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SPOTLIGHT

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The integration of AI in manufacturing offers a unique opportunity for businesses seeking to stay competitive in today's dynamic market. Collaborating with technology vendors offering AI-infused applications enables companies to access cutting-edge technology tailored to their industry's specific requirements.

AI and Manufacturing: How AI Is Reshaping Manufacturing Strategies

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Introduction

The manufacturing industry is no stranger to challenges, including talent shortages, global economic shifts, resource constraints, and geopolitical uncertainties. To thrive in this unpredictable environment, manufacturers are turning to advanced technologies, with artificial intelligence (AI) taking center stage.

Although manufacturing organizations understand AI provides value to the business and has great importance in data-driven decision-making, they are not sure exactly where on the granular level. This explains why they are still devising their AI strategy through piloting or experimenting with initiatives, but they are uncoordinated.

Focusing on this task can be challenging for organizations as they are managing numerous priorities. Such priorities include forming a technology methodology to digitally transform the organization while identifying and updating existing technology. In addition, part of this overarching methodology involves recognizing the potential that emerges when adopting an innovation like AI.

AT A GLANCE

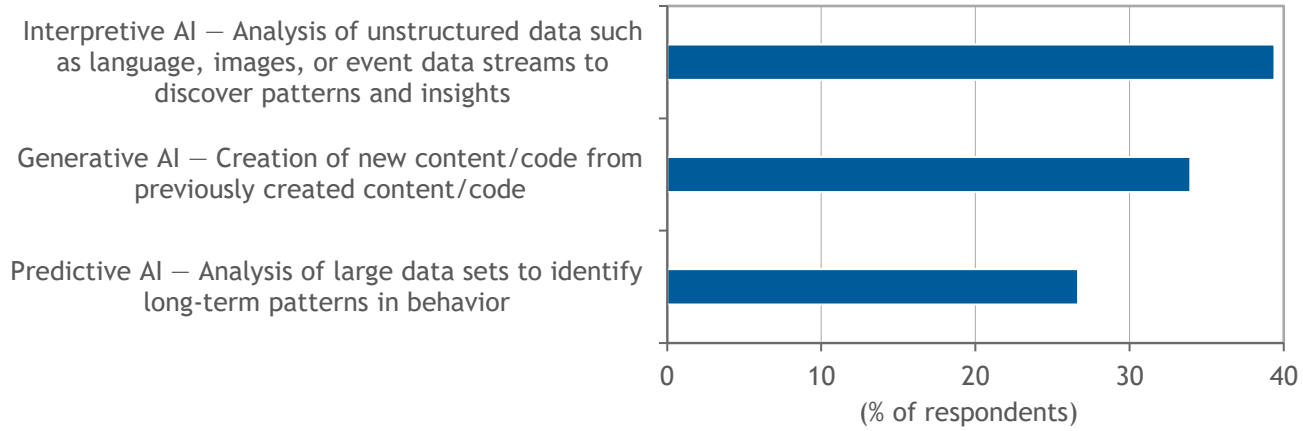
KEY STATS

- 70% of companies indicated generative AI has either already disrupted their business, is starting to disrupt their business, or will have significant impact in the next 18 months.
- 32% of companies view AI as the most important technology in their organization today.
- 28% of companies are willing to pay more for AI as they consider it the most essential in their SaaS application.

AI is a critical new workload that companies worldwide are beginning to invest in; however, most already have significant AI investments that will influence data, models, and AI governance decisions (see Figure 1).

FIGURE 1: ***Companies Understand the Value AI Brings to Manufacturing***

Q How will your AI-related investments be allocated over the next 18 months?



Source: IDC's Future Enterprise Resiliency and Spending Survey, January 2024

The Evolution of AI in Manufacturing

The manufacturing sector is undergoing a digital transformation driven by advancements in AI. AI encompasses a range of capabilities such as machine learning (ML), deep learning, natural language processing, and robotics, all of which are increasingly being integrated into manufacturing processes. These technologies are enabling manufacturers to optimize operations, improve product quality, enhance supply chain management, and develop innovative products at a faster pace.

