HCLSoftware

Tech Trends 2026

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Who should read this report and why?

This report is designed for C-suite executives, board members, and senior business, technology and innovation leaders who are making decisions that will define enterprise competitiveness in 2026 and beyond. It focuses on the few technology shifts that are moving from experimentation to execution - and explains where to act, where to wait and how to scale with confidence.

You should read this report if you are:

- Defining growth, transformation, or investment priorities.
- Translating AI and digital ambition into operating models.
- Balancing speed, trust, resilience and long-term value.
- Looking to benchmark your strategy against global peer momentum.

What this report helps you do?

- Identify which technology bets matter the most vs the noise.
- Understand where each trend sits on the adoption curve.
- Pressure-test existing roadmaps against real enterprise signals.
- Align strategy, talent, data and governance before scaling.

How the insights were built?

This report is grounded in 7–8 months of structured research, combining quantitative signals with executive judgment to ensure relevance and rigor.

The analysis is based on:

Primary research with 173+ CXOs, VPs, and Directors across industries and regions. This primary research is done in partnership with MarketsAndMarkets.

Large-scale sentiment and signal analysis across thousands of data points.

Secondary research spanning analyst reports, industry publications and market data.

Expert validation to refine trend framing, maturity and impact.

All inputs and graphs/visual representations were synthesized through a structured, step-by-step methodology - moving from broad signal scanning to focused trend validation and final prioritization. For more details, please refer to the research methodology section at the end of the report.

Executive Summary

We are entering a decade where enterprises will be defined less by what they build and more by what they allow technology to decide, adapt, and govern on their behalf. The research signals a clear inflection point: digital transformation is no longer about adopting tools, but about redesigning enterprises around intelligent systems that operate responsibly and at scale.

AI, software, infrastructure, experience, and trust are converging into living operating models that reshape how value is created and sustained. AI agents and autonomous systems are emerging as a universal foundation, dissolving the boundaries between software and services. Sovereignty will become an extremely important topic due to concerns over control and compliance.

There needs to be a fundamental shift in how enterprises view AI. They need to shift the focus from AI as a Destination to AI as a Means to an End.

This shift demands a new architectural lens. HCLSoftware's XDO blueprint—Experience, Data, and Operations - captures this convergence, enabling enterprises that are intelligent by default, governed by design, and built to scale. While platforms are global, execution is increasingly glocal, shaped by regional priorities around trust, automation, sustainability, and innovation. Tech Trends 2026 is not a prediction of the future, but a guide to the present - helping leaders make a small number of intentional bets and align software, services and governance to build autonomy, resilience and trust.

Kalyan Kumar (KK)
Chief Product Officer at HCLSoftware

Introduction

Value is no longer created by adoption - but by integration, orchestration and governance

Technology is entering a point of irreversible momentum. For enterprise leaders, the defining question is no longer what could be done, but what cannot be postponed. HCLSoftware's Tech Trends 2026 synthesizes months of primary research, executive sentiment analysis and early adoption signals to cut through experimentation fatigue and surface what truly matters next. Spanning 12 megatrends across four converging themes, the report distinguishes between capabilities that are reshaping organizations today and those that will determine competitive position tomorrow. The pattern is unmistakable: technology is shifting from discrete initiatives to integrated systems, from isolated pilots to enterprise-scale operating models and from digital aspiration to measurable business impact. This is not a catalogue of innovations - it is a strategic guide for leaders who must make a small number of decisive bets now, while deliberately building the governance, talent and architectural foundations required to scale with confidence.

Cognition & Compute: When intelligence becomes the enterprise core

AI is no longer augmenting decisions; it is beginning to make them. **Agentic systems,** next-generation software models and new computing architectures are converging to create platforms that learn, adapt and act continuously. The shift underway is structural: static applications are giving way to living systems and software delivery itself is being rewired around autonomy, orchestration and speed. Leaders who succeed here will not simply deploy more AI - they will redesign how work, decisions and value creation happen at scale.

Experience & Engagement: The new operating layer for human interaction

Experience & engagement reflects a parallel transformation in how humans interact with technology. Digital experiences are escaping the confines of screens and sessions - evolving into persistent, spatial and context-aware environments. From **immersive reality** to advanced connectivity, interaction is becoming continuous rather than transactional. The implications are profound: engagement that does not log out, collaboration that is no longer bound by location and experiences that respond to their surroundings in real time. What differentiates leaders in this domain is not adoption of new interfaces, but the ability to translate immersion into clarity, trust and measurable outcomes.

Resilience & Responsibility: Trust is the price of scale

Security, transparency, ethical accountability and sustainability are no longer defensive concerns, they are core enablers of durable growth. This theme marks a shift from reactive compliance to resilience by design: embedding responsible AI, **cyber-readiness, environmental stewardship** and **bio-governance** directly into platforms, infrastructure and decision systems. As technologies increasingly act on behalf of the enterprise - optimizing operations, reshaping processes and managing resources at scale - leaders must ensure that governance, explainability, safety and sustainability evolve as fast as capability.

Frontiers & Foundation: Where tomorrow's advantage is quietly built

New infrastructure stacks - spanning space technologies, advanced semiconductors, robotics and manufacturing innovation - are quietly reshaping what organizations can sense, compute and execute. Some of these capabilities are already delivering value; others are early signals of where the next decade will be won. Together, they underscore a critical insight: future-ready enterprises are investing simultaneously in exploration and in the foundations that allow frontier technologies to move from pilots to platforms.

The following section shifts the lens to 2030, showing how today's technologies converge into tomorrow's industry-shaping plays.

2030 Trend Matrix:
16 combined plays that will reshape industries

Each row highlights a 2030 opportunity space; each cell shows how converging technologies combine to create real-world impact.

	AI Autonomy	Immersive XR	Trusted Data & Digital Sovereignty	Bio-Driven Health & Sustainability	2030 Theme
AI Autonomy	**Autonomous decision core** An AI engine continuously recommends actions on pricing, approvals and scheduling, while people review high-impact decisions.	**AI-guided immersive service** Branch/contact-centre staff use XR with real-time AI prompts to resolve issues faster and cross-sell better.	**Self-driving enterprise decisions** AI continuously re-plans sales, supply and resources using compliant local data, so the business can respond to demand changes in near real time.	**Footprint optimizer** AI reviews energy use, staffing and asset performance across sites and recommends changes that cut costs while reducing emissions and improving workplace conditions.	**The self-managed enterprise.**
Immersive XR	**Co-pilot workspaces** Distributed teams meet in XR rooms where AI handles notes, actions, language translation and next steps.	**Persistent virtual sites** Virtual branches, plants and showrooms mirror physical ones for sales, training and remote inspections.	**Sovereign virtual control rooms** XR control rooms visualise only policy-allowed data, keeping sensitive data inside each jurisdiction.	**Impact experience labs** Customers and citizens explore how choices affect health and sustainability through immersive, interactive simulations.	**The end of the screen-based enterprise.**
Trusted Data & Digital Sovereignty	**Governed decision fabric** Clean, permission-checked data flows into AI models so decisions are accurate, explainable and compliant across the enterprise.	**Sovereign customer service pods** Agents and customers meet in immersive pods where data views are tailored to each country's rules.	**Enterprise data mesh & catalogue** Organisation-wide catalogue and mesh ensure everyone uses the same, approved data and definitions.	**Bioengineered impact ledger** Trusted ledgers track engineered materials, therapies and emissions - supporting regulation, incentives and outcome-based accountability.	**Sovereign intelligence at scale.**
Bio-Driven Health & Sustainability	**Early-risk & resource triage** AI flags high-risk patients, assets and locations so teams can prioritise outreach, maintenance and investment.	**XR field & community support** Clinicians, engineers and communities use XR overlays in the field to follow best-practice protocols on-site.	**Health–environment insight hub** Analytics correlate pollution, climate, utilisation and outcomes to target local interventions and policies.	**Circular & resilient ecosystems** End-to-end tracking of materials, waste and health impacts to meet circular-economy and public-health targets.	**Human–planet co-operating systems.**

Some trends are global; others are being shaped region by region.

Category	Mega Trend	Global %	North America%	Europe %	APAC%	LATAM+MEA%
Cognition & Compute	AI Agents & Autonomous systems	76%	29%	26%	25%	20%
	Next-Gen Software	36%	23%	34%	32%	11%
	Quantum	17%	20%	30%	27%	23%
Experience & Engagement	Immersive Reality	8%	14%	29%	21%	36%
	Advanced Connectivity	23%	15%	28%	28%	30%
Resilience & Responsibility	Trust, Transparency & Cybersecurity	34%	21%	33%	26%	21%
	Energy & Sustainability	17%	21%	21%	21%	38%
	Bioengineering	3%	20%	0%	60%	20%
Frontiers & Foundation	Robotics	14%	33%	12%	33%	21%
	Space Tech	4%	14%	0%	0%	86%
	Advanced Semiconductors & Computing Architectures	8%	8%	23%	46%	23%
	Manufacturing & Digital Fabrication	4%	33%	17%	25%	25%

Exhibit A

AI autonomy is a global priority - everything else is scaling region by region.

Source: HCLSoftware interviews & surveys with 173 industry leaders

The regional adoption patterns point to a deeper reality: while a small set of megatrends - most notably AI Agents and Autonomous Systems - are reaching global consensus as foundational capabilities, most others are advancing along distinct, uneven pathways. This divergence is not accidental. It reflects how factors such as regulatory posture, industry structure, talent concentration, capital availability and societal priorities shape which technologies mature fastest and how they scale. The implication for leaders is clear: the next wave of competitive advantage will not come from uniform global rollouts, but from the ability to orchestrate innovation intelligently - learning from early proof points, investing where ecosystems are strongest and timing expansion as technologies move from localized momentum to platform-scale impact.

> These top trends together signal the arrival of an intelligent, secure, sustainable, and hyper-connected era in next 5 years: AI agents emerge as the globally unified priority, Europe accelerating responsible AI and next-gen Software, APAC forging ahead in robotics, and LATAM+MEA redefining satellite connectivity and sustainability.
>
> **Shekeb Naim**
> VP Tech Advisory, MarketsandMarkets

The 12 Mega Trends

Enterprise Readiness Vs Momentum Scorecard

This scorecard positions the 12 mega trends based on two critical dimensions: the level of enterprise interest they are generating today and the maturity of real-world adoption already underway. By plotting these trends against one another - and layering in projected market impact - the view moves beyond hype to reveal where conviction is forming, where execution is catching up and where ambition still outpaces readiness.

Together, the scorecard highlights which technologies are already shaping enterprise agendas and which are approaching their inflection point toward broader scale.

