

AI is transforming manufacturing industries by augmenting human innovation and productivity, leading to increased quality, more efficient supply chains, and flexible production and service that accurately meet customer needs.

The Impact of AI on Manufacturing

March 2025

Questions posed by: SAP

Answers by: Jeffrey Hojlo, Research Vice President, Manufacturing Insights and Industry Ecosystem Strategies

Q. What is the maturity of manufacturers today with AI, ML, and generative AI?

A. Discrete and process manufacturing organizations are moving quickly to become digital-first organizations. AI and generative AI (GenAI) are everywhere, but that is not the only reason for this acceleration toward digital, which is 25 years in the making within manufacturing. Cloud platforms and applications are becoming ubiquitous in support of global collaboration after years of slow adoption. Quality management continues to be a focus, and closer engagement with customers and consumers is a top priority, according to our discussions with organizations and IDC's survey data. Ecosystems are evolving, with manufacturers working more closely with partners to spark co-innovation, optimize supply chains, and better serve customers.

IDC's research has found that manufacturers are in the experimental phase with GenAI, and manufacturers have increasingly built AI and ML routines into quality assurance, production, and maintenance processes in recent years. Quality and employee productivity are the top 2 drivers for AI investments as companies focus on automating tasks and processes to drive consistency and efficiency in their organizations. We are now rapidly moving to the next phase of adoption as these organizations realize that AI and GenAI are extremely effective tools and approaches to mitigating data deluges. Manufacturers are realizing the rapid automation of data collection, analysis, and federation and are also focusing on industry and domain use cases for increased productivity and better, faster decision-making. A testing and quality framework and retrieval-augmented generation for GenAI use cases will rise in importance as a complement to this.

Q. What is the challenge (and opportunity) that manufacturers face with data, and how can AI help?

A. Data abounds in manufacturing industries, varying by discrete products (e.g., cars, medical devices, and semiconductors) and process-oriented products (e.g., chemicals, food, and pharmaceuticals), and regardless of the industry, IDC sees it increasing exponentially over the next 20 years. According to IDC's Global DataSphere research, IDC expects that by 2030 (less than five years away!), the manufacturing industry as a whole to generate 90EB of data (compared with 8EB in

2022). For perspective, an exabyte is a unit of measurement for digital data storage that is equivalent to 1 quintillion bytes or 1 billion gigabytes; it is also equivalent to 1,000PB or 1 million terabytes. In short, a lot of data.

Challenges with this excess of data include:

- » Distinguishing between good, bad, and dark data (i.e., finding relevant data)
- » Structuring unstructured data
- » Integrating AI applications and platforms with legacy systems and Internet of Things (IoT) platforms
- » Identifying the right data storage strategies and solutions (edge versus cloud versus on premises)

This set of challenges is why manufacturing industries focus so much on AI, digital twins, and ecosystems. AI is a critical element of effective strategies to address the universal challenge of data complexity, but it is also important that manufacturers consider their data strategy holistically. AI helps transform data into actionable knowledge that enhances productivity and fosters innovation. Digital twins serve as containers or vehicles for sharing data, knowledge, and models that are used for improving communication, collaboration, and business operations. Ecosystems create an environment that extends digital capabilities beyond the manufacturing enterprise, enabling knowledge sharing with partners to drive faster innovation and enhance responsiveness to opportunities or disruptions.

Another opportunity related to data and AI is that everything will be software defined. It is not only cars and trucks that will be software defined; everything that is IoT connected delivers large streams of data and requires applications to make decisions, whether products, assets, or facilities. This is why software providers serve different industries, whether manufacturing, energy, high tech, or healthcare. They provide cloud platforms to capture and analyze data as well as a marketplace and collaborative environments to support co-innovation and application development across full-fidelity, high-code, or low-code/no-code scenarios. Increasingly, in the near term, this approach will also include GenAI-aided software development, which will dramatically accelerate the quantity and quality of software available directly to customers and within connected products.

Q. How does AI apply across the manufacturing process chain, including product development, supply chain, production, and aftermarket/service?

A. Manufacturers can leverage AI to realize various benefits across the entire manufacturing process chain. There are key applications across predictive maintenance, quality control, supply chain optimization, and product design that use capabilities such as AI predictive analytics and maintenance, real-time detection, AI-assisted visual inspection, quality issue resolution, AI-assisted production engineering, and AI-assisted root cause analysis. This investment in AI will ensure that organizations predictably and reliably meet their operational goals, such as improving operational efficiency, accelerating innovation, and reducing their environmental footprint.

The modern manufacturing process chain also needs to incorporate ecosystem partners, whether for formal joint ventures or project-based collaborations. Organizations are expanding the scope and scale of how they work with their partners — public and private sector, with organizations inside and outside their core industry. Inevitably, the use of AI and GenAI will enhance collaboration and decision-making by determining which partners are best for particular projects

and predicting the success of joint ventures. In addition, the opportunity for AI and GenAI within ecosystems is to augment partner collaborations by enhancing data analytics, operational efficiency, and digital skills. According to IDC's September 2024 *Future of Industry Ecosystems Survey*, almost 75% of respondents are planning to invest in AI to support ecosystem initiatives, up from 30% the year prior. These initiatives include anticipating/predicting customer needs, identifying shared data monetization opportunities, and improving supply chain efficiency. This adoption of AI and GenAI inside and outside the organization will help drive continued cloud infrastructure and application sales, as well as spark new device sales as AI PCs and tablets become available and upgrade cycles are upon us. These device sales will in turn also drive AI-enabled application sales.

