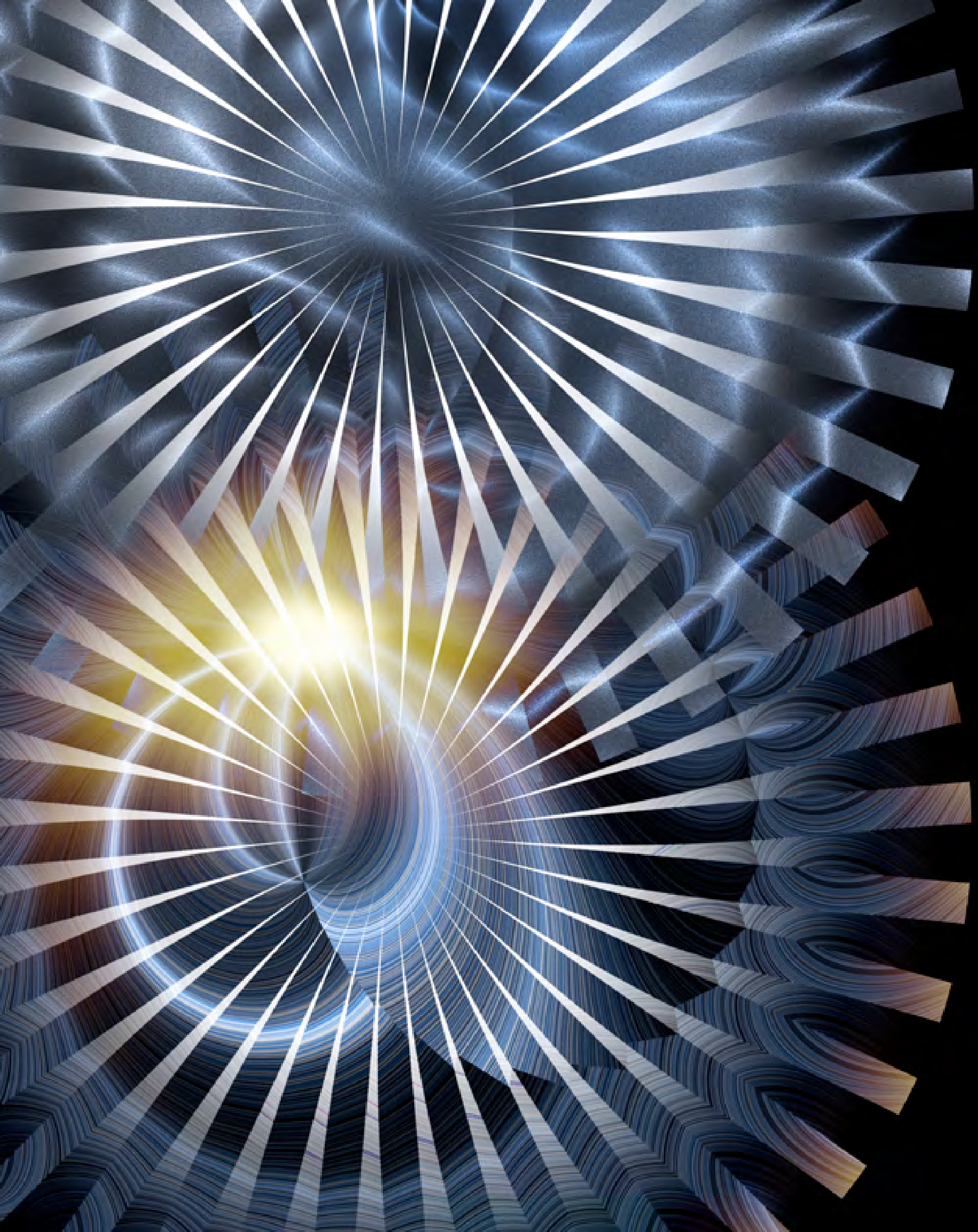

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Realizing augmented engineering

The role of AI and digital continuity in aerospace and defense transformation

Make it real.

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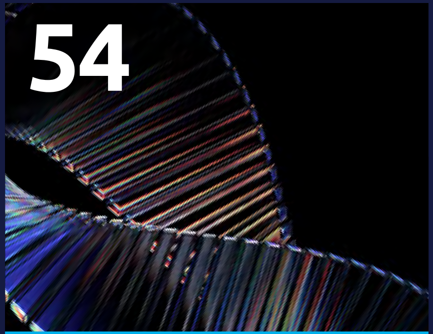


Who should read this report and why?

This report is intended for C-suite and senior leaders at aerospace and defense (A&D) organizations, including OEMs, suppliers, and MRO providers. It offers practical insights to help leaders move from fragmented digital continuity and AI initiatives to an integrated, scalable augmented engineering operating model. Given the convergence of AI and lifecycle data across engineering workflows, the report is particularly relevant to CEOs, CTOs, CIOs, CDOs, and Chief AI Officers/Heads of AI, as well as leaders driving engineering, data, and transformation agendas.

It is equally valuable for AI, data, and digital leaders seeking to scale AI beyond pilots and embed it into core engineering workflows, as well as for engineering and digital engineering leaders responsible for lifecycle integration, digital thread, and system-level performance. In addition, program leaders and functional heads across engineering, manufacturing, and operations will find it useful in understanding how AI-enabled workflows and connected systems can improve time-to-market, quality, compliance, and lifecycle outcomes.

This report is based on original findings from a global survey of 200 A&D organizations, with two respondents from each organization representing digital continuity and AI-enabled engineering functions, conducted in April–May 2026. Respondents span multiple geographies and industry segments, including OEMs, suppliers, operators, and MRO providers. The research is complemented by interviews with 10 industry experts, offering additional insights on AI adoption, engineering transformation, governance, and workforce readiness.

Executive summary

Augmented engineering is emerging as a key competitive focus for AI-driven transformation

A&D engineering is entering a new competitive era. Geopolitical uncertainty, supply-chain fragility, cybersecurity risks, talent shortages, and increasingly software-defined products are placing unprecedented pressure on engineering organizations. The readiness gap is significant: 81% of organizations cite talent and skill shortages as a major threat, yet only 46% feel well prepared to address it. The consequences are strategic as well as operational, with 65% of organizations concerned about losing future program positions, workshare, or access to top engineering talent if they fail to adapt quickly.

In response, augmented engineering is emerging as a new source of competitive advantage. Organizations increasingly recognize that engineering transformation depends on two mutually reinforcing capabilities: digital continuity and AI-enabled engineering. Digital continuity provides the trusted lifecycle context needed to connect requirements, design, manufacturing, certification, suppliers, and sustainment, while AI helps convert connected data into faster and better engineering decisions. Together, they form the foundation of a more integrated engineering system.

The convergence of these capabilities is also reshaping engineering work. Engineers are spending less time on routine activities and more time defining intent, validating AI-generated outputs, managing trade-offs, and exercising accountable decision-making. Productivity gains are increasingly being redirected toward R&D, advanced engineering, and innovation, positioning AI as a growth and competitiveness lever rather than solely a cost-reduction tool.

46%

Percentage of organizations that are well prepared to address talent and skills shortages.

Executive summary

Digital continuity remains the foundational bottleneck to scaling AI-enabled engineering

Despite its importance, digital continuity remains the industry's most significant structural constraint. Only 6% of organizations have achieved end-to-end digital continuity supported by a connected enterprise-wide architecture and a single source of truth.

Most organizations continue to operate with fragmented lifecycle architectures, limited interoperability, and weak traceability across functions and suppliers. Closed-loop engineering remains immature, with manufacturing and in-service data often failing to flow back into engineering processes. Supplier ecosystems also remain heavily document-driven, limiting visibility, configuration control, and lifecycle learning.

These shortcomings explain why many organizations can demonstrate digital and AI successes within individual functions yet struggle to scale them across programs, platforms, and partner networks. As organizations strengthen these foundations, digital continuity is increasingly becoming a prerequisite for scaling AI beyond isolated deployments.

AI adoption is accelerating, but enterprise-scale transformation remains early

AI adoption is gaining momentum across A&D, but large-scale transformation remains at an early stage. While organizations are increasingly deploying AI across engineering activities, only 17% report workflow orchestration or end-to-end integration.

AI scales fastest in contained workflows where data is structured, outcomes are measurable, and validation is straightforward, such as predictive maintenance, simulation interpretation, production planning, and fault diagnosis. More complex use cases requiring cross-functional coordination, supplier integration, lifecycle traceability, or system-level impact analysis remain harder to industrialize.

Executive summary

Organizations are also navigating a growing tension between maintaining sovereignty over data, models, and intellectual property and relying on external ecosystems to access AI capabilities at scale. At the same time, human-AI operating models remain immature. Organizations estimate that 68% of the engineering workforce will require reskilling or upskilling to succeed in an AI-enabled environment. As AI becomes embedded in engineering workflows, stronger governance, clearer decision rights, auditability, and oversight mechanisms will be essential to scaling AI with trust, accountability, and regulatory confidence.

Most organizations have yet to achieve maturity across digital continuity and AI-enabled engineering

Our analysis shows that only 10% of organizations qualify as augmented leaders, demonstrating advanced capabilities across both digital continuity and AI-enabled engineering. The remainder follow less mature pathways. Some have established strong digital foundations but have yet to scale AI, while others are experimenting with AI without the connectivity and governance needed to industrialize it. Nearly half remain immature across both dimensions.

The findings highlight that leadership is not determined by AI adoption alone. Augmented leaders distinguish themselves by embedding AI into connected engineering systems and operating models. By combining strong digital continuity with scalable AI capabilities, they achieve stronger outcomes in areas such as compliance, time-to-market, cost performance, workforce effectiveness, and supply-chain resilience.

Executive summary

Seven actions can help A&D organizations operationalize augmented engineering at scale:

1 **Build the engineering foundation:** Transform digital continuity into an authoritative engineering knowledge backbone that connects requirements, design, manufacturing, certification, suppliers, and sustainment.

2 **Redesign engineering around human-AI teams:** Reconfigure processes, decision rights, and operating models so engineers and AI systems work together effectively and responsibly.

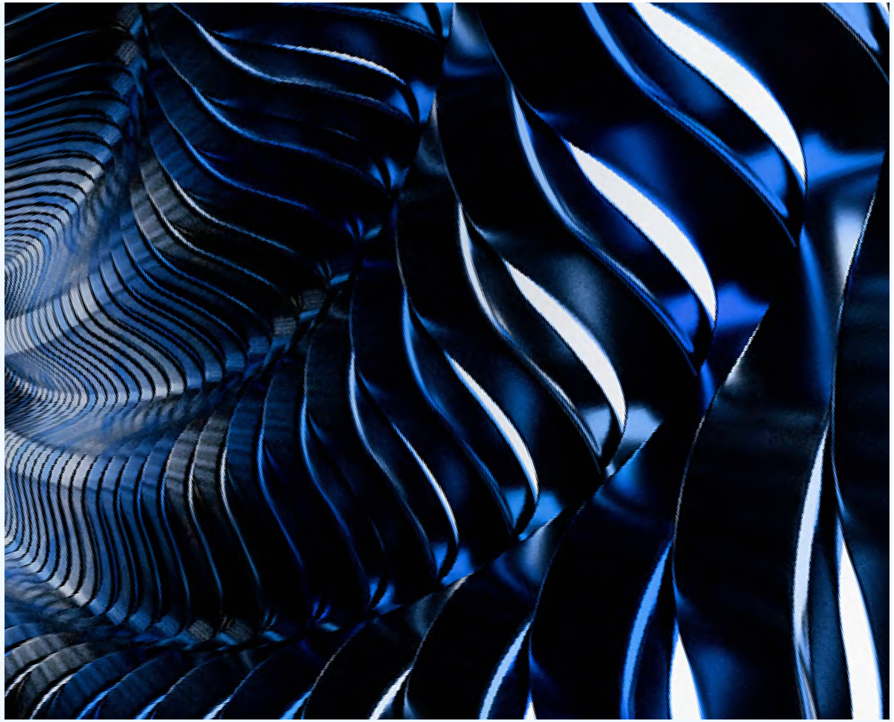
3 **Build closed-loop learning from design to sustainment:** Feed manufacturing, operational, maintenance, and in-service insights back into engineering to improve products and accelerate lifecycle learning.

4 **Industrialize AI in decision-grade workflows:** Focus AI on repeatable engineering activities where outcomes are measurable, explainable, and scalable across programs.

5 **Create an engineering decision intelligence layer:** Orchestrate decisions, dependencies, risks, and bottlenecks across functions and suppliers through real-time visibility and AI-enabled coordination.

6 **Build the AI and compute foundation for engineering at scale:** Establish the infrastructure, platforms, governance, and sovereignty-aligned architectures needed to deploy AI securely and efficiently across the enterprise.

7 **Embed safety, quality, certification, sovereignty, and trust into engineering by design:** Ensure AI-enabled engineering systems are explainable, traceable, auditable, secure, and aligned with regulatory, airworthiness, IP, and export-control requirements.



"The organizations leading the next era of engineering are not simply digitizing existing processes—they are redesigning how engineering work is orchestrated. Digital continuity provides the foundation, AI accelerates decision-making, and human expertise remains the critical differentiator. Together, these capabilities create an engineering system that learns, adapts, and scales far beyond traditional productivity gains."

Frédéric Combes,

EVP, Global Aerospace & Defense Leader, Capgemini

Augmented digital engineering

Augmented digital engineering (or augmented engineering) is the convergence of digital continuity and AI to create connected, intelligent, and adaptive engineering environments. It extends beyond digitizing engineering activities by ensuring that data, models, requirements, decisions, and operational insights remain connected across the product lifecycle. AI enhances how engineers analyze information, generate solutions, validate designs, and make decisions.

As digital continuity matures, organizations are extending the digital thread toward digital twins and semantic data models that provide richer context for simulation, validation, and optimization. These capabilities strengthen the basis for scalable AI-enabled engineering by enabling organizations to test scenarios, evaluate alternatives, and continuously improve outcomes using both virtual and real-world data.

At its core, augmented engineering combines a persistent digital thread with AI-powered capabilities to improve speed, quality, traceability, and collaboration. Digital continuity enables seamless information flow across functions, tools, and lifecycle stages, while AI transforms engineering data into actionable insights, automates routine tasks, accelerates knowledge reuse, and supports informed decisions. Together, they enable organizations to move from fragmented, reactive engineering processes to a more connected, data-driven, and continuously learning engineering ecosystem capable of delivering greater innovation, resilience, and operational performance.

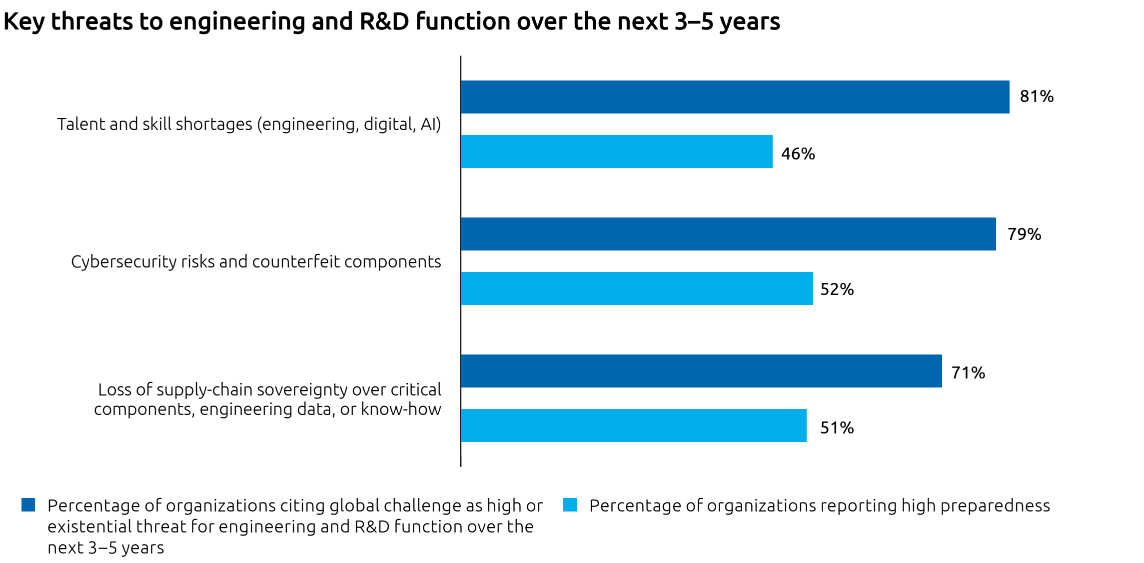
01 Augmented engineering is becoming central to A&D competitiveness

Rising risk outpaces readiness, making innovation non-negotiable

A&D engineering risk is rising faster than response capability. The most critical pressures are structural: 81% of organizations cite talent and skill shortages across engineering, digital, and AI as a significant threat, yet only 46% say they are well prepared to address these talent gaps. Cybersecurity risks and counterfeit components are nearly as pervasive, identified by 79% of organizations, but just 52% report strong readiness to address these threats.

Bernd Schmidt, Global Head of PM at Rheinmetall, says, *"Over the past two years, cybersecurity requirements have doubled. We now face around 800 cyberattacks a day—it's remarkable how much additional work this creates."* Supply-chain sovereignty concerns, spanning critical components, engineering data, and know-how, are flagged by 71%, preparedness to manage these dependencies remains limited at 51%. This highlights the widening gap between threat exposure and response readiness in a more contested environment.

Figure 1.
Organizations face significant engineering threats, but preparedness lags



Source: Capgemini Research Institute, Augmented engineering survey, April – May 2026, N = 200 organizations.

The consequences are no longer confined to operational disruption but are becoming strategic. A substantial 65% of organizations risk losing future program positions, workshare, and access to top engineering talent to faster-moving or non-traditional players if they fail to deliver an innovative response at speed.

Evan Digney, Head of Enterprise Data and AI Platforms at Etihad Airways, adds, *"Innovation is critical to staying competitive, but the challenge now is the sheer number of disruptors. There are so many players doing good work that knowing who to follow and where to invest becomes a problem in itself."*

The findings suggest that innovation is increasingly being treated not only as a growth lever, but also as a response to rising competitive and operational pressures. Nearly eight in ten (78%) organizations identify digital-enabled innovation and value creation as critical to engineering and R&D over the next 6–12 months, signaling a clear mandate for augmented engineering to close capability gaps, strengthen resilience, and protect long-term competitiveness.

"Over the past two years, cybersecurity requirements have doubled. We now face around 800 cyberattacks a day—it's remarkable how much additional work this creates."

Bernd Schmidt,

Global Head of PM, Rheinmetall

"Innovation is critical to staying competitive, but the challenge now is the sheer number of disruptors. There are so many players doing good work that knowing who to follow and where to invest becomes a problem in itself."

Evan Digney,

Head of Enterprise Data and AI Platforms, Etihad Airways

Engineering transformation is anchored in digital continuity and accelerating AI ambition

Digital continuity is emerging as a foundational capability connecting data, processes, and stakeholders across the lifecycle to support speed, coordination, and compliance. Increasingly, this continuity is evolving from a data-exchange layer into a semantic, model-based foundation that enables richer digital twin capabilities for simulation, validation, and lifecycle decision-making.

The Head of Operations at an Asian A&D organization explains, *"Digital continuity is impacting 70–80% of organizations across manufacturing, HR, finance, and other functions, with real-time data and dashboards enabling more effective decision-making."* A strong majority (73%) say digital continuity supports production ramp-up; 68% link it to business transformation; and 60% believe it will strengthen and accelerate certification and regulatory approval processes. In regulated A&D environments, this means digital continuity must support not only engineering collaboration, but also certification-ready evidence flows across design, production, quality, and sustainment activities.

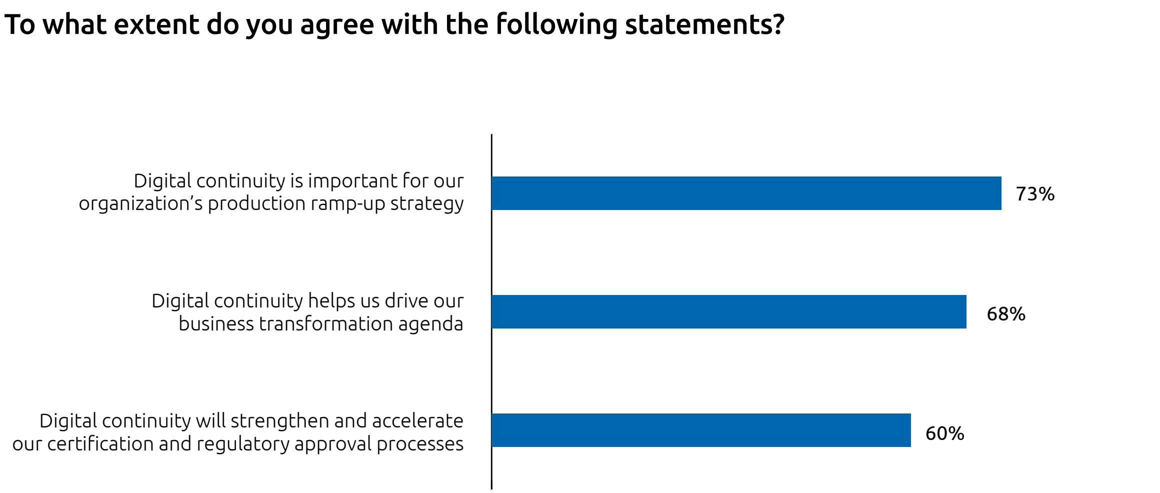
For example, Airbus is working toward end-to-end digitalization, where information across aircraft design, production, and maintenance is integrated and managed through unified digital platforms. This effort is supported by a unified digital architecture built on secure platforms such as Dassault Systèmes' 3DEXPERIENCE and SAP.[1] In April 2025, Bombardier said it was expanding its use of the Siemens' Xcelerator portfolio to digitally transform aircraft engineering from concept through production. The announcement said Bombardier is using Teamcenter as the digital backbone to connect mechanical and electrical design in a product lifecycle management (PLM)-based collaborative environment and to help shorten program cycles.[2]

Organizations are breaking down siloed engineering systems and connecting the lifecycle end-to-end. This makes digital continuity critical for scaling operations and improving resilience.

73%

Percentage of organizations that say digital continuity is important for their production ramp-up.