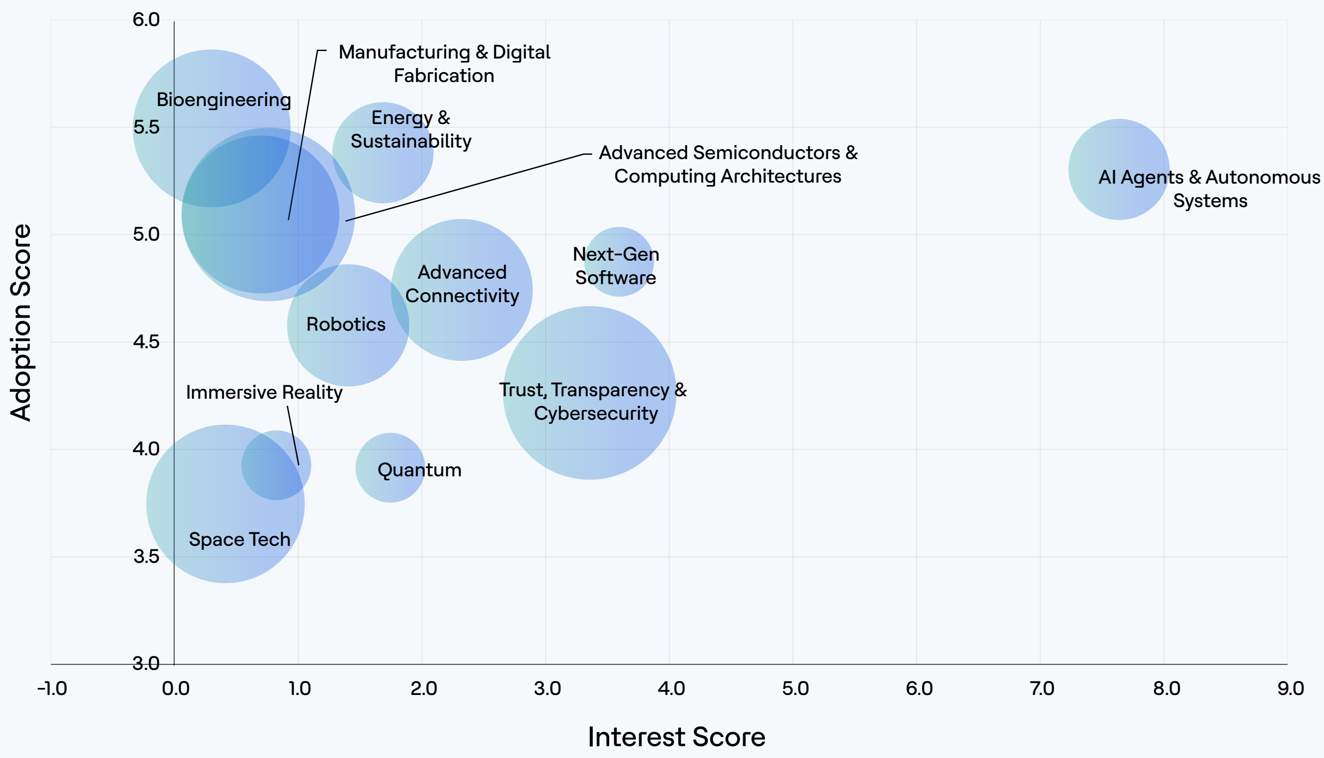


Exhibit B

Each trend is scored based on its level of interest generated, adoption maturity index and the projected market size till 2030

Note: The interest & adoption scores for all 12 mega trends are relative to each other and is based on 173 survey responses.
The bubble size for each of megatrends is based on the respective projected market size 2030 in USD Billion.

Megatrend 1: AI Agents & Autonomous Systems

AI enters its decisive decade.

Almost **8 out of every 10** survey respondents now deploy AI systems — with agentic AI powering today's operations and AGI shaping tomorrow's ambitions — yet governance remains the missing link for **one in four.**

Delegated intelligence takes charge

Something significant is happening in technology right now. For years, AI helped us analyze, predict, and automate pieces of work. But over the last 18 months, something shifted. AI stopped being just a tool we use. In 2026, it is defined by **autonomy** — systems that not only analyze but act, not only assist but decide.

The next wave of digital transformation lies in **AI agents and autonomous systems** — intelligent entities capable of reasoning, learning, and executing tasks with minimal human oversight.

Over the past decade, organizations mastered predictive analytics and began experimenting with generative AI. Today, these capabilities are converging into **agentic architectures** — ecosystems of autonomous agents that can execute workflows, coordinate across digital systems, and continuously learn from feedback loops.

This marks AI's pivotal shift from intelligence augmentation to intelligence delegation: moving from tools that support humans to systems that partner with them.

At the same time, the conversation around **Artificial General Intelligence (AGI)** continues to shape strategic foresight — the aspirational pursuit of human-level cognition and reasoning in machines. Together, these two trajectories define the evolving arc of AI — **one grounded in enterprise application, the other in visionary exploration.**

Why it matters?

Key findings

Autonomy is scaling fast: 81% of enterprises in HCLSoftware's 2026 survey report live or pilot initiatives involving autonomous AI agents.

Operational impact is tangible: Respondents rated operational efficiency and business model innovation as the top outcomes from agentic AI adoption.

Public trust is strong but the challenge is disciplined scale: Sentiment analysis shows high confidence in AI agents, and nearly three-quarters of organizations now operate with centralized or hybrid governance models. The real gap is no longer experimentation, but ensuring consistent, safe governance as agentic AI scales across the enterprise.

AGI fuels long-horizon ambition: More than **73%** of executives expect AGI maturity only after 3-4 years, framing it as a strategic but distant horizon.

2026 is the crossover year: The year when AI transitions from being a predictive technology to an autonomous capability — from intelligence that responds to intelligence that acts.

Emerging Now: Agentic AI

Autonomy becomes the new automation.

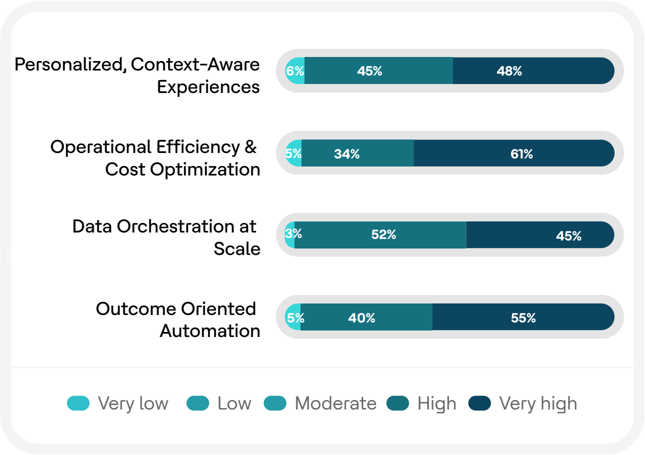
For years, AI has been our analytical sidekick—predicting demand, suggesting next steps, generating content on cue. But something new is happening. AI is no longer the system that simply "assists." It's becoming the system that acts. Take global supply chain, for example. In the past, teams chased delays, updated spreadsheets, and reacted to disruptions as they surfaced. Now? An AI agent monitors ports, weather patterns, shipment routes, and inventory signals all at once. It identifies a brewing delay, reroutes containers, renegotiates timelines with vendors, updates the ERP, and alerts the logistics team—all before the first human even notices something is off. That's not automation. That's autonomy.

Agentic AI marks this practical leap forward. These agents don't just follow rules—they understand context, reason through goals, learn from feedback, and collaborate with other systems. They can secure a network in real time, orchestrate workflows across departments, accelerate code delivery, or streamline customer operations without depending on step-by-step human instructions.

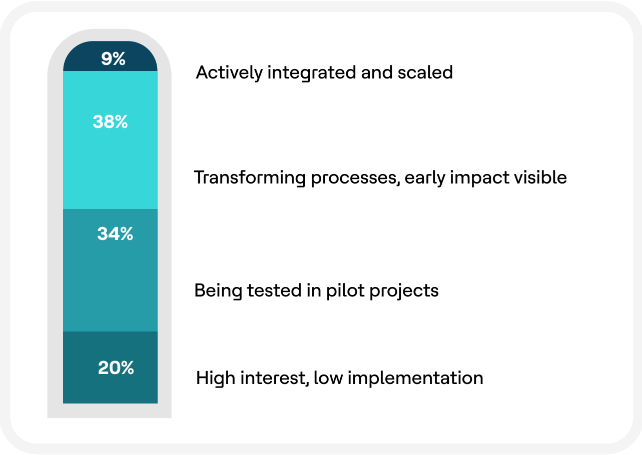
In essence, enterprises are no longer just training models. They're deploying intelligent actors—digital teammates—that expand organizational capacity while reducing the operational burden on humans. And this is only the beginning. Agentic AI is rewriting the relationship between people and machines, shifting us from "telling AI what to do" to working alongside systems that can think, decide, and act.

Exhibit 1.1

Enterprises are prioritizing agentic AI for efficiency and automation, while personalization and data orchestration are emerging next.



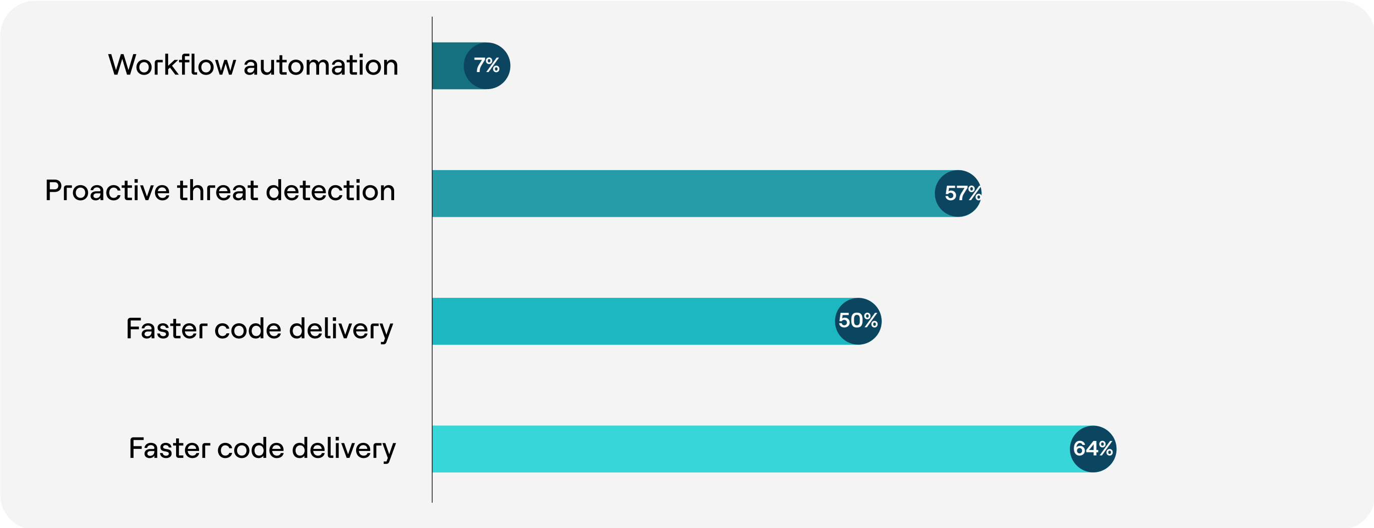
Agentic AI adoption stages among organizations in 2025



But what makes agentic AI the latest game changer in the AI landscape? Data in exhibit 1.1 reveals enterprises are prioritizing **Operational Efficiency (61%)** and **Outcome-Oriented Automation (55%)** as the main catalysts for agentic AI adoption, underscoring a strong focus on measurable productivity and ROI. Interest in **Personalized Experiences (48%)** and **Data Orchestration (45%)** indicates growing recognition of AI's broader potential, though these remain secondary priorities. Overall, organizations are approaching agentic AI with pragmatic intent -leveraging it first to streamline operations before expanding into experience-driven and data-intelligent applications.

