

How manufacturers can reap the benefits of digital transformation





Customers are more demanding and fickle than ever, so manufacturers should be agile and constantly innovating — characteristics that are hard to achieve with legacy environments. Fortunately, the digital revolution is making advances into the \$10 trillion-plus global manufacturing sector, promising to help organizations revamp their operations all along the value chain.

The trouble is getting there from here. There are so many technology options and opportunities to pursue it can be hard to calculate the best path forward. But this much is clear: Standing still is not an option. Given the current pace of change, the laggards will be quickly disrupted.

With digital transformation, it all starts with the data, and the same is true in manufacturing. Collaboration, data sharing and engagement across the value chain can help companies better address customer, partner and supplier requirements, transforming manufacturing operations into a demand-driven supply chain. Here's how to get started.

Techs at play

Market leaders are using the power of big data and analytics for a supply chain advantage, and large manufacturers can choose from a vast array of technologies to improve operations. These technologies range from automation and robotics to the industrial internet of things (IIoT), data-driven simulation through “digital twins,” streamlining and optimizing end-to-end processes in a “digital thread,” machine learning and artificial intelligence (AI).

Computer-aided design and cloud computing, for example, make it possible for suppliers to collaborate faster and more efficiently than ever. Vehicle manufacturers can share three-dimensional models of engines and car bodies with suppliers, who can then share information about the availability of parts, delivery times and pricing. This greatly reduces the time and labor required to make design changes compared to older and less-sophisticated solutions.

Furthermore, production modeling allows engineers and manufacturers to better understand, predict and optimize performance via a digital representation of each product prior to physical development and production, reducing cost and increasing velocity.

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The digital revolution is creating a market landscape in which companies must learn how to thrive on digital transformation or be left behind. Data reigns supreme, dramatically transforming the ways people work and businesses compete. A goal of every manufacturer should be to create a seamless flow of data linking every phase of the product life cycle, from design, sourcing, testing and production to distribution, point of sale and ongoing service. This transformation will continue to drive disruption across all manufacturers, large and small.

Where to begin? Start small.

Companies are at various levels of adoption when it comes to digital technology and adding IoT capabilities, analytics and AI to their processing systems. Some organizations, for example, have been using just-in-time parts scheduling for years while others are still using manual processes. No matter if a company is advanced or just getting started, there's always more that can be done. And it can be done today.

Start by looking at existing processes to identify opportunities for improvement. The simplest thing a company can do is put in a system to keep track of where parts are in the supply chain. You don't have to do the whole system at once. You can make incremental improvements to your factory processes today then grow from there.

Positive business outcomes can be immediate. For example, a truck manufacturer put small monitors on pallets of high-value axles used in construction equipment because full pallets of axles kept disappearing. Once they could track the pallets, the company found they weren't being stolen, they were simply getting lost in the giant stockyard. By tracking them, they didn't need to double order, and they could quickly find the parts when the factory needed them. That's a simple supply chain management tracking fix that can be implemented quickly to produce immediate results.

Another good place to start on the path to digital transformation is gathering data for analytical purposes, such as predictive maintenance. Whether it's a fastening machine or a robot, many factory tools today generate data. If that data can be collected, analytics can be applied. Done right, the data can be used to predict when a piece of equipment needs maintenance, when it is going to fail and when there's a problem, what kind of problem it is. This makes factory operations more digital and more proactive.

Taking advantage of digital

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One area AI can help, for example, is in improving product quality. AI can be used to drive vision and test systems that provide intelligence, analytics and valuable feedback that operations people can use to take action right on the factory floor, improving the velocity, cost and quality of product output.



Other technologies that should be considered as part of a manufacturing digital transformation include:

- **Digital twins.** In the pre-digital age, equipment inspection and modification typically required shutting down machines, hindering production. Using virtual representations of equipment — so-called digital twins — enables manufacturers to monitor components of a system to watch for indicators like temperature, vibration and wear, making it possible to proactively intervene and address problems before they become catastrophic. Digital twins also enable manufacturers to run what-if scenarios to see how, say, increasing production rates will affect equipment.
- **Digital thread.** A digital thread is a communications framework that gives organizations access to the right data at the right place, at the right time. It joins information from unconnected systems across the design, build, operate and maintain phases. A digital thread ties together key planning and execution domains and facilities, improving velocity, output, quality and cost. Manufacturers are looking to drive horizontal integration with customers, suppliers and even peers through trusted and dynamic value networks leveraging manufacturing platforms and manufacturing-as-a-service solutions. A digital thread helps them achieve this by optimizing their supply chain and aftermarket service capabilities and letting them effectively use their data assets to accelerate business outcomes.
- **Edge computing.** With many machines/sensors generating data, the volume makes it impractical to forward all of it to a central collection point for analysis and action, so manufacturers are shifting that analysis from the data center to the edge of the network, on the shop floor. Performing analytics at the edge optimizes processes and improves responsiveness. Top-level results and determinations can then be transmitted into the cloud for further trend analysis and planning purposes.
- **Self-healing systems.** Even better than proactive fixes are machines that can solve their own problems, so-called self-healing systems. A self-healing system, for example, might notice that the wrong version of software is being called for a given process and run a fix to avoid disrupting the manufacturing process. Self-healing systems can also coordinate activities across procurement, scheduling and operational systems. For instance, if a component fails, the system can put an order for a new part and schedule a time for maintenance.