Figure 2.
Digital continuity supports production scale-up, business transformation, and regulatory readiness



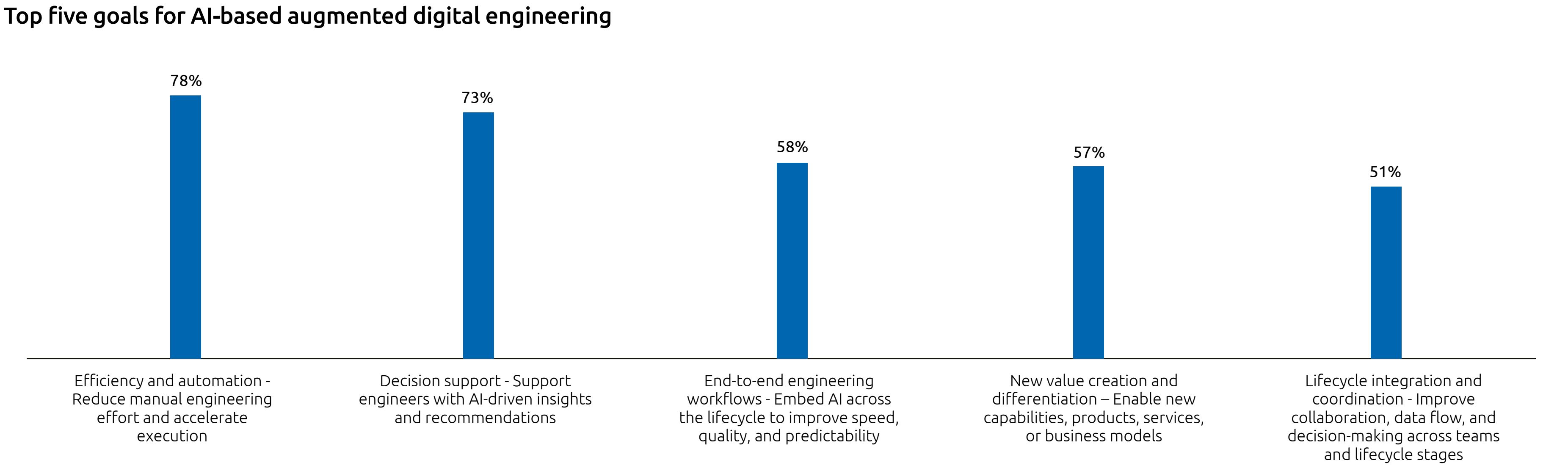
Source: Capgemini Research Institute, Augmented engineering survey, April–May 2026, N = 200 digital continuity experts.

As new AI models have been built and become much more capable and widely available, it is evolving beyond its initial role as a productivity tool to become a broader engine of engineering transformation. While 78% of organizations prioritize efficiency and automation, and 73% focus on AI-driven decision support, organizations are already expanding their ambition: 58% are targeting end-to-end engineering workflows, 57% are focusing on new value creation and differentiation, and 51% are working toward lifecycle integration and coordination.

While efficiency and automation remain important, organizations are increasingly positioning AI as a driver of growth and differentiation, with many reinvesting productivity gains into R&D, advanced engineering, and new product development.

In March 2025, Lockheed Martin said it would integrate Google's generative AI (Gen AI) into its AI Factory ecosystem to train, deploy, and sustain high-performance AI models for national security and aerospace applications. Lockheed said the platform is designed to provide traceability, reliability, and monitoring, and that AI capabilities would be applied to areas including predictive aerospace maintenance, optimized engineering design, supply chains, secure software development, and workforce training.[3] This progression marks a shift from point solutions to embedded, lifecycle-wide transformation, where AI is increasingly integrated into how engineering decisions are made, executed, and optimized.

Figure 3.
AI adoption is expanding from productivity gains to end-to-end engineering transformation



Source: Capgemini Research Institute, Augmented engineering survey, April – May 2026, N = 200 AI experts.

To scale AI successfully, organizations must operate the technology effectively across engineering workflows. Digital continuity enables this transition, with 59% of organizations saying it significantly or critically strengthens accuracy, quality and reliability of AI outputs. This is followed by increasing trust and adoption rates among engineers (42%), reflecting the importance of traceability and explainability. At the same time, 40% say digital continuity reduces the effort required to deploy AI in production workflows, helping overcome the 'last mile' challenge of embedding AI into toolchains and day-to-day operations.

In February 2026, GE Aerospace announced a multi-year investment of up to $300 million to expand engine-repair capabilities in Singapore, built around advanced automation, digitalization, and AI-enabled inspection technologies. The organization said the program includes predictive maintenance, automated digital inspection, and an AI Center of Excellence using a data fabric ecosystem[4] to improve turnaround time, service predictability, and operational efficiency.[5] Together, these outcomes highlight a defining characteristic of augmented engineering: it is not driven by AI capability alone, but by the combination of trusted data, human adoption, and workflow integration. Digital continuity is the backbone that allows AI to scale reliably across the engineering lifecycle.

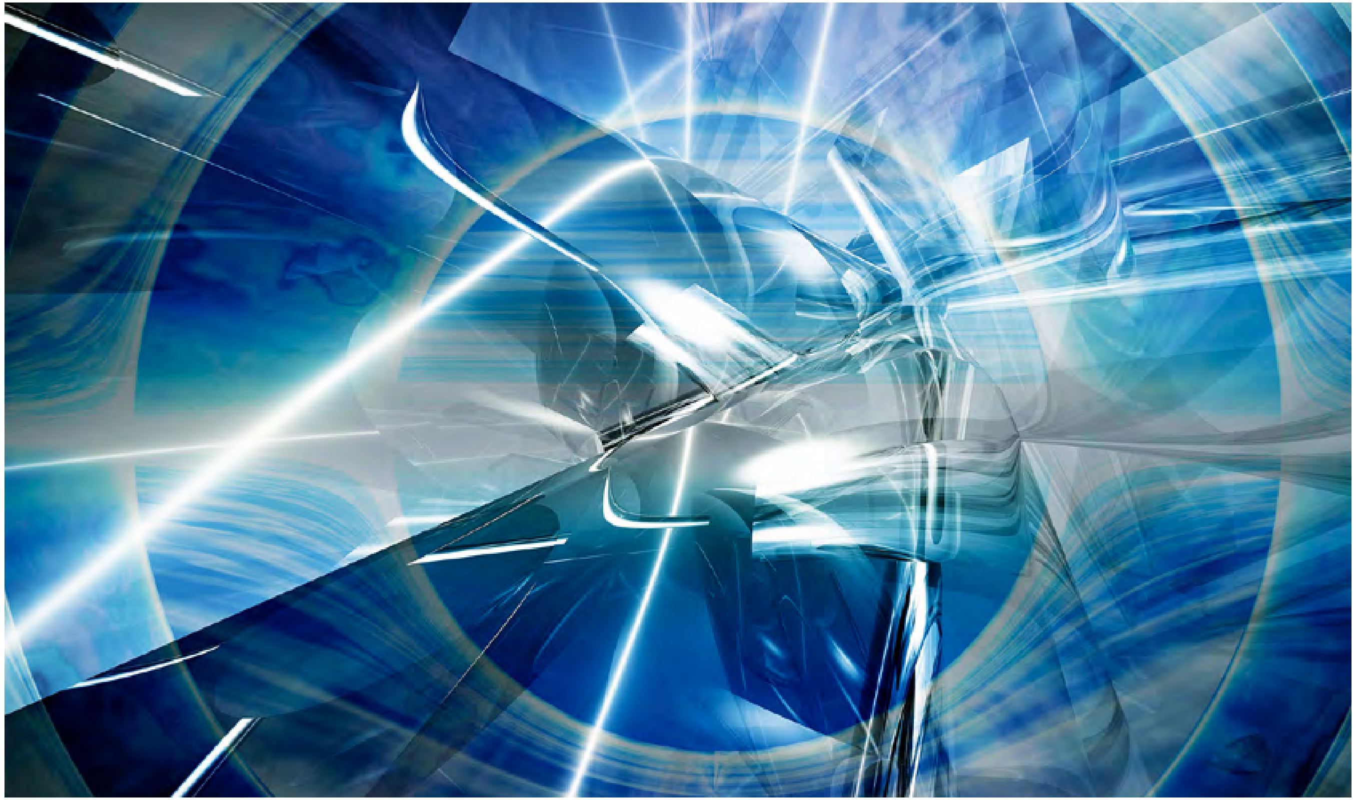
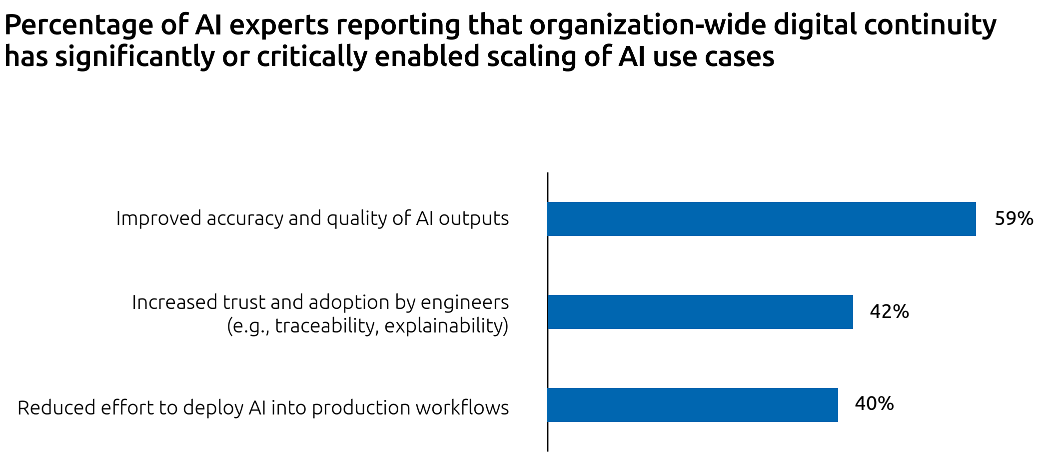


Figure 4.
Digital continuity is the backbone for scaling trusted, production-ready AI

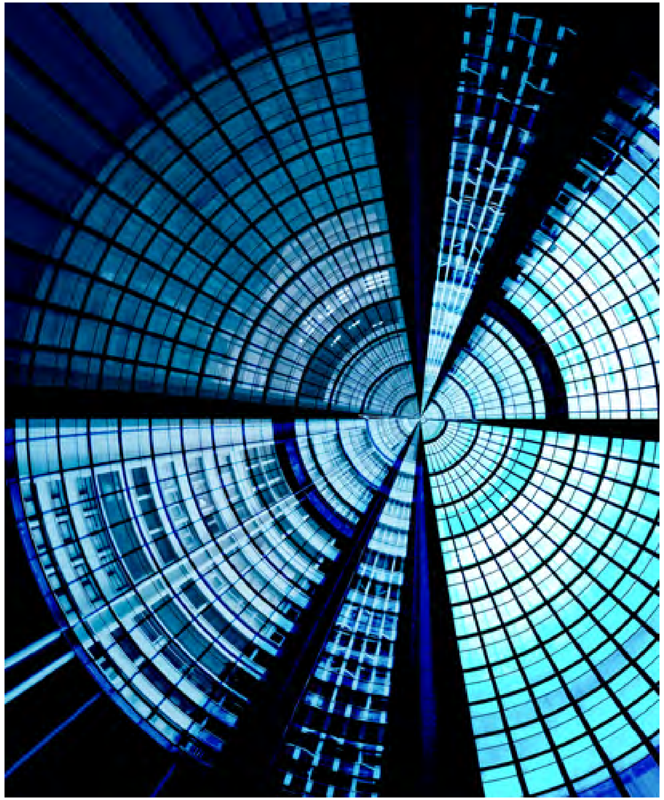


Source: Capgemini Research Institute, Augmented engineering survey, April–May 2026, N = 200 AI experts.

Engineering transformation is shifting in a fundamental way. Digital continuity and AI deliver their full value only when they work together as one system, connecting data, workflows, and decision-making across the lifecycle.

This is giving rise to augmented engineering. In this model, AI helps run and optimize engineering workflows, while digital continuity ensures the underlying data is reliable, traceable, and compliant. The two reinforce each other. Digital continuity gives AI the context it needs to scale effectively, and AI helps improve and automate engineering decisions and processes.

As a result, transformation is no longer about isolated improvements. It is about building an integrated, AI-enabled engineering environment where data flows seamlessly, decisions are supported in real time, and workflows are continuously improved. This shift is becoming a key source of competitive advantage.



Augmented engineering is redefining work, value creation, and skill requirements

As AI-enabled engineering and digital continuity scale, the role of engineers is expected to shift from executing tasks to orchestrating, validating, and governing AI-driven work. Most organizations anticipate that engineers will spend more time on defining requirements and inputs for AI systems (65%), reviewing and validating AI-generated outputs (63%), and making system-level design and trade-off decisions (61%), indicating a move toward higher-value, decision-centric responsibilities. At the same time, engineers are expected to spend significantly less time on routine and repetitive tasks (70%), as these are increasingly automated.

However, this is not a reduction but a redistribution of effort. Engineers will remain central to activities such as cross-functional collaboration and standardized workflows, though these will increasingly be executed through shared data environments, connected tools, and AI-supported processes. Together, these shifts define the emerging augmented engineering model.

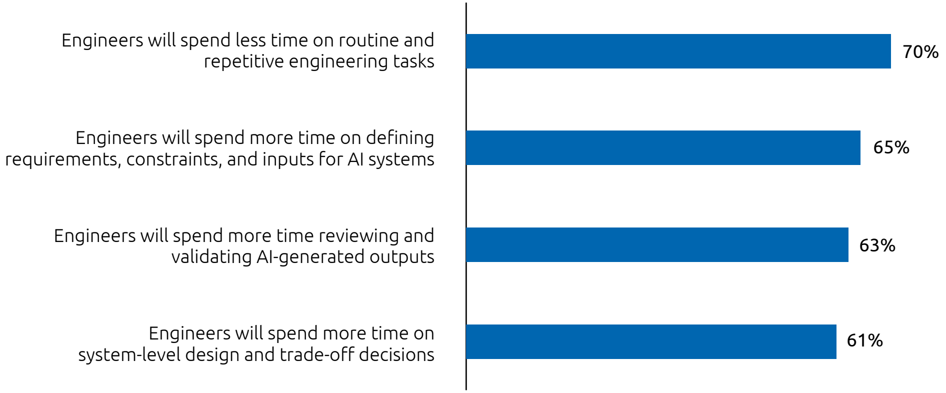
Jayant Mukherjee, Director, Digital Transformation, APAC at Pratt & Whitney, says, *"Increasingly, AI will take on repetitive design configurations, simulations, data analysis, technical documentation, and aspects of verification work – reducing manual effort – while engineers focus more on scenario creation, test planning, validation readiness, and complex design decisions."*

70%

Percentage of organizations that report engineers will spend less time on routine and repetitive tasks through AI automation.

Figure 5.
Day-to-day engineering work will move from task execution to orchestration, validation, and decision-making

How would AI-enabled engineering and digital continuity at scale affect your engineers' day-to-day work?



Source: Capgemini Research Institute, Augmented engineering survey, April – May 2026, N = 200 AI experts.

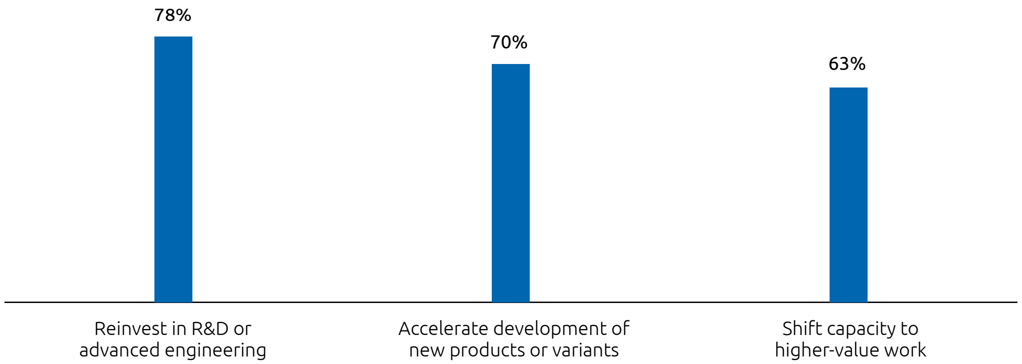
Rather than primarily translating productivity gains into cost reduction, organizations are increasingly using AI to expand engineering value. Most reinvest this capacity into R&D or advanced engineering (78%), accelerate development of new products or variants (70%), and shift effort toward higher-value work (63%). This growth orientation is highly visible in China, where 84% of organizations that track AI impact say they use AI-driven gains to accelerate the development of new products or variants, compared with 70% globally.

At the same time, 57% explicitly target new value creation and differentiation, reinforcing that AI is becoming a strategic growth lever rather than just an efficiency tool.

This pattern reinforces that augmentation expands the scope and impact of engineering, rather than reducing its importance. The additional capacity created through adoption of AI increases innovation throughput, shortening development cycles and shifting focus onto more strategic and differentiated work, rather than simply improving efficiency. In practice, this marks a transition toward viewing productivity gains as a core lever for scaling engineering value and business growth.

Figure 6.
Organizations are using AI-driven efficiency to scale innovation

How does your organization primarily use productivity gains or cost savings from AI in engineering? Top 3 selected responses



Source: Capgemini Research Institute, Augmented engineering survey, April – May 2026, N = 174 A&D organizations that actively track engineering metrics to assess the impact of AI in engineering.

Only 47% of organizations explicitly prioritize direct engineering cost reduction, underscoring that efficiency is no longer the primary objective of AI adoption. Rather, 66% view AI as a means to address engineering talent constraints, highlighting its role in augmenting workforce capacity and closing skill gaps. Together, these trends reinforce that AI is less a cost-cutting tool and more a strategic enabler to scale engineering output, overcome talent shortages, and accelerate innovation at a time of increasing demand for engineering capabilities.

But to sustain this shift toward value creation, organizations will need to close a major capability gap. Forrester said in March 2026 that many organizations are deploying AI without adequately upskilling employees. It also noted that the portion of employees with an adequate understanding of prompt engineering rose only from 22% in 2024 to 26% in 2025, reinforcing the workforce readiness issue.[6]

The chart indicates that the skills judged most important for succeeding in an AI-enabled augmented engineering environment are those where current levels of expertise are lowest. AI governance and compliance awareness shows the largest capability gap (68 percentage points), followed by AI tools (61pp) and digital thread literacy (55pp). These discrepancies suggest that scaling augmented engineering is being constrained less by access to tools and more by the ability to use them safely, traceably, and within controlled engineering workflows.

Overall, organizations prioritize augmentation to expand engineering capacity and innovation, but realizing this value will depend on accelerating upskilling in orchestration, lifecycle traceability, and governance-by-design, not just coding or tool adoption.

66%

Percentage of organizations that view AI as a means to address engineering talent constraints.

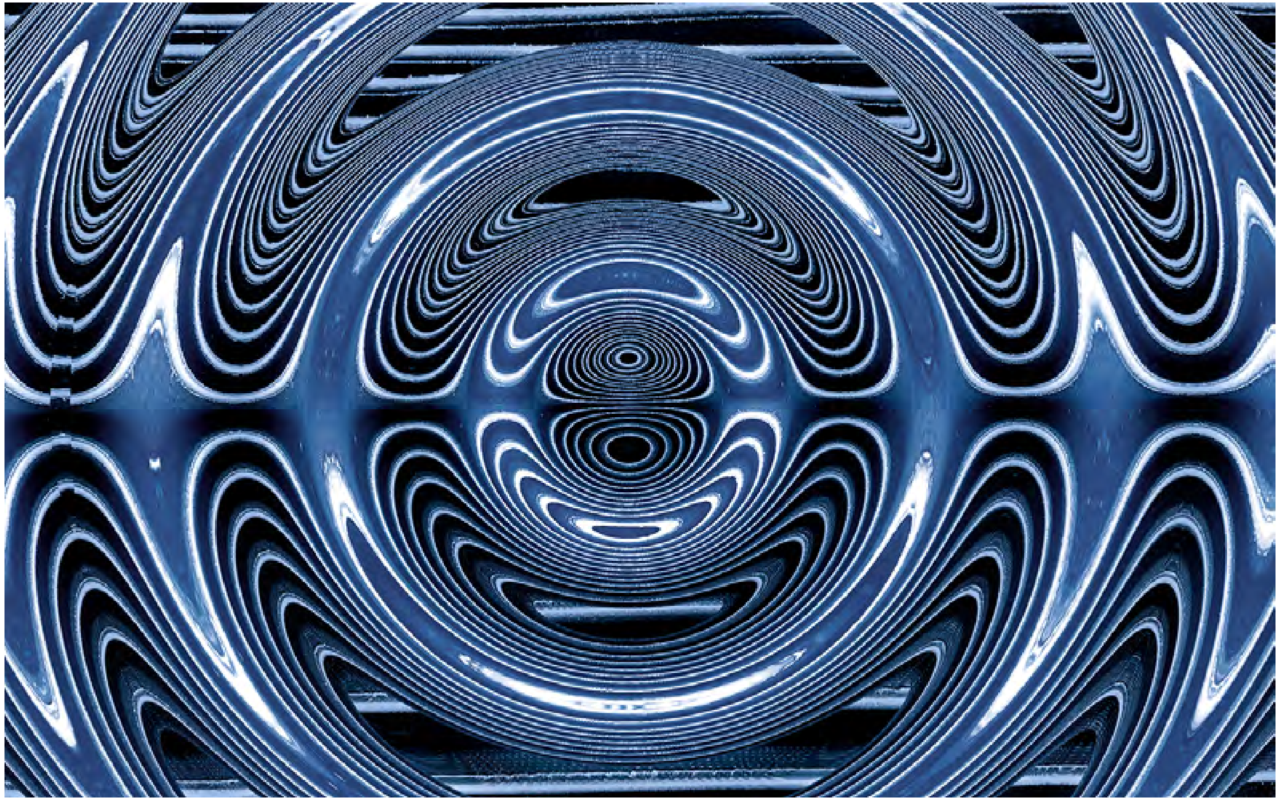
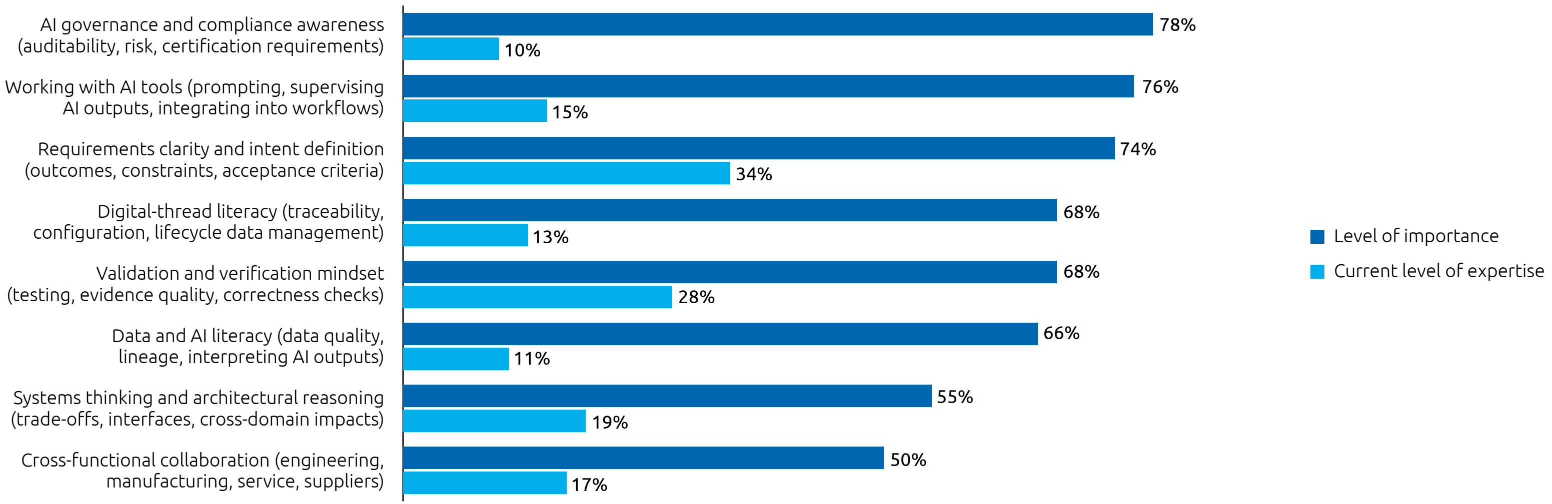


Figure 7.
Scaling augmented engineering is constrained more by skill gaps than by access to AI tools

Skills for engineers to succeed in an AI-enabled augmented engineering environment



Source: Capgemini Research Institute, Augmented engineering survey, April – May 2026, N = 200 AI experts.