Agentic AI has rapidly evolved from an experimental innovation to a transformative capability. The high percentage of organizations in the "transforming processes" stage underscores its "emerging now" status — it's no longer a speculative technology but one that's actively reshaping enterprise operations.

Exhibit 1.2 : Lead conversion acceleration tops agentic AI adoption in 2025



Speed is the new competitive edge — and agentic AI is redefining how enterprises move.

In 2025, the conversation around agentic AI has shifted from "what it could do" to "what it's already doing." Once confined to innovation labs and small-scale proofs of concept, Agentic AI is now embedded in the heart of enterprise operations.

Nearly **38%** of organizations report visible process transformation, while another **34%** are testing pilots that hint at imminent scale. The message is clear — enterprises are no longer experimenting with autonomy; they're operationalizing it.

Transformation is happening in the real trenches of work.

When we look at where agentic AI is being most widely implemented, the picture becomes even more telling (see exhibit 1.2). **Lead conversion acceleration** (42%) dominates as the top use case, showing how organizations are channelling AI's cognitive capabilities toward sharper customer engagement and faster deal cycles. **Workflow automation** (26%) follows, underscoring a growing emphasis on end-to-end process intelligence and autonomous execution. **Proactive threat detection** (19%) signals early experimentation in resilience and intelligent risk prevention while **Faster code delivery** (13%) remains smaller but steadily evolving. Collectively, these patterns suggest that enterprises are using agentic AI not just to optimize processes, but to drive growth, safeguard operations, and accelerate digital execution.

In many ways, agentic AI is becoming the nervous system of the modern enterprise.

It connects operational muscles with strategic intent — ensuring that every process, every interaction, and every decision can respond dynamically to change. This is not just about efficiency; it's about adaptability at scale.

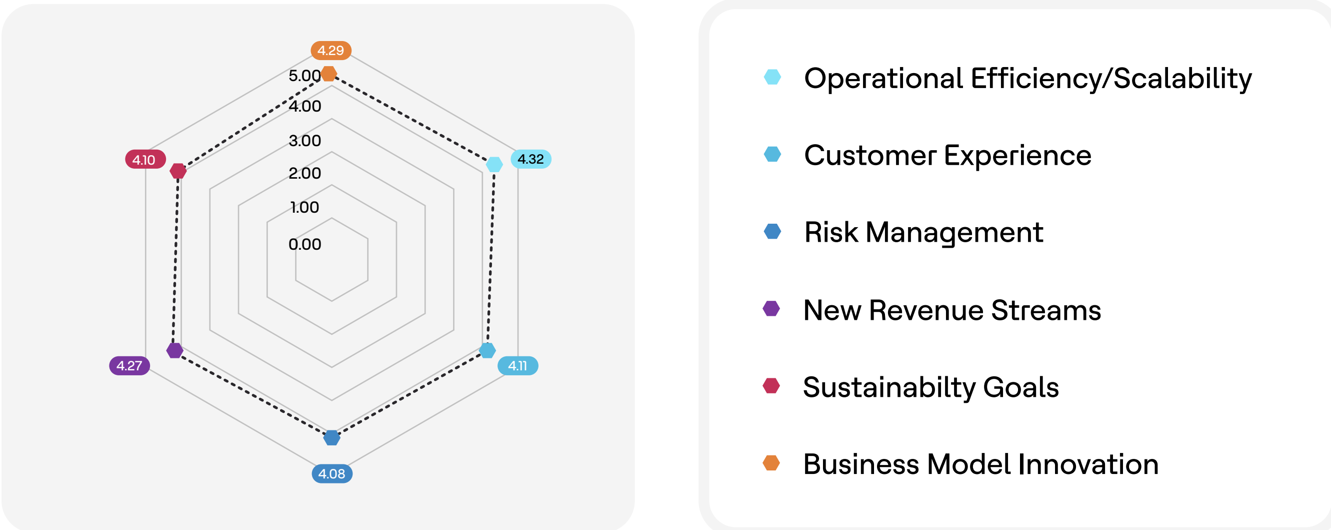
And as organizations continue to expand their AI capabilities, agentic AI is fast becoming the silent architect behind a new kind of enterprise — one built for speed, intelligence, and continuous evolution.

Barriers: Governance gaps, data friction, and the trust deficit

For many enterprises, scaling agentic AI is less about technology and more about confidence. With **56%** of organizations adopting hybrid governance models, the challenge now lies in balancing agility with accountability. Most are still defining how human and machine decision rights coexist — who acts, who oversees, and who is accountable when AI takes initiative.

Without unified governance frameworks, enterprises risk either over-controlling innovation or under-regulating autonomy. At the same time, data ecosystems remain fragmented and inconsistent, limiting the context and quality that agentic AI needs to operate effectively. Siloed systems and compliance barriers slow down intelligence flow, turning data into friction rather than fuel. The shift now is from collecting data to connecting it — ensuring that AI systems can interpret intent, not just information. And beneath it all lies the trust deficit — enterprises trust AI to optimize, but not yet to decide. This hesitation isn't about capability; it's about comfort. True adoption will depend on transparency, explainability, and alignment with human judgment. Ultimately, governance, data, and trust form the new foundations of AI maturity — not as barriers to autonomy, but as the architecture that makes responsible autonomy possible.

Exhibit 1.3
Agentic AI – Mesh of keep it as Possibilities



Plotting the north star of autonomy

The data in exhibit 3.1 reveals that agentic AI is delivering balanced, enterprise-wide impact, with scores consistently strong across strategic, operational, and sustainability dimensions. **Operational Efficiency**(4.32) and **business model innovation** (4.29) emerge as the top areas of maturity — reflecting how organizations are using AI not just to streamline, but to rethink how value is created and delivered.

In essence, agentic AI is redefining enterprise intelligence from being process-driven to being purpose-driven — fostering innovation that is scalable, sustainable, and strategically cohesive.

The road ahead

- **Governance as a growth engine** – Codify responsible autonomy with frameworks that embed compliance, transparency, and traceability.
- **Human-AI collaboration by design** – Shift from oversight to partnership, empowering teams to co-create and continuously adapt with AI agents.
- **Integration over expansion** – Prioritize connected AI ecosystems that link agents, workflows, and data for adaptive intelligence.
- **Redefine the core –** Rethink existing processes and operating models to fully harness agentic AI; transformation won't come from layering AI on top of legacy systems.
- **Measure resilience, not just results –** Track adaptability and learning agility as key performance metrics.

Coming Soon: Artificial General Intelligence

At the edge of ambition and reality.

Artificial general intelligence (AGI) refers to systems capable of general reasoning, adaptable learning, and cross-domain problem solving — the theoretical stage of AI evolution where machine cognition parallels human intelligence.

USD 116 billion by 2035, at a compound annual growth rate (CAGR) of **36.25%**

Source: StartUs Insights

Exhibit 1.4
How well are enterprises prepared for AGI in the coming future?

54% of organizations report being ready to leading in AGI talent preparedness — signalling strong foundations but limited depth for advanced AGI specialization.

81% of leaders have moved from awareness to active advocacy — showing that AGI is now a boardroom conversation, not a lab experiment.

56% of organizations rate their ecosystem ready or leading —indicating rising collaboration but continued dependence on external innovation.

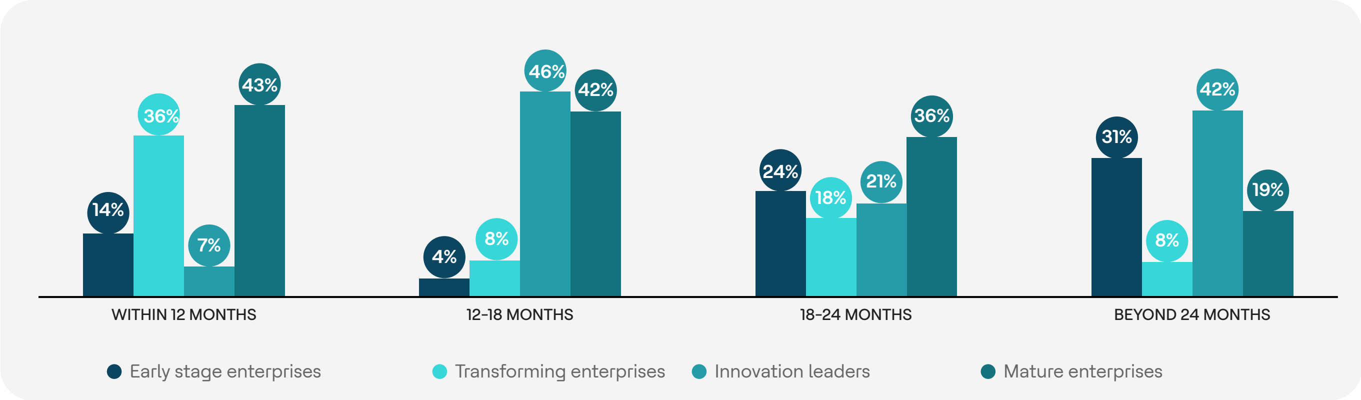
Digitally mature enterprises are setting the AGI pace.

The analysis in exhibit 1.5 reveals a strong correlation between digital maturity and readiness to scale AGI initiatives. Mature and innovation-leading organizations are significantly ahead—translating strategic intent into tangible AGI while early-stage firms remain largely in the exploratory or pilot phase.

This maturity gap reveals a widening strategic divide: enterprises with advanced data ecosystems and established AI operations are not only scaling faster but are also shaping the contours of the AGI era itself.

The recent Microsoft–OpenAI partnership exemplifies this dynamic, where digital maturity, strategic alignment, and ecosystem advantage converge to define leadership in AGI.

