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MANUFACTURING, CONSTRUCTION AND RETAIL

How AI can lift manufacturing out of its productivity and staffing squeeze

Manufacturing could benefit significantly from AI across both core and support processes, while easing chronic shortages of technical staff. Yet European manufacturers lag behind other sectors in AI adoption, and uptake varies greatly from country to country



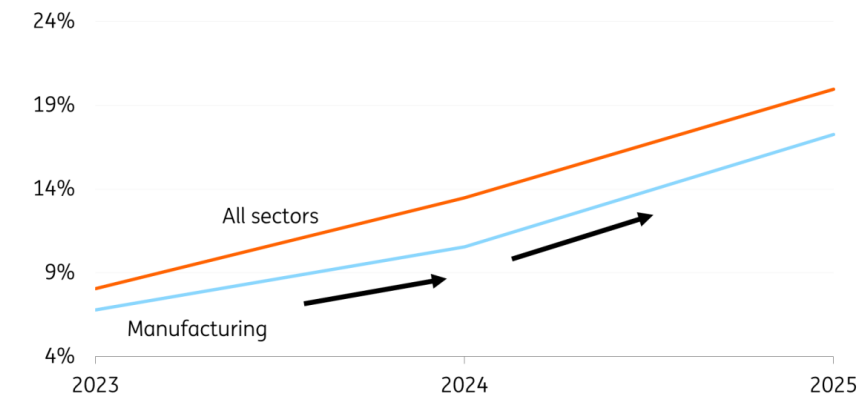
German industrial production improved in June, defying higher energy prices and the war in the Middle East

EU manufacturing is increasingly using AI, but is still lagging behind other sectors

EU manufacturing companies are increasingly incorporating AI into their business processes. In 2025, 17% of manufacturers used AI, two and a half times as many as in 2023. The share of 'heavy users' – companies using at least three AI technologies – quadrupled over the same period to 6%. But the downside is clear: laggards are struggling to catch up with the frontrunners. And with average AI use across EU sectors now at 20%, compared with 17% in manufacturing, the industry still has some ground to make up.

Industrial AI usage is picking up, but still lags behind

Share of EU companies using at least one AI technology



Source: Eurostat

Manufacturing risks missing out on major productivity gains

Academic studies at the company level show that the adoption of AI can increase the annual productivity growth of employees by up to [three percentage points](#). In the medium term, manufacturing companies that implement AI tend to outperform competitors that don't, both in terms of [productivity and market share](#). While the benefits vary by task and therefore by company, the industry is at risk of falling behind on a major new technology with potentially significant productivity gains.

Larger manufacturing companies use AI three times as often as smaller companies

AI adoption is strongly related to company size. Larger manufacturing companies with 250 or more employees use AI three times as often (namely 64% of the total) as smaller companies with 10 to 50 employees (21%). Although fast-growing AI frontrunners are often small startups or scale-ups, scale itself appears to be the differentiating factor for most mature manufacturing companies. Across the industry, hundreds of AI use cases have now been identified, and most surveyed manufacturing companies expect a positive return within [one to four years](#).

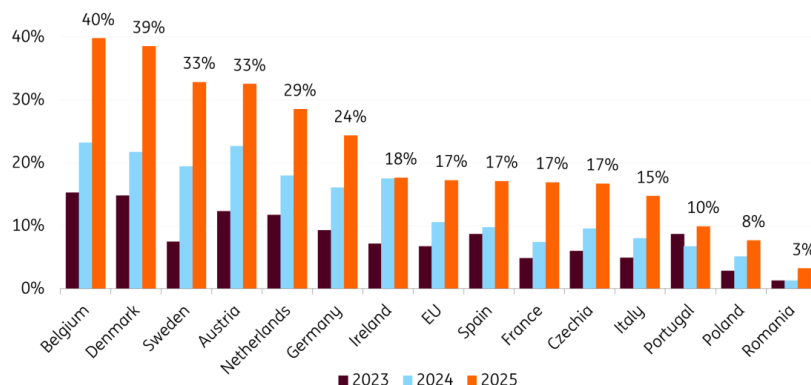
Belgium and Denmark are the industrial AI leaders within the EU

Industrial AI adoption varies widely across the EU. While fewer than one in ten manufacturing companies in Romania and Poland use AI, the figure rises to one in three in Sweden and Austria. In other Northwest European countries such as Belgium and Denmark, it's closer to two in five. Despite these differences, AI adoption is accelerating rapidly across the EU. In almost every EU country, the number of manufacturing companies using AI has more than

doubled in the past two years.