From procurement to delivery and from R&D to aftermarket services, there are a seemingly endless number of components in the manufacturing value chain. A key to success in digital transformation is integrating these various components in a way that various factions can communicate and collaborate (see **Figure 1**).

Integrated digital manufacturing value chain

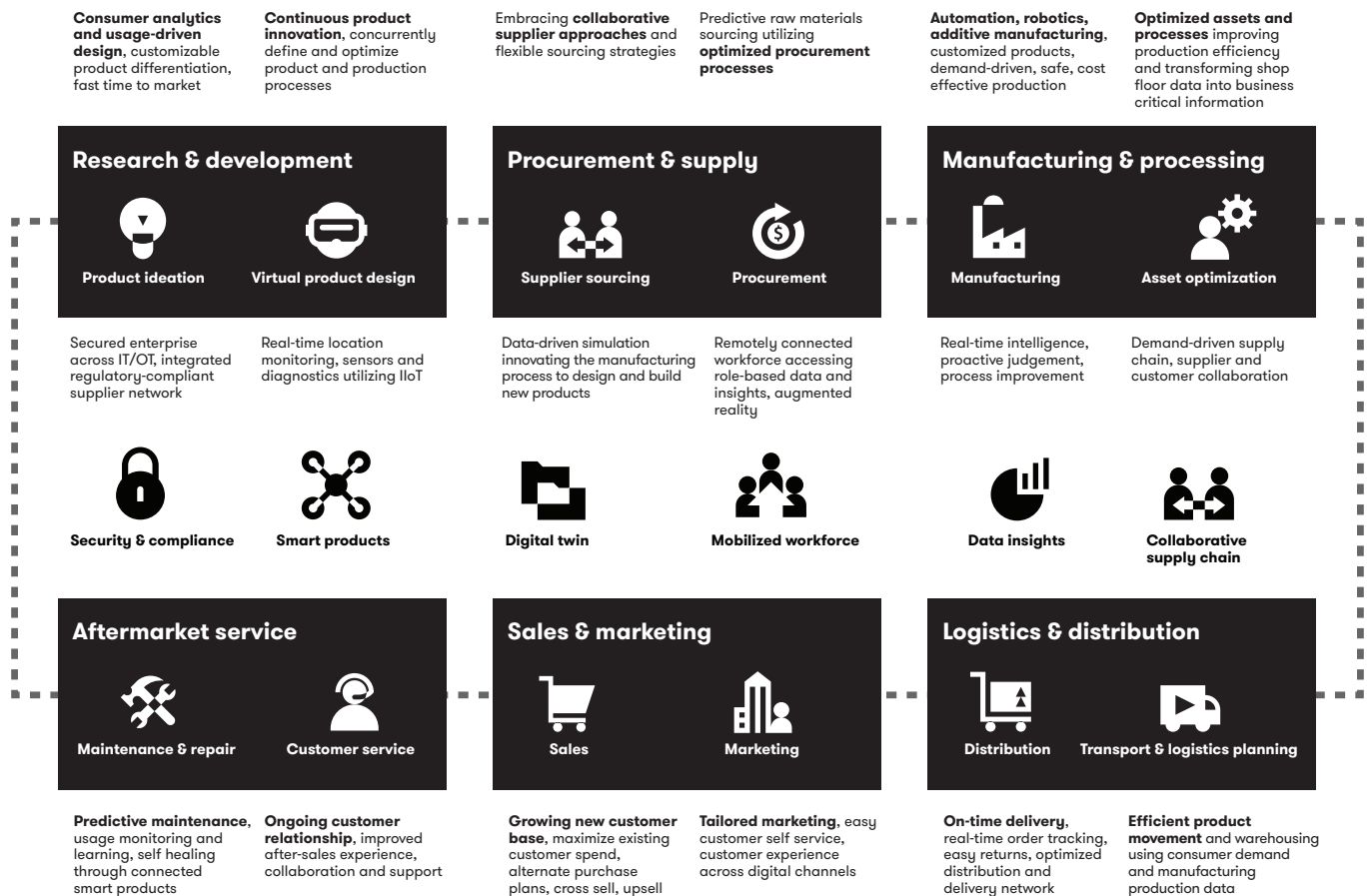


Figure 1. Integrated digital manufacturing value chain

Reaping the benefits

Digital transformation can transform manufacturing. By linking every phase of the product life cycle, from design through support, adopters gain a competitive advantage by maximizing the capabilities of their supply chains and accelerating the pace of innovation while lowering production and maintenance costs.

Using digital technology to monitor and maintain manufacturing processes enables improved productivity and flexibility while reducing costs and downtime associated with unscheduled maintenance.

It also improves the experience of the workers who are in the factory interacting with machines. In operations, the goal is always to improve quality while reducing operational costs and downtime. A focus on better user experience as part of the digital transformation can contribute to achieving all of these.

There are opportunities for manufacturing companies of all sizes to reap the benefits of digital transformation. Still, most manufacturing professionals are conservative by nature and some have been reluctant to embrace digital change. After all, they are managing expensive parts, expensive equipment, expensive plants and expensive people — all working in a tightly choreographed dance to produce goods — and a misstep could cause everything to grind to a halt.

But wholesale change isn't necessary. Start slowly and grow it from there. The key is to develop a strategy so as you grow into your digital transformation you realize incremental benefits that, in turn, provide the drive for the next step forward.

About the author



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