Exhibit 1.5
Digital maturity sets the tempo for AGI readiness — mature enterprises lead, while others race to catch up



The AGI imperative: Strategy, skills, systems

While AGI's full realization may still be years away, the window to prepare is now. The enterprises that act early will not just adopt AGI — they'll define its operating logic, ethics, and advantage.

Interestingly, public sentiment already reflects this shift. In a recent poll, **72% of respondents** believed an AI discovering a medical cure by 2026 is possible or very likely, signalling that consumer trust in AI's potential is growing faster than enterprise readiness. The world expects intelligent breakthroughs — and enterprises must catch up breakthroughs.

To bridge that gap, organizations need to move on three parallel tracks:

- **Strategy** — Define a clear AGI ambition that balances innovation with integrity. Establish governance principles that codify ethical decision-making, ensure explainability, and maintain human alignment. AGI strategy isn't about what to build— It's about building it responsibly.
- **Skills —** Develop an AGI-ready workforce fluent in reasoning, orchestration, and critical oversight. This means retraining leaders for cognitive collaboration, not control.

- **Systems —** Invest in AI-native architectures designed for self-learning, interoperability, and dynamic orchestration. The enterprises that evolve from data platforms to intelligence platforms will be first to operationalize AGI at scale.

The AGI race won't reward the biggest — it will reward the most adaptive. The call to action is clear: start building cognitive capability today, before intelligence itself becomes the competitive moat.

> "AI technologies - from frugal, energy-efficient models to generative and embedded AI - are transforming healthcare, finance, smart cities and industries. France's strong research ecosystem, advanced infrastructure, and interdisciplinary institutes foster startups, talent and collaboration, ensuring technological leadership, responsible deployment, and societal impact, positioning the country as a global AI innovation leader."
>
> **Department of Business**
> A branch of the French Ministry of Economy and Finance

People Pulse #1

It's 2026, and an AI independently discovers a cure for a major disease

27%
said: **Very likely** - it's already with reach

46%
said: **Possible,** bur still a long way

22%
said: Unlikely - AI isn't there yet

6%
said: Impossibale

In the age of decisive AI, the hardest questions aren't technical — they're human.

As AI transitions from experimentation to ubiquity, a new set of questions is emerging — less about feasibility, more about philosophy, governance, and shared benefit.

Among the key questions now defining the AI decade are:

- **Can enterprises balance autonomy and accountability** as agentic AI systems begin making decisions independently?
- **Will AI governance frameworks evolve fast enough** to ensure trust, fairness, and explainability at scale?
- Can smaller firms and emerging markets leapfrog maturity stages to compete with digitally native enterprises?
- And ultimately — **what will "human-in-the-loop" mean** in a world where AI increasingly becomes the loop itself?

In this evolution, AI is not just a megatrend — it is the 'meta-trend' that will shape how every other technological, social, and economic transformation unfolds through 2030 and beyond.

Megatrend 2: Next-Gen Software

Welcome to the age of self-building, self-running systems.

Nearly **8 in 10** enterprises expect AI-accelerated low-code/no-code to scale **within 18 months** — and Service-as-Software™ (SaS) is rapidly closing in, marking the fastest dual transformation in the software stack.

The emergence of self-creating, self-operating digital systems

Software is entering its most transformative shift since cloud computing. For the first time, enterprises are seeing creation and operations evolve at the same time — and at extraordinary speed. GenAI has collapsed the distance between an idea and a working system, while intelligent services are pushing operations toward self-management and continuous optimization.

Low-Code/No-Code (LCNC) strengthened by generative AI, is no longer a shortcut for simple apps. It has become a strategic layer for building business workflows, automations, and internal tools at scale —enabling teams to move from concept to execution in hours, not weeks. This is redefining how organizations deliver change, absorb complexity, and respond to opportunities.

In parallel, SaS is reshaping the runtime environment itself. Instead of managing tickets, dependencies, and incidents manually, enterprises are moving toward services that can observe, adapt, and remediate on their own.

Together, these trends are creating a new software fabric for the enterprise — one where software grows faster, adapts faster, and delivers value continuously.

Next-Gen software is not just about efficiency; it is about designing digital systems capable of keeping pace with the speed of business and the scale of modern operations.

Why it matters?

Key findings

Creation autonomy arrives first: With **84% of enterprises** expecting AI-accelerated low - code/no-code to scale within **18 months,** LCNC is the fastest - moving shift in enterprise software. Adoption is already mainstream, with **60%** in active use today.

GenAI changes the game: GenAI copilots are propelling LCNC forward by generating apps, workflows, models, tests, and integrations. This is turning citizen developers into governed contributors rather than peripheral experimenters.

Agentic service platforms are rising fast: While not fully autonomous yet, 31% of enterprises are already running SaS pilots. Most expect meaningful scale within the same 18-month window, signalling a move toward self-managing services.

Enterprises are ready to modernize: Strong leadership conviction and improving infrastructure readiness indicate organizations are moving beyond experimentation. The focus is now on operationalizing software autonomy end-to-end.

APAC leads Next-Gen software adoption: APAC emerges as the global hotspot due to its high concentration of digitally mature IT and software enterprises. Advanced adoption of both LCNC and SaS is accelerating scale across the region.

Emerging Now: Low-Code/No-Code

Accelerating software creation through GenAI-powered development.

Organizations are no longer treating low - code/no-code as an experimental side tool — GenAI has propelled it into the mainstream of enterprise software creation. What once helped teams assemble simple apps has evolved into a powerful AI-driven creation layer where workflows, data models, integrations, and interfaces can be generated from natural language. LCNC isn't just accelerating delivery — it's redefining the very mechanics of how software comes to life.

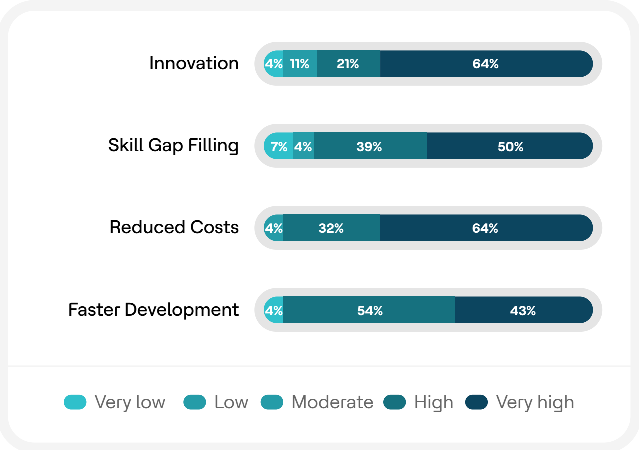
With nearly **three-quarters** (see exhibit 2.1) of organizations beyond early interest—and a growing share actively transforming processes or operating at scale—LCNC is no longer a fringe experiment but an emerging enterprise standard. This momentum is reinforced by what leaders value most faster development, lower costs, stronger innovation, and the ability to close skill gaps.

As GenAI accelerates how quickly ideas can be turned into working software, enterprises are using LCNC not just to clear backlogs but to expand digital capacity far beyond traditional development models. The constraint is no longer developer bandwidth—it's how fast teams can express intent and validate outcomes.

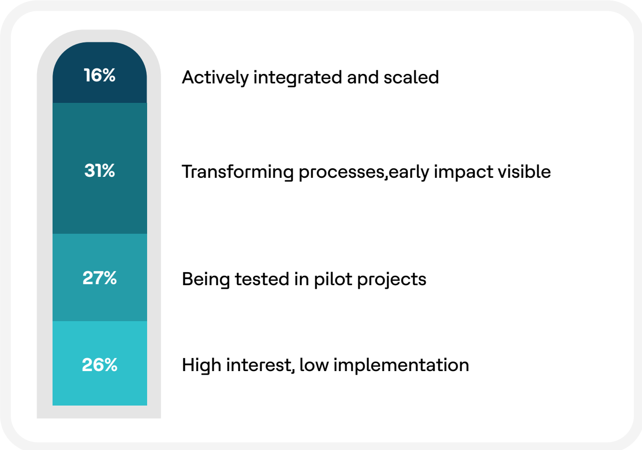
This shift is reshaping how work gets built across organizations. Business and IT teams can now collaborate in real time, co-creating governed digital solutions while AI automates the heavy lifting behind the scenes. As LCNC adoption deepens, companies are beginning to standardize AI-generated apps, embed governance-by-design, and orchestrate workflows across functions. The model is changing: from software being built for teams to software being built with them — instantly and iteratively, and at scale.

Exhibit 2.1

LCNC uptake is driven primarily by the need for faster delivery, lower costs, and stronger innovation capacity.



LCNC adoption stages among organizations in 2025



A new geography of software creation is taking shape.

Digitally mature regions are moving fastest, but each region is advancing along its own curve. **APAC** shows strong mid-maturity momentum, with **around 18%** of organizations already in pilot or early-transformation stages, reflecting its deep base of software-forward enterprises. **Europe** stands out as the most advanced region overall, with nearly **18%** of organizations in the transforming or actively scaled tiers—evidence of structured modernization and sustained enterprise commitment.

The maturity landscape isn't just descriptive — it signals where LCNC is headed next. Regions already running LCNC at scale are shifting effort toward governance, integration, and enterprise - wide orchestration. Regions earlier in the curve are focusing on pilots and proving value. Yet the end-state is consistent across markets: a software fabric that can be created quickly, adapted continuously, and shaped directly by the teams closest to the work. What's emerging is not merely a faster way to build apps, but a new operating philosophy for software — one where ideas translate into execution far more easily, powered by AI-enabled creators.

The LCNC Curve: From workflow stabilization to strategic creation

As enterprises advance in digital maturity, the role of low-code/no-code evolves from a tactical accelerant into a strategic capability. What begins as a tool for reducing manual effort gradually becomes a core engine for process orchestration and, ultimately, digital innovation.

The data in Exhibit 2.2 makes one pattern unmistakably clear: workflow automation is the universal starting point and the structural backbone of LCNC adoption. Whether organizations are early in their journey or already digitally mature, LCNC's first and most persistent contribution is streamlining fragmented, manual processes — establishing the operational stability needed to scale more sophisticated digital initiatives.

But as enterprises mature, the strategic horizon expands. App development rises sharply among transforming and innovation-leading organizations, signalling a move from LCNC as a tool for efficiency to LCNC as a platform for creating new value. Generative AI is amplifying this evolution: **44%** of respondents (see pulse survey #2) expect its biggest impact to be faster builds, dramatically reducing the effort required to prototype and iterate, while **31%** see smarter workflows as the most transformative benefit. Together, these capabilities turn LCNC into an engine of rapid productization — an environment where teams co-create digital solutions, test ideas, and bring offerings to market far faster than traditional engineering cycles allow.

Internal tools and data reporting also gain traction as maturity increases, reflecting a deeper integration of LCNC into enterprise systems. Mature organizations don't just automate tasks — they re-architect how information flows and how teams interact with systems.

