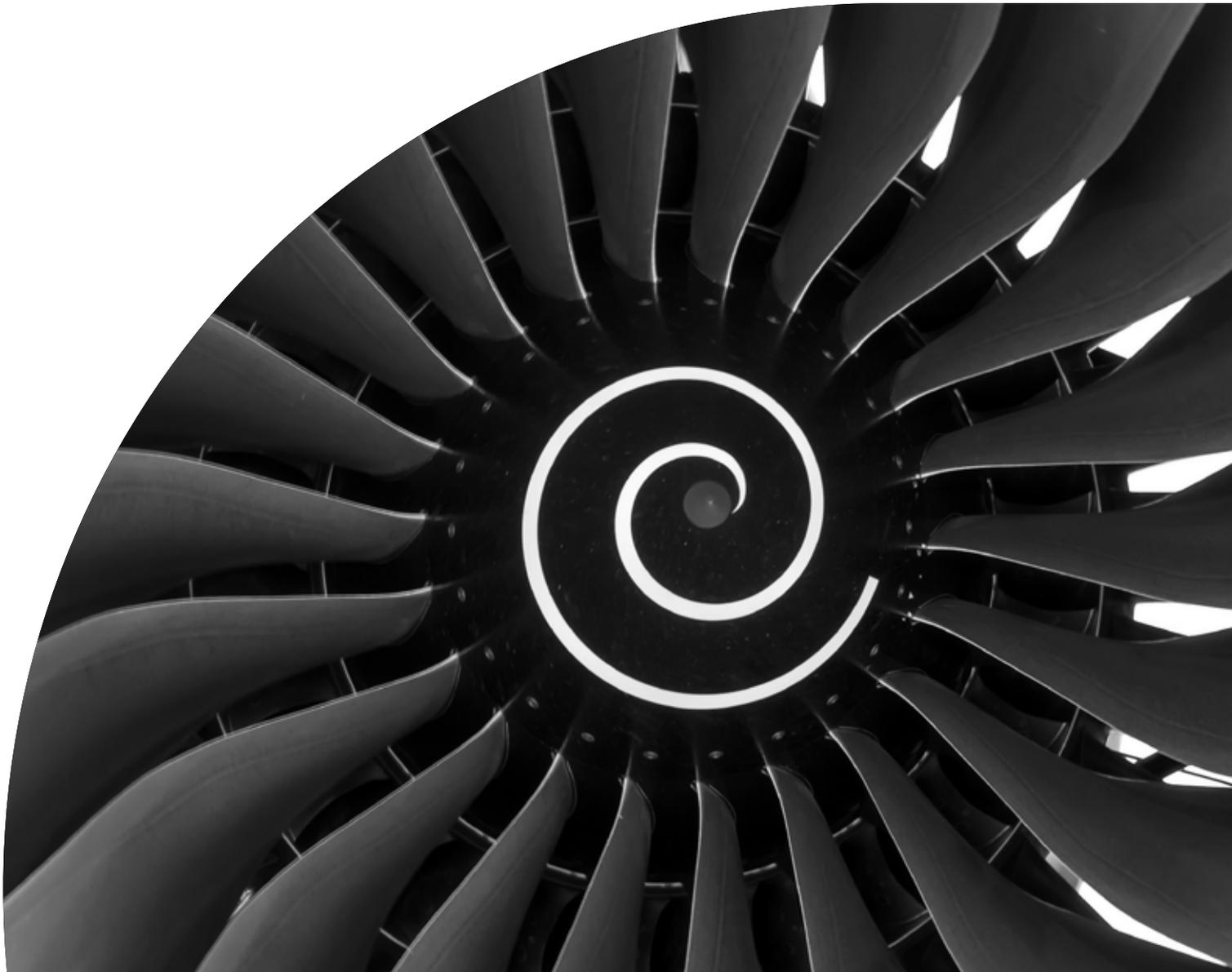


How digital transformation can accelerate the product life cycle

New trends for 2020 highlight A&D challenges and opportunities



Over the past decade, aerospace and defense (A&D) companies successfully navigated defense budget cuts, cyberattacks and rapidly changing technologies, but now — at the outset of the 2020s — they face a new set of challenges and opportunities. Customers are demanding innovative products that are always connected, and A&D companies need to counter rapidly evolving cybersecurity threats and physical threats around the world.

New, more nimble competitors have emerged, such as SpaceX and Blue Origin, looking to build on their successes in adjacent industries. A&D companies must now create new value for customers through products and data-driven services in ways that are agile, fast and scalable.

For years, A&D companies have invested in continuous improvement initiatives and point solutions to help them cut costs, increase throughput and improve product quality. Those gains, substantial as they have been, are no longer enough. To ensure profitability, A&D manufacturers need to satisfy customer demands as well as rethink processes. In the 2020s, A&D manufacturers need to transform business models by adapting reusable digital services as building blocks for business processes, assembling high-performance teams, and strongly focusing on data applied throughout the product life cycle to optimize delivery, cost and quality.

Three keys to digital transformation

Three key elements of the digital transformation journey are coming together in a unique way that will help A&D manufacturers achieve substantial gains in both product and process. These elements, when combined, will help organizations realize new levels of flexibility and speed in product design, manufacture and maintenance.

1. Data. The *value of enterprise data* continues to grow as technology helps companies find new ways to ingest, tag, combine and use data to make quicker and better decisions. The rapid growth of sensors and data capture devices in manufacturing and products being used in the field is creating incredible data flows that can likewise be used to create new value in terms of predictive maintenance, product design, production and supply chain management.

A recent article, “*2020 trends signal next-gen productivity*”, underscores this fact: “Businesses are capitalizing on the data they have and merging it with other data for more value. CEOs must determine how to build a business model around a data ecosystem, and business leaders must obtain consent from individuals to have their data shared.”