Belgium and Denmark in the lead

Share of EU manufacturing companies using at least one AI technology



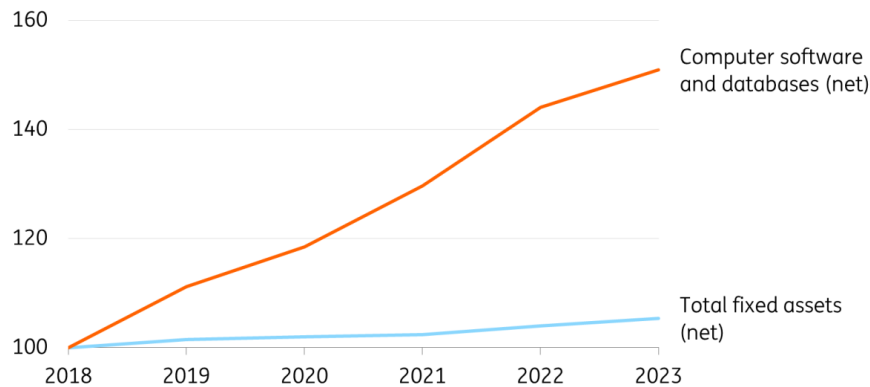
Source: Eurostat

Industrial investment in software is growing rapidly in the EU...

Productive AI deployment requires larger software investment. In the larger EU countries for which data is available, industrial investment in software and databases has increased significantly over the past 10 years. While the value of software and databases owned by manufacturing companies increased sharply – by 33% between 2013 and 2018 – due to additional investment, growth accelerated even further between 2018 and 2023 (the last year for which data is available for nine larger EU countries), exceeding 50%. This is a very strong increase comparable to the average software capital growth in all sectors. This particularly stands out when compared to the 5.5% growth in total capital goods in the manufacturing industry and the growth of only 2.5% in ownership of computer hardware.

Industrial software assets in major EU countries grow much faster than total capital stock

Net capital stock development in the manufacturing sector, unweighted average of nine larger EU economies for which data is available, 2018 = 100*



Source: Eurostat

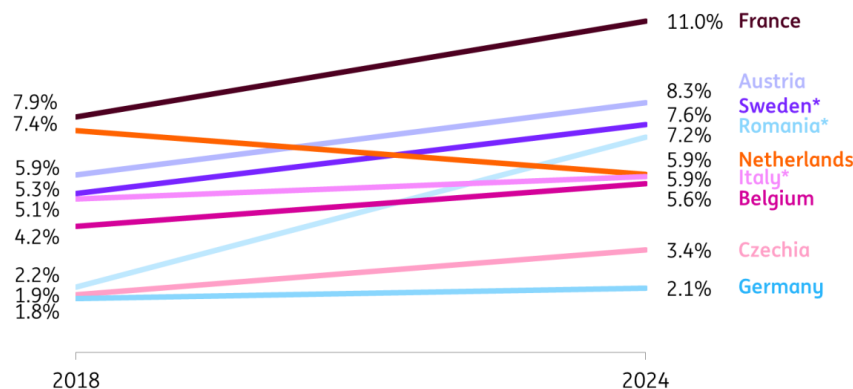
*Austria, Belgium, Czechia, France, Germany, Italy, the Netherlands, Romania, Sweden. Data based on chain linked volumes

...but German manufacturing needs to catch up to harness the potential of AI

In some countries, investments in industrial software are clearly lagging behind. This is particularly true for the Netherlands, where software ownership fell by 9% between 2018 and 2023. While there is growth in Germany and Italy (+8% and +17%, respectively), it lags far behind the average growth of 51%. The Netherlands does start from a high level, however. In 2018, the Dutch manufacturing industry had the second-largest software ownership relative to the sector's added value. This is not the case for Germany. In fact, as early as 2013, the European industrial powerhouse had the lowest software ownership among the larger EU countries, and this remained the case in 2024. The added value of the German manufacturing industry declined relatively sharply during this period, which may explain the low investment. Germany will have to make significant progress in the field of AI. In 2024, software ownership amounted to only 2.1% of added value. This is considerably lower than the average of 6.3%. France tops the list with 11.0%, followed by Austria (8.3%) and Sweden (7.6%).

French manufacturing invests heavily in software, Germany lags behind

Net capital stock of computer software and databases, as a % of gross added value of the manufacturing sector (for the nine larger EU economies for which data are available).



Source: Eurostat

*2023 instead of 2024

Making production processes more efficient and reducing staff shortages

Artificial intelligence can make manufacturing companies more efficient. Improving the efficiency of production processes is crucial in order to compensate for the shortage of personnel. Business processes still require countless manual actions at most manufacturing companies. Much of that work can be done more efficiently with further automation and AI, for example, by using self-learning robots. The trend towards smaller and more diverse orders ("high-mix, low-volume"), in particular, requires IT solutions that enable more autonomous production processes. The smart application of AI also makes manufacturing processes faster, higher quality and more reliable.

