers, controlling machinery, advancing research through data wrangling, bridging linguistic barriers, and monitoring agricultural shocks.[70]

The World Economic Forum (WEF) considers the adoption of AI and analytical modeling an important component of ***"regenerative agriculture,"*** a new approach to farming that is estimated to produce profit increases as high as 120%.[71] As mentioned above, AI allows farmers to build advanced monitoring systems and predictive analytics. In particular, applying AI this way could boost the agricultural GDP of low- and middle-income countries by $450 billion or more, according to the WEF.[71]

For lower-income countries, access to cost-saving open source technologies is critical to also reap the benefits of digital agriculture. Semios is an example of an open source agricultural tool, providing precision crop monitoring and environmental conditions tracking.[72] The tool uses the open source TensorFlow in its AI insect monitoring tool. The AI assistant Farmer. Chat is another example of a tool, providing localized and tailored advice to farmers built using the Llama model.[73] Farmers all over the world can adopt these tools while keeping their advisory costs minimal.

Construction

The 2023 McKinsey report on AI's economic impacts included an analysis of the construction sector.[37] It found that AI will boost the industry by $90-$150 billion (0.7%-1.2% of its revenue) when companies apply it primarily to marketing and sales, product R&D, and supply chain and operations functions. A 2021 Adroit Market Research study identified AI's key use case as the analysis of past projects to predict delays, identify risks, build schedules, forecast bottlenecks, and provide proactive advice for managers.[74] In the Asia-Pacific region, a 2025 Deloitte and Autodesk survey of the construction sector found that 37% of respondents were already using AI, with 33% planning to use it in the future.[75]

AI adoption in construction is low, but the sector is well positioned to adopt AI because of its reliance on data-driven decision-making.[76] The fastest-growing market appears to be Asia-Pacific, while the largest market is North America.[77] AI use in pre-construction phases, such as planning, designing, and building information modeling, indicates the value of developing an open and accessible foundation model so that new builds take a standardized approach across the sector.

Expert opinions from the open source community

Briq, a software solution that provides digital labor to sectors such as construction, relies on an open model to fine-tune its solution based on industry-specific topics and issues.[78] AI provides important cost savings to its clients through task automation, and using an open model means it can optimize solutions to meet its clients' specific contexts and needs.

Bassem Hamdy, CEO and Co-founder of Briq, stated that *"Briq's digital workers use open source LLMs to understand natural language, machine learning to optimize decisions, and automation engines to take action across dozens of platforms. They can read submittals, validate risk documentation, process payroll, and even forecast revenue. They replicate the faculties of a human worker (seeing, reading, thinking, deciding, and acting) and serve as project engineers, compliance officers, financial analysts, and risk managers. They don't just reduce costs—they change how companies operate."*[79]

Manufacturing

The McKinsey analysis (2023) found that AI will boost the advanced manufacturing industry by $170-$290 billion when companies apply it primarily to product R&D, marketing and sales, and software engineering functions.[37] Lawson (2024a) found that AI is the second area to most benefit from open source, behind operating systems (see **FIGURE 14**).[65]

FIGURE 14. KEY OPEN SOURCE TECHNOLOGIES IN MANUFACTURING

Most benefit from open source	Greatest uses of open source	Most OSS contributions
1. Operating systems **(37%)**	1. Operating systems **(52%)**	1. Operating systems **(23%)**
2. AI / ML **(33%)**	2. CI / CD **(37%)**	2. IoT / Embedded **(21%)**
3. Cybersecurity **(30%)**	3. Database management **(36%)**	3. Cloud / containers **(17%)**
4. Analytics / Data science **(23%)**	4. DevOps / GitOps **(35%)**	4. DevOps / GitOps **(15%)**
5. IoT / Embedded **(23%)**	5. Web & app dev **(31%)**	5. CI / CD **(14%)**

2024 World of Open Source Survey, Q14, Q29, Q36, Sample Sizes = 101, 99, 94 Respectively

Source: Lawson, A. (2024, December). 2024 Global Spotlight Insights Report: The Role of Open Source in Uniting Innovation, Collaboration, and Resilience Across Regions and Industries. The Linux Foundation. https://www.linuxfoundation.org/research/world-of-open-source-global-2024

This sector produces enormous amounts of data—1,1812 petabytes per year, according to a 2020 Deloitte report—and processing and using this data greatly enhances decision-making processes along the manufacturing line.[80] For example, the implementation of AI for smart production allows for the automation of factory tasks, order management, and scheduling. Heimburger et al. (2024) examine the factors that determine AI adoption in production and manufacturing environments and discuss the technology's potential in the areas of maintenance, quality control, and production planning.[81] AI's potential in manufacturing is massive—the global AI market size for the manufacturing industry has been worth more than $70 billion since 2023, and the vast majority of companies believe it to be a pivotal technology for growth and innovation in the sector.[80] However, this potential is still nascent. Only 15% of companies that Deloitte surveyed are in the implementation stage, while the rest are in the proposal and pilot stages.[80]