Interpretive, predictive, and now generative AI (GenAI) are transforming the way organizations operate. The advancements of AI have provided organizations with better tools to make informed decisions and have significantly improved processes, adding more value to their operations. Interpretive AI focuses on understanding and interpreting data, extracting meaningful insights, and enabling decision-makers to comprehend complex information more effectively. Predictive AI utilizes historical data to forecast future trends and outcomes, enabling proactive decision-making and risk mitigation strategies. Generative AI creates new content using previously created content.

In the realm of manufacturing, AI plays a crucial role from a data analysis perspective. One key aspect is the integration of AI into enterprise resource planning (ERP) software, which streamlines data management and analysis across different departments. AI applications in manufacturing data analysis include predictive maintenance, demand forecasting, quality control, and supply chain optimization.

Benefits

AI serves as a catalyst for seamless connectivity within manufacturing ecosystems, bridging the gap between manufacturers, suppliers, and customers. Through AI-driven data integration and analytics, stakeholders gain real-time visibility into supply chain operations, production workflows, and market dynamics while fostering collaboration, transparency, and agility, bringing total value to the supply chain.

Ultimately, the role of AI in manufacturing data analysis provides a substantial insight advantage, allowing companies to stay competitive in a rapidly evolving market landscape. By harnessing the power of AI, manufacturers can unlock hidden opportunities, optimize production processes, improve product quality, and deliver enhanced customer experiences, driving sustainable growth and innovation within the industry (see Figure 2). By leveraging AI algorithms, manufacturers can analyze vast amounts of data in real time, identify patterns and anomalies, and make data-driven decisions to enhance efficiency and reduce costs.

FIGURE 2: ***Benefits of AI in Manufacturing***

Q ***What kinds of benefits have you seen from artificial intelligence/machine learning deployments in your supply chain?***

Source: IDC's Supply Chain Survey, April 2024

Furthermore, AI algorithms play a vital role in driving innovation across various manufacturing domains, including:

- **Product design optimization:** AI-powered design tools analyze customer feedback, market trends, and performance metrics to iteratively optimize product designs, enhancing functionality, aesthetics, and user experience.
- **Process optimization:** AI-driven process optimization algorithms identify inefficiencies, bottlenecks, and quality issues, optimizing production workflows, reducing cycle times, and improving resource utilization.

- **Predictive maintenance:** AI-enabled predictive maintenance systems leverage ML algorithms to analyze equipment performance data, predict maintenance needs, and prevent costly downtime, maximizing asset uptime and longevity.
- **Resource utilization:** AI-driven resource optimization tools optimize material usage, energy consumption, and production scheduling, minimizing waste, reducing costs, and enhancing environmental sustainability.

Overcoming Roadblocks to Adoption

The integration of AI into manufacturing processes has brought about transformative changes, yet it also presents a range of challenges that companies must navigate. Integrating AI requires addressing issues such as accurate data, data silos, legacy systems integration, cybersecurity risks, workforce reskilling, and ethical considerations. Collaborative efforts between manufacturers, technology providers, regulators, and stakeholders are essential for responsible AI adoption and sustainable industry growth.

One prominent concern is the proliferation of AI across industries, leading to intense competition and potential risks related to data and intellectual property. The emergence of advanced AI systems, often termed *GenAI,* raises questions about the control and security of valuable assets, including proprietary data and innovative ideas. Companies are increasingly cautious about how AI adoption might impact their ability to safeguard these assets and maintain a competitive balance.

Another significant challenge is the considerable costs associated with implementing AI-enhanced application software. While AI promises efficiency gains and improved decision-making, the initial investment required for acquiring and customizing such technology can be substantial. Moreover, ongoing expenses related to infrastructure development and maintenance for model training or running AI applications add to the financial liability. Balancing the potential benefits of AI with the associated costs remains a key challenge for manufacturers seeking to leverage this application effectively.

In addition to financial considerations, manufacturers must address concerns about brand reputation and regulatory compliance when using AI. The use of AI technologies introduces new complexities related to data privacy, algorithm transparency, and accountability, which can expose companies to reputational risks if not managed carefully. Also, regulatory organizations are increasingly scrutinizing AI applications in various industries, necessitating a proactive approach to compliance to avoid potential legal and operational pitfalls.