Taken together, these patterns signal a larger evolutionary arc: **LCNC moves enterprises from stabilizing workflows → to scaling operations → to accelerating innovation.**

It's not simply a development shortcut — it's a maturity amplifier.

People Pulse #2

Where will Generative AI create the biggest impact in Low-Code/-No-Code platform?

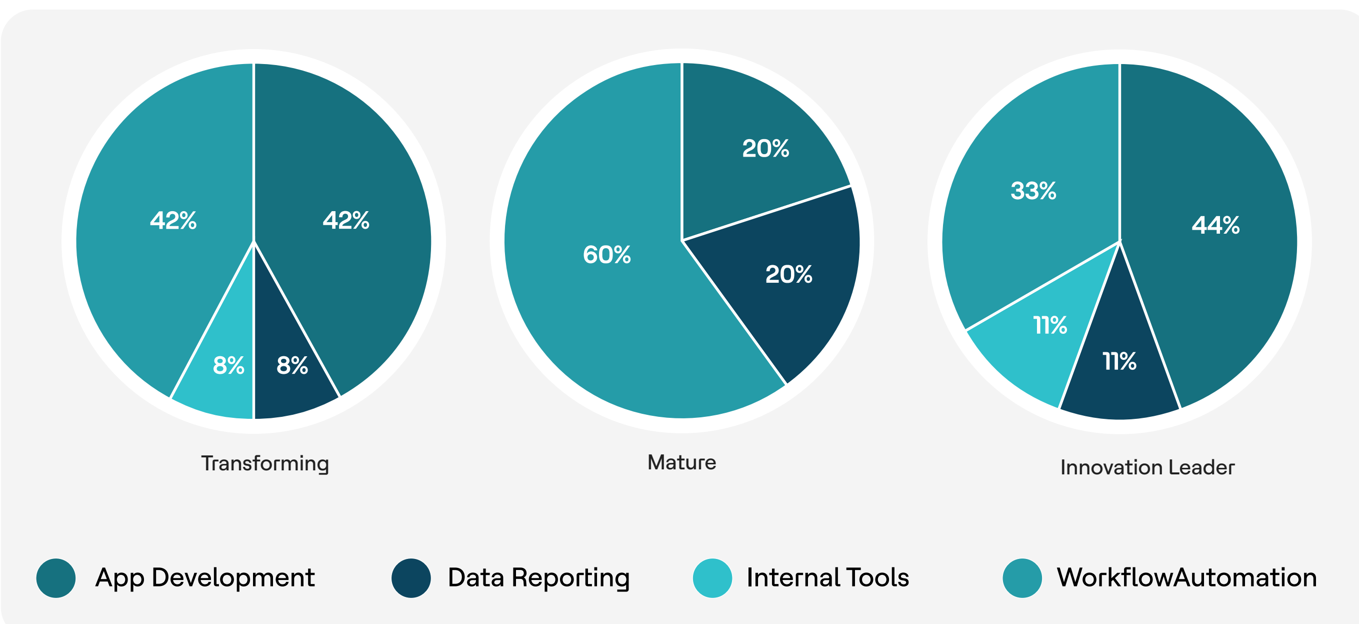
44%
said: Faster builds

31%
said: Smarter workflows

13%
said: Personalized UX

12%
said: Data insights

Exhibit 2.2
As enterprises mature, LCNC shifts from fixing processes to creating digital products.



Barriers: Concentrated ownership, uneven scalability foundations and talent that hasn't caught up

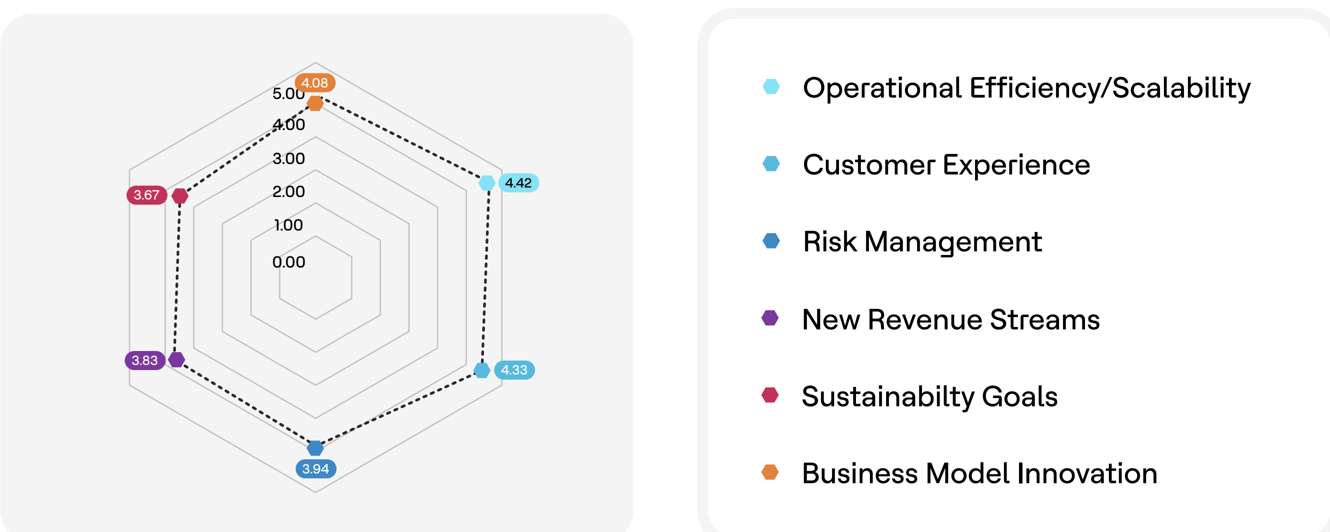
Despite rapid adoption, enterprises are discovering that scaling low-code/no-code in a GenAI-powered world is harder than it looks. The challenge isn't enthusiasm for LCNC — it's that the foundational capabilities needed for enterprise-wide scaling remain uneven and still maturing.

A key constraint is concentrated ownership. With **61%** of LCNC pilots still led by IT, the model is yet to democratize into the hands of business teams and citizen developers, who collectively account for only **35%** of early adoption. This keeps LCNC confined within traditional delivery structures and limits the shift toward true co-creation.

Beneath this, deeper structural barriers emerge. Successful scaling depends on architectural maturity — and while organizations lean heavily on API integrations, platform upgrades, and cloud-native deployment, many lack consistent API hygiene, reusable components, or modern data foundations. This mirrors broader industry findings: LCNC platforms struggle when integrational complexity, customization limits, or legacy environments collide with the need for enterprise-grade stability.

And then there's the talent and cultural shift. GenAI amplifies LCNC's potential but raises the bar for what "citizen development" requires. Teams need new skills in prompt design, workflow reasoning, testing AI-generated logic, and validating automated decisions. Underestimating this shift leads to stalled adoption, over-reliance on IT, and inconsistent application quality.

Exhibit 2.3
LCNC– Mesh of Possibilities



It's no longer about building faster — it's about building smarter

The LCNC impact radar shows a platform whose value extends well beyond rapid builds. Operational efficiency **(4.42)** and customer experience **(4.33)** emerge as the strongest impact areas, but the pattern is broader: LCNC is steadily becoming a catalyst for business model innovation **(4.08)** and system-level resilience.

GenAI is amplifying this shift — enabling faster UI creation, smarter workflows, and more personalized digital journeys. Even emerging dimensions like risk management, new revenue streams, and sustainability are gaining traction as enterprises use LCNC to embed standardization, automate reporting, and experiment at speed.

The Road Ahead

- **Strengthen integration and cloud-native foundations**-LCNC scalability depends on modern, well-structured integration and data layers. Organizations need robust APIs, clean data pipelines, and cloud-native architectures to support enterprise-grade LCNC adoption.

- **Build GenAI-enabled development capability-** Equip teams with skills in prompt design, logic validation, and oversight of AI-generated workflows to reduce dependence on IT.

- **Create reusable enterprise assets -** Standardize templates, connectors, and data models to accelerate reuse, ensure consistency, and reduce duplication.

- **Measure real impact, not output -** Shift KPIs from "apps delivered" to improvements in efficiency, experience, and value creation.

- **Position LCNC as a product innovation engine-** Use GenAI + LCNC to speed experimentation, build testable prototypes, and launch digital offerings faster than traditional development cycles allow.

The real opportunity ahead isn't just about turning work around faster — it's about turning LCNC into a dependable, enterprise-wide creation layer that teams can trust. As governance strengthens, architectures modernize, and GenAI becomes a co-builder rather than a novelty, LCNC will shift from solving tactical gaps to shaping how organizations deliver digital change.

Coming Soon: Service-as-Software™ (SaS)

Delivering outcomes through software that runs itself.

SaS is the next big shift in how enterprises consume technology. If traditional Software as a Service (SaaS) delivered applications, SaS delivers services that run themselves — systems that can automate fixes, enforce SLAs, optimize performance, and deliver continuous outcomes without constant human intervention. Think IT incident resolution that fixes itself, cloud cost optimization that adjusts in real time, or software test automation that self-heals — all delivered as ready-to-consume services. This evolution is being fueled by AI, cloud-native architectures, automated observability, and outcome-based consumption models. Instead of buying tools and assembling workflows manually, enterprises increasingly want ready-to-run capabilities that integrate seamlessly, heal autonomously, and deliver measurable value out of the box.

Exhibit 2.4
How well are enterprises prepared for SaS in the coming future?

36% of organizations say their **talent capability** is partially ready, signalling that skills are advancing — but broad workforce readiness still needs to accelerate for **agentic service platforms** to scale.

14% believe they have a mature **vendor ecosystem,** underscoring that partner models for SaS remain nascent.

32% of organizations report leading-level **leadership commitment,** showing that executive intent for SaS is already strong — yet only 27% say their **budget and investment** posture is at a similar level, revealing a readiness gap between vision and financial commitment.

USD 89.9 billion by 2034, at a compound annual growth rate (CAGR) of **25.4%**

Source: Dimension Market Research

Is SaS the new marker of digital sovereignty?