Human-AI operating models are essential, but maturity lags

The future engineering workforce will require new human-AI operating models – not simply new tools – because scaling AI across the lifecycle forces organizations to formalize who decides, who validates, and who is accountable. Among AI experts, the biggest signal is that decision-rights and governance are still maturing.

For core practices such as defined decision rights and ownership and clear escalation paths for decisions and exceptions, only about one in five organizations has implemented them consistently (21% and 20%, respectively), while the largest share remains in progress (35% and 38%). This indicates that many organizations are scaling AI use cases faster than they are scaling the operational 'rules of the road' needed to run AI-enabled engineering safely and repeatably. For A&D organizations, these governance models must also define who owns regulatory interfaces, who approves certification-relevant evidence, and who remains accountable when AI supports or recommends safety-critical engineering decisions.

Armel Djeukou, senior aerospace transformation and growth advisor, summarizes: *"AI shouldn't make decisions on our behalf. Decisions should remain with the human. It requires building a culture where people would trust the AI proposals because it is explainable, traceable and reliable. Trust in AI takes time to build, especially in a safety critical sector like aerospace."*

21%

Percentage of organizations that have consistently implemented decision rights and ownership for AI governance.

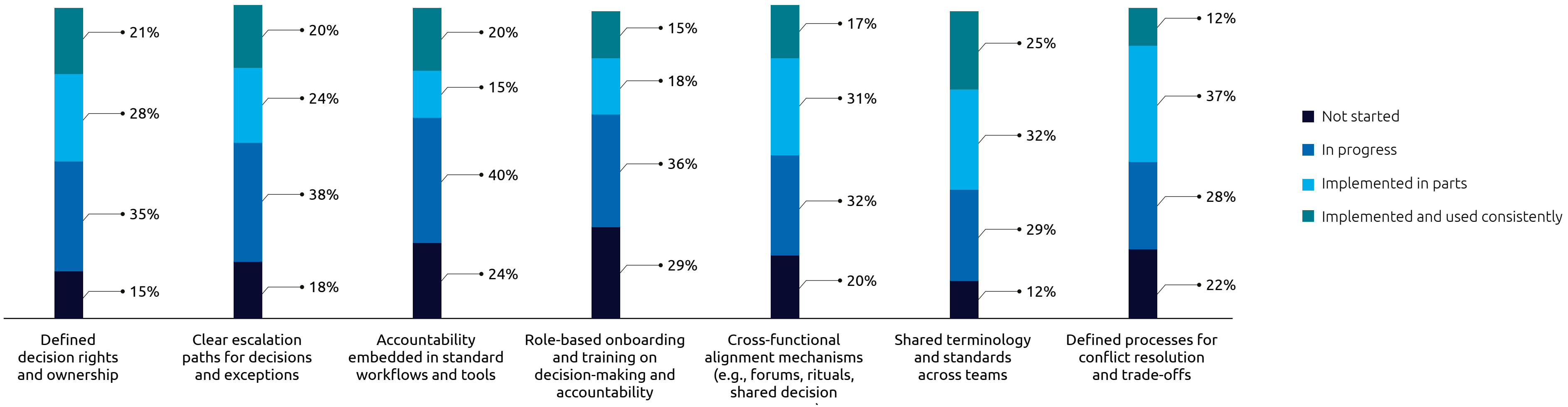
"AI shouldn't make decisions on our behalf. Decisions should remain with the human. It requires building a culture where people would trust the AI proposals because it is explainable, traceable and reliable. Trust in AI takes time to build, especially in a safety critical sector like aerospace."

Armel Djeukou,

Senior aerospace transformation and growth advisor

Figure 8.
Human-AI operating models remain immature, with most organizations still developing governance and decision structures

Which of the following practices has your organization implemented to ensure clear engineering decision rights, accountability, and governance?



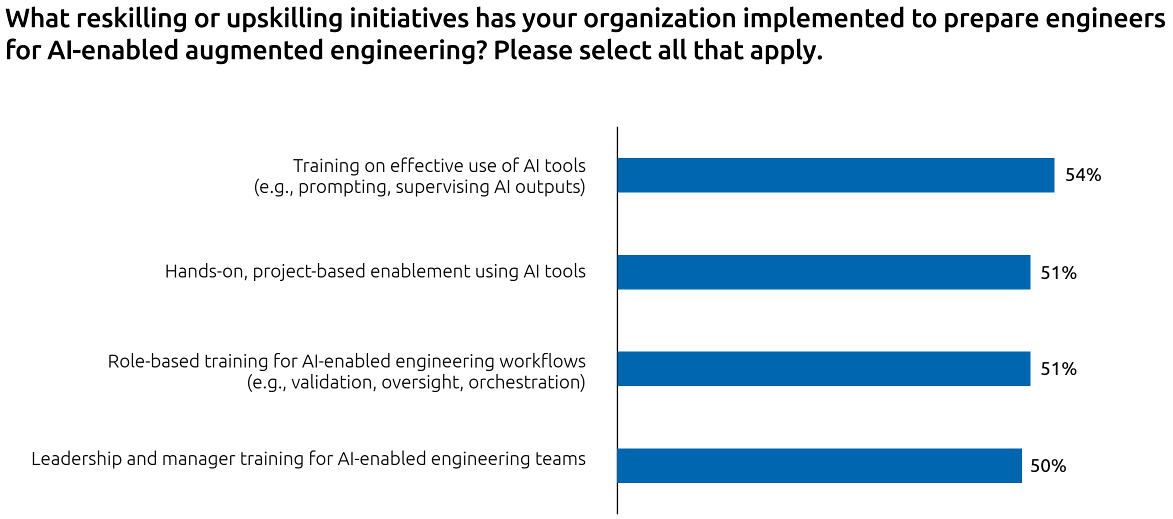
Source: Capgemini Research Institute, Augmented engineering survey, April – May 2026, N = 200 A&D organizations.

Organizations do recognize that inadequate workforce readiness constrains operating-model redesign. On average, around 68% of the engineering workforce will require reskilling or upskilling to succeed in an AI-enabled augmented engineering environment, highlighting the scale of transformation required.

In response, organizations are prioritizing foundational and applied enablement, with structured AI and data training (55%), training on effective use of AI tools such as prompting and supervising outputs (54%), and role-based training for AI-enabled workflows such as validation and oversight (51%) emerging as the most common initiatives. China shows this pressure clearly: 90% of respondents cite engineering, digital, and AI talent shortages as a significant threat, while only 25% say they are well prepared. At the same time, 85% report training engineers on effective use of AI tools and 70% provide role-based training for AI-enabled workflows, suggesting a strong push to close the readiness gap.

Figure 9.

Organizations are focusing on foundational and role-based AI training



Source: Capgemini Research Institute, Augmented engineering survey, April–May 2026, N = 200 A&D organizations.

Finally, organizations are beginning to codify the human versus AI division of work. However, approaches remain fragmented and risk-driven, rather than fully systematized. The most common parameter for deciding whether work is automated or human-led is risk, safety, and regulatory considerations (60%), followed by business objectives (45%), and explicit workflow design (40%), emphasizing that human-AI task allocation is increasingly **performance and outcome-driven.** At the same time, 15% of organizations report that these decisions are still not formally defined, highlighting that human-AI interaction is often governed by implicit or ad hoc practices.

Taken together, these findings underscore that the future engineering workforce will not be defined solely by new skills, but by the ability to operate within structured, governed, and adaptive human-AI systems. Organizations that succeed will move beyond tool deployment to establish governed, scalable, and repeatable human-AI collaboration frameworks across the engineering lifecycle.

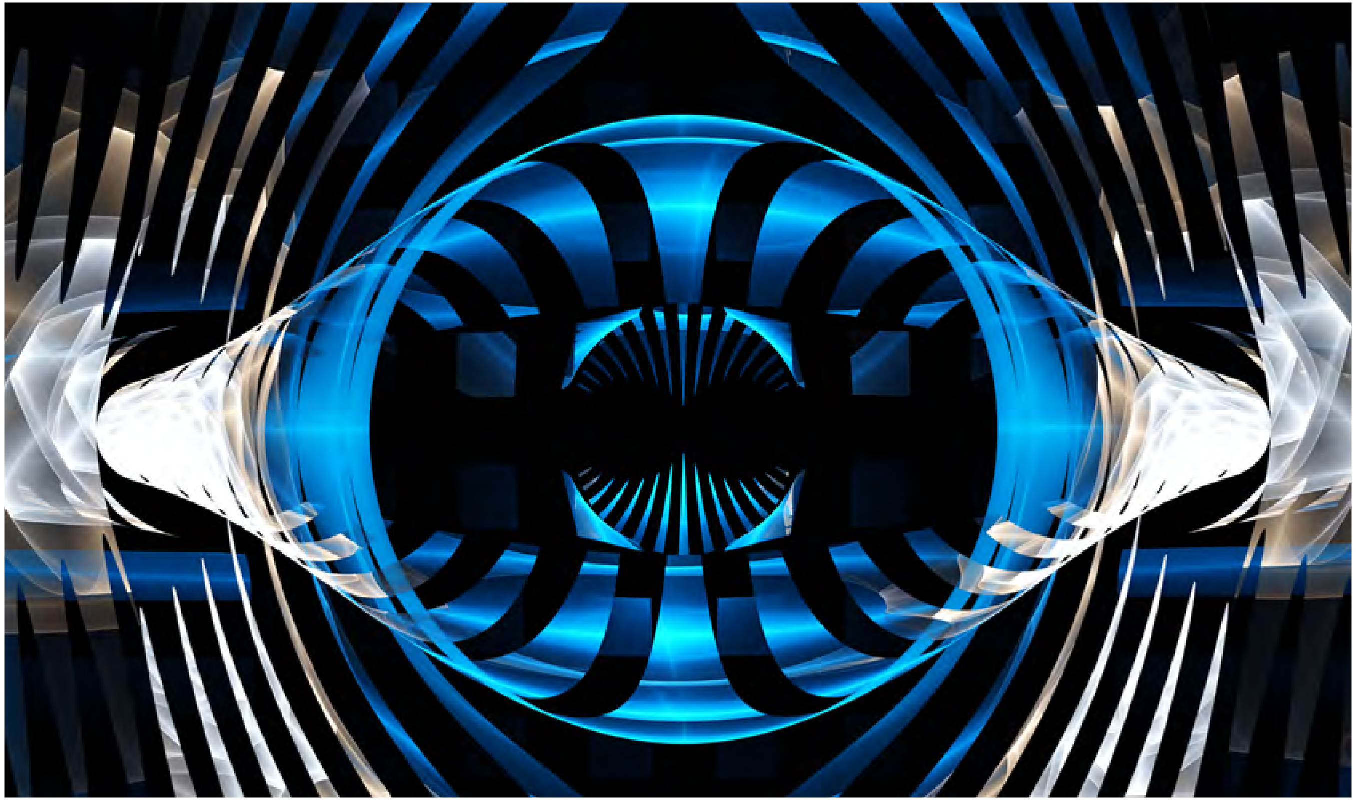
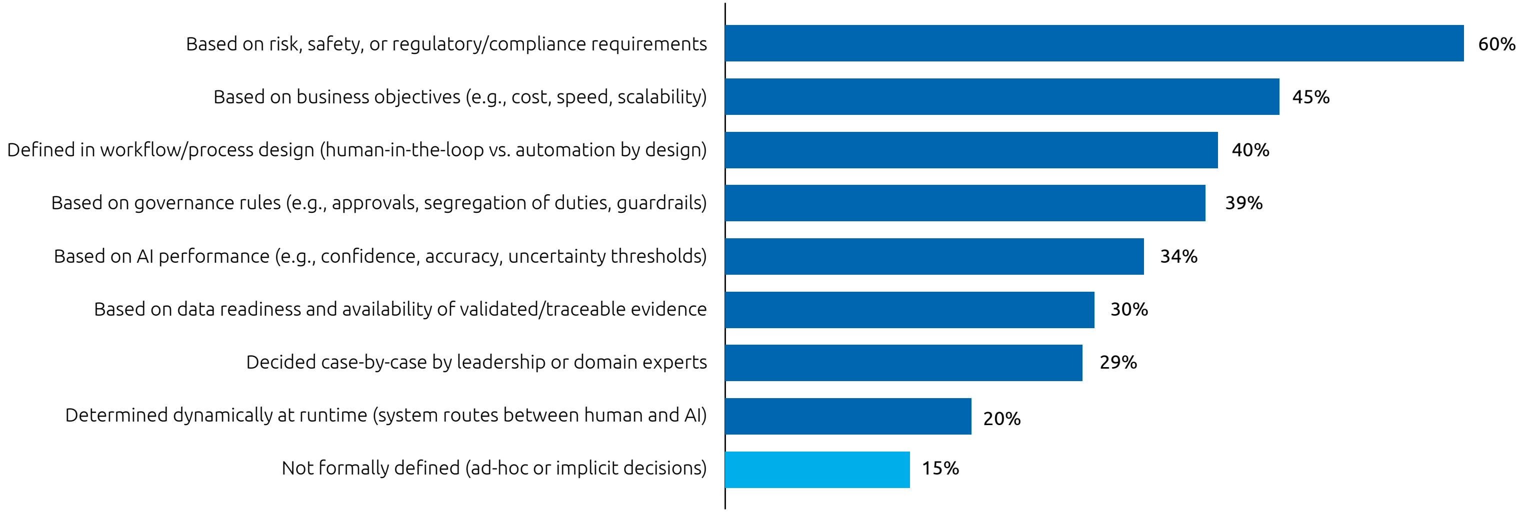


Figure 10.
The division of work between humans and AI is becoming more explicit, but many organizations still govern it through risk-based and ad hoc decisions

In augmented engineering processes, how does your organization decide whether an activity is performed by a human or is automated (RPA, AI, agents)? Please select all that apply.



Source: Capgemini Research Institute, Augmented engineering survey, April – May 2026, N = 200 A&D organizations.

“Increasingly, AI will take on repetitive design configurations, simulations, data analysis, technical documentation, and aspects of verification work – reducing manual effort – while engineers focus more on scenario creation, test planning, validation readiness, and complex design decisions.”

Jayant Mukherjee,

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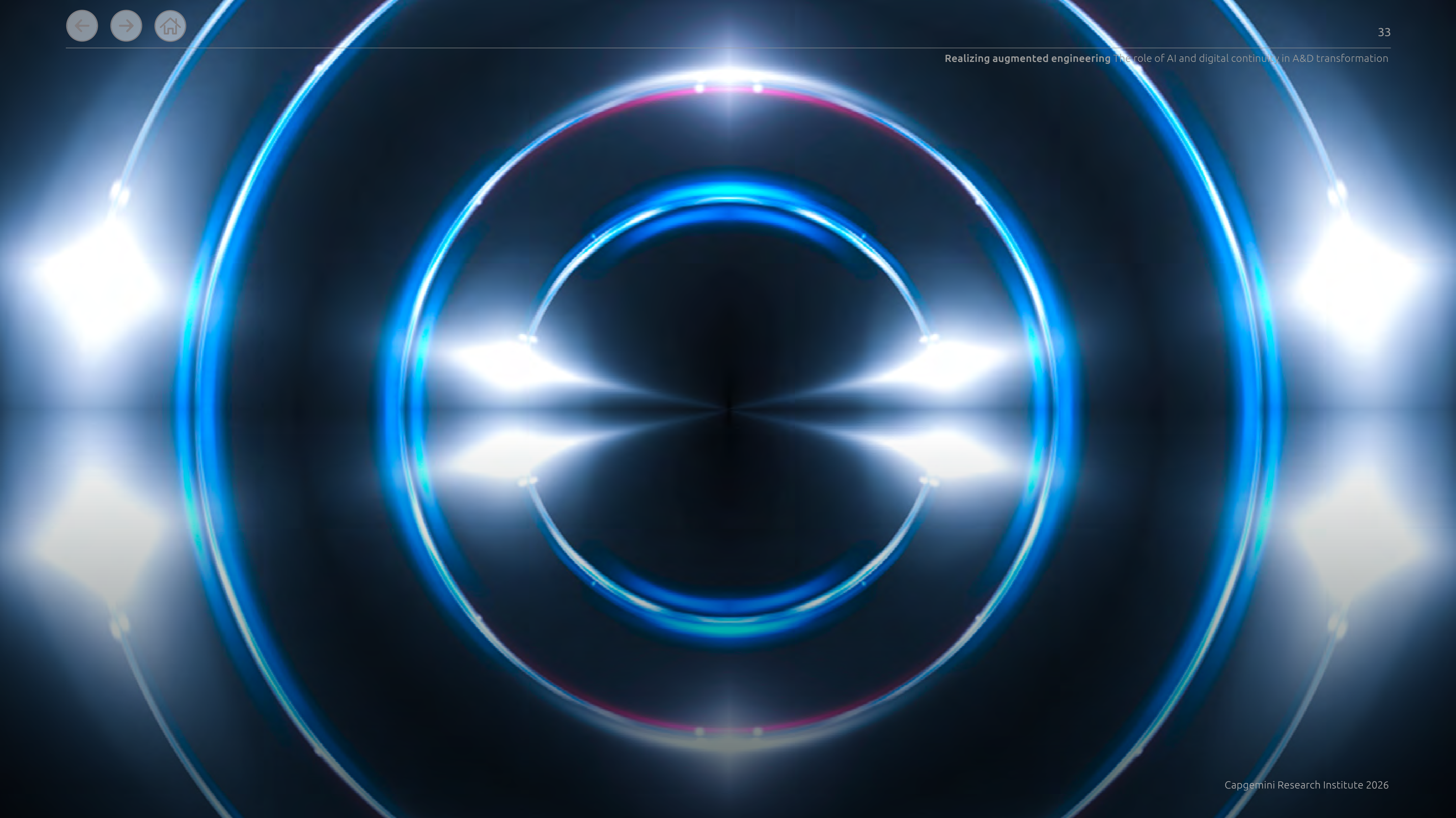


02 Digital continuity remains the foundational bottleneck to scaling AI-enabled engineering

Data foundations for AI-enabled engineering are still maturing

Scaling AI-enabled engineering requires digital foundations that can support AI-ready data, enable agentic architectures, and unlock value from legacy systems. Yet many A&D organizations are still working through data-quality, interoperability, and governance challenges that limit enterprise-wide scale. AI and digital continuity programs depend on consistent, accessible, and interoperable lifecycle data, but many organizations continue to operate with fragmented legacy systems, inconsistent standards, and limited enterprise-wide data governance. As a result, while organizations are often able to demonstrate AI capabilities in isolated use cases, they struggle to operationalize them across programs and functions.

A Chief Technology & Innovation Officer at a defense contractor from Southern Europe says, *"You cannot implement digital continuity without strong data governance. The data must be collected, moved, prepared, controlled, and aligned across tools, otherwise AI will only accelerate fragmented processes."*

Our research shows that data-readiness and quality-management initiatives are gaining traction, with many organizations already piloting or scaling efforts around cleansing, validation, and standardization of engineering data. But core structural challenges remain unaddressed. Organizations need to move from generic data-quality initiatives to lifecycle-specific governance, with explicit standards for accuracy, completeness, consistency, lineage, traceability, version control, and change history across critical engineering data domains. Nearly 40% of organizations say migration and remediation of legacy data for digital thread readiness is still a work in progress.