Security, risk management, and compliance are central themes in the AI-in-manufacturing landscape. As AI systems become more sophisticated and interconnected, the need to safeguard sensitive data, mitigate cybersecurity threats, and ensure regulatory adherence becomes paramount. Companies must invest in robust cybersecurity measures, risk assessment protocols, and compliance frameworks to mitigate potential vulnerabilities and maintain trust among stakeholders.

Last, companies must optimize infrastructure and IT operations to support AI initiatives. From developing scalable computing architectures to integrating AI models seamlessly into existing workflows, manufacturers face complex technical hurdles that require expertise and strategic planning. Efforts to optimize infrastructure and IT operations are crucial for maximizing the efficiency and effectiveness of AI deployments while minimizing disruptions and downtime.

Such concerns often lead to delayed implementation. Manufacturing companies should consider the following factors before implementation of AI models:

- **Implementing data sharing and operations practices:** To ensure data integrity for large language models developed internally or with third parties, manufacturing companies must implement robust data sharing and operations practices. This involves secure data storage, encryption protocols, access controls, and data governance frameworks to protect sensitive information and maintain accuracy.
- **AI awareness and acceptable use training:** Designated workforce groups need mandatory AI awareness and acceptable use training programs. These programs educate employees on AI capabilities, ethical considerations, data privacy, and responsible usage. By fostering a culture of AI literacy and ethical conduct, organizations mitigate risks and maximize AI's benefits.
- **Corporate guidelines for transparency and tracking:** Establishing corporatewide guidelines is essential for evaluating transparency and tracking the use of AI code, data, and trained models. Clear policies on data ownership, model explainability, bias mitigation, and algorithmic accountability ensure ethical AI practices and regulatory compliance.
- **Internal AI center of excellence (COE):** Creating an internal AI COE accelerates AI adoption and sets corporatewide standards. The COE fosters collaboration among data scientists, domain experts, and business leaders to develop innovative AI solutions, share best practices, and drive continuous improvement in AI capabilities.
- **AI evaluation criteria in software-as-a-service (SaaS) requests for proposals (RFPs):** It is crucial to incorporate AI evaluation criteria into all new or renewal SaaS RFPs. This criterion assesses AI capabilities, data governance features, security protocols, vendor transparency, and ethical guidelines to select AI-enabled solutions that align with organizational objectives and values.
- **AI governance, ethics, and risks council:** Establishing or expanding a formal AI governance, ethics, and risks council is imperative. This council oversees AI strategy, compliance with regulatory requirements, risk assessments, ethical guidelines, and stakeholder engagement. By integrating diverse perspectives and expertise, the council ensures responsible AI deployment and mitigates potential risks, implementing data sharing and operations practices.

Advancements in AI Technologies for Manufacturing

GenAI Models/Platforms: New Workloads and Decision-Making

The emergence of GenAI models and platforms represents a significant shift in manufacturing workloads. Advanced AI systems require new approaches to decision-making regarding application development, AI platform selection, and infrastructure readiness. Key considerations include data availability, model complexity, scalability, and compatibility with existing systems.

Making build/buy decisions for AI-ready infrastructure involves evaluating factors such as data processing capabilities, GPU/CPU resources, storage requirements, and integration with AI frameworks. Organizations must assess the long-term sustainability and adaptability of their chosen infrastructure to accommodate evolving AI workloads.

Location and Infrastructure Investments

The level of tuning, specialized training, and use of private data in AI models impacts decisions related to location and infrastructure investments. Organizations must consider factors such as proximity to data sources, network latency, regulatory requirements, and cost-effectiveness when choosing deployment locations and facilities.

Investing in AI-ready infrastructure involves assessing the scalability, reliability, and security of cloud-based, on-premises, or hybrid solutions. Balancing performance requirements with operational costs is essential for optimizing AI workflows and maximizing return on investment.

Opportunities for Innovation and Growth

AI presents numerous opportunities for innovation and growth in manufacturing. Advanced robotics, computer vision, natural language processing, and predictive analytics are reshaping traditional workflows and enabling agile, data-driven decision-making.

