

Manufacturing Digital Transformation



Manufacturing is rapidly evolving.

Recent years have witnessed immense progress in automating and streamlining business processes and systems throughout the industry, with the [digital transformation](#) fundamentally altering how goods are produced. This has ultimately driven higher productivity, improved quality, and reduced costs.

Many manufacturers are implementing [digitization practices](#), including automation, artificial intelligence, machine learning, and IoT, to streamline their [operations](#). They are now able to collect real-time data, analyze it, and make informed decisions based on actual data rather than assumptions.

The digital transformation shows no signs of slowing down, either, with [80% of CEOs](#) increasing investments in digital technology.

Let's discuss the benefits of the digital transformation throughout manufacturing, how it can provide a competitive advantage, and what the future may hold for what many are calling

industry 4.0.

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The impact of manufacturing digital transformation

The digital transformation introduced new technologies to manufacturing — and those same technologies have become better. Here are some benefits of introducing technology to production workflows.

Lowered expenses and higher margins.

Digital transformation has led to a significant reduction in production costs as many manufacturing processes require significant resources.

For example, automated production lines and robots have replaced manual labor in some areas, often [reducing](#) the cost of production significantly.

Companies can also optimize their logistics through the use of data analysis, which helps identify the shortest and most efficient supply chain routes.

Environmental benefits.

The manufacturing industry is a significant producer of greenhouse gasses, although digital improvements hope to better that.

Reduced energy consumption through IoT devices, waste reduction through automated processes, and improved supply chains all can mean reductions in carbon emissions.

Enhanced quality.

Digitization has also enhanced quality control in the manufacturing process. High-tech inspection systems have helped enable companies to detect defective products early, leading to reduced production costs.

The use of sensors and IoT devices has allowed companies to monitor the quality of products throughout the production process and identify areas that require improvements.

This has not only improved customer satisfaction but also helped save companies from product recalls and lawsuits.

Customization and flexibility.

Digitization allows manufacturers to collect data from customers, analyze it, and tailor their products and services to meet unique customer needs.

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This means that manufacturers can create highly personalized products and services that cater to specific customers, streamlining the process from identifying a product need and production.

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Primary factors pushing digital transformation

Technology is creating new options for smart manufacturing that brings higher efficiency, reduced costs, and greater production. These are some of the technologies driving the digital transformation for providers.

Robotics and automation.

Robotics automates repetitive and time-consuming manual tasks, reducing human error and increasing speed and efficiency. This technology allows robotics to perform human-like processes, including assembling products.

IoT (Internet of Things).

The Internet of Things — or Industrial Internet of Things (IIoT) — has been rapidly making inroads in the manufacturing industry, which integrates cyber-physical systems, advanced data analytics, automation and machine learning, and cloud computing to achieve seamless connectivity between plant assets, workers, customers, and suppliers.

IoT devices in manufacturing can predict maintenance needs, monitor conditions, improve safety, and improve logistics.

Cloud-based ERP solutions.

Cloud-based Enterprise Resource Planning (ERP) solutions offer a comprehensive set of features, including inventory management, quality control, production planning, and human resource management.

Cloud-based ERP solutions can also offer manufacturers a single source of truth and provide real-time visibility into their operations, allowing companies to react faster to changes.

3D printing.

3D printing is a revolutionary technology that is making rapid gains in the manufacturing industry. Digital models are turned into physical objects and allow manufacturers to produce complex designs and customized products.

Eco-friendly manufacturing.

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All of the above are helping contribute to reductions of carbon footprints in the manufacturing sector. More efficient processes lead to less waste, which leads to reductions in materials used. This all means less carbon is put into the atmosphere and better for sustainability efforts.

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Digital transformation objectives for manufacturers

For manufacturers, digital transformation means the ability to significantly upgrade key processes or parts of their business model. Before that, however, they should follow these objectives to provide a clear path to improvement.

Select the right technologies and platforms.

Any digital transformation starts with an audit of existing systems to identify where improvements would make the most impact. This should be followed by an evaluation of potential new systems or platforms that can meet the company's unique needs.

Evaluate ROI and iterate for improvement.

This process is never really done. Once new systems are integrated, businesses should regularly monitor to determine how effective they are and identify areas where further improvement is possible.

Address cybersecurity and data privacy concerns.

Cybersecurity is a concern for any business as new threats emerge seemingly daily. If a business stores personal information — like customer payment information — they should have a robust security apparatus that protects critical data.

