

Digital Manufacturing: what it means and how to get there



Manufacturing aerospace products and the process of “being digital” have much in common. Manufacturing is a complex activity with many variables. Likewise, the digital journey is multifaceted and takes many turns. Manufacturing success requires vision, strong leadership and control over a sprawling, multiyear process. It also takes the same qualities to successfully complete a long-term digital transformation.

However, that’s where the similarities end. Manufacturing processes tend to be very well defined and widely understood. But that’s less true in the digital world, where design thinking, agile approaches and other new concepts are not only still evolving, but also require a different perspective and a level of understanding that many companies have not yet achieved.

What it means to be digital depends on whom you ask. For some, digital is about implementing the latest information technologies. For others, it’s about disruptive business models. Still others focus on new ways of serving customers. Each of these perspectives is right, yet incomplete.

This helps explain why so many aerospace manufacturers are struggling with their digital journey. Companies are bursting with digital initiatives, many of them working at cross-purposes. It’s all too common, for example, to see related business units implement incompatible product life-cycle management (PLM) and manufacturing execution system (MES) solutions, creating unsynchronized data that leads to inconsistencies in product development and — inevitably — mistakes and rework. Further, the lack of alignment between projects and differences in the business outcomes they are trying to achieve often lead to underwhelming results that create resistance to future digital initiatives.

Being digital isn’t a tangible thing

Manufacturers are experts at creating tangible things. It’s just that *being digital* isn’t tangible. It’s a change in thinking and a change in the way business outcomes are achieved. Customer needs and preferences change. Technologies make new things possible. Becoming digital means learning how to interpret these changes as opportunities or threats and discerning whether that means developing new businesses in adjacent categories or diving deeper into existing markets to find new value.

Being digital means rethinking how to identify and use new capabilities to improve the customer journey. Superficial changes aren’t enough. Creating value for customers means implementing a cyclical dynamic across the business that helps companies deliver the best experience to their customers.

Being digital means modernizing the enterprise technology stack — retooling individual skills, adding modern tools and technologies, continuous development (agile), automated IT, decoupled and API-wrapped core legacy systems and other IT-specific initiatives. A fully modernized enterprise technology stack allows companies to use data as a weapon to make better, faster decisions. It includes more iterative and rapid ways of working that include cross-functional collaboration, flat hierarchies and an environment that rewards innovation.

There are many paths to becoming digital, but for aerospace manufacturers, four initiatives stand out for their ability to help companies innovate, achieve better business results and unlock growth in existing and new markets.

1.

Federate data to spin a digital thread

Products built by aerospace and defense companies are sophisticated, which means they're often complex. Complexity that results in superior features is fine. In other forms, complexity can be undesirable. Often, products and their constituent parts are tracked in dozens of systems from design to manufacturing to maintenance, resulting in an average of 26 different reference numbers for each part. That's a form of complexity that results in errors and creates unwanted costs.

Tying together the key components of the aerospace manufacturing value chain creates a digital thread: a smooth, integrated flow of information in a company with its suppliers and customers inside and outside the company. Digital threads reduce complexity in the value chain by federating and sharing data across design, manufacturing and service to improve decision making. This enables a business to understand what's happening at any time, from any link in the value chain.

Companies can begin this process by enabling smaller programs with good data management practices, giving business units and suppliers access to datasets they've never had access to before. When that information is merged with previous datasets, a company can begin to realize new insights that lead to better decision support.

2.

Smart products require a smart factory

With demand at an all-time high, manufacturers are looking for ways to improve throughput and eliminate delays to reduce a backlog of orders — not just to satisfy customers, but also to realize all the profitability a contract offers and to avoid potential penalties for late deliveries.