Innovative AI applications include autonomous robots for assembly and logistics, AI-powered quality control systems, predictive maintenance algorithms, virtual assistants for workforce training, and personalized product customization based on consumer preferences. Investing in talent development, AI skills training, and cross-functional teams encourages creativity, experimentation, and continuous improvement in manufacturing processes.

From a manufacturing perspective, AI and automation are driving transformative changes across the value chain. AI-powered robots, collaborative robots, and autonomous systems are augmenting human capabilities, improving safety, and optimizing resource utilization.

Smart factories equipped with Internet of Things sensors, AI-driven analytics platforms, and digital twins enable real-time monitoring, predictive maintenance, and adaptive production scheduling. AI-enabled insights and decision-support tools benefit supply chain visibility, inventory optimization, and demand forecasting.

Considering Epicor

Epicor Kinetic global cloud ERP helps manufacturers increase revenue and operational efficiency. Kinetic is designed to reduce cost and complexity in an organization's ERP deployment with industry-specific solutions and composable capabilities like advanced planning and scheduling (APS), manufacturing execution systems (MESs), and configure price quote (CPQ), extended as you grow. It offers deployment options (public cloud, on premises, hybrid) in a single solution set that delivers agility with no/low-code configuration, integration, and self-service analytics to better support connected workers with the tools they need for greater productivity.

Kinetic assists organizations in optimizing the impact of their ERP investments with a technology partnership and solutions where automation and AI tools are infused in the technology with specific use cases to boost worker productivity across business processes in both the front office and operations.

Challenges

Like many other established enterprise resource planning systems, Epicor faces several challenges in the context of the rapidly evolving AI landscape within the manufacturing industry. AI applications need to integrate the technology seamlessly into existing ERP functionalities while ensuring compatibility with diverse manufacturing processes and

systems. This integration often requires substantial resources in terms of time, expertise, and investment, as AI technologies must be tailored to meet specific manufacturing requirements and deliver tangible business value.

There also is a plethora of competitors vying for market share in the manufacturing AI space. These competitors range from tech giants with vast resources and AI capabilities to smaller, niche players specializing in AI solutions for manufacturing processes. This competitive landscape puts pressure on ERP solutions to continuously innovate and enhance AI offerings to stay ahead of the curve. Despite these challenges, the widespread adoption of AI in the manufacturing industry presents opportunities for AI solution providers to leverage AI technologies to improve efficiency, optimize processes, and deliver greater benefits and value to their customers.

Conclusion

In conclusion, the integration of AI in manufacturing offers a unique opportunity for businesses seeking to stay competitive in today's dynamic market. Collaborating with technology vendors offering AI-infused applications enables companies to access cutting-edge technology tailored to their industry's specific requirements. This partnership streamlines operations and empowers organizations to optimize processes, enhance efficiency, and foster innovation. By leveraging AI for data-driven decision-making, manufacturers can gain valuable insights that drive strategic initiatives and enable agile responses to market fluctuations, leading to sustainable growth and long-term success.

AI serves as a catalyst for seamless connectivity within manufacturing ecosystems, bridging the gap between manufacturers, suppliers, and customers.

Last, having a technology provider with AI-infused applications can be instrumental in several key areas within manufacturing. Technology providers deliver unique industry AI solutions that harness best-of-breed technology, ensuring that businesses have access to advanced tools and capabilities. Emphasizing the importance of leveraging AI for data-driven decisions, this approach enables manufacturers to make informed choices backed by real-time insights, thereby enhancing productivity, reducing costs, and maximizing overall performance.

About the Analyst

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Roderick Gaines is a research director for IDC's Worldwide Supply Chain Strategies program, responsible for providing research, analysis, and guidance on key business and IT issues pertaining to manufacturing, retail, and healthcare supply chains. He currently leads the Worldwide Supply Chain Strategies: Warehousing, Inventory and Order Management practice, providing fact-based research, analysis, and insight on best practices and the use of information technology to assist clients in improving their capabilities in these critical supply chain fulfillment areas.

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