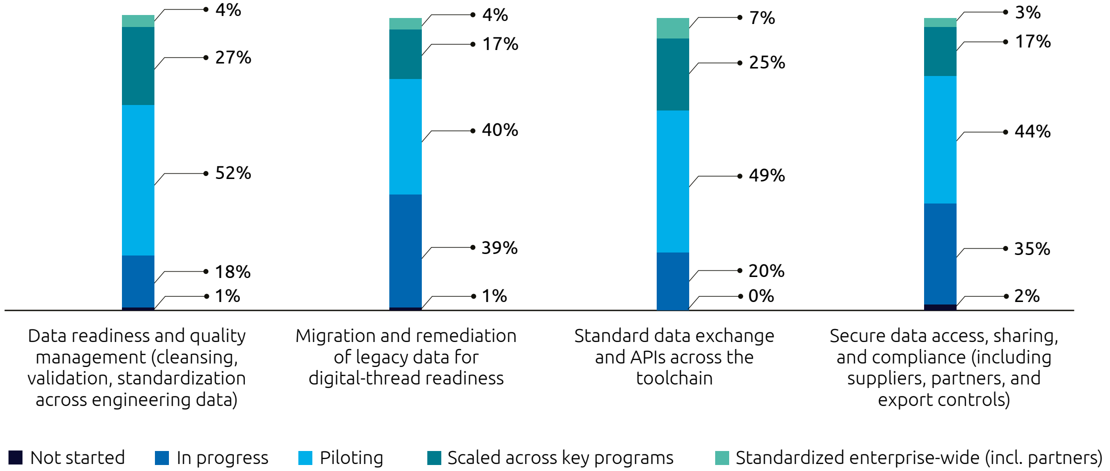
The maturity gap becomes even starker in enterprise-wide data exchange and collaboration capabilities. Only 7% report having standardized data exchange and API frameworks across the toolchain at organizational level, while secure data access and sharing practices remain immature across much of the industry. Data from China reinforces this tension: while 15% report enterprise-wide standard data exchange and API frameworks, none report end-to-end digital continuity or enterprise-wide data-readiness standardization. This suggests that pockets of digital integration and AI deployment can emerge before the full lifecycle data foundation is in place, creating isolated progress rather than enterprise-wide continuity.

These limitations create barriers not only to internal collaboration, but also for supplier integration, AI deployment, and lifecycle traceability.

Figure 11.

Most A&D organizations are still building the necessary data foundations

Which of the following data practices are in place to support AI-enabled and digitally connected engineering in your organization?



Source: Capgemini Research Institute, Augmented engineering survey, April–May 2026, N = 200 A&D organizations.

However, the challenge extends beyond data availability to how engineering knowledge is structured and understood across the lifecycle. In many organizations, data exists as disconnected artifacts – CAD models, simulation outputs, test results, and maintenance records – without a consistent semantic layer that defines relationships, dependencies, and meaning across stages.

For AI to operate effectively in engineering environments, data must not only be accessible but also contextualized. This necessitates linking requirements to design decisions, design to manufacturing outcomes, and operational performance back to engineering assumptions. In A&D, this also includes physics-based traceability, where engineering data is grounded in validated models, material behavior, and system constraints, ensuring that AI outputs remain explainable, auditable, and aligned with real-world performance.

Most A&D organizations still operate with fragmented lifecycle architectures

As a result, most A&D organizations remain far from achieving a seamless digital thread across the product lifecycle. Engineering, manufacturing, and service systems have often evolved independently, creating fragmented platforms, repositories, and point integrations that make lifecycle data difficult to use at scale.

Our research suggests that only around 6% of organizations have achieved true end-to-end digital continuity with a connected enterprise-wide architecture and a single source of truth. However, a single source of truth should not be interpreted as one centralized repository for all engineering data. In A&D, digital continuity depends on clearly defined authoritative sources for each lifecycle domain, such as requirements, system models, design definitions, configurations, test evidence, manufacturing records, supplier data, certification evidence, and in-service feedback, connected through governed traceability. The next stage of maturity is not simply a more connected digital thread, but a semantic engineering data model that enables digital twins to represent relationships, dependencies, constraints, and behaviors across the lifecycle.

Most remain stuck in the middle: 35% describe their environments as only partially connected, while another 30% say systems are connected only within certain functions.

Pratt & Whitney's Mukherjee highlights, *"The digital thread exists in pockets – across engineering, supply chain, and ERP (enterprise resource planning)– but integrating these into a unified enterprise view remains a significant challenge."*

This fragmentation is not a recent gap. It reflects decades of independent investment across engineering, manufacturing, and service domains. As systems evolved in silos, so did data models, ownership structures, and processes, creating deep structural barriers to integration.

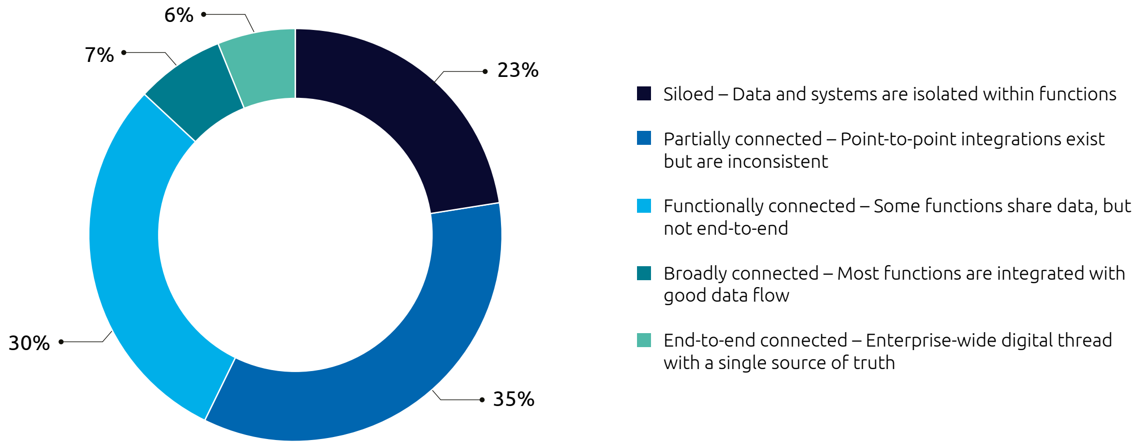
6%

Percentage of organizations that reported having true end-to-end digital continuity with a connected enterprise-wide architecture and a single source of truth.

Despite progress in digital engineering and model-based systems, most A&D manufacturers still operate with fragmented enterprise systems and manual, paper-based processes, with limited integration across ERP, PLM, manufacturing execution systems, and supplier networks. As programs become more software-defined and lifecycle complexity increases, these disconnected environments are becoming harder to sustain.

Figure 12.
Less than one in ten organizations have an end-to-end connected digital thread

How would you describe the current state of digital continuity across your organization?



Source: Capgemini Research Institute, Augmented engineering survey, April–May 2026, N = 200 Digital Continuity experts.

The operational impact is becoming increasingly visible. Fragmented lifecycle data, cited by 85% of organizations, is now the most common barrier to scaling digital continuity initiatives. In parallel, nearly three-quarters struggle with poor interoperability between engineering, manufacturing, and service systems, limiting visibility and slowing collaboration. This lack of lifecycle traceability has a direct consequence: it limits the ability to create closed-loop engineering, where insights from manufacturing, testing, certification, sustainment, and in-service performance continuously inform design and development decisions.

35%

Percentage of organizations that report having partially connected systems with point-to-point integrations.

Closed-loop engineering remains immature across manufacturing and service lifecycles

Given these traceability gaps, closed-loop engineering and a continuous feedback cycle remain an aspiration for most A&D organizations. While organizations generate more operational and product performance data than ever before, much of this data remains trapped within functional silos or disconnected systems. For example, historically, configuration management in aerospace maintenance, repair, and overhaul (MRO) has been defined by a fundamental process disconnect: the aircraft that arrives at a maintenance bay rarely matches the configuration documented in the original design record. Over years of service, component replacements, engineering orders, service bulletins, and ad-hoc repairs disrupt the as-maintained configuration until it diverges significantly from the as-designed baseline. Reconciling these two states before any major maintenance event requires labor-intensive manual audits, cross-referencing paper logbooks, engineering drawings, and multiple disconnected IT systems.[7] As a result, lessons from manufacturing and field performance are often slow to reach engineering teams, slowing design evolution, issue resolution, and the optimization of future programs.

Our research shows that only 4% of organizations have fully implemented closed-loop feedback processes, while another 9% have standardized such practices across most programs, suggesting that implementation is still fragmented or confined to pilot initiatives. In many cases, feedback loops exist within individual domains but fail to extend across the broader lifecycle.

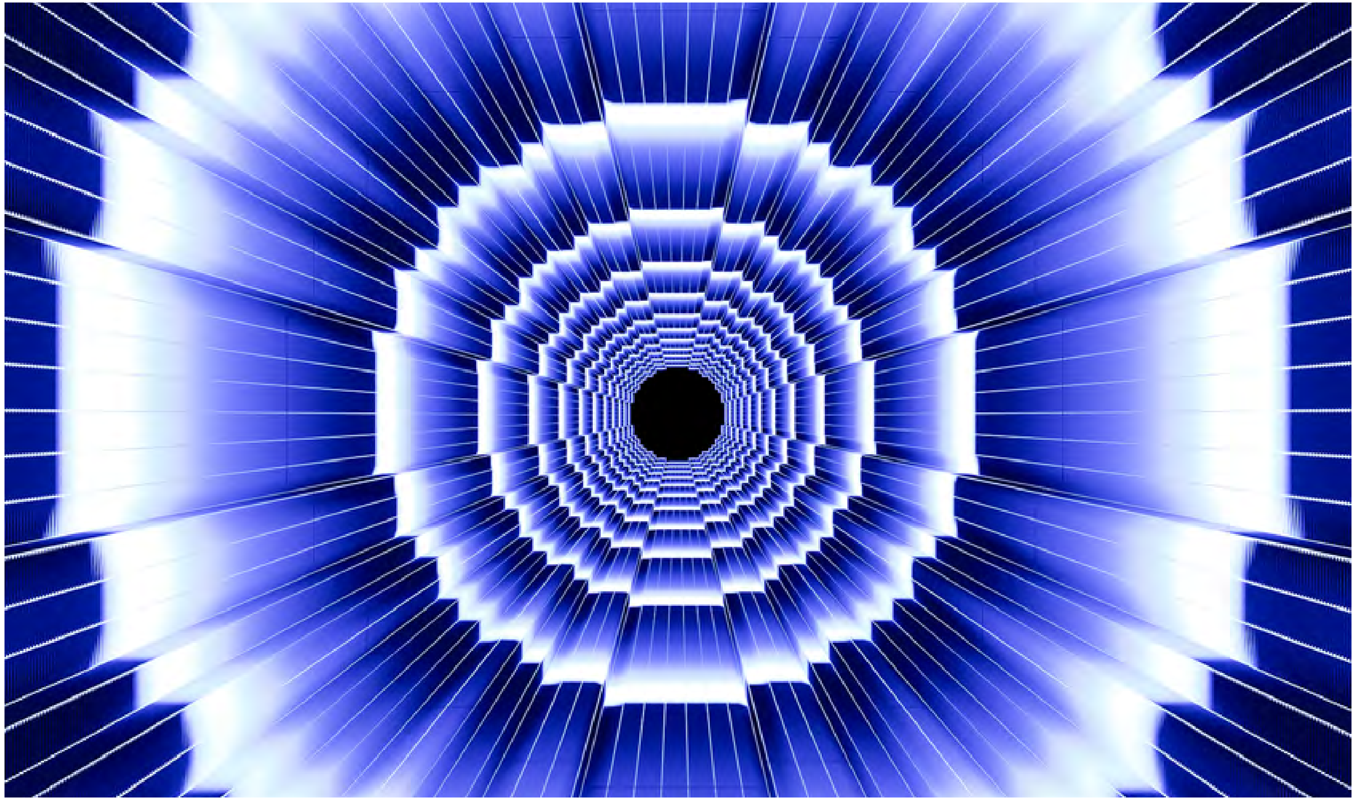
The gaps become even more pronounced when manufacturing and in-service operations are considered. Only 5% report having end-to-end loops that connect manufacturing and in-service feedback back into engineering environments. Similarly, just 35% actively use in-service data to inform engineering decisions. For increasingly connected and software-defined platforms, this represents a significant missed opportunity.

For example, commercial aircraft carry tens of thousands of individually serialized parts, each with its own airworthiness certification, maintenance history, and remaining service life. Defense platforms add further complexity through classified modification programs, multi-national supply chains, and operational configurations that change between deployments. In both commercial and defense contexts, the inability to maintain a live, accurate configuration record can create airworthiness risk and drive unnecessary maintenance cost.[8] This also makes configuration management, verification and validation, and certification evidence management core process capabilities, rather than downstream compliance activities.

Organizations that fail to operationalize closed-loop engineering risk slower innovation cycles, higher maintenance costs, and reduced responsiveness to operational issues. As AI-enabled engineering scales, the ability to feed real-world performance, manufacturing, and sustainment data back into design and development will increasingly become a competitive differentiator. A director of edge and cloud services at an avionics firm says, *"We have established pipelines where outputs are fed back into the system, creating feedback loops that enable a degree of automation in process optimization."*

However, in A&D, lifecycle continuity cannot be achieved within OEM boundaries alone. Critical engineering knowledge, configuration data, manufacturing records, certification evidence, and sustainment inputs often sit across a multi-tier supplier base deeply embedded in program delivery. Supplier integration is therefore a core part of digital continuity, not a downstream collaboration issue.

Jean-Marc Barniol, VP and Head of Defense at Capgemini Engineering, summarizes, *"The greatest benefit of digital continuity is not better data management—it is better business outcomes. Engineering organizations that maintain continuity across the lifecycle can shorten learning cycles, improve quality, reduce costly rework, and adapt more quickly as customer, regulatory, and mission requirements evolve. It also provides the essential foundation for AI-enabled capabilities that help achieve these outcomes at scale."*



“The greatest benefit of digital continuity is not better data management—it is better business outcomes. Engineering organizations that maintain continuity across the lifecycle can shorten learning cycles, improve quality, reduce costly rework, and adapt more quickly as customer, regulatory, and mission requirements evolve. It also provides the essential foundation for AI-enabled capabilities that help achieve these outcomes at scale."

Jean-Marc Barniol,

VP and Head of Defense, Capgemini Engineering

The extended A&D enterprise remain heavily document-driven

In A&D, suppliers should not be viewed as external entities sitting outside the organization. They are embedded participants in the extended engineering and industrial enterprise, often owning critical work packages across design, manufacturing, certification, software, systems integration, and sustainment.

Yet collaboration across this supplier-integrated enterprise remains far more document-driven than digitally connected. While OEMs are advancing internal digital engineering initiatives, collaboration with Tier 1, Tier 2, and Tier 3 partners still often depend on PDFs, spreadsheets, drawings, emails, and manual data exchanges. This creates delays in information flow, limits visibility across the value chain, and makes it difficult to maintain a consistent digital thread across programs.

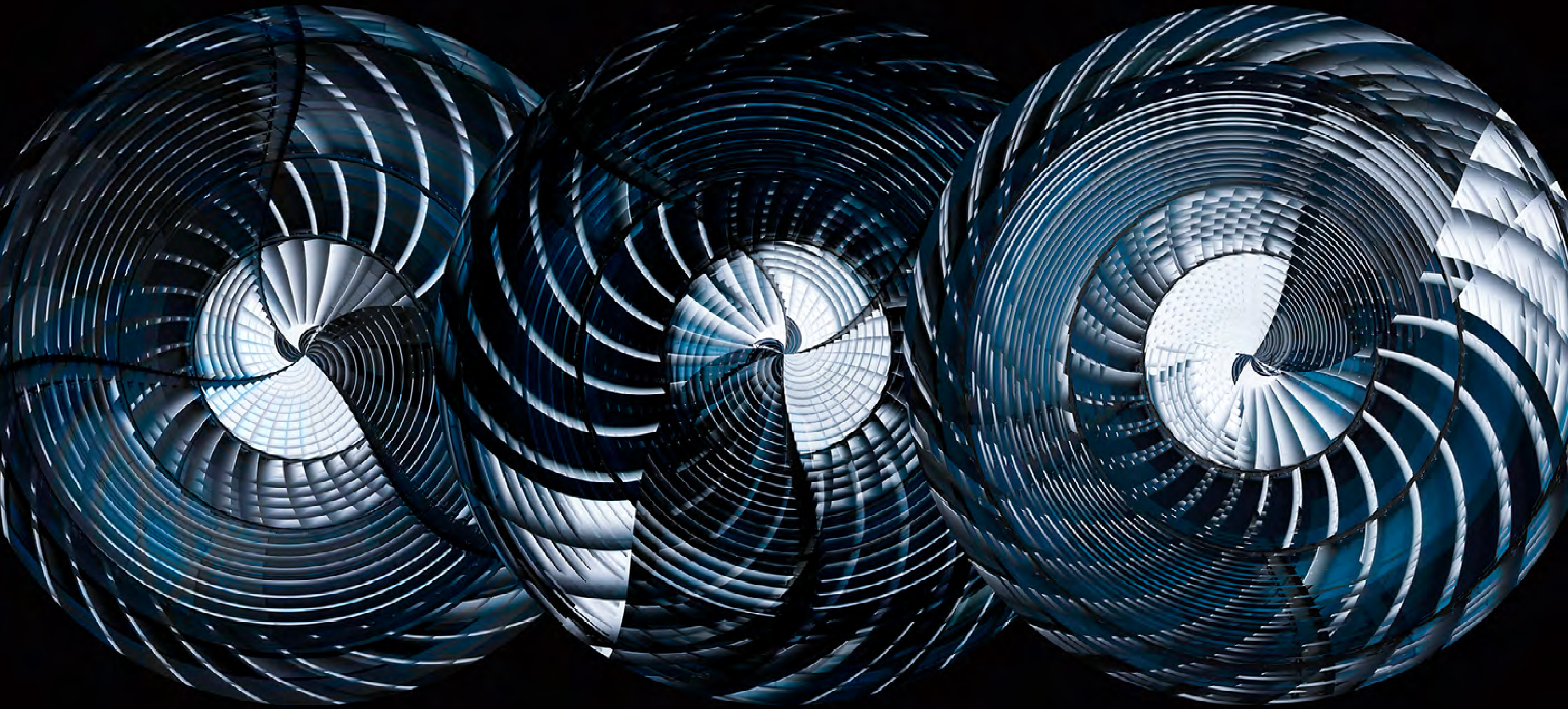
Our research shows that document-based exchange remains common even with strategically important suppliers: 53% of organizations still rely on it with Tier 2 and Tier 3 suppliers, and 43% with strategic Tier 1 partners. These findings highlight the gap between internal digital engineering ambitions and the reality of operating as an extended, multi-tier A&D enterprise, where critical lifecycle knowledge sits across OEMs, suppliers, subcontractors, and sustainment partners.

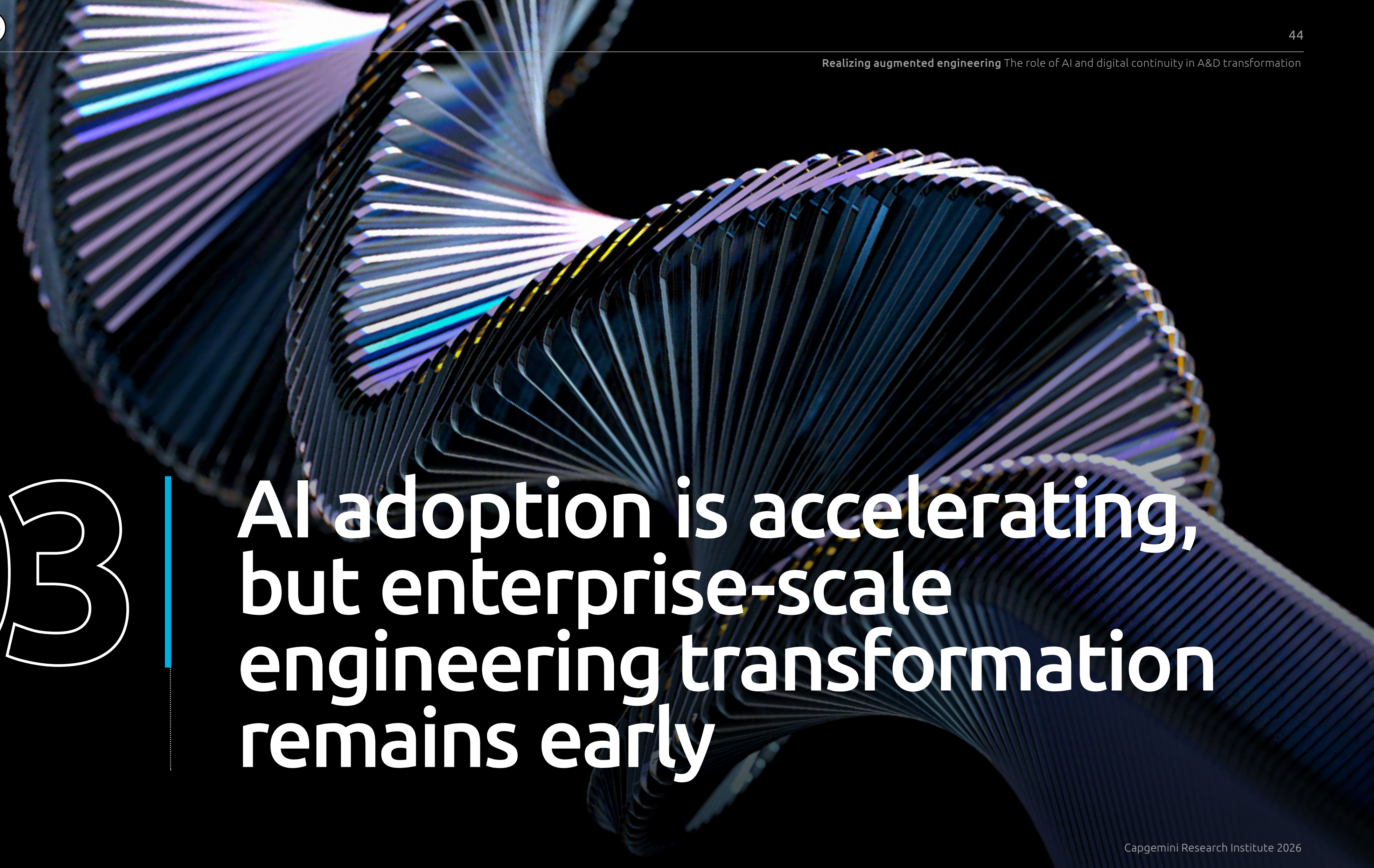
Djeukou, the aerospace transformation and growth advisor, adds: *“Suppliers are usually Risk Sharing Partners owning their IP, so they want to protect it for good reasons. That creates a major challenge when trying to establish a connected digital thread across the supply chain. Trusted and collaborative industry digital ecosystem like DECADE-X have been initiated to enable seamless and secure data exchanges across the whole aerospace and defense sector.”*

As products become increasingly software-defined and development cycles accelerate, fragmented supplier collaboration models are becoming harder to sustain. Document-driven processes not only slow design iterations and change management, but also increase risks around configuration control, traceability, and data consistency across programs. The challenge becomes even more critical in large, multi-tier ecosystems where suppliers play a significant role in engineering, manufacturing, and sustainment activities.