A smart factory improves quality and throughput by connecting parts of the factory to help them function more cohesively. Each stage of smart factory implementation delivers greater value (through product quality and throughput) and data-driven decision-making capabilities to the aerospace manufacturing operation. Digitally connected processes (digitalization) and decision making, powered by advanced technologies such as internet of things (IoT) in manufacturing, artificial intelligence (AI), analytics, agile methods and a collaborative partner ecosystem are key components of smart manufacturing. Together, this new environment leads to major improvements in manufacturing output, better quality and improved on-time delivery.

From a manufacturing standpoint, successfully implementing a smart factory will increase output by taking the assets a company has today and making them more productive. Doing this can also better integrate new, intelligent assets, which helps fulfill growing demand and lets the company respond quickly to unique customer needs of the future.

Implementing a smart factory takes a strong commitment and a change in attitude. Aerospace manufacturers must start with maturity models that identify where they are today and where they want to go. That vision must include where their customers are and how the vision will provide additional guidance for the overall plan. One approach is to perform an assessment that includes data calls, interviews with key employees, and reviews of current processes and systems.

Last, companies must invest in reskilling employees to ensure they are prepared to use new methods (agile) and to maximize the productivity a new smart factory will offer. This new agile approach will be supported by change management and transformation tools that will help the company on its journey as well as setting new expanded expectations.

3.

Digital twins accelerate innovation

Aerospace companies are constantly challenged to improve component design. Building prototypes is a time-consuming, expensive and difficult process; imagine the cost of testing an airplane engine. At the same time, aerospace companies are also challenged to reduce production costs and product defects.

A digital twin replicates a physical asset with a digital substitute, enabling engineers to create virtual scenarios that are otherwise expensive to perform in a physical environment. This includes, for example, testing, visualizing and creating models during the design phase before manufacturing a physical prototype to see how it works or fails, which leads to faster improvements. Managers are given a better understanding of the manufacturing process and are thereby better equipped to plan production and predict what will happen.

Deploying digital twins gives a company unprecedented insight into its manufacturing designs and processes and helps shorten throughput and time to market. It helps improve product quality, reduce waste and solve predictive maintenance challenges. Information gleaned from digital twins can also contribute to better communication with customers.

Developing a digital twin begins by having enough high-performance computing (HPC) capacity in place. HPC is essential to digital twin efforts, but costly. Companies can avoid large capital outlays by choosing flexible on-premises solutions (as a service) with cloud bursting to accommodate spikes in HPC demand. These alternatives will become the norm as digital twin requirements continue to grow.

4.

Deliver a digital workplace experience

Aerospace companies must compete with the likes of Amazon, Google and Microsoft for top talent. Winning the war for top recruits means giving employees what they want and need to be productive and happy. Today's workers demand a high-quality, consumer-like experience and the ability to work the way they want, where they want. The digital workplace is about giving employees the tools and choices they need for greater flexibility and control.

A digital workplace covers the employment life cycle from recruitment and onboarding to reskilling and retirement. Having the right technology tools for all employees and the role (or roles) they perform is key to creating an engaging digital workplace. The goal is to have employees who are productive, happy, staying on board and working well with clients.

A digital workplace spans areas from office cubicles and conference rooms to the manufacturing floor, from engineering staff who design products to specialists who support those products once they are sold. It uses AI to bring new levels of satisfaction to enterprises striving to retain employees. A digital workplace also introduces new experiences that include augmented and virtual reality and other wearable technologies to raise productivity to new levels and help workers avoid risks, reduce travel and leverage the expertise of senior employees more effectively

Being digital is doable

Success in the aerospace industry depends on being digital, but its achievement goes well beyond implementing technology alone. Being digital means challenging well-worn business models and taking new, yet well-informed, risks. It involves developing a deeper understanding of customers than most companies have today. It means searching the value chain for new ways to improve, simplify and innovate. It includes creating the right mix of people and processes to go along with advanced technology and creating a happy, productive work environment for your employees.

Ultimately though, success means delivering value to customers that your competitors can't match. And today, you can't do that until you have become digital.

Learn more at www.dxc.technology/aerospace_defense

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