Expert opinions from the open source community

When asked about sector-specific impacts, Frank Nagle commented: *"the sectors where OSAI will have the greatest impact are, first and foremost, in software development, where the users are already tech-savvy and we already see substantial impacts; and second, in manufacturing, where open models provide the flexibility to be integrated directly into operational processes to great effect."*[30]

Energy

The energy sector is embracing AI, with nearly three-quarters (74%) of energy and utility companies around the world indicating they have implemented or explored AI in 2023.[82]

The impacts of AI on energy demand: AI puts significant demand on data center power.[83,84,85] This pressure on energy demand will necessitate innovation toward energy-efficient solutions, such as model software optimizations, new techniques at the data center level, or models designed for more efficient chips.[86] Developing AI infrastructure with energy efficiency in mind can cause a re-drawing of AI's energy demand, meaning that the industry impacts can decrease over time.[84,87]

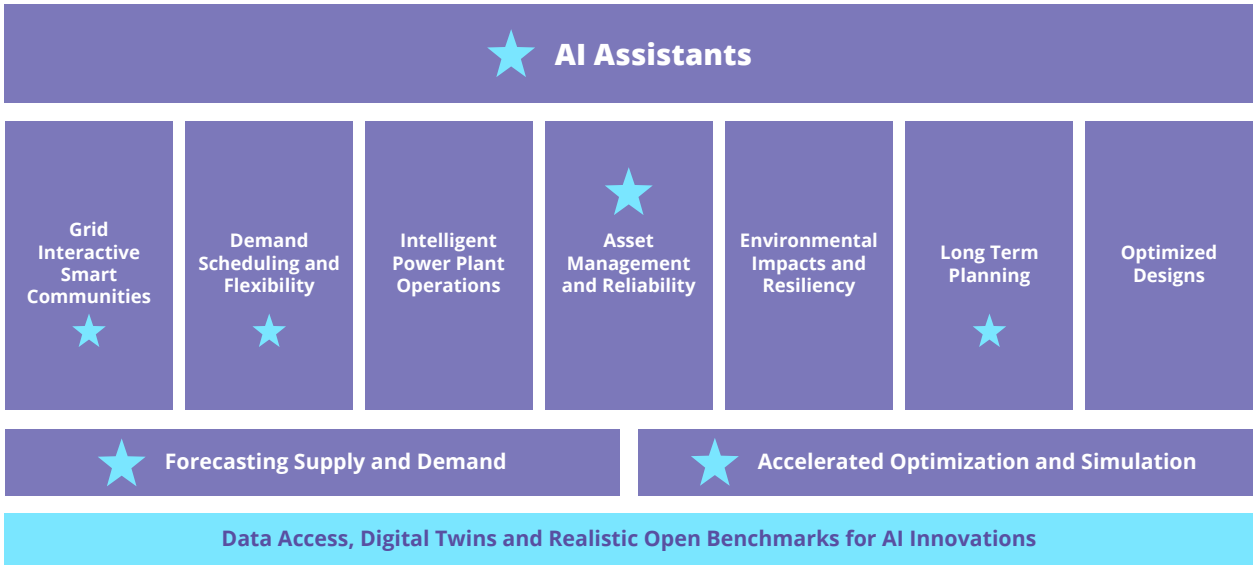
The impacts of AI on energy Operations: AI will also have an operational impact on the energy sector. The 2023 McKinsey report found that incorporating AI into business functions such as customer operations and marketing and sales could boost the revenue of the global energy sector by $150-240 billion—a 1%-1.6% increase in the industry's revenue.[37]

The 2020 PwC report also scored AI's impacts in the energy sector.[69] The report identified the main applications of AI as monitoring energy consumption, predicting energy demand and supply, coordinating decentralized networks, and increasing the efficiency of assets. It predicted a 1.6%-2.2% increase in global GDP by 2030. The report argued that smart monitoring lowers energy costs, which boosts economic activity. It also argued that coordinating decentralized networks increases distribution which leads to greater productivity for the energy sector.