Carlos Castillo Rubio, Director of Product Engineering at Indra, notes, *"Limited ability to share classified data with suppliers is restricting full digital integration. This is one area where the defense industry is clearly behind."*

Without stronger digital continuity across the supplier-integrated enterprise, A&D organizations will struggle to maintain configuration control, regulatory traceability, and responsiveness across increasingly complex programs.





03 AI adoption is accelerating, but enterprise-scale engineering transformation remains early

AI adoption remains concentrated in localized engineering use cases

AI adoption in engineering is advancing, but it remains concentrated in targeted, function-specific use cases. Most organizations are still progressing through pilots or selective deployments, reflecting a measured approach to scaling. In aerospace, this pace is shaped by the industry's operating environment. Certification requirements, data governance expectations, and the need for explainable decision-making in safety-critical contexts naturally lead organizations to expand AI in a controlled manner. Integration with legacy systems adds further complexity but also highlights the scale of the opportunity as these foundations evolve.

Machine learning and Edge AI show the strongest traction, with higher levels of scaled use cases (19-20%), followed by Gen AI and physical AI (12-13%). These tend to deliver immediate, contained value in areas such as documentation, knowledge support, and asset-level intelligence. In contrast, agentic AI remains early, with only 8% reporting scaled adoption, indicating a clear maturity gap between emerging and operationalized capabilities.

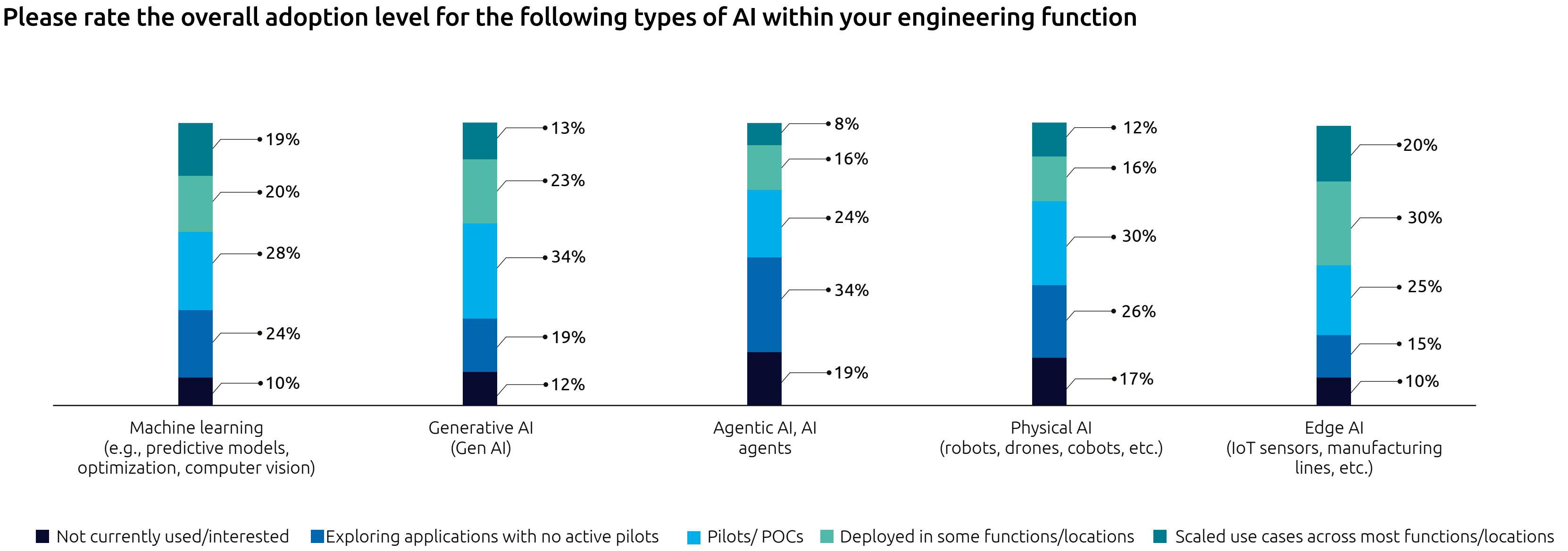
Regional patterns suggest that Asia-Pacific may be moving faster in selected emerging AI domains. Across APAC markets in our sample, scaled adoption of physical AI and agentic AI is around 20%, compared with 12% and 8% globally, respectively. In China specifically, scaled adoption reaches 25% for physical AI and 20% for both Gen AI and agentic AI, indicating active experimentation and deployment in execution-oriented AI capabilities.

24%

Percentage of organizations that deployed agentic AI in some or most locations / functions.

Figure 13.

Most AI use cases in engineering remain at exploration and pilot stages



Source: Capgemini Research Institute, Augmented engineering survey, April – May 2026, N = 200 AI experts.

The maturity of agent-based capabilities reinforces this. Only 18% report workflow automation as fully established, and just 24% report integration of AI agents across systems. More advanced capabilities are rare. Only 15% report modular architecture, and 9% have multi-agent coordination across lifecycle stages.

This gap is reflected in how organizations use AI currently:

- 61% of organizations remain at experimental or task-level use, while only 17% report workflow orchestration or end-to-end integration
- Organizations apply AI within individual tools and functions, but not yet connecting engineering workflows in a coordinated manner

This pattern reflects a clear but uneven progression toward agent-driven engineering. In practice, organizations are moving through distinct stages of maturity:

Task-level AI (current baseline)

AI is embedded within individual tools and functions, supporting isolated tasks such as documentation, simulation interpretation, or fault analysis, with limited cross-functional coordination.

Workflow-level automation

AI begins to orchestrate activities within defined workflows, such as predictive maintenance or production planning, where steps are structured, data is available, and outcomes are measurable.

Cross-functional orchestration

AI connects workflows across engineering, manufacturing, and operations, enabling coordinated decision-making and reducing handoffs, but still requiring significant human oversight and intervention.

Multi-agent, lifecycle coordination (emerging)

Distributed AI agents operate across lifecycle stages, coordinating decisions, actions, and data flows with increasing autonomy, supported by continuous monitoring, governance, and human-on-the-loop supervision.

While most organizations remain anchored in the first two stages, only a small minority are progressing toward cross-functional orchestration and multi-agent coordination, highlighting a significant gap between experimentation and system-level transformation. This pattern is reinforced by organizational factors:

- 60% of organizations prioritize safety, reliability, and compliance over speed of scaling
- 54% report leadership readiness to guide AI-driven change, but this has not yet translated into consistent execution at scale. The head of operations at the Asian A&D company elaborates, *"Production remains the primary focus, which slows the pace of digital initiatives. In addition, trust at the management level is limited due to legacy systems and data constraints."*

Overall, AI is delivering localized efficiency gains, but it is yet to fully reshape engineering operating models or unlock its full potential in driving new capabilities, differentiated products, and engineering-led growth.

AI scales first where value is immediately visible and workflows are contained

Across use cases, maturity levels are tightly clustered in the 30-40% range for partial or scaled deployment. This indicates that, while AI adoption is broad across the engineering lifecycle, full industrialization remains limited. Even the most advanced use cases plateau at similar levels, suggesting that scaling is constrained by system-level integration challenges.

However, where organizations are successfully scaling AI, a distinctive pattern emerges. The highest levels of operationalization are seen in predictive equipment maintenance (22%), automated simulation result interpretation (20%), and production planning and fault diagnosis (19%). These use cases share common characteristics like structured workflows, high-quality data, and measurable outcomes which also explains why more complex applications such as cross-functional orchestration and physical AI deployments (e.g., robotics, inspection, and autonomous operations) remain harder to scale today.

Evan Digney of Etihad Airways notes, *"AI is already driving significant productivity gains. In some cases, processes are up to ten times faster, freeing up capacity that can be reinvested into higher-value work and learning."*

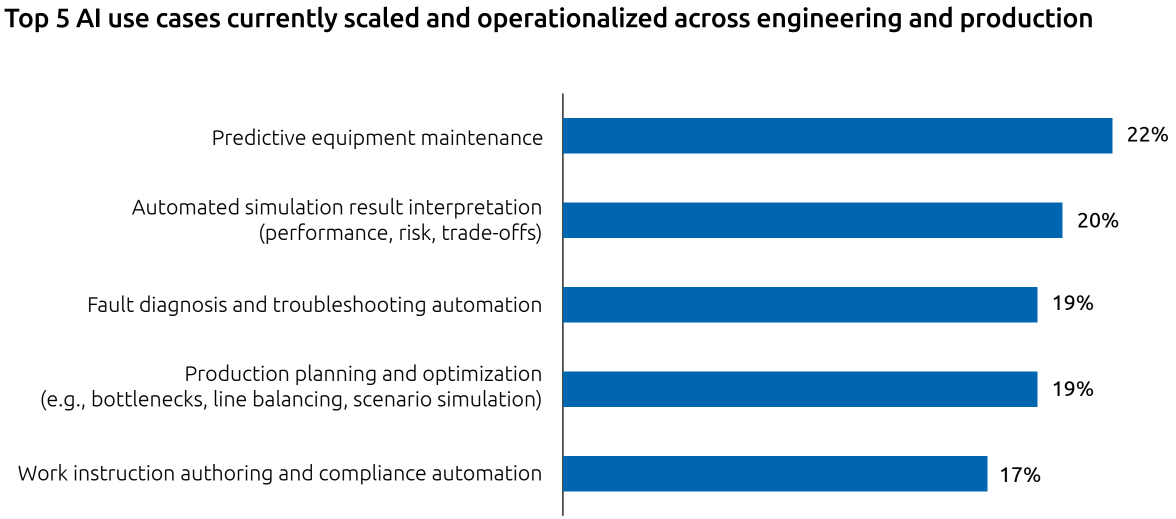
For example, drone-based inspection and robotic systems are already being deployed in aerospace to automate asset inspection, significantly reducing inspection time while improving coverage and defect detection demonstrating the tangible operational impact of physical AI in engineering environments.

These use cases share common characteristics: they operate within well-defined workflows, rely on structured data, and deliver direct, measurable productivity and performance improvements. This makes it easier to implement, validate, and scale within specific functions or environments.

Recent examples from A&D organizations reinforce this pattern. In April 2026, Boeing reported that its Aircraft Data Reasoner improved predictive maintenance for the C-17 military transport aircraft, delivering a **2-3% increase in aircraft availability**.[9] Boeing uses AI-driven quality-control systems across its manufacturing processes to enhance inspection efficiency and reduce defects. On the 787 Dreamliner assembly lines, Boeing uses AI-enabled scanning technologies to detect micro-fractures in composite materials prior to final assembly, while infrared imaging helps identify structural weaknesses in fuselage. Machine learning (ML) models further improve inspection accuracy by learning from historical defect patterns. Together, these capabilities have helped reduce rework costs and minimize manufacturing delays.[10]

Similarly, Lockheed Martin is applying AI to sustainment, focusing on **predictive maintenance, performance monitoring, and logistics optimization** across combat aircraft fleets.[11] In engineering, GE Aerospace demonstrated that Gen AI can produce **hundreds of viable design options in a single session**, compressing early design cycles from months to seconds.[12] Anduril partnered with Dirac to deploy AI-driven work instruction authoring across its manufacturing operations, following an evaluation of enterprise and internal solutions. Early deployments reduced authoring time by 87.5%, from 12 hours to 90 minutes, delivering a ~8x reduction in time and enabling faster product launches and scalable production without increasing headcount.[13]

Figure 14.
AI is scaling fastest in operational use cases with measurable performance impact



Source: Capgemini Research Institute, Augmented engineering survey, April–May 2026, N = 200 AI experts.

By contrast, use cases that require cross-functional integration, complex data dependencies, or coordination across lifecycle stages, such as system architecture, supplier collaboration, and digital thread-based impact analysis, remain largely at exploration or pilot phases. This divergence indicates that organizations are prioritizing AI where value is immediate and execution is contained, while broader, system-level transformation continues to face challenges related to integration, data consistency, and process alignment. As AI begins to move from isolated tools to coordinated, agent-driven workflows, these integration challenges become even more pronounced, requiring new approaches to orchestration, control, and governance.

Organizations face a tension between sovereignty and ecosystem dependence

As AI adoption progresses, aerospace and defense organizations are placing strong emphasis on control, trust, and sovereignty in AI deployment. Most prioritize transparency and explainability of AI models (80%), alongside control over data, models, and intellectual property (IP; 75%), and secure or sovereign AI deployment environments (70%). These priorities reflect the highly regulated and mission-critical nature of engineering in this sector, where trust, traceability, and compliance are non-negotiable. Rheinmetall's Schmidt explains: *"The primary priority is determining where data is stored and who can access it. We therefore prefer on-premises or sovereign cloud environments, along with strict access controls, to reduce dependency."*

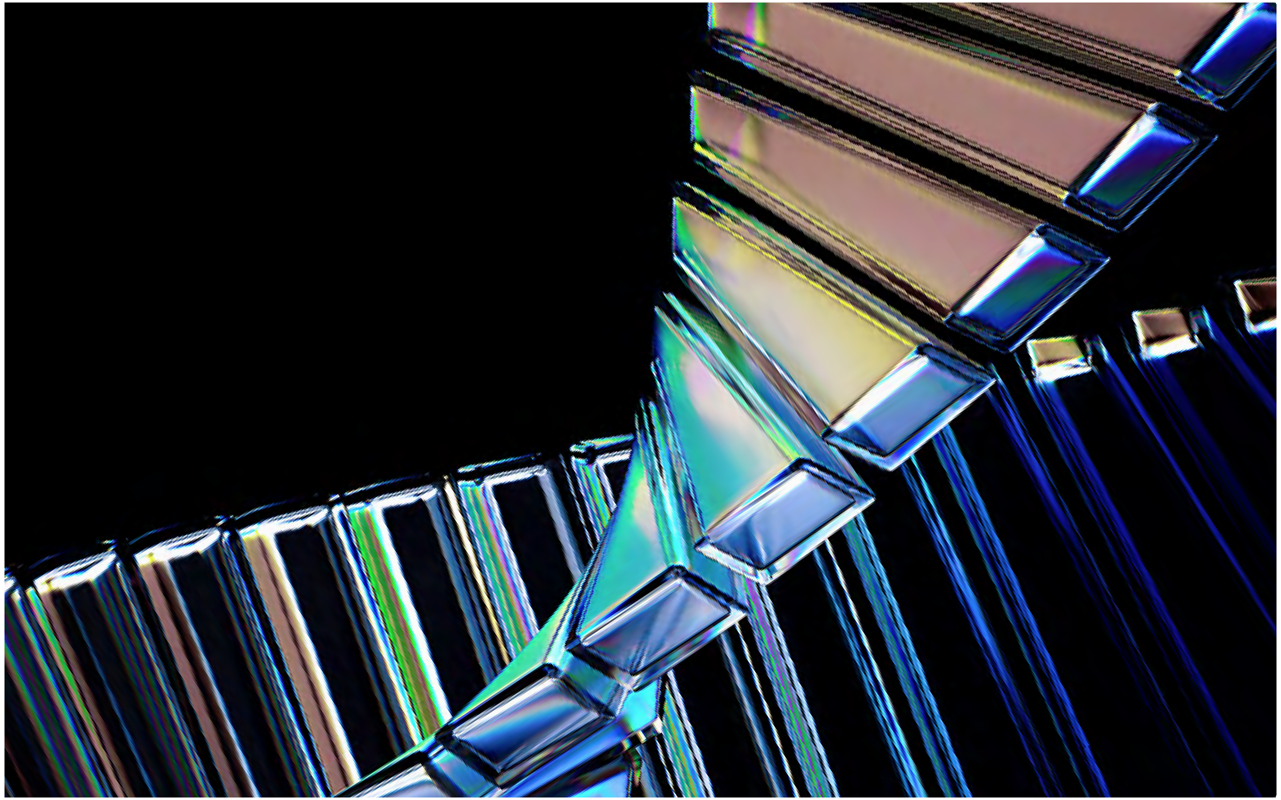
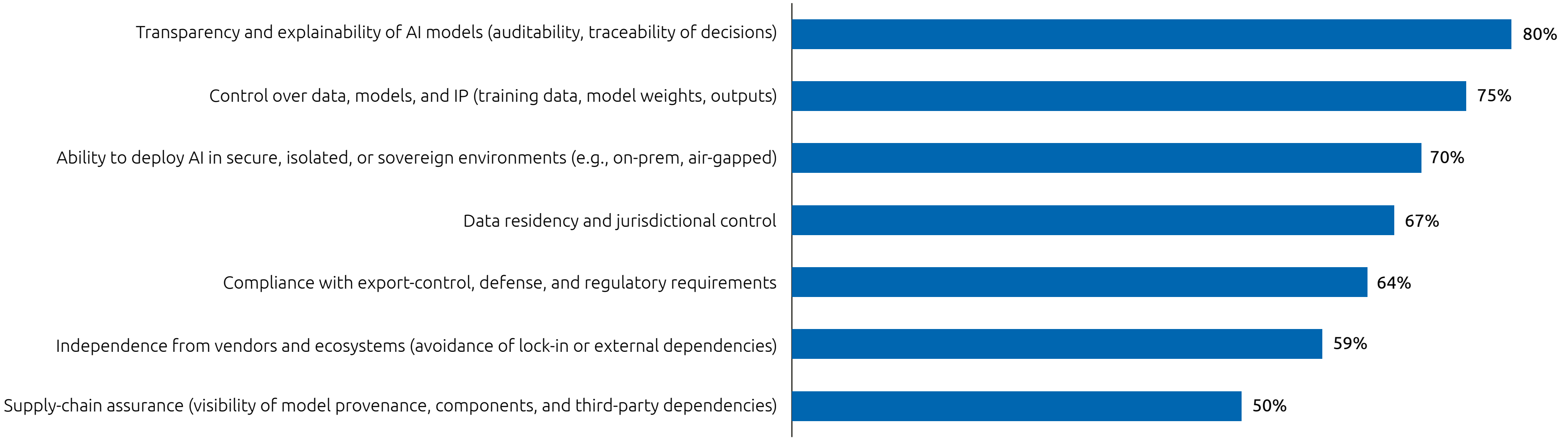


Figure 15.
Organizations prioritize trust, control, and sovereignty in AI deployment

How important are the following considerations when selecting AI solutions for engineering?



Source: Capgemini Research Institute, Augmented engineering survey, April–May 2026, N = 200 AI experts.

But this emphasis on sovereignty and control is not fully aligned with sourcing and deployment of AI capabilities. Only 18% of organizations primarily build AI solutions in-house, while a significantly larger share, 41%, rely primarily on external vendors or platform providers.

This creates structural tension. Organizations aim to retain control over critical assets such as data, models, and engineering decisions, yet depend heavily on external ecosystems to access AI capabilities at scale. This reliance can introduce challenges around integration, governance, and alignment with internal engineering systems, particularly as AI evolves from isolated tools to coordinated, agent-driven workflows.

In many cases, this tension is beginning to shape engineering and AI architecture decisions themselves. Sovereignty requirements around data residency, access control, and IP are increasingly influencing where data can reside, which AI services can be used, and how systems are integrated across the lifecycle. As a result, scaling AI is becoming closely tied to how well organizations balance sovereignty needs with ecosystem dependence.

Governing human and agent collaboration remains a developing capability

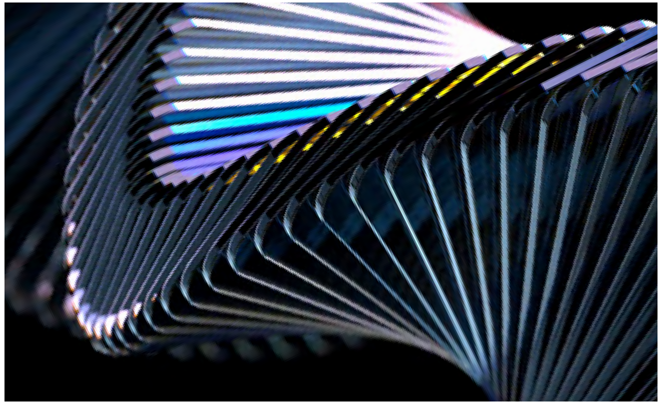
As engineering moves from AI-assisted tools to agent-driven execution, governance must evolve beyond traditional model oversight to orchestrating collaboration between humans and autonomous systems. Unlike conventional AI, agents operate across workflows, make decisions within defined boundaries, and interact with multiple systems. Consequently, they require continuous supervision, rather than one-time validation.

To manage this shift, organizations require governance models that define:

- Clear task allocation and control boundaries between humans and agents
- Approval layers and escalation protocols for decision making
- End-to-end traceability and auditability of agent actions across the lifecycle
- Continuous monitoring mechanisms to detect drift, anomalies, or unintended behavior
- Human oversight models, evolving from human-in-the-loop to human-on-the-loop (with human monitoring outputs only) as autonomy increases

Susanne Lee, Director of Technology at L3Harris Technologies, adds: *"Embedding agentic AI in our documentation processes enables us to implement automated traceability from the beginning. This is a fundamental shift in the documentation process: from static outputs to enabling real-time audit trails. We will no longer have to rely on scattered notes, emails, or version histories that vary depending on whose computer they are on."*

In essence, governance must move from static safeguards to dynamic, embedded oversight across workflows, ensuring that agent actions remain aligned with engineering, regulatory, and safety requirements.