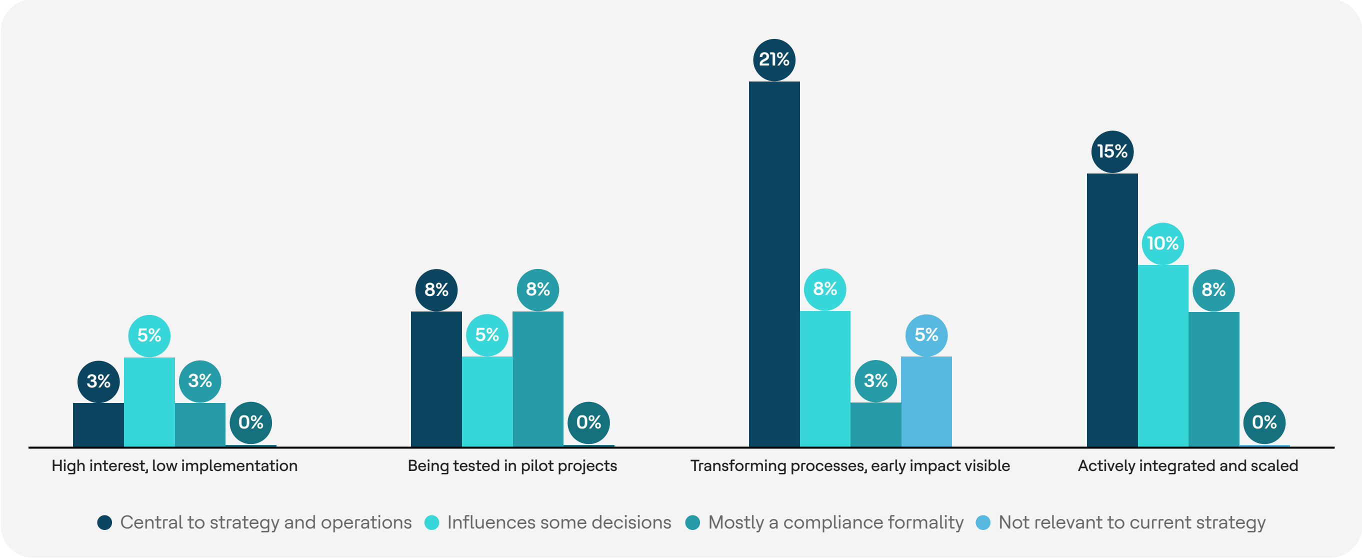
As enterprises move toward autonomous, outcome-based services, one factor consistently separates early adopters from the rest: **digital sovereignty.** Organizations that treat sovereignty as central to their digital strategy are also the ones furthest ahead in SaS maturity. The data confirms it: **36%** (exhibit 2.5) of sovereignty -focused organizations have already reached transforming or scaled stages in their SaS journey.

This is more than correlation — it's causation in motion. SaS is strengthened by programmable policies, strong governance, and cloud-native delivery — all of which are only viable when enterprises design for data control, localization, and automation at scale. Sovereignty-minded organizations are more likely to invest in the architectural backbone that SaS demands: unified service layers, intelligent observability, and regionally adaptable service contracts.

Conversely, enterprises that view sovereignty as peripheral or outdated tend to remain locked in legacy models — unable to scale service delivery across geographies or enforce consistent SLAs through software. The absence of sovereignty disciplines creates operational friction that SaS alone cannot overcome.

Ultimately, the relationship runs deeper than readiness: digital sovereignty shapes an enterprise's ability to trust, deploy, and scale autonomous services with confidence. In an era where services increasingly run themselves, sovereignty becomes not just a governance stance — but a strategic catalyst for realizing the full promise of outcome as agentic.

Exhibit 2.5
Organizations that prioritize sovereignty are scaling SaS faster.



SaS impact zones: Faster ops, smarter services, better experiences

While SaS remains an emerging trend, the early signs of transformation
are already visible—especially in areas where services are frequent, measurable, and process-heavy. These are domains that benefit most from autonomous execution, standardized SLAs,
and AI-driven reliability. The message is clear: SaS is not a distant vision—it's quietly gaining ground in places where intelligent service delivery can immediately prove its value.

The strongest early traction is in operational support areas. A majority of respondents cite **IT helpdesk (65%), process automation (68%), data insights (68%)** as the top domains where the earliest value from SaS is being realized. These are functions where responsiveness, standardization, and embedded intelligence make immediate business sense—and where AI-led remediation and real-time optimization can be deployed with minimal friction.

Customer-facing areas are not far behind. With **61%** pointing to customer engagement as a promising impact zone, it's clear that enterprises see potential for SaS to streamline resolution workflows, automate experience triggers, and scale personalized support. This marks a shift from traditional "back office first" automation to frontline service intelligence.

In conclusion, SaS is gaining traction wherever repeatability, observability, and AI-enablement intersect. This first wave of impact reveals where organizations can build early wins—and where Service-as-Software™ will evolve from a tactical edge to a foundational model for digital service delivery.

From tools to trust: The playbook for scaling SaS

SaS is not just a new deployment model — it's a new way to think about services. Traditional enterprise services depend on teams, tickets, and turnaround times. SaS replaces that with software systems that remediate, optimize, and deliver value automatically.

But the shift doesn't happen by switching platforms. It requires re-architecting how services are built, governed, and scaled. Most organizations still treat service delivery as a cost center. The frontrunners are treating it as code.

To scale SaS, organizations need to rewire three foundations:

1. Architecture: Design for self-management, not oversight - Scaling SaS starts with architecture that can carry it. Legacy systems built for request – response models won't cut it. Organizations need modular, API-rich, event-driven platforms where services can self-monitor, self-heal, and run across sovereign boundaries. The goal isn't just integration — it's to embed resilience, security, and observability into the very fabric of service delivery.

2. Automation: Go beyond scripting — automate the outcome - SaS isn't about automating tasks, it's about automating decisions. GenAI takes this further — enabling dynamic optimization and self-correcting logic. True automation means the service knows what to do, when, and why — whether fixing a failure, enforcing an SLA, or optimizing a response — with zero manual intervention.

3. Ownership: Shift from activity to accountability - When services run themselves, teams need to run by outcomes. That means fewer silos, clearer metrics, and co-ownership between tech and business. SaS maturity requires shared responsibility for uptime, time-to-resolution, and user impact — not just pushing tickets, but delivering trust at scale.

SaS is how leading enterprises will scale complex operations without scaling effort. It's not just about better tools — it's about building services that manage themselves. And the faster one operationalizes that shift, the closer one gets to frictionless, autonomous digital delivery.

> The journey from XaaS to SaS represents a pivotal moment for the technology sector - evolving the service model to embed intelligence, embrace automation and focus on outcome-driven consumption so organizations can realize new efficiencies and deliver greater value to customers.
>
> **Kalyan Kumar (KK)**
> Chief Product Officer at HCLSoftware

If software can now build itself — and run itself — what still needs us?

The rise of Next-Gen software marks a shift in how organizations build, operate, and scale digital capability. Low-Code/No-Code accelerates creation. SaS automates execution. Together, they're redefining what "software delivery" even means — and where human judgment, governance, and intent must evolve next.

In this transition, new questions take center stage:

- When software can be generated, **who defines its boundaries** — and maintains its integrity?
- As services become autonomous, **what happens to control, ownership, and accountability?**
- **Can design and development truly be democratized** without losing coherence or security?
- **How do organizations avoid fragmentation** as tools, copilots, and automation explode across teams?

This isn't just a shift in tooling. It's a shift in thinking. Next-Gen software invites enterprises to move from *running software* to *running on software* — a transformation that requires new platforms, new skills, and a new mindset.

The decisions leaders make now will determine whether software becomes a bottleneck — or a breakthrough.

Megatrend 3: Trust, Transparency & Cybersecurity

Security, transparency and trust converge.

1 in every 3 survey respondents now flag cybersecurity, trust & transparency as a near-term priority — with responsible AI already reshaping today's decisions and post-quantum cryptography emerging as tomorrow's safeguard.

Trust, transparency & cybersecurity — The new currency of digital business

Cybersecurity is undergoing a quiet revolution. It's no longer just about firewalls, signatures, or keeping intruders out. Today, leaders are being asked a different question: Can your systems, data, and AI-driven decisions be trusted — not just by you, but by customers, regulators, and society?

The stakes have changed. AI now runs credit models, routes energy flows, verifies identities, approves payments, and shapes customer experiences in real time. At the same moment, attackers are becoming faster and more automated — using AI to scale intrusions and quietly exfiltrate data for future exploitation. And on the horizon sits a quantum era that threatens to break the very cryptography that holds the digital economy together.

Put simply: trust is no longer assumed. It must be designed, demonstrated, and continuously earned. That's why the trust agenda is splitting into two urgent fronts:

- **Responsible AI** — the "now" problem: governing how AI makes decisions, ensuring they are fair, explainable, and defensible. It's the new operating system for reputation, risk, and regulatory credibility.
- **Post-Quantum Cryptography (PQC)** — the "next" problem: rebuilding cryptographic foundations so the data encrypted today remains secure long after quantum computers arrive.

Together, these shifts push cybersecurity beyond protection. They redefine it as the architecture of digital confidence — the foundation on which every intelligent system, every customer promise, and every competitive advantage will depend.

Why it matters?

Key findings

Trust rises on the C-suite agenda: 34% of leaders already place cybersecurity, trust & transparency among their top priorities.

Responsible AI is here, not hype: 79% say it's happening now, and 33% report it is already transforming or scaled in their organizations.

It's values, not mandates, that propel responsible AI: Over **90%** cite ethics, brand reputation, and risk avoidance as the strongest drivers for responsible AI adoption.

Momentum is building toward a quantum-safe enterprise: Even as PQC is seen on the near horizon, **88%** of enterprises are proactively exploring pilots and readiness planning.

Sovereignty and cybersecurity rise together as the twin pillars of digital control: Organizations that treat sovereignty as core to strategy are **~1.5× more** likely to prioritize cybersecurity, trust & transparency.

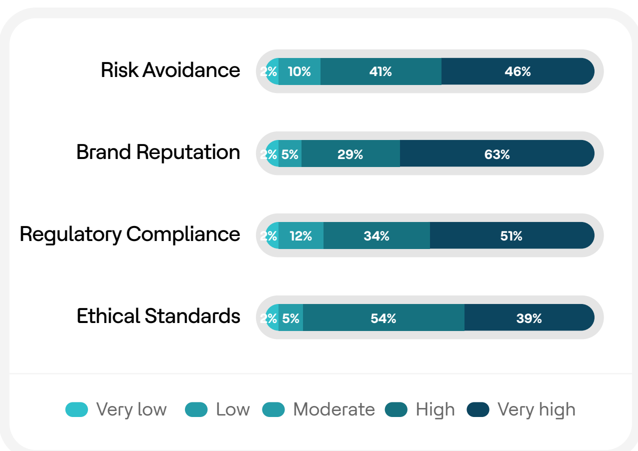
Emerging Now: Responsible AI

Making AI explainable, auditable and defensible.

Organizations aren't just experimenting with responsible AI anymore — they're leaning into it with conviction. Responsible AI, at its core, is the disciplined practice of designing, developing and deploying AI systems that are fair, transparent, explainable, secure, and accountable. For enterprises, this means treating AI not as a black box, but as a system whose decisions can be understood, justified, and governed with the same rigor applied to financial reporting or safety protocols.