Q. How do manufacturers best manage change and mitigate the risks that new technology such as AI brings?

A. Like any new technology, with the increased use of AI and GenAI, managing change across an organization and empowering workforces with the proper knowledge and training while mitigating risks is a considerable undertaking. The accelerated use of AI and the extremely rapid growth of GenAI make this more difficult. Although there is a tremendous upside in productivity, innovation, and knowledge sharing, organizations must put the technological and organizational tools and boundaries in place that establish trust among employees and executives. This will give them the confidence to access new data sources to support their AI initiatives, such as those from large and small language model marketplaces, ecosystem partners, and emerging initiatives, such as open data spaces in the European Union.

One particular challenge to address with AI and GenAI (whether applied internally or externally) is the need for a legal framework and regulation to manage the use of data and consumer information and govern the use of large language models that include third-party information. A cybersecurity governance platform is also needed to predict and defend against anomalies, as well as authenticate and validate data sources. In 2024, a prominent CEO in the high-tech industry suggested the establishment of a common set of AI guidelines across industries to ensure trust across an ecosystem of partners and the proper usage and interoperability of data. Whether the adoption of such guidelines is universal or happens industry by industry remains to be seen.

Q. How will AI and ML help fill the resource and skills gaps that exist in manufacturing industries today?

A. IDC's research consistently shows that a digital skills gap exists among IT, business, supply chain, and operational roles in manufacturing. There is also a resource shortage due to an ageing workforce and a lack of younger talent coming into the industry. Training existing employees on new tools, such as GenAI, predictive analytics, augmented reality, and virtual reality, is a focus now and in the near future for manufacturers. Manufacturers also need to systematically educate their workforce using AI to identify and prioritize who should learn what and when to ensure cross-training and upskilling is achieved to meet the organization's current and future needs. This acceleration of tech skills will happen quickly because it is necessary for manufacturers to survive and thrive in the future.

Concurrently, the unification of structured and unstructured data is the top challenge in every manufacturing industry organization today; easier consumption and sharing of data and knowledge is critical to enabling better and faster innovation and streamlined operations. This complex, cross-enterprise data model must also consist of the relevant small language and large language models, often sourced externally, to support GenAI use cases for all manufacturing roles, whether sales and marketing, product development, supply chain, production, or service. These two efforts — data unification and AI/ML empowerment — will converge so that manufacturers can simply make better, more proactive decisions across the business, resulting in better quality, faster and more reliable supply chains, and improved customer experiences.

The establishment of large, flexible ecosystems that consist of participants from within and outside core industries is also a key component of manufacturing workforce enablement. This increasingly common strategy includes sharing operations and expertise and sharing and codeveloping physical and digital products and services. Organizations are also looking to build new business models with ecosystem partners to harvest and leverage the gold mine of data that exists from connected products and assets, as well as shared data and insights from external sources, all with the goal of better serving end customers, consumers, citizens, or patients. Across each of these shared areas — data, applications, and operations — the use of AI, ML, and GenAI will enhance sharing, analysis, and decision-making capabilities in a targeted list of use cases.

About the Analyst



Jeffrey Hojlo, Research Vice President, Manufacturing Insights and Industry Ecosystem Strategies

As research vice president, Future of Industry Ecosystems and Manufacturing Insights at IDC, Jeff Hojlo leads IDC's manufacturing research globally. Of particular focus is research focused on designing and developing trusted industry ecosystems and next-generation value chains in discrete and process manufacturing, construction, healthcare, retail, and other industries through shared data and insight, shared applications, and shared operations and expertise.

MESSAGE FROM THE SPONSOR

SAP is committed to helping the world run better and improving people's lives. Our vision is to bring out the best in every business. When your business depends on your production, your supply chain is critical. A risk-resilient and sustainable supply chain has built-in AI that is connected and contextualized.

Digital Manufacturing solutions from SAP allow you to manage your workforce and production needs safely and sustainably while supporting productivity.

SAP Digital Manufacturing is a manufacturing operations management platform enables you to optimize production, enhance product quality, and improve operational efficiency and productivity using the latest AI solutions.

For more information, please contact your SAP Partner.

The logo for IDC Custom Solutions, featuring a blue circular icon with a white dot inside, followed by the text "IDC Custom Solutions" in a blue sans-serif font.

IDC Research, Inc.
140 Kendrick Street
Building B
Needham, MA 02494
T 508.872.8200
F 508.935.4015
blogs.idc.com
www.idc.com

IDC Custom Solutions produced this publication. The opinion, analysis, and research results presented herein are drawn from more detailed research and analysis that IDC independently conducted and published, unless specific vendor sponsorship is noted. IDC Custom Solutions makes IDC content available in a wide range of formats for distribution by various companies. This IDC material is licensed for external use, and in no way does the use or publication of IDC research indicate IDC's endorsement of the sponsor's or licensee's products or strategies.

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications, and consumer technology markets. With more than 1,300 analysts worldwide, IDC offers global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries. IDC's analysis and insight helps IT professionals, business executives, and the investment community to make fact-based technology decisions and to achieve their key business objectives.

©2025 IDC. Reproduction is forbidden unless authorized. All rights reserved. [CCPA](#)