In late 2024, Thales introduced a dedicated governance structure to systematically assess all AI-enabled solutions against a defined set of responsible AI criteria. Building on this foundation, a pilot initiative at cortAIx Factory in 2025 began to advance an initial set of use cases anchored in six core commitments:

- keeping humans in control
- ensuring transparency of system design
- embedding privacy-by-design principles
- strengthening security, robustness, and resilience
- promoting frugal and purposeful use of data
- and actively mitigating discriminatory bias in digital technologies

This approach translates high-level responsible AI principles into practical implementation, ensuring that AI solutions are both effective and aligned with organizational values.[14]

However, current governance maturity remains limited. Only 9% of organizations have fully implemented governance frameworks at scale, while 30% are still building or rolling out structures, and 22% remain at planning stage. This indicates that most organizations are still in transition and do not yet have fully operational governance models to support agent-driven engineering.

The director of edge and cloud services at an avionics firm notes, *"There is an ongoing debate about the role of humans in the approval process. The challenge lies in determining the right level of automation while maintaining appropriate checks and balances."*

Where governance mechanisms do exist, they are heavily oriented toward foundational controls that focus on security, privacy, and export-control safeguards (66%), risk-assessment frameworks (61%), and AI governance councils or centers of excellence (57%), with about half embedding data governance, compliance checks, and explainability standards into workflows.

Only 33% report more dynamic capabilities, such as monitoring and audit mechanisms to track model behavior over time, highlighting a gap in real-time oversight and lifecycle governance, which are critical for scaling agent-based systems.

This gap reflects a broader structural challenge. While organizations are prioritizing trust, security, and control, they are still building the governance models needed to manage distributed, autonomous decision making across engineering workflows, limiting the ability to scale agentic AI beyond controlled environments.

04 Most organizations have yet to achieve maturity across digital continuity and AI

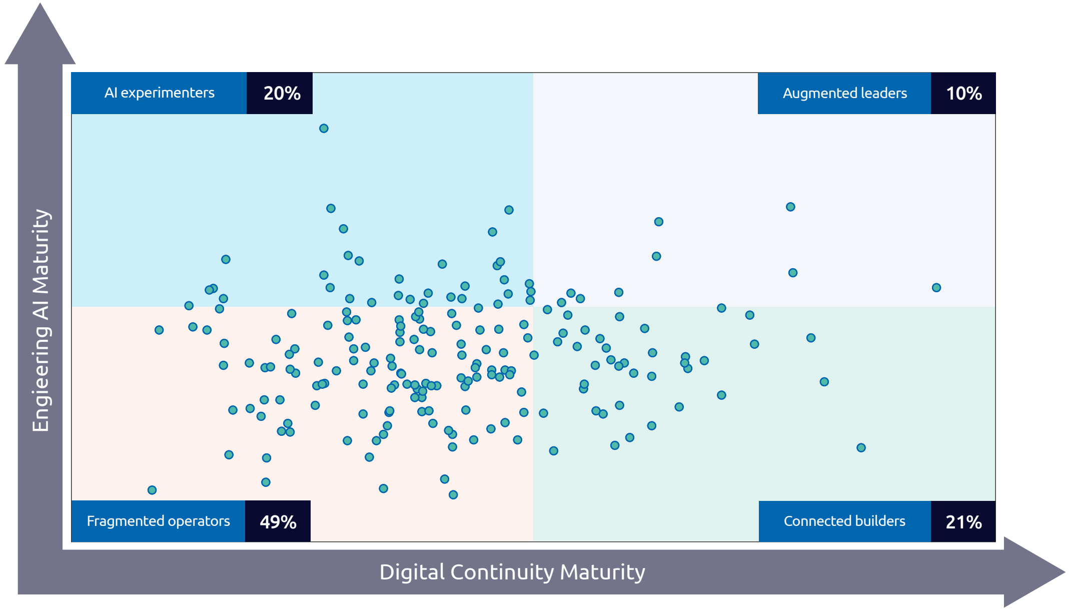
We assessed A&D organizations across two critical dimensions: digital continuity and AI-enabled engineering capabilities. Digital continuity reflects the establishment of an integrated, end-to-end digital thread across the product lifecycle, supported by strong data foundations, interoperability, and governance. AI maturity captures how effectively organizations are building the capabilities required to embed AI into engineering workflows and scale impact.

Together, these dimensions define an organization's readiness to industrialize engineering through AI-augmented engineering. Crucially, end-to-end continuity does not mean the same thing across the sector. Commercial OEMs, independent MRO providers, and military programs face structurally different continuity challenges. OEMs focus on new-product development and certification, MRO providers operate across gaps between as-designed and as-maintained configurations, and defense programs must work within strict security and access constraints that limit data sharing.

As a result, leading organizations do not pursue universal connectivity. They make deliberate choices on where to harmonize enterprise-wide, where to standardize within business lines, and where variation must be preserved at the program or site level. Treating continuity as selective and segment-aware, rather than pursuing a single end state, is itself a marker of maturity.

Figure 16.

Majority of A&D organizations remain in the early-stage of augmented engineering



Source: Capgemini Research Institute, Augmented engineering survey, April–May 2026, N = 200 A&D organizations.

In our analysis only 10% of organizations qualify as augmented leaders, demonstrating strong capabilities across both digital continuity and engineering AI (see Figure 16). These organizations are successfully aligning their connectivity foundations with engineering capabilities and are beginning to unlock disproportionate value from this convergence.

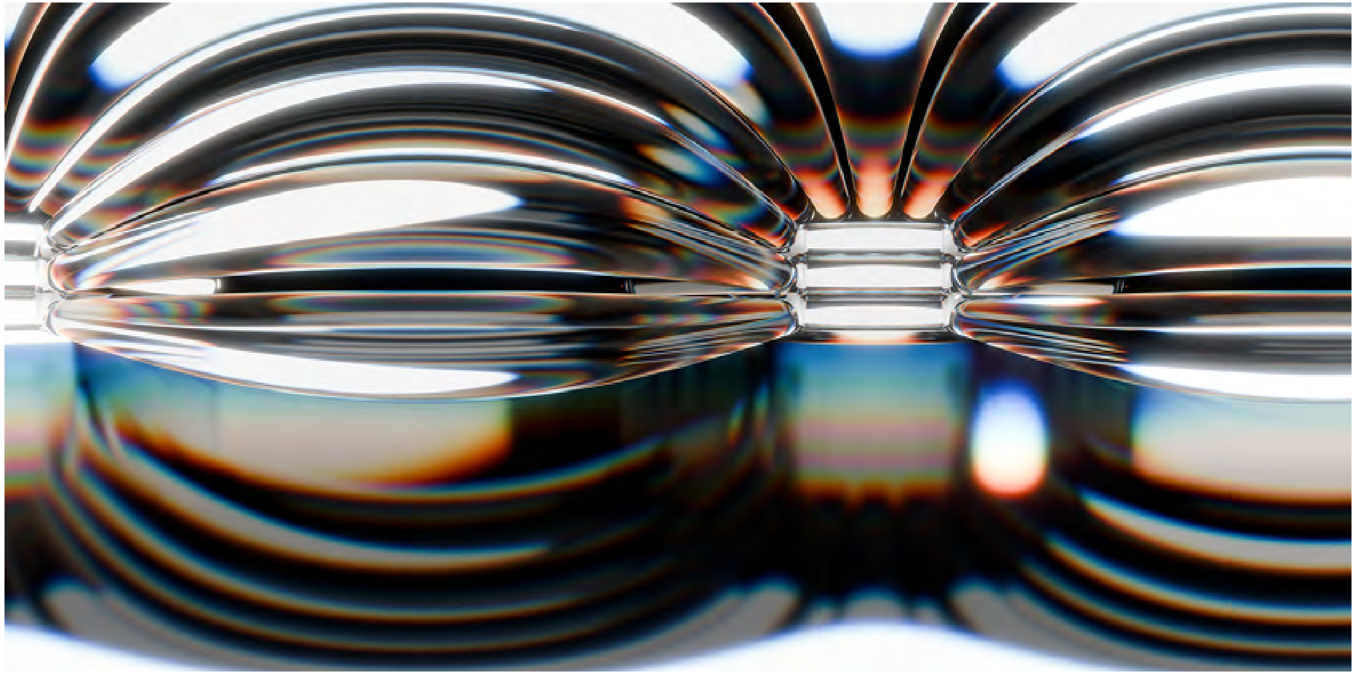
However, most organizations remain significantly behind:

21%
show relatively strong digital continuity but lag in engineering AI readiness

20%
demonstrate emerging engineering AI capabilities without adequate connectivity foundations

49%
fall into the fragmented operators category, with limited progress across both dimensions

This distribution highlights a widening maturity gap. While some organizations are building strength in either digital continuity or engineering AI, very few are advancing both in parallel. As a result, most continue to struggle to scale augmented engineering beyond isolated initiatives.



Key characteristics of each cohort

10% Augmented leaders

Organizations in this cohort have built strong capabilities across both digital continuity and AI-enabled engineering. They combine advanced lifecycle connectivity, robust data governance, and mature AI operating models to embed AI across design, manufacturing, and certification workflows. As a result, they achieve outsized improvements in cost, compliance, and time-to-market and other metrics. Their ability to pair a strong digital backbone with scalable AI enables transformation at a systems level.

21% Connected builders

Organizations in this cohort have established strong digital continuity foundations, including integrated lifecycle data, traceability, and connected engineering systems. They perform well in areas such as asset reuse and cross-functional collaboration but remain relatively early in their AI journey. AI adoption is often limited to a small number of use cases, leaving significant untapped potential. With strong foundations already in place, they are well-positioned to scale AI rapidly.

20% AI experimenters

Organizations in this cohort are actively investing in AI but lack the digital continuity foundations needed to scale its impact. While AI is being deployed across selected engineering use cases, fragmented data, limited traceability, and disconnected systems constrain broader value realization. As a result, benefits are often confined to localized improvements such as design productivity and automation rather than system-level outcomes.

49% Fragmented operators

Organizations in this cohort are characterized by siloed data, fragmented systems, limited lifecycle integration, and immature governance. AI adoption remains minimal or exploratory, supported by weak data foundations and limited strategic direction. As a result, AI delivers only isolated or incremental benefits, and significant progress is needed across both digital continuity and AI capabilities to enable meaningful transformation.

While APAC and the Middle East represent only 25% of the overall sample, they account for 45% of augmented leaders, indicating a higher concentration of organizations that combine strong digital continuity with advanced AI adoption. In contrast, the Americas are underrepresented among leaders relative to their overall share. One possible explanation is that many organizations in APAC and the Middle East have had the opportunity to build newer engineering and digital infrastructures, enabling them to integrate AI into connected engineering environments more rapidly. Strong government-backed industrial modernization programs and large-scale investments in advanced manufacturing may also be accelerating adoption.

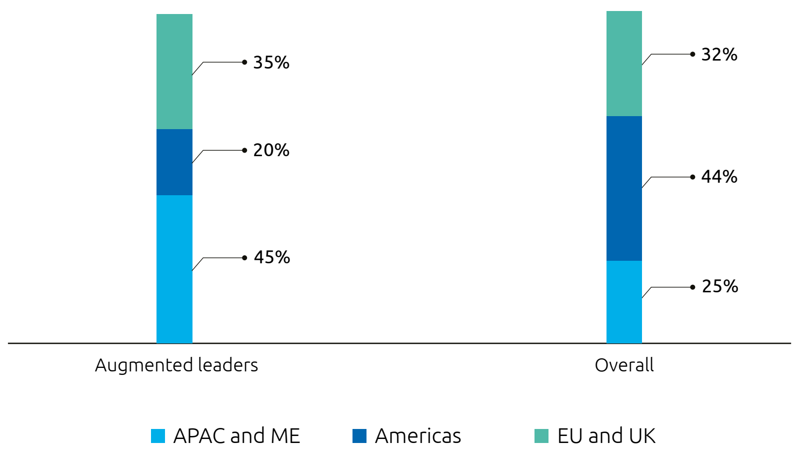
45%

Percentage of augmented leaders from APAC, compared with APAC's 25% share of the overall population.

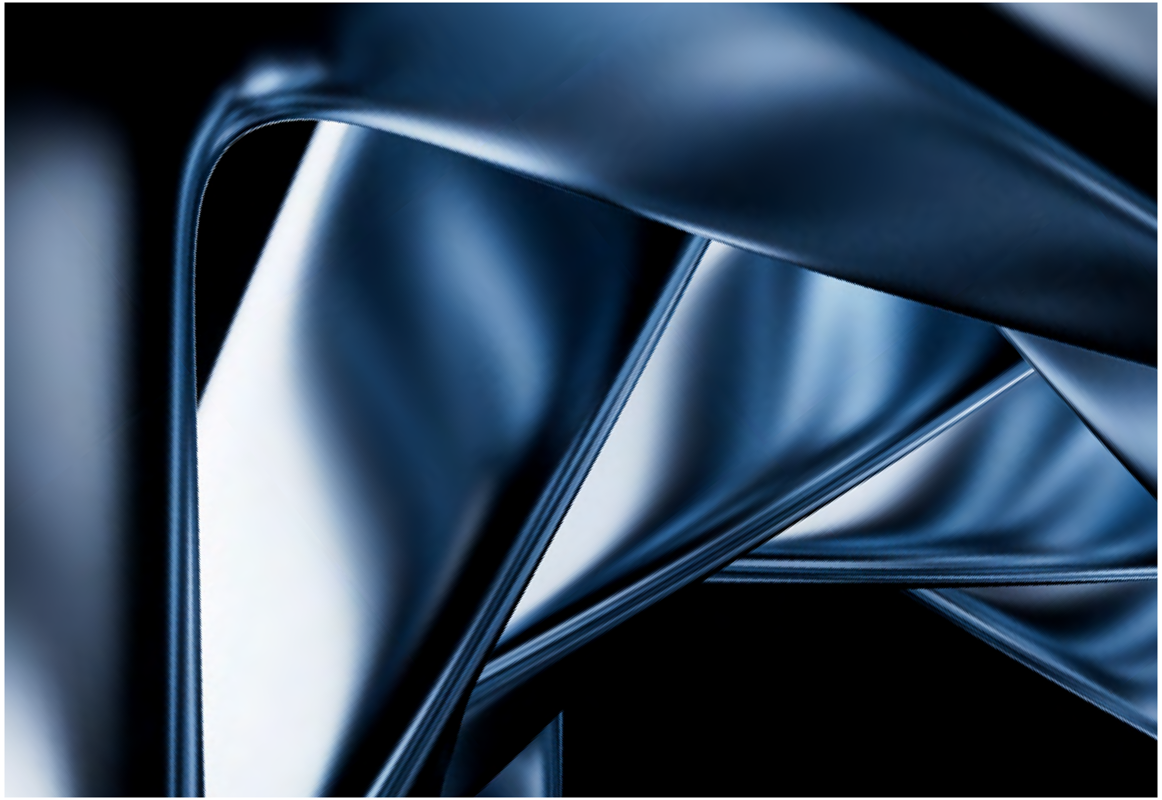
Figure 17.

APAC and the Middle East account for a larger share of augmented leaders

Region-wise distribution of augmented leaders



Source: Capgemini Research Institute, Augmented engineering survey, April–May 2026, N = 20 leaders and 200 A&D organizations.



Leaders translate integrated capabilities into system-level impact

To understand how maturity translates into business value, we compared the impact of AI reported by augmented leaders versus other organizations across key engineering performance metrics (see Figure 18).

Augmented leaders report significantly higher impact from AI in areas that depend on end-to-end lifecycle integration and coordination, including:

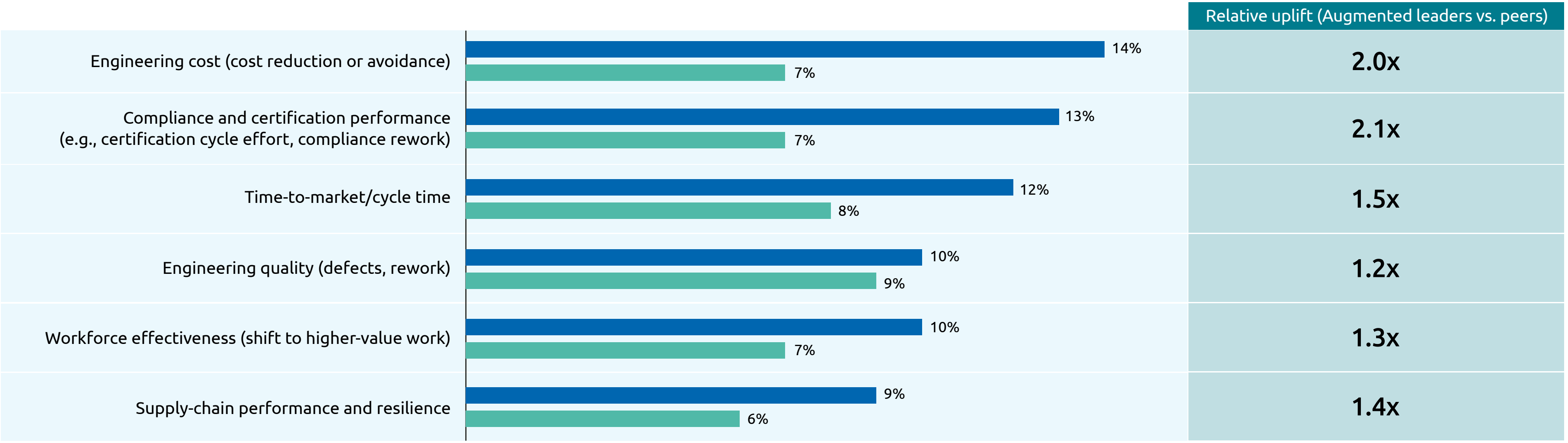
- Compliance and certification performance
- Time-to-market acceleration
- Engineering cost reduction or avoidance
- Workforce effectiveness
- Supply-chain performance and resilience

These are outcomes that rely heavily on connected data, traceability, and coordinated decision-making across the lifecycle capabilities enabled by strong digital continuity.

Figure 18.

Organizations with stronger AI and digital-continuity capabilities achieve greater impact across key engineering metrics

Augmented leaders vs. peers: Percentage of improvement in AI impact across engineering metrics



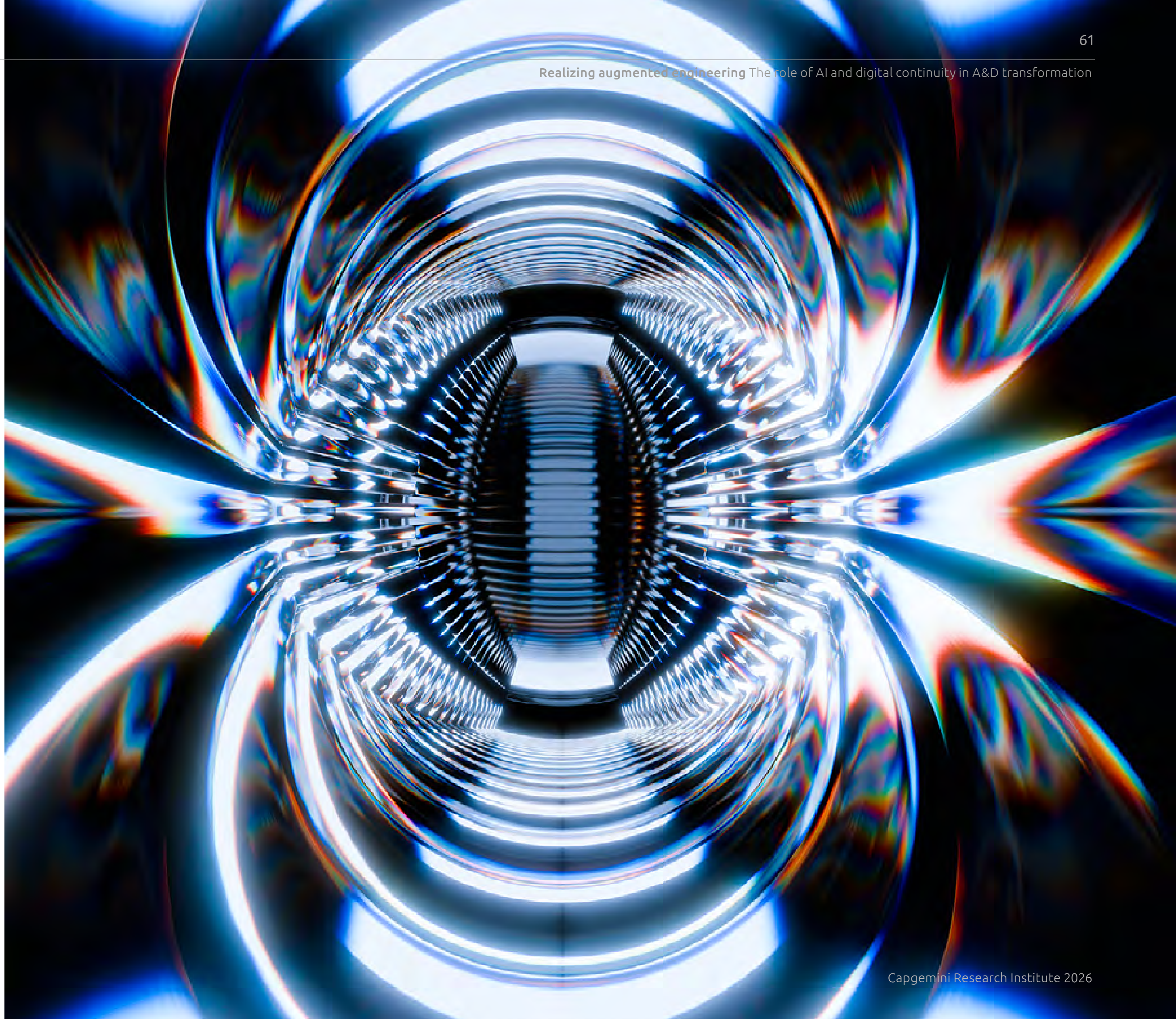
Source: Capgemini Research Institute, Augmented engineering survey, April–May 2026, N = 200 organizations.

The findings reveal a fundamental difference in how organizations are applying AI:

- Organizations outside the leader cohort tend to focus on improving individual tasks or functions, leading to incremental gains in areas such as productivity and quality.

- But leaders are harnessing AI as part of a broader transformation of engineering systems. By embedding AI into connected workflows, supported by strong digital continuity, they are achieving impact in areas that require cross-functional integration and lifecycle coordination.