Integrate legacy systems with new technologies.

When a company introduces a new system, it should be able to work well with their existing IT ecosystem. These integrations can be difficult, so be prepared to invest in the process, though the end result will be a fully optimized operation.

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Obstacles in manufacturing digital transformation

Getting started with digital manufacturing is no easy feat, and roadblocks can arise along the way. Let's dive into the top obstacles that manufacturers encounter in their digital transformation journey.

Initial investment concerns.

Due to the upfront investment required in transforming existing systems, the return on investment can be hard to determine when shifting to digital. Manufacturers must measure ROI by identifying clear metrics, such as reductions in inventory or increases in productivity.

Internal resistance to change.

One common obstacle in digital transformation is getting everyone in the organization on board. This starts with management, who plays a crucial role in leading the way and modeling the behaviors that they want to see in their employees.

Without the support of those at the top, it can be challenging to get buy-in from others in the company.

Skill gap and training needs.

The digitization process often changes the skill set required from the workforce, leading to a talent mismatch. Manufacturers might face a shortage of skilled employees capable of managing and maintaining complex digital systems.

Additionally, many workers hold outdated skills and require training to upskill or reskill. Thus, building a digital-ready workforce is essential for successful digital transformation.

The future of digital transformation

The march of progress continues and will continue to re-shape how manufacturers approach their industry. These new technologies and initiatives will bring new opportunities to traditional manufacturing companies.

AI and machine learning.

Manufacturers are using AI-powered algorithms and machine learning to analyze vast amounts of data from production lines and supply chains, with predictive maintenance identifying potential problems before they occur and making adjustments in real-time to maintain optimal performance.

In addition, AI is being used to automate quality control processes, ensuring that defects and other issues are caught before they can impact the final product.

On-demand manufacturing.

One of the biggest advantages of on-demand manufacturing is the ability to manufacture products without needing to hold large stocks of inventory. This is being made more accessible with the use of 3D printing technology, which enables manufacturers to create complete products simply by feeding the design into a 3D printer.

Blockchain.

[Blockchain technology](#) provides a secure and transparent method of tracking products throughout the supply chain. This allows manufacturers to trace the origin and journey of a product, creating a complete profile from raw materials to finished goods.

It also enables manufacturers to verify the authenticity of a product.

Digital twins.

A digital twin can be used to simulate and optimize production processes, allowing manufacturers to test different scenarios and make predictions about future performance.

This technology has the potential to revolutionize the way products are developed, designed and produced, which allows manufacturers to rely on predictive analytics and reduce time to market and improve product quality.

Augmented reality and virtual reality (AR/VR).

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AR and VR technology allows manufacturers to better inform and educate employees with more immersive experiences. For example, AR and VR can be used to guide workers through a specific assembly process to reduce the likelihood of errors.

Onshoring resurgence.

The COVID-19 pandemic exposed some challenges in supply chains, encouraging manufacturers to onshore operations and bringing them closer to home.

This is partially due to risk mitigation, as well as avoiding disruptions or downtime, but it also streamlines supply chain management to make these processes more efficient and effective.

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The final word

Done correctly, digital transformation strategies can re-imagine manufacturing. Advanced technologies have the potential to fundamentally change how many manufacturers and associated stakeholders operate, opening them to new opportunities to become more effective and efficient.

This data-driven decision making and new methodologies can have positive impacts on the production and consumption of new products as well as the customer experience.

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FAQs about manufacturing digital transformation

How can manufacturers ensure security of their data when undergoing digital transformation?

It is imperative for manufacturers to develop and implement a comprehensive cybersecurity strategy that spans across all layers of the organization and supply chain. This includes hardware, software, networks, people, and processes. The strategy should include regular assessments and testing, as well as policies and procedures that provide clear guidelines for securing data, training employees, and reporting incidents.

What roles will humans play in fully digitized, smart factories?

Advanced technologies cannot replace the intuition and experience of human workers. Instead, smart factories will require human workers to collaborate with technology to achieve optimal results. For instance, a worker can use data analytics to improve production processes, or an engineer can troubleshoot a problem with the help of a machine learning algorithm.

Can small manufacturers also benefit from digital transformation?

Digital transformation in manufacturing is a leveler that creates opportunities for small businesses to compete with larger organizations. Small businesses can utilize digital solutions such as automation, cloud computing, and data analytics to improve operational efficiency, enhance their manufacturing operations, and secure their place in the market.

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