High value for core manufacturing processes

The number of successful industrial AI use cases is growing by the day. Manufacturers are also increasingly using machine and deep learning models in core processes. For example, for AI-assisted quality checks in the production line, or shortening changeover times through AI-driven machine setting and automatic tool selection. [Siemens](#) has reduced automation costs at its Erlangen plant by 90% in certain assembly steps by deploying AI-driven robots that pick up various parts and materials and place them in automated assembly lines. There are also numerous AI applications with potential in logistics processes, for the marketing and sales departments and in service provision. Think of optimising ordering and inventory management, automated answering of customer questions with chatbots and generating optimal pricing and quotations without human intervention.

Greatest gains to be made outside the core process

The greatest potential of (Gen)AI is not in the core process of production itself. This is already highly automated with machines and robots. There is still a lot to be gained in the surrounding processes, such as logistics processes and service provision, but also content creation and analysis applications for departments such as marketing and sales, HR, IT, finance and legal. Concrete examples are:

- Making production planning more efficient,
- Translating a product design into processing steps faster and more accurately,
- Better prediction of wear and tear and malfunctioning machines,
- Optimising logistics and inventory management and pricing,
- Autonomous transport systems between warehouse and production line,
- Automated ordering and quoting processes for standard products,
- AR (Augmented Reality) applications that support technicians in real time,
- Automatic documentation via speech-to-text for work instructions and training,
- Automated answering of customer questions with chatbots,
- Automated code writing for machine and robot drivers,
- AI support in the development of new products and processes.

This increases productivity, while employees have more time for work where their knowledge adds the most value.

Smart AI applications are expected to make hardware product development (engineering) much faster and more successful by generating design proposals based on accumulated knowledge. With its strategic [partnership](#) with AI developer Mistral, the role of AI at ASML is shifting from supporting software applications to becoming integral to its engineering, production processes, and customer solutions. ASML now deploys various [AI agents](#), drawing on different technologies and serving a wide range of use cases.

Another example is [BMW](#), which uses GenAI in production engineering with NVIDIA. BMW created a synthetic dataset of more than 800,000 images to train vision models for assembly tasks. This reduced the time to develop and implement new quality control models by more than two-thirds.

Many benefits for manufacturing companies

The potential benefits of AI applications for the manufacturing industry can be summarised as follows:

- **Increased efficiency:** By automating repetitive tasks and allowing machines to adjust themselves, AI speeds up production, shortens lead times, and significantly reduces errors.
- **Reduced costs:** Predictive analytics can reduce the costs of material waste, energy

consumption, and maintenance and downtime.

- **Higher quality and fewer rejects:** Product quality improves. Vision systems, sensors and deep-learning models detect deviations early, after which machines automatically correct and reduce rejects.
- **Better decision-making:** AI's ability to process large amounts of data in real time and simulate scenarios via digital twins enables more informed decisions and allows for better pre-assessment of risks.
- **Greater safety:** In addition, AI-controlled robots, cobots and AR-supported instructions increase safety by taking over heavy or dangerous work.
- **Faster innovation:** Another advantage is the acceleration in design and development processes. AI facilitates the creation of virtual prototypes and shortens the time-to-market through simulations.
- **More sustainable production:** Finally, AI contributes to sustainability by using energy and materials more efficiently and planning maintenance smarter, which makes machines last longer and reduces the environmental impact.

Potential benefits of AI applications for manufacturing companies



Source: ING Research based on IBM

Good data infrastructure is the foundation for success

Sound data infrastructure is the basis for success. Companies that are more [digitised](#) can implement AI faster and therefore reap its benefits [sooner](#). Many industrial companies would therefore do well to make their processes more transparent, clean up data and make it more consistent, and to link IT and operational technologies (OT) to ensure reliability. The better the data is unlocked and structured, the more effectively AI can make connections and create value.

Strategic vision from executives and knowledge building are needed to embed AI in work processes

AI requires a clear strategic vision from company directors, because the technology brings about a system change that can cause resistance from employees. This is also shown by [research](#) that shows that 95% of GenAI pilots fail because organisations try to avoid that

friction. However, frontrunners show that friction can be removed with vision and management involvement, especially when AI is not used as a generic tool but is deeply embedded in work processes. Staff are often reluctant to change their existing way of working, do not always have experience with AI and are often concerned about (future) job losses. However, the latter risk seems limited in manufacturing. Continuous staff shortages suggest large-scale layoffs are unlikely. Automation also comes largely at the expense of less competitive activities and less popular activities. In addition, employees are focusing more on the development of products and manufacturing processes and less on the manufacturing process itself.

Building knowledge, starting small and creating scale

Knowledge building is also crucial. Employees need to become familiar with AI step by step so they can recognise its added value and use it more effectively. By starting small, knowledge can be gained in an accessible way, such as with prompting for office-based tasks. In addition, collaboration and consolidation help to create the scale required not only to support digital transformation, but to cope with rising competitive pressure and growing complexity in manufacturing processes, as well as staff shortages and regulatory demands.

Read the extended version of [the report in Dutch](#) here.

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