As a result, leaders are not simply optimizing engineering tasks. Rather, they are transforming their engineering operations at a systemic level, delivering faster programs, improved compliance outcomes, and more efficient resource utilization.



05 Operationalizing augmented engineering at scale

Augmented engineering requires more than deploying AI tools. It requires redesigning engineering processes around human-AI collaboration, while building the digital foundations, governance mechanisms, and operating models needed to scale AI across complex engineering environments.

A&D organizations face a dual challenge. They must deliver immediate productivity gains in high-friction engineering workflows while simultaneously modernizing the underlying engineering environment. AI can accelerate activities such as requirements analysis, part classification, simulation interpretation, engineering change assessment, and test evidence generation today. However, achieving enterprise-scale augmented engineering requires stronger digital continuity, trusted engineering knowledge, clear decision accountability, and architectures designed for safety, certification, and sovereignty.

Frédéric Grousson, VP and Head of Aerospace & Defense at Capgemini Engineering, reflects, *"Engineering organizations have spent years optimizing individual functions. The next competitive advantage will come from optimizing the connections between them. When design, manufacturing, software, supply chain, and service operate from a common engineering context, AI becomes far more than a productivity tool—it becomes a catalyst for better engineering decisions across the lifecycle, and improving the quality and the time to market."*

The following recommendations provide a practical roadmap for moving from isolated AI initiatives to production-ready augmented engineering.

"Engineering organizations have spent years optimizing individual functions. The next competitive advantage will come from optimizing the connections between them. When design, manufacturing, software, supply chain, and service operate from a common engineering context, AI becomes far more than a productivity tool—it becomes a catalyst for better engineering decisions across the lifecycle, and improving the quality and the time to market."

Frédéric Grousson,

VP and Head of Aerospace & Defense, Capgemini Engineering

Figure 19.
Key recommendations for operationalizing augmented engineering

Source: Capgemini Research Institute analysis.

Build an authoritative engineering knowledge backbone

Most A&D organizations have connected tools, but few maintain continuity of engineering knowledge across requirements, design, manufacturing, certification, suppliers, operations, and sustainment. In many cases, fragmented ERP, PLM, engineering, and operational systems continue to create information silos that limit traceability, reuse, and AI effectiveness.

Leading organizations increasingly view digital continuity not as an integration exercise but as a multi-year enterprise transformation. The goal is to create an authoritative engineering knowledge backbone that captures not only what was designed, but why decisions were made, what assumptions were used, and how outcomes evolved throughout the lifecycle.

For safety-critical engineering, this knowledge backbone also provides the evidence base needed to validate AI outputs, support certification activities, and demonstrate why engineering decisions were made.

Key actions:

- **Establish lifecycle continuity from requirements through sustainment:** Connect requirements, models, design data, manufacturing records, certification evidence, operational data, and sustainment feedback across priority programs. Organizations with mature lifecycle connectivity can reduce unplanned maintenance events, improve fleet readiness, and reduce sustainment costs. For example, Northrop Grumman used a digital thread to connect teams designing, building, and manufacturing the Model 437's removable wing assemblies, enabling simultaneous cross-functional work, faster execution, stronger collaboration, and reduced risk.[15]
- **Move beyond digital threads toward semantic engineering knowledge networks:** Link requirements, configurations, models, decisions, assumptions, test evidence, and operational outcomes into a shared engineering environment. This semantic layer enables digital twins, engineers, and AI systems to understand relationships, dependencies, rationale, and change impacts rather than simply accessing disconnected datasets.
- **Capture engineering rationale, not just engineering data:** Most organizations record models, documents, and outputs but fail to preserve the reasoning behind engineering decisions. Capture engineering rationale, assumptions, validation results, and approval records so that engineering decisions can be reconstructed for certification, audit, and airworthiness purposes.
- **Treat traceability as an operational capability:** Configuration traceability, certification evidence chains, and change-impact visibility should support everyday engineering execution, not only audits and compliance reviews. Traceability should enable faster decisions, reduced rework, and quicker certification activities. Shop-floor issues can flow back into design, while field performance data informs future iterations, creating a closed loop from design to service.[16]
- **Extend continuity requirements across the supplier-integrated enterprise:** Define common requirements for model exchange, configuration management, traceability, and intellectual property protection across the ecosystem. This becomes increasingly important as programs depend on distributed engineering networks and digital collaboration.
- **Measure continuity through business outcomes:** Track decision latency, information loss across handoffs, evidence recreation effort, and change-impact assessment speed rather than the number of systems connected.

Redesign engineering around human-AI teams

The future of engineering is collaborative, with humans and AI working as integrated partners. AI can accelerate analysis, automate repetitive activities, and generate recommendations at scale. Engineers continue to provide judgment, creativity, contextual understanding, accountability, and certification authority.

Our research highlights a significant gap between technology adoption and workforce readiness. While 65% of organizations expect engineers to spend more time defining inputs for AI, 63% validating AI outputs, and 61% making system-level decisions, 68% of the workforce is expected to require reskilling or upskilling.

Younes Karim, Director, Digital Engineering Bids and Projects Solutions at Thales Alenia Space, says, *"The role of engineering is set to evolve. In the future, engineers will increasingly act as managers of AI, delegating lower-value tasks while focusing on areas where human expertise adds the greatest value."*

There is also a need to evolve how human and AI roles are defined in engineering workflows. In many cases, AI agents are still treated as automation tools that either replace tasks or provide discrete inputs. A more effective model is to position AI as a dialogue partner that contributes additional insights and perspectives during engineering activities. This approach can accelerate decisions, improve output quality, and reduce resistance to adoption.

Organizations therefore need to redesign both processes and operating models around human-AI collaboration.

65%

Percentage of organizations that expect engineers to spend more time defining inputs for AI.

Key actions:

- **Redesign workflows around human-AI collaboration:** Clearly define how work is triggered, executed, validated, escalated, and governed. AI agents can coordinate repeatable activities while humans retain accountability for intent, judgment, safety, and certification-relevant decisions.
- **Define what should be automated, augmented, and authorized:** Routine activities can increasingly be automated, while high-consequence decisions involving safety, compliance, airworthiness, mission effectiveness, or certification should remain human-authorized. Organizations should define where AI use is not permitted under current regulatory, safety, or customer requirements.
- **Develop discipline-specific AI copilots:** Create copilots tailored to systems engineering, software engineering, manufacturing engineering, testing, certification, and sustainment rather than relying on generic enterprise AI tools
- **Preserve and deepen critical engineering expertise:** As AI automates routine activities, organizations should reinvest engineering capacity into high-value disciplines such as systems engineering, software engineering, airworthiness, certification, safety analysis, mission engineering, and model-based engineering. The objective is not simply to create AI-enabled engineers, but to create better engineers who can leverage AI while exercising the judgment required for safety-critical and certification-relevant decisions.
- **Build human-in-the-loop controls for critical decisions:** Maintain human review for decisions affecting safety, compliance, mission outcomes, quality, and operational performance.
- **Treat adoption as a structured change journey:** Adoption depends on trust as much as training. Engineers need to understand how AI changes their role, increases their impact, and supports rather than replaces their expertise.
- **Build future engineering career paths:** Develop new roles focused on AI-enabled systems engineering, engineering orchestration, lifecycle analytics, digital twins, and engineering governance.

"The future of engineering is not autonomous agents replacing engineers, but about trusted agents extending engineering capabilities, enabling the transition from digital thread to digital twin across the full spectrum of engineering. As these agents begin to coordinate analyses, generate design alternatives, and orchestrate workflows, organizations must establish clear accountability between human expertise and machine execution. The quality of this partnership will ultimately determine the value AI ultimately delivers."

Thierry Berthelon,

CTO, Global PLM practice, Capgemini Engineering

Build closed-loop learning from design to sustainment

Engineering organizations have historically struggled to learn systematically from products once they enter service.

Our research highlights a significant gap. Only 4% of organizations have fully implemented closed-loop feedback, while only 9% have standardized it across most programs. Just 5% have established end-to-end feedback loops connecting manufacturing and in-service data back into engineering, and only 35% actively use in-service data to inform engineering decisions.

As products become increasingly connected, software-defined, and data-rich, these gaps become harder to justify.

Key actions:

- **Integrate operational and sustainment data into engineering environments:** Connect manufacturing, maintenance, operational, and mission data directly to engineering workflows and digital threads.
- **Use AI to identify reliability and performance patterns:** Analyze large volumes of operational data to identify recurring failures, degradation trends, reliability risks, and improvement opportunities.
- **Automate feedback loops into engineering decisions:** Ensure operational insights, maintenance findings, and customer experiences systematically influence requirements, design decisions, and future programs.
- **Develop living digital twins:** Continuously update digital twins using operational evidence, maintenance records, and real-world performance data to improve simulation accuracy and decision-making.
- **Embed learning into program governance:** Review field performance, sustainment outcomes, reliability trends, and operational feedback as part of routine governance processes.
- **Align incentives with lifecycle outcomes:** Measure success using reliability, maintainability, availability, mission effectiveness, and customer outcomes rather than development milestones alone.

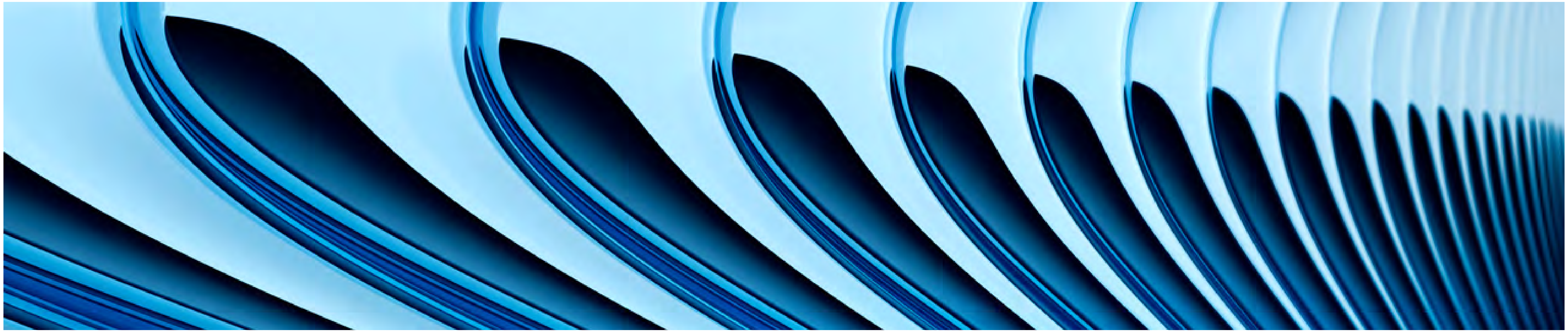
Industrialize AI in decision-grade engineering workflows

AI is creating the greatest value where workflows are repeatable, measurable, and supported by trusted engineering data. Rather than attempting to scale AI everywhere, organizations should focus on workflows where outcomes can be validated, governed, and replicated across programs. This is particularly important in A&D, where AI must operate within safety-critical and regulated engineering environments, and where some uses may be constrained or prohibited by certification and authority requirements.

Younes Karim of Thales Alenia Space adds, *"Use cases should be designed for scale from the outset. If a proof of concept cannot scale across the organization, it is better to stop it early rather than invest time in something unlikely to deliver enterprise impact."*

Our research shows that scaling remains constrained by regulatory and safety requirements (80%), trusted data and traceability (76%), interoperability challenges (74%), and workflow integration complexity (64%). These findings reinforce the need for disciplined prioritization.

Organizations should pursue a dual-track approach: deploy near-term AI use cases that deliver measurable value today while building the foundations required for broader transformation.



"The role of engineering is set to evolve. In the future, engineers will increasingly act as managers of AI, delegating lower-value tasks while focusing on areas where human expertise adds the greatest value."

Younes Karim,
Director, Digital Engineering Bids and Projects Solutions,
Thales Alenia Space

Key actions:

- **Target high-value engineering workflows first:** Prioritize use cases such as requirements validation, engineering change impact analysis, simulation interpretation, test evidence generation, quality inspection, production planning, predictive maintenance, manufacturing reconciliation, fault diagnosis, and part classification. These workflows combine measurable outcomes with relatively clear validation pathways.
- **Classify AI use cases by safety and regulatory exposure:** Segment AI use cases into low-risk productivity support, human-in-the-loop engineering assistance, certification-relevant workflows, and safety-critical decisions. This helps organizations prioritize where AI can scale quickly, where additional validation is required, and where deployment may be constrained by current regulations.
- **Redesign workflows around decisions, not tasks:** AI should be embedded into decision flows rather than added as another engineering tool. Focus on reducing delays, manual reviews, information handoffs, and rework while preserving appropriate human oversight.
- **Build validation and control points from the outset:** Define confidence thresholds, escalation criteria, approval requirements, and audit trails before deployment. Engineering teams should understand when AI recommendations can be accepted automatically, when human review is required, and when decisions must be escalated. For safety-critical workflows, organizations should also define where AI can support decisions and where current regulations require human authorization or prohibit AI-led action.
- **Create reusable implementation playbooks:** Document data requirements, governance controls, validation approaches, KPIs, integration patterns, and change-management lessons from successful deployments. This allows AI capabilities to be replicated across programs instead of remaining isolated pilots.
- **Establish a structured path from pilot to scale:** Progress AI initiatives through defined stages covering business value, operational readiness, compliance, cybersecurity, adoption, and certification considerations before expanding deployment.
- **Balance performance metrics with trust metrics:** Track cycle-time reduction, throughput improvements, defect reduction, and engineering productivity alongside adoption rates, override frequencies, exception volumes, and trust indicators.

Create an engineering decision intelligence layer

As engineering programs become increasingly digital, the challenge shifts from generating information to coordinating decisions across complex networks of teams, suppliers, systems, and programs. The creation of an engineering decision intelligence layer provides visibility into dependencies, bottlenecks, risks, decision queues, and workflow execution across the lifecycle. This layer functions as an engineering control tower, helping organizations move from reactive coordination toward proactive and increasingly AI-supported execution.

Susanne Lee of L3Harris Technologies says, *"By feeding the entire production workflow into the system, AI can determine what should be prioritized and how work should be sequenced to minimize bottlenecks."*

Key actions:

- **Create a program-wide view of engineering decisions:** Provide visibility into pending decisions, responsible owners, required evidence, downstream impacts, certification readiness, and regulatory constraints across requirements, design, manufacturing, certification, and sustainment. US A&D organizations are adopting integrated digital practices, AI-enabled design and software-centric development approaches as the requirements for competitiveness change.[17]
- **Deploy AI agents for workflow coordination:** Use AI agents to monitor activities, identify missing inputs, detect dependency conflicts, recommend next actions, and route issues to appropriate stakeholders, while ensuring that certification-relevant or safety-critical decisions remain subject to defined human approval paths.
- **Introduce orchestration layers across engineering systems:** Connect authoring tools, PLM, ERP, MBSE, MES, simulation, test, and sustainment environments through orchestration capabilities that enable both humans and AI systems to act on shared context.
- **Create visibility into bottlenecks and decision queues:** Track unresolved engineering issues, supplier dependencies, delayed approvals, certification gaps, and testing backlogs before they impact schedules or program outcomes.
- **Shift governance from applications to workflows:** Assign accountability for end-to-end workflows such as requirements-to-validation, design-to-manufacturing, and issue-to-resolution rather than individual systems.
- **Measure decision quality and execution speed:** Success should be evaluated through cycle-time compression, faster issue resolution, improved first-time-right outcomes, and reduced engineering rework.

"By feeding the entire production workflow into the system, AI can determine what should be prioritized and how work should be sequenced to minimize bottlenecks."

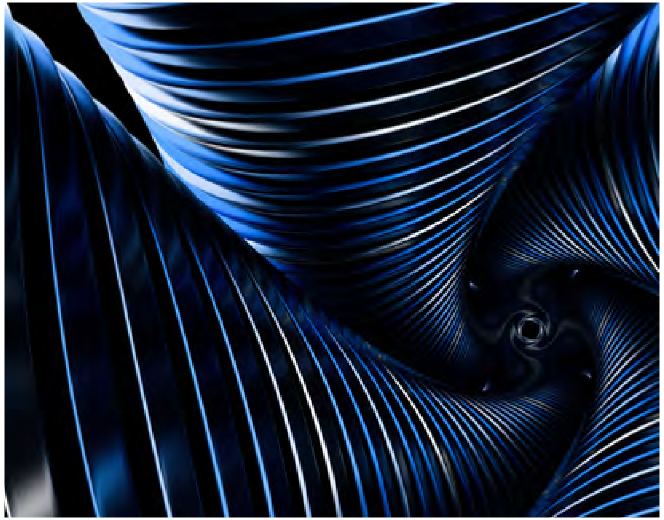
Susanne Lee,
Director of Technology, L3Harris Technologies

Build the AI and compute foundation for engineering at scale

Industrializing AI requires more than deploying models into engineering workflows. Many organizations underestimate the importance of the underlying infrastructure, operating environment, and ecosystem decisions needed to support AI at scale. As AI adoption expands across engineering, organizations must balance performance, cost, security, sovereignty, and regulatory requirements while ensuring that engineering teams can reliably access the computational resources, data platforms, and tools they need.

Indra's Carlos Castillo Rubio elaborates, *"AI investment often follows a two-step model: organizations must first build the underlying data, compute, and platform infrastructure before aligning products and use cases. As a result, value realization is less immediate, and because the impact of infrastructure is often indirect and distributed across programs, it can be difficult to justify the investment upfront."*

This is particularly important in A&D, where sensitive engineering data, export-control restrictions, sovereign deployment requirements, and intellectual property considerations often limit the use of standard cloud-based AI approaches. Organizations should therefore establish a clear AI platform strategy that aligns technology choices with engineering priorities, governance requirements, and long-term business objectives.



Key actions:

- **Define a build-partner-buy strategy for AI capabilities:** Determine which AI capabilities should be developed internally, sourced from strategic partners, or consumed through commercial platforms. Retain control of capabilities that create competitive differentiation, contain sensitive engineering knowledge, or influence certification-relevant decisions.
- **Align AI infrastructure with sovereignty and security requirements:** Establish deployment architectures that address data residency, export-control obligations, security classifications, supplier IP protection, and national sovereignty requirements. These constraints should shape infrastructure decisions from the outset rather than being addressed after deployment.
- **Create scalable engineering AI platforms and shared services:** Provide common services for model development, deployment, monitoring, data management, and governance rather than allowing individual functions or programs to build isolated solutions. Shared platforms improve reuse, reduce costs, and accelerate deployment across programs.
- **Invest in the compute and data foundations needed for engineering AI:** Assess current and future requirements for high-performance computing, simulation environments, cloud resources, edge capabilities, and engineering data platforms. Infrastructure planning should anticipate growing demand from generative AI, agentic systems, digital twins, and advanced simulation workloads.
- **Establish operating models for AI platform management:** Define ownership for infrastructure, models, data, security, governance, and engineering adoption. Clear accountability helps organizations manage AI as an enterprise capability rather than a collection of disconnected technology initiatives.
- **Measure platform effectiveness through reuse, scalability, and adoption:** Track how effectively AI platforms support deployment across programs, reduce implementation effort, improve model reuse, and accelerate the transition from experimentation to production-scale engineering applications.

"AI investment often follows a two-step model: organizations must first build the underlying data, compute, and platform infrastructure before aligning products and use cases. As a result, value realization is less immediate, and because the impact of infrastructure is often indirect and distributed across programs, it can be difficult to justify the investment upfront."

Carlos Castillo Rubio,
Director of Product Engineering, Indra

Embed safety, quality, certification, sovereignty, and trust into engineering by design

In A&D, the primary constraint on AI adoption is rarely technical capability. Rather, it is the ability to deploy AI in ways that are trusted, explainable, secure, and aligned with regulatory, certification, and sovereignty requirements. Safety, quality, and certification requirements determine what can be designed, changed, approved, and deployed. As a result, AI must be integrated into engineering workflows in ways that preserve product quality, generate evidence, maintain accountability, and respect clear limits on where AI can and cannot be used.

Our research shows that 60–80% of organizations cite governance, traceability, and compliance as major barriers to scaling AI. At the same time, 70–80% prioritize explainability, sovereignty, and control over data and intellectual property.

As a result, quality, safety, certification, regulation, and sovereignty should be treated as architectural design constraints rather than governance afterthoughts. The CTIO of a defense contractor from Southern Europe notes, *"Security for data and AI assistants must be integrated from the outset, not added later. Agents introduce new risks, as they can access tools and data much like humans; therefore, least-privilege principles and continuous verification must be embedded in the architecture from day one."*

70-80%

Percentage of organizations that prioritize AI explainability, sovereignty, and control over data and IP.

Key actions:

- **Design for certification readiness from the outset:** Ensure AI outputs can be traced back to source data, model versions, assumptions, engineering decisions, validation activities, approval records, and quality evidence. Certification evidence should be generated as part of normal engineering workflows.
- **Define validation and certification pathways for AI-assisted engineering:** Establish where AI can support engineering activities, where human approval is required, and what evidence is needed to demonstrate product quality, compliance, airworthiness, and auditability.
- **Engage regulatory, safety, certification, quality, and airworthiness experts early:** Involve domain experts when selecting use cases, defining controls, and interpreting regulatory requirements to ensure AI deployments align with applicable standards and operational constraints.
- **Protect configuration integrity and engineering accountability:** Maintain visibility into how AI influences requirements, designs, configurations, engineering changes and quality records throughout the lifecycle.
- **Align AI architectures with sovereignty requirements:** Incorporate data residency, export controls, supplier IP boundaries, security classifications, and sovereign deployment requirements into technology decisions from the outset.
- **Embed governance into engineering workflows:** Move beyond policy-based oversight by incorporating decision rights, validation controls, escalation paths, and audit trails directly into day-to-day engineering execution.
- **Build trusted agent architectures for engineering:** Design AI agents with clear operating boundaries, least-privilege access, defined autonomy levels, and secure interactions with engineering systems. Specify which activities agents can execute independently and which require human authorization.
- **Operate agent-based engineering environments with continuous assurance:** Continuously monitor agent behavior, validate outputs, detect anomalies, and maintain auditable records of agent actions. Regular oversight helps ensure agents remain reliable, compliant, and aligned with engineering, safety, and certification requirements.