When we asked leaders what motivates them to prioritize responsible AI, the answer was overwhelmingly clear: this isn't about ticking a regulatory box. It's about earning trust, protecting the brand, and reducing real business risk. Across respondents, more than 90% rated ethical standards, brand reputation, and risk avoidance as high or very high motivators. That tells us something important: Responsible AI is becoming a strategic trust lever, not a compliance afterthought.

Exhibit 3.1
Ethics, brand reputation and risk avoidance overwhelmingly drive responsible AI adoption.



Leaders are signalling that how AI behaves — how fair, explainable, and accountable it is — now directly shapes how customers, regulators, and even employees perceive their company. And this isn't abstract ambition.

It reflects a broader shift in the digital economy: trust is no longer an intangible value; it's a measurable business asset. Enterprises that build responsible AI into their operating model are not just avoiding risk — they're creating competitive advantage in markets where decision quality, transparency, and responsible innovation increasingly determine who wins consumer confidence and regulatory goodwill.

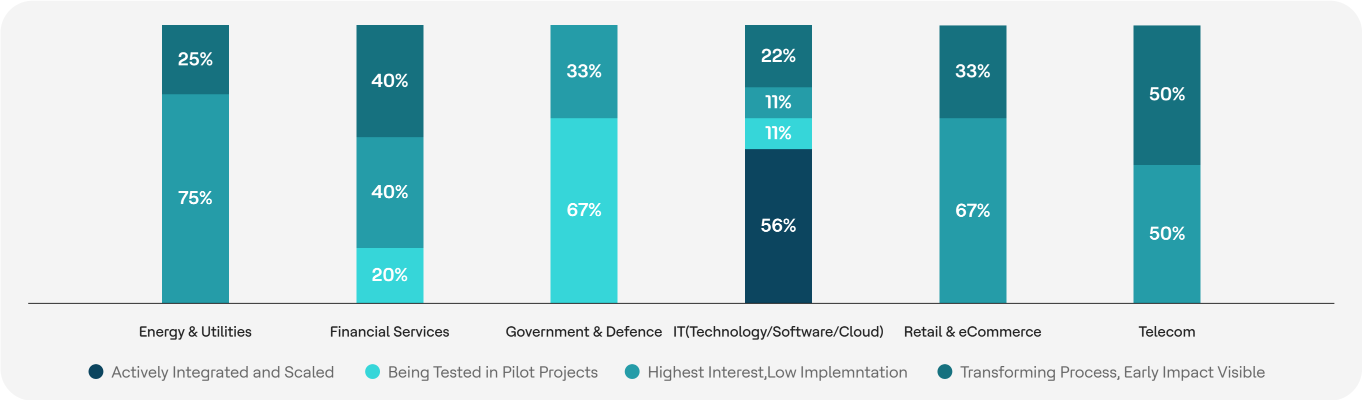
Many industries are already embedding responsible AI into their operating models, but the pace of maturity varies sharply by sector, revealing where it is moving fastest and where it remains in early exploration.

Across industries, a clear pattern emerges (exhibit 3.2): high-stakes, high-regulation sectors are scaling responsible AI faster, while digital-first and retail environments are still heavily in pilot mode.

1. Regulation- and safety-critical industries are leading responsible AI adoption.
Energy & utilities (**75%**) and government & defence **(67%)** are the fastest movers, driven by high-stakes decisions, compliance demands, and the need for verifiable trust.

2. Consumer-facing sectors are actively testing but not yet scaling.
Retail & eCommerce (**67%** in pilots) and financial services (**40%** pilots, **40%** early interest) are cautious adopters — experimenting heavily but scaling selectively as they balance customer experience with risk.

Exhibit 3.2
Responsible AI maturity varies by sector: Energy & utilities and government & defence are leading with 67–75% transformed or scaled, while tech, retail, and finance remain concentrated in pilots and early-stage adoption.



3. Digital-native industries face complexity, not lack of intent. Telecom shows a balanced maturity curve (**50%** pilots / **50%** transforming), while technology/software/cloud sees **56%** still in early interest, reflecting the challenge of embedding responsible AI into rapidly evolving product ecosystems.

Taken together, these industry patterns reinforce the overarching storyline: Responsible AI is no longer theoretical — it is diffusing across sectors with varying degrees of urgency - driven by risk exposure, regulatory scrutiny, and the strategic value of trusted AI.

Responsible AI momentum is clear — **71%** of enterprises have shifted from exploration to hands-on pilots and tangible adoption.

What does real AI accountability look like inside an enterprise?

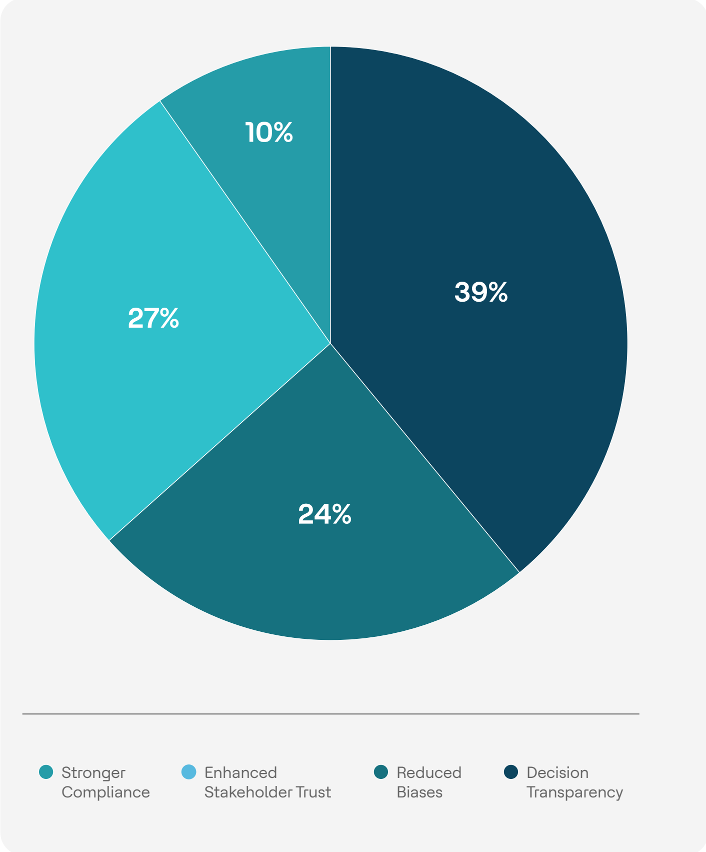
As responsible AI moves from aspiration to implementation, enterprises are beginning to operationalize how AI is governed, monitored, and held accountable at scale. What's emerging is not a single playbook but a multi-layered governance architecture — one that blends human oversight, technical transparency, and clearly defined lines of accountability. Leaders are no longer relying on ad-hoc ethics discussions; they are formalizing governance in ways that increasingly resemble financial, operational, and risk-management controls.

As found in the research, the strongest signals of maturity come from the rising use of governance boards **(41%)** and explainable AI tools **(41%)** — a pairing that reflects a shift toward AI decisions that can be reviewed, justified, and defended. This combination reveals a deeper cultural transformation: organizations are embedding responsible AI not just as a compliance requirement, but as a framework for decision integrity.

And these shifts are already reshaping outcomes. As mentioned in exhibit 3.3, early transformation is most visible in greater decision transparency **(39%),** improved stakeholder trust **(27%),** and measurable reductions in bias **(24%)** — all of which underscore that explainability and fairness are becoming the new currency of digital trust.

Together, these developments point to a clear trajectory: Responsible AI governance is moving from policy statements to embedded operational practice. Boards are taking ownership, transparency is becoming standard, and enterprises are beginning to treat AI accountability the way they treat financial or safety accountability. Responsible AI is evolving into a system of governance — not just a set of principles, but the backbone of trusted AI at scale.

Exhibit 3.3
Transparency and trust dominate the early benefits of responsible AI adoption.

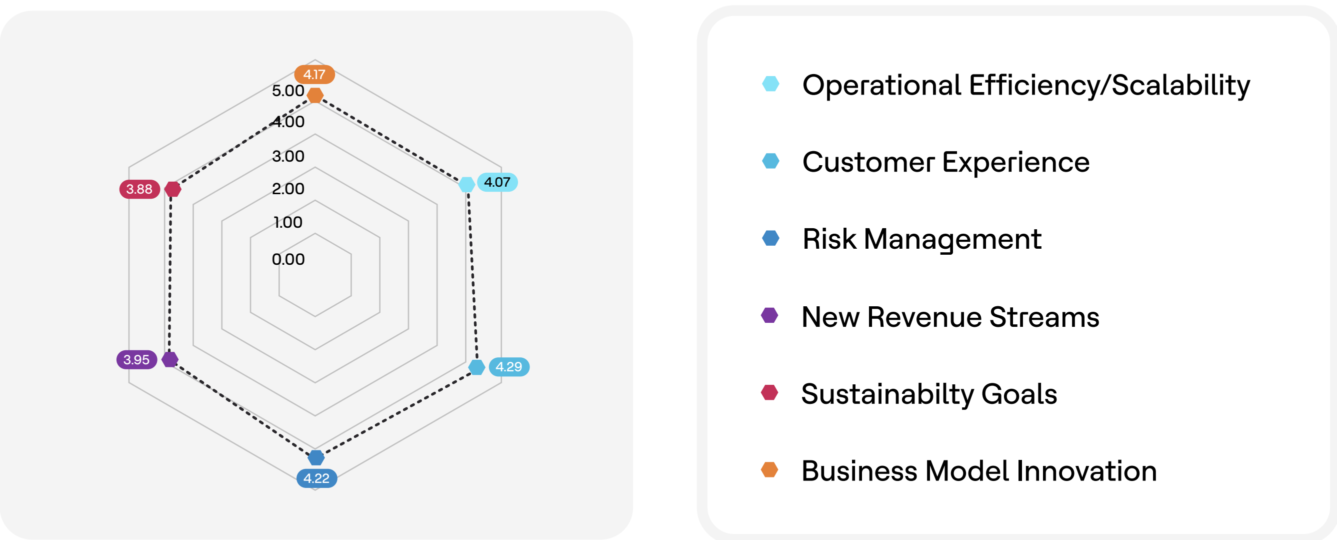


Barriers: Limited depth, centralized oversight, fragile data foundations

Scaling responsible AI remains challenging not because leaders lack intent, but because the capabilities required for enterprise-wide adoption are still uneven and incomplete. While organizations are actively piloting foundational tools — with bias detection **(76%)** and explainability techniques **(78%)** seeing the highest experimentation — the data reveals significant maturity gaps that slow progress beyond pilots. Only **37%** have run privacy audits, and a mere **7%** have piloted fairness metrics, underscoring that deeper, systemic dimensions of Responsible AI remain nascent. This creates a fragmented approach where surface-level controls advance faster than the harder, structural ones needed for scale.