There are a number of different opportunities specific to the U.S. energy market for AI to solve problems in the sector. In nuclear energy, power grid operations, carbon management, energy storage, and energy materials management, AI can accelerate and facilitate various activities such as licensing processes, design and deployment of a plant, autonomous operation and maintenance, emissions prediction, and identification of new materials.[88] As the Argonne National Laboratory estimated in 2024, AI has the potential to reduce commercial power plant design and licensing schedules by around 20% across new clean energy, with a savings potential in the hundreds of billions of dollars by 2050.[88]

A 2024 LF Energy whitepaper discusses similar use cases for AI, including forecasting energy demand and supply, optimizing energy systems, managing asset reliability and performance, and performing long-term planning (see **FIGURE 15**).[89] The whitepaper argues that using AI in these capacities saves costs and increases productivity by replacing human resources with AI for these activities, improving the breadth and depth of information we have on energy systems and increasing the speed of these activities. However, the whitepaper notes the relatively low industry adoption of AI. It points to concerns around privacy and regulatory compliance, lack of AI readiness, and the difficulty in setting up industry-academia collaborations. To address these obstacles, the whitepaper points to the value of open source tools to increase collaboration and standardization to build an industry-wide pre-competitive layer on which players can build their own solutions. As the IEA argues, ***"The technology is uniquely placed to support the simultaneous growth of smart grids and the massive quantities of data they generate."***[90] Using open models and tools can ease the pressure on energy demand just as fast as the optimization of the grid.

FIGURE 15. AI USE CASES IN THE ENERGY SECTOR



Source: LF Energy (2025, January). Unlocking AI's Potential for the Energy Transition through Open Source. The Linux Foundation. https://lfenergy.org/unlocking-ais-potential-for-the-energy-transition-through-open-source/

Expert opinions from the open source community

Alex Thornton, Executive Director of LF Energy, identifies two key features of open source that will drive its adoption in this sector: collaboration and transparency. *"OSAI presents an approach to uniquely address many of the challenges facing the intersection of AI with energy,"* he comments. *"Open source collaboration has already yielded step-change improvements in AI compute and energy efficiency, and I expect this trend only to continue as OSAI commoditizes proprietary approaches. In applying AI to energy systems, trust is essential. Open source is the only way to have this necessary trust through extreme transparency and confidence in the digital supply chain."*[91]

It is possible that this sector will face resistance to OSAI adoption. As Groopman and Lindstrom (2023) point out in their analysis of the microgrid sector, the novel application of AI is a significant differentiator for those managing the distribution and control of energy. As a result, these entities may wish to remain proprietary as a form of competitive advantage, at least in the near term.[92]

Conclusion

This report provides a review of prior research and empirical data on the adoption rates, market impacts, and workforce effects of OSAI. The evidence base shows that the use and adoption of AI tools are already becoming ubiquitous, with open source making up a significant portion of this adoption. A majority of organizations using AI have adopted open models, and an average of 41% of adopters' code infrastructure is open source. Adoption is asymmetrical in certain sectors, geographies, and occupations, with open source being a particular priority of small and medium-sized businesses.

The economic impacts of OSAI can be predicted on the basis of the proven economic impacts of open source software (OSS). Research has shown that the top benefits of OSS are cost savings, productivity gains, and faster time to innovation. If OSS did not exist, companies would have to spend 3.5x more on software than they currently do. The literature also showed that increased OSS is related to returns on productivity and entrepreneurship. When examining AI's economic impacts, its potential boost to GDP is in the trillions (as much as $15 trillion[42]) due to increased productivity and innovation. Although its adoption is not uniformly high across all sectors, it shows significant potential within healthcare, energy, agriculture, construction, and manufacturing. When looking at its

impact on the workforce, it appears that AI will act more as a task complement than a job replacement mechanism, and the skills necessary to use AI will command a wage premium.

This review reveals significant evidence gaps in our understanding of OSAI's economic impacts. To advance our understanding of the economic impacts of AI, we recommend the following directions for future research that draw on econometric methodologies previously used to quantify the economic value of OSS. Specifically, we recommend future studies to:

1. Investigate the effects of OSAI adoption, particularly open models, on total AI market growth, including but not limited to complementary innovation, services, and applications;
2. Measure the economic returns on investment in OSAI infrastructure, providing insights for both policymakers and organizational decision-makers considering resource allocation toward open models, datasets, and related components.
3. Examine the relationship between OSAI adoption and innovation, such as new venture creation, patent applications, and R&D efficiency;
4. Measure the cost differential between implementing open versus proprietary AI solutions across organizational sizes, sectors, and geographies;
5. Quantify the impacts on worker productivity and satisfaction across different tasks and sectors that are attributable to the adoption of open models.

Empirical evidence on these questions, among others, would contribute to a more comprehensive, evidence-based understanding of the adoption and economic impacts of OSAI, in particular open models, ultimately helping to guide future OSAI investment, policy, and adoption decisions.

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