2. Teams. Data is the essential raw material, but its real value is unlocked by using multidisciplinary, high-performing teams to analyze it. Cross-functional teams skilled in software engineering tasks, cloud, data analysis and DevOps automation are critical to understanding the outcomes a business must achieve. These teams also analyze the broad questions that need to be addressed and the datasets needed to create new insights.

In this environment, enterprises will test multifunctional teams during 2-week sprints, define user stories and really begin to understand how to tune that agile process. We'll see organizations spring to life — because once they start working as multifunctional interconnected teams, they'll never go back. The work will be distributed more evenly among teams instead of the bulk of it going to one high performer. And there's an added bonus: People in teams learn from each other, which creates a multiplier effect that allows employees to advance more quickly.

3. Data-driven platforms. New approaches to the product life cycle require volumes of data and simulations that vastly exceed the computing capacity available from on-premises computing resources nearing the end of life. High-performance computing (HPC) is essential to integrating and managing data at volume.

Analytics platforms consume large amounts of data to generate insights. Moving data adds complexity, time and expense to the process. Using an on-premises, edge or cloud (AWS, Azure or Google) solution for integrated data ingestion minimizes the need to move data. This is a critical feature. A key component of this approach is tagging the data to make continuous data analysis and integration possible without physically moving the data. The platform must also include the orchestration and workflow management needed to accelerate the data-tagging process.

Digital thread in the product life cycle

Transformational value is created when these three important elements are combined.

Data, multiskilled teams and HPC represent the key components that A&D manufacturers need to construct highly valuable “digital threads.” Digital threads tie together, simplify and streamline the key design, manufacture and service domains. This environment also integrates important components such as product life-cycle management, supply chain management, enterprise resource planning and customer relationship management.

Creating digital threads gives A&D companies the kind of end-to-end integrated view across the business they've never had before. For example, enterprises can now see and understand the flow of a single part throughout the manufacturing life cycle. This new visibility will help A&D companies recognize tremendous cost savings, reduce rework and errors, improve security and manage compliance and regulatory issues with greater efficiency.

Digital threads also address many of the underlying issues that A&D companies are anxious to solve. Digital threads accelerate product life-cycle management (PLM) modernization and transformation by eliminating the need to create and recreate parts at different stages. They can help companies be smart about using smart factory roadmaps and implementations. Where supply chain digitization is weak and lacks data sharing, implementing digital threads will help achieve tighter linkages. In addition, the rich context that digital threads create can be used to improve insights derived from key performance indicators.

Better data creates richer digital twin simulations

That's just the first level of benefits. Making digital threads happen requires A&D manufacturers to share data across organizational boundaries within the company, with partners, suppliers and customers. The integration of this previously siloed data has the potential to create even greater value. More data sharing creates the opportunity to build richer digital twin simulations that can be used to further reduce costs and enable increased product agility and quicker product launches.

A "digital twin" is the digital representation of an actual product or physical asset, such as an autonomous vehicle, an engine or even an entire manufacturing assembly line. Digital twins are used to replicate the physical world and the key components of its value chain. This allows manufacturers to find flaws early and design higher-quality products that can be manufactured and sustained faster and more cost-effectively.

For example, in the development of autonomous vehicles, the actual test car in real-world conditions may collect 10,000 hours of data. By comparison, the digital twin of a self-driving car can generate millions of comparable "road hours" of data. When digital twins are used in simulations, this new approach will allow manufacturers to create and test robust models by integrating digital components not necessarily present in their base model. They can also add important components that improve the customer experience.

Digital twins are also extremely useful for conducting destructive tests that can't be carried out on actual assets such as jet engines or weapon systems. Using simulation based on historical, predicted and live data, digital twins enable A&D companies to be more agile in creating solutions that meet the needs of different customers without much of the expense associated with creating customized products.

Where to start

But let's be clear. Developing a data strategy, transitioning to high-performance teams and implementing data-driven, HPC platforms are long-term investments, but they are not "infinity projects." There are specific steps companies can and should take to make measurable progress toward these goals.

The scope of data that must be addressed is usually the largest stumbling block. Because it seems like a "boil the ocean" project, many companies fail to prioritize the first and most important step: defining a data strategy. A few key points can help companies move toward a data strategy that sets the stage for the rest of the agenda.

Make an affirmative decision to manage your data. Companies that form a holistic point of view in adopting an enterprise-grade data strategy are well-positioned to optimize their technology investments and lower their costs.

Establish executive sponsorship and governance. Sustaining a successful data strategy requires alignment with corporate objectives and enforced adherence. As corporate objectives evolve, so should the data strategy — keeping up with not only how the business is operating, but also with how supporting technologies and related innovations are maturing.

Examine human resources practices to create more agile processes and a team focus. Groups create, execute and review their goals and tasks frequently to adapt quickly to new information as it comes in. As more work is organized this way, management and talent systems will need to focus less on tracking individual performance and place more emphasis on team performance. Specific investments in personnel will also be required, ranging from augmenting executive and IT staff with roles such as chief data officer and chief data strategist to expanding the responsibilities of traditional enterprise data architects.

The best way to get started is by implementing good data management practices in smaller programs. Demonstrate the value that data management can deliver at a small scale and what it could potentially deliver at the enterprise level. Applying an agile methodology, which continually demonstrates short bursts of success, will help build momentum — like a snowball rolling down a hill — and organizational acceptance.

Once underway, you can then begin to iterate based on a program of continuous improvement. Constant evaluation, iteration and action describe the strategy behind the investments that companies will need to make in data, teams and platforms to realize the breakthrough benefits of digital threads and digital twins.

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