Organizations should prioritize different actions depending on their current level of digital continuity and engineering AI maturity, progressively strengthening the engineering foundation, scaling AI, redesigning operating models, and embedding trust by design (see figure 20).

Figure 20.

Organizations should prioritize different actions based on their augmented engineering maturity

AI experimenters (20%)

- Strengthen the engineering foundation so AI pilots are supported by trusted lifecycle data and engineering knowledge.
- Industrialize successful AI pilots by embedding them into engineering workflows and building the supporting AI and compute foundation.
- Redesign engineering processes by defining human AI roles, developing workforce capabilities, and introducing structured change management.

Augmented leaders (10%)

- Continuously evolve the engineering knowledge backbone to support enterprise-wide reuse, AI reasoning, and lifecycle learning.
- Advance industrialized AI through engineering decision intelligence, agentic engineering, and optimized AI platforms and compute infrastructure.
- Lead the next generation of trusted engineering by shaping certification approaches, sovereign AI architectures, and industry best practices

Fragmented operators (49%)

- Build the engineering foundation by connecting priority engineering data and establishing governance for critical engineering assets.
- Industrialize AI selectively by focusing on a few high-value, decision-grade engineering workflows with measurable outcomes.
- Engineer trust by design by establishing baseline governance, traceability, safety, and regulatory controls before scaling AI.

Connected builders (21%)

- Scale AI across connected engineering workflows by expanding from isolated use cases to enterprise-wide decision intelligence.
- Redesign the operating model around human-AI teams and build closed-loop learning across engineering, manufacturing, and sustainment.
- Engineer trust by design by embedding certification readiness, explainability, sovereignty, and governance into AI-enabled engineering

Source: Capgemini Research Institute analysis.

Conclusion

A&D engineering is entering a new era, where competitiveness will depend less on the number of digital tools deployed and more on the ability to operate engineering as a connected, intelligent system. As programs become more software-defined, data-intensive, and autonomous, the organizations that move fastest will be those that can preserve trusted engineering context across the full lifecycle and use AI to act on it.

But the pressure on A&D organizations is immediate.

They are being asked to increase speed, capacity, and responsiveness in a context where demand signals remain uncertain, and delivery timelines are tightening. This means the sector cannot wait for perfect data, fully integrated systems, or complete enterprise transformation before capturing value.

This report shows that augmented engineering is not simply an evolution of digital transformation. It is a new operating model for how engineering work is designed, executed, governed, and continuously improved. Semantic, model-based digital continuity provides the lifecycle backbone, connecting requirements, design, manufacturing, certification, suppliers, and sustainment. AI brings intelligence to this backbone, enabling faster analysis, better decision support, workflow automation, and new forms of human-AI collaboration. Full value emerges when these capabilities work together: AI needs trusted data to scale, and digital continuity needs AI to become an engine for continuous learning and optimization.

The leaders identified in this research are already moving in this direction. They are embedding AI into connected workflows, strengthening governance, building digital thread literacy, and using productivity gains to expand innovation capacity. Their advantage is not simply better tools; it is a more integrated way of engineering – one that improves program speed, certification readiness, cost control, workforce effectiveness, and supply chain resilience. The next advantage will come from combining this long-term transformation discipline with near-term execution. Leaders will use quick wins not as isolated pilots, but as stepping stones toward scalable augmented engineering, proving value in contained workflows before industrializing them across programs, functions, and partner ecosystems.

Looking ahead, this gap is likely to widen. Agentic AI, autonomous systems, and increasingly complex software-defined platforms will require engineering organizations to govern not only models and tools, but also decisions, workflows, and human-AI accountability across decades-long lifecycles. In this environment, fragmented progress will not be enough.

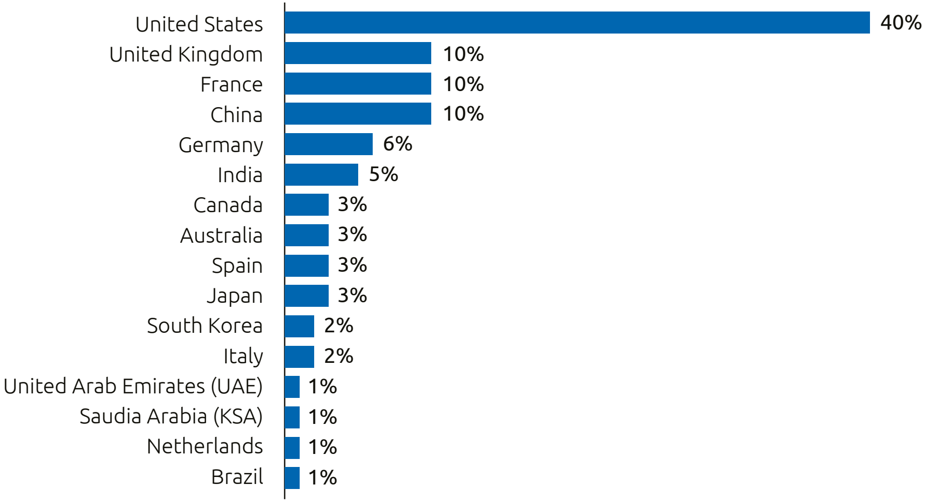
For A&D organizations, the imperative is clear: build the digital backbone, scale AI through high-value workflows, prepare the workforce, and govern human-AI collaboration by design. Those that do will be better positioned to accelerate innovation, strengthen resilience, and shape the next era of engineering advantage.

Research methodology

In April and May 2026, we conducted a global survey of executives from 200 aerospace and defense organizations, with two respondents from each organization, one representing digital continuity (digital thread) initiatives and one representing AI-enabled engineering. Respondents included senior leaders and practitioners across engineering, digital, and operations functions, spanning OEMs, defense contractors, suppliers, and MRO providers. The study assessed organizations' maturity across digital continuity and AI-enabled engineering, along with foundational capabilities such as data, governance, and workforce readiness, and their impact on key engineering outcomes including time-to-market, cost, compliance, quality, and reuse.

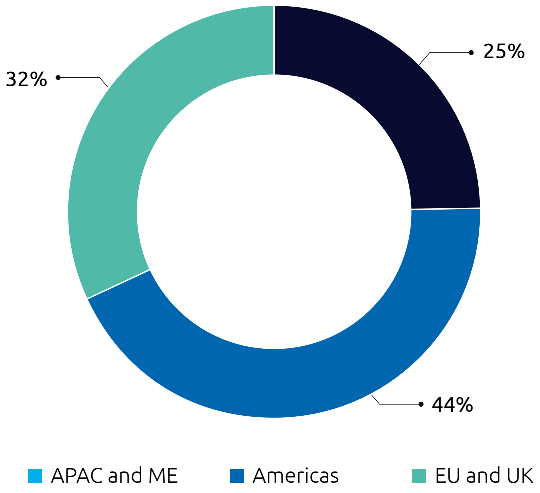
The surveys were complemented by 10 in-depth interviews with industry experts. The distribution of survey respondents is provided in the following figures. The study findings reflect the views of the respondents to our online questionnaire for this research and are intended to provide directional guidance. Please contact one of the Capgemini experts listed at the end of the report to discuss specific implications.

Organizations by location

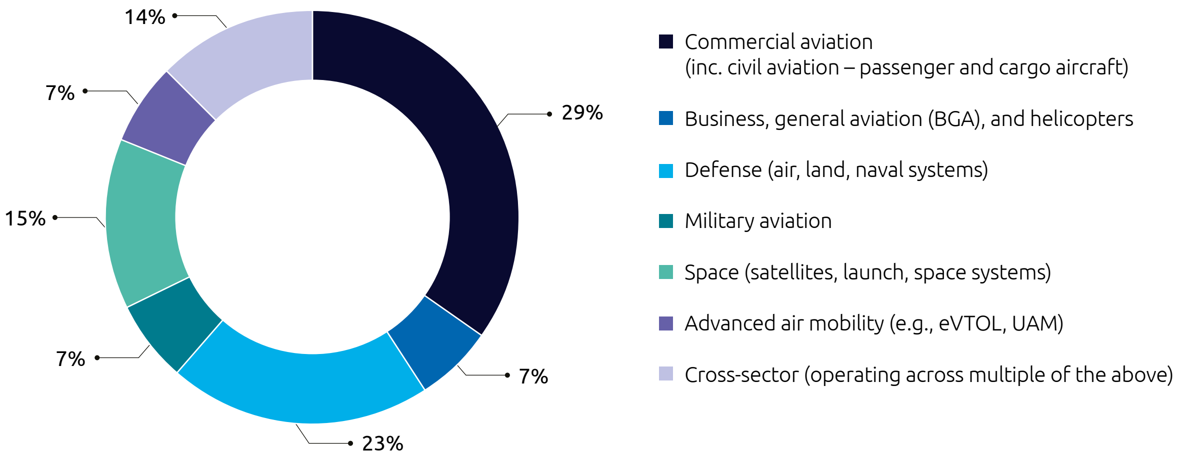


Source: Capgemini Research Institute, Augmented engineering survey, April – May 2026, N = 200 A&D organizations.

Organizations by region

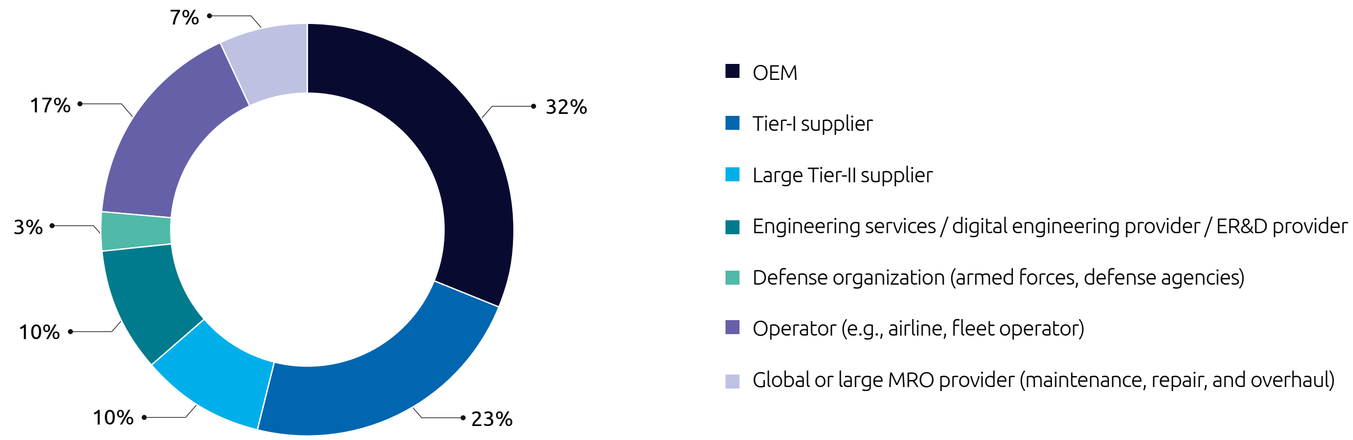


Organizations by subsector



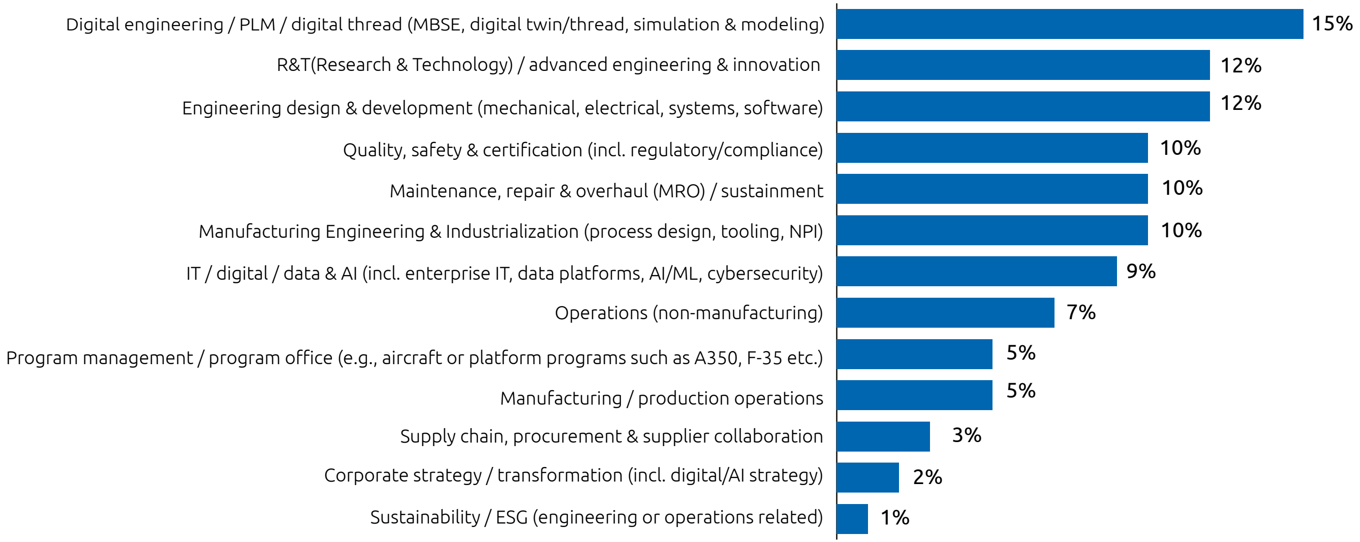
Source: Capgemini Research Institute, Augmented engineering survey, April – May 2026, N = 200 A&D organizations.

Organizations by segment



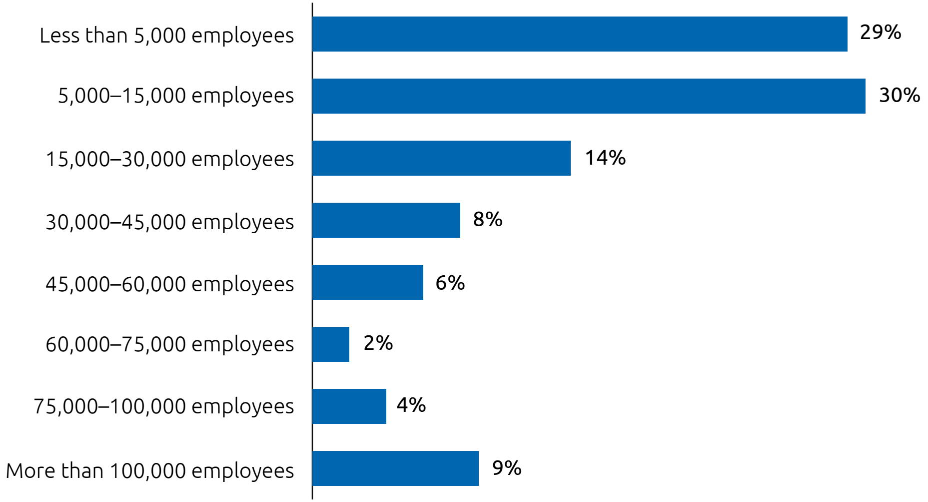
Source: Capgemini Research Institute, Augmented engineering survey, April – May 2026, N = 200 A&D organizations.

Executives by department/function



Source: Capgemini Research Institute, Augmented engineering survey, April – May 2026, N = 200 A&D organizations.

Organizations by size of workforce



Source: Capgemini Research Institute, Augmented engineering survey, April – May 2026, N = 200 A&D organizations.

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Meet the experts

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Frédéric Combes joined Capgemini in 2024 as Quality Excellence Priority Leader, bringing 30 years of Aerospace & Defense experience. Formerly at Airbus, he held senior leadership roles spanning engineering, safety, customer services, and business development, where he led major programs and large-scale transformations. He has a proven track record in driving operational performance and quality improvement across complex environments. Frédéric combines deep industry expertise with the ability to lead global, cross-functional teams and deliver measurable results. He is passionate about advancing operational excellence and strengthening capabilities in the Aerospace and Defense sector worldwide. He continues to support clients in transformations.

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Frédéric is a Doctor of Engineering in control systems and joined the Capgemini Group in 2000. Since then, he has built extensive experience in the aeronautics sector, working with a wide range of industry clients. He has developed deep expertise at the Airbus account, where he has been a key member of the industry sales team since 2015, supporting major programs and strategic initiatives. With a strong track record in client engagement and sector development, he now leads the Aerospace and Defense sector globally for Capgemini Engineering, driving growth, innovation, and delivering value across complex, international environments and partnerships.

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Thierry Berthelon joined Capgemini in 2024 as CTO for the PLM Global Practice, bringing over 35 years of experience in technology leadership and innovation. He spent 28 years at Airbus Defense and Space, leading design offices and delivering complex engineering programs. Over the past decade, he has specialized in digital transformation, notably as Program Director of the DDMS initiative at Airbus Helicopters. Thierry combines strong expertise in PLM deployment, change management, cybersecurity, cloud, and agile with a sharp focus on customer outcomes.

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Ramya has over fourteen years of experience in consulting and digital transformation. She earned gold medals in both her undergraduate and postgraduate studies, the latter from the Indian Institute of Technology. She has co-authored numerous publications for the Capgemini Research Institute on the impact of digital technologies across industries and developed proprietary tools for assessing clients' data and digital maturity.

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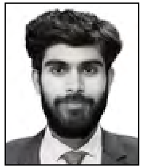
Donald has over five years of experience in consulting, market research, and technology strategy. An engineer by training with an MBA from NMIMS Mumbai, he focuses on the intersection of technology and business transformation. His research and thought leadership span AI, digital engineering, and industry transformation across aerospace & defense, automotive, banking, and sustainability.



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Chetan is part of Capgemini Invent, driving research and consulting initiatives in digital transformation and emerging technologies. An MBA graduate from IIM Jammu, he brings expertise in data-driven strategy and innovation. He has contributed to projects on government data maturity, post-quantum security readiness, and global consumer trends, and has experience developing AI- and IoT-based solutions for supply chain optimization and energy efficiency

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Capgemini brings deep industry and technology experience to aerospace and defense

Quick start for PLM transformation – AI-powered PLM

Turning augmented engineering into measurable outcomes requires more than isolated AI pilots. Capgemini helps organizations build the digital continuity foundation, prioritize high-value AI opportunities, and scale transformation through a structured, outcome-driven approach.

	Experts exchange / ideation	Deep dive AI-PLM status	AI opportunity roadmap	Deploy POV assessment	Structure a full PLM modernization plan
Description	Exchange on the spectrum of activities that can be jointly delivered to activate PLM modernization across the value chain in the organization.	Present some REX on multi agent close to the main client priorities.	This assessment tool focuses on the transition between phases, helping organizations prioritize improvements and quick wins for business transformation initiatives related to digital continuity.	Measure the baseline (business & products), identify and prioritize opportunities, and kick-start selected agent initiatives.	Measure the baseline (business and products), identify and prioritize opportunities, and kick-start the digital continuity transformation.
Approach	• Digital continuity value proposition pitch • Multi agent power • Exchange on ongoing and future initiatives • Alignment on exploration topics	• Expert meeting outputs as meeting inputs • Brainstorm on implementation roadblocks and levers • Concrete demonstration zooming in on client-specific use cases • Present the typical use cases • Expose the Digital Continuity execution model	• Tailored AI use-case map • Provide a list of opportunities prioritized by ROI	• Set a common vision through tailored interviews and workshops using the flash assessment results • Leverage established methodology to design the agentic solution	• Phased delivery for a full transformation program including: IT modernization, engineering agent, data model-based modernization
Expected results	• Understand the starting point of the clients on engaged digital engineering • Initial understanding of PLM modernization initiatives to deep-dive	• Full understanding of the system IT landscape and agent strategy • Objective assessment of PLM, data, and AI maturity, highlighting gaps, risks, and priorities	• Pragmatic, prioritized roadmap aligned with business objectives and operating model • Identification of proof-of-value opportunities to demonstrate potential	• Operational agents demonstration with measurable benefits	• Detailed definition of a digital transformation for engaged digital engineering plan • Key business processes challenged • Detailed plan for new operating model deployment with driver KPIs
	2 hours	1 week	~2 weeks	4–8 weeks	+3 weeks

3 phases / 5 functions / 30 agentic systems / 8 PLM data semantic strategic patterns

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About the Capgemini Research Institute

The Capgemini Research Institute is Capgemini's in-house think tank on all things digital. The Institute publishes research on the impact of digital technologies on large traditional businesses. The team draws on the worldwide network of Capgemini experts and works closely with academic and technology partners. The Institute has dedicated research centers in India, Singapore, the United Kingdom, and the United States. The Institute was ranked #1 in the world for the quality of its research by independent analysts for six consecutive times - an industry first.

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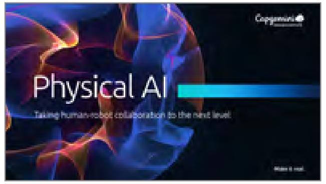

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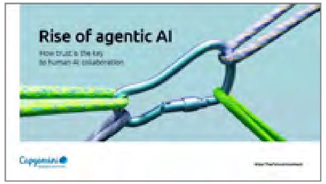

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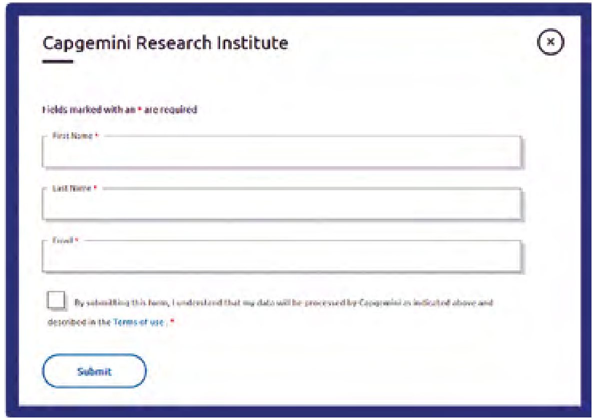

Notes

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Capgemini is an AI-powered global business and technology transformation partner, delivering tangible business value. We imagine the future of organizations and make it real with AI, technology and people. With our strong heritage of nearly 60 years, we are a responsible and diverse group of over 420,000 team members in more than 50 countries. We deliver end-to-end services and solutions with our deep industry expertise and strong partner ecosystem, leveraging our capabilities across strategy, technology, design, engineering and business operations. The Group reported 2025 global revenues of €22.5 billion.

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