Compounding this is the reliance on top-down governance: although governance boards and explainable models each underpin **41%** of accountability efforts, these mechanisms still sit at the apex rather than being embedded across engineering, product, and risk functions. As a result, responsible AI often becomes a specialist-driven exercise instead of a shared organizational muscle. Add to this the ongoing challenges of data quality, lineage, and documentation, and the picture becomes clear: enterprises are investing in responsible AI, but scaling it requires stronger data foundations, broader cultural readiness, and deeper integration of fairness and privacy into everyday AI workflows. Until these gaps close, responsible AI will remain caught between aspiration and impact.

Exhibit 3.4
Responsible AI – Mesh of Possibilities



Setting the course for a trusted AI future

The strategic impact assessment makes one point unmistakably clear: Responsible AI is no longer just a risk or compliance mandate — it is emerging as a strategic multiplier across the enterprise. With high impact scores across all six dimensions, from customer experience **(4.29)** and risk management **(4.22)** to business model innovation **(4.17),** organizations are beginning to recognize responsible AI as a capability that not only safeguards decisions, but also shapes how value is created, delivered, and trusted.

The Road Ahead

- **Make governance the default operating system:** Establish unified responsible AI frameworks so accountability and transparency are built into every AI system, not added later.
- **Build explainability in from day one:** Shift from inspecting models after deployment to designing AI that is transparent and understandable from the start.
- **Fix the data foundations first:** Strengthen data quality, lineage, and documentation so organizations can progress from basic bias checks to richer fair and robust practices.
- **Share responsibility across the enterprise:** Move beyond governance boards — make product, engineering, data, compliance, and business teams jointly accountable for responsible AI.
- **Measure responsibility, not just accuracy:** Define KPIs for transparency, bias reduction, trust, and accountability to ensure AI is not only effective, but responsible.

Responsible AI has reached an inflection point. The next competitive edge won't come from deploying more models, but from deploying trustworthy models — AI that organizations can explain, justify, and stand behind. Those that master responsible AI won't just use AI effectively; they will operate with a level of digital integrity that becomes their defining advantage in an increasingly AI-driven world.

Coming Soon: Post Quantum Cryptography (PQC)

Protecting today's data from tomorrow's computers.

Imagine a future where a quantum computer can break encryptions in seconds, which is next to possible for today's machines. In that world, the encryption protecting our financial records, identities, transactions, and critical infrastructure would no longer hold. PQC is the security upgrade designed to protect against that scenario — new cryptographic methods built to withstand quantum-level computing power.

Exhibit 3.5
How well are enterprises prepared for PQC in the coming future?

57% of organizations acknowledge their rising focus on **talent & infrastructure,** signalling willingness to build the foundational capabilities.

48% highlight they do not have a ready **vendor ecosystem** for PQC, presenting a strong opportunity for accelerated collaboration and co-innovation.

41% report that **budget and investment** planning for PQC is still underway — a sign that organizations are beginning to embed quantum security into long-term resilience strategies.

The quiet race to quantum safety has already begun.

Post quantum cryptography is rapidly emerging as one of the most critical—although least mature — capabilities within the cybersecurity, trust & transparency megatrend. Awareness is rising and leaders increasingly recognize the strategic risk of "harvest now, decrypt later" **(67%)** attacks, but the data shows that organizations are still at the very early stages of quantum-safe readiness. Early experimentation is highly concentrated with most pilots limited to cloud and data storage encryption.

More than half of enterprises **(52%)** sit in the "high interest, low implementation" stage, with only **2%** in actively scaled stage. This maturity gap is mirrored in how organizations view the timeline to meaningful PQC scale.

A clear majority expect PQC adoption to materialize only **beyond 24 months,** reinforcing that quantum migration is perceived as a multi-year enterprise shift rather than an immediate priority. A second wave of enterprises expect scaling within **12–18 months,** suggesting early momentum among more digitally advanced or highly regulated sectors.

Securing the quantum future: The Road Ahead

Quantum-safe security is no longer a distant concern — it is becoming a strategic inflection point. While most organizations are still in the early stages of PQC exploration, awareness is rising and the groundwork for large-scale migration is beginning to form. The next few years will determine who transitions smoothly, and who faces disruption when quantum capabilities accelerate.

To move from early intent to enterprise readiness, organizations must advance on three essential fronts:

1. Set a clear quantum-safe strategy
Define the long-lived data, systems, and workflows that must be protected first. Establish a roadmap that prioritizes crypto-agility, migration pathways, and governance principles.

2. Build foundational PQC skills across teams
Develop cross-functional literacy in cryptography modernization — not just within security, but across engineering, architecture, and risk. The goal is enterprise-wide readiness, not specialist-only expertise.

3. Modernize systems for hybrid and crypto-agile security
Prepare infrastructure to support hybrid cryptography and flexible key management. Prioritize platforms and vendors capable of implementing PQC standards, as recommended by NIST.

USD 2.84 billion by 2030, at a compound annual growth rate (CAGR) of **46.2%**

Source: MarketsAndMarkets

People Pulse #3

How are organizations progressing on PQC readiness?

27%
said: Running active pilots

12%
said: Strategy in design phase

42%
said: In research phase

19%
said: Not sure

> Next-generation AI - foundation models, privacy-preserving architectures, edge intelligence, and high-fidelity simulation - is advancing rapidly. Switzerland's expertise in machine learning, cryptography, robotics, and secure infrastructures enables powerful, efficient, and trustworthy AI systems, establishing the country as a hub for industrial and societal AI innovation with real-world impact.

Ms Liv Minder
Investment Promotion Director, Deputy Chief Investment Promotion Officer, Switzerland Global Enterprise

When everything is digital, what — and who — can you trust?

As enterprises deepen automation, the security question evolves from "Are we protected?" to the more fundamental "Can our systems be trusted?"

The next decade will be shaped by a new set of strategic give bullets below:

- **Can enterprises prove the integrity of AI-driven decisions,** not just secure the systems that make them?
- **Will governance and accountability evolve fast enough** to meet rising expectations for transparency and fairness?
- **How can organizations prepare for quantum disruption** when PQC readiness is still at an early stage?
- **Can firms build trust parity across geographies and ecosystems** as digital sovereignty becomes a strategic fault line?
- And ultimately, **what does trustworthy infrastructure look like when systems begin certifying themselves?**

In this landscape, trust, transparency & cybersecurity becomes the strategic lens through which every technology must scale. Enterprises that answer these questions early will define the standards of digital confidence for the decade ahead.

Megatrend 4: Advanced Connectivity

The rise of a pervasive, intelligent network fabric.

Advanced Connectivity is entering a breakthrough decade — with LEO already reshaping operations for **7 in 10** organizations, while 6G builds the foundation for the next era of intelligent, ubiquitous networks.

Networks that sense, predict and never go dark

The next decade of digital transformation will be shaped not just by intelligent systems, but by the connectivity fabric that binds them. Advanced connectivity, powered by low-earth orbit (LEO) constellations and the emergence of 6G, marks a shift from traditional network upgrades to a world of pervasive, resilient and intelligence-ready communications.

LEO is rapidly becoming a frontline connectivity layer rather than a backup for remote zones. Advancements in satellite density, ground infrastructure and terminal economics are enabling reliable coverage across terrains where fiber and mobile networks fall short. As a result, organizations are increasingly using LEO to harden operations, extend digital reach and ensure continuity in environments where resilience is as critical as speed.

While still early in development, 6G is redefining the future network as a unified system for communication, sensing and computation. Its architecture aims to support real-time spatial experiences, autonomous systems, planetary-scale digital twins and AI-native orchestration that surpasses the capabilities of 5G. 6G represents the blueprint for networks that are not only faster, but deeply aware of and responsive to the physical world.

Together, LEO and 6G transform connectivity from passive infrastructure into a strategic capability: an intelligent mesh that sustains operations, enables autonomy and reshapes how enterprises compete in a distributed, data-intensive world.

Why it matters?

Key findings

Industry momentum behind advanced connectivity: Fuelled by LEO and 6G, advanced connectivity megatrend is accelerating fastest in IT, telecom and government sectors where distributed, high-risk operations demand more than traditional networks can deliver.

LEO rapidly emerges as the powerhouse of next-gen connectivity: More than two - thirds of organizations have already operationalized LEO in some form and over 90% plan to scale further within two years.

Enterprise readiness for LEO is hitting a tipping point: LEO shows a strong readiness profile with 77% technically prepared, 76% aligned at the leadership level and 85% budget-ready, supported by a mature vendor ecosystem.

6G is entering its early discovery phase: With 63% showing high intent and 35% experimenting through pilots, the foundation for tomorrow's intelligent networks is quietly taking shape.

6G sets the long-term vision for intelligent, sensing-driven, autonomous networks: Leaders increasingly see 6G not as bandwidth evolution but as the operating system for future industries: real-time digital twins, autonomous mobility corridors, spatial computing and cross-planetary IoT. This makes 6G a strategic north star, shaping multi-year technology roadmaps even before commercialization.

Emerging Now: Low Earth Orbit Satellites

The future of enterprise connectivity is no longer on the ground.

Imagine a mining operation thousands of miles from the nearest fiber line or a logistics fleet moving across oceans, borders, and terrain without ever losing signal. Until recently, these environments meant living with blind spots and brittle connectivity- hard limits imposed by terrestrial networks. LEO satellite constellations are dismantling those limits, delivering high-quality coverage that traditional infrastructure simply cannot match.

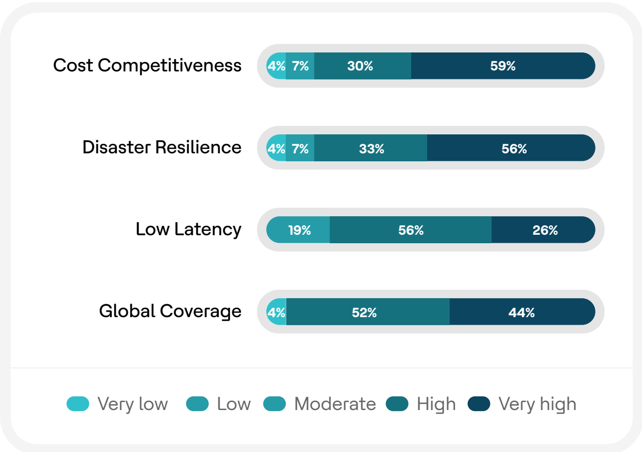
And enterprises aren't adopting LEO for novelty- they're adopting it because it answers their most critical needs: global reach, disaster resilience and tackling low-latency performance, with **~90%** of leaders rating these capabilities as top drivers.

This necessity is reflected in the adoption curve (see exhibit 4.1). Nearly **60%** of organizations have already moved beyond early interest, with **40%** piloting LEO and almost **30%** seeing early transformational impact, while **15%** have fully scaled deployments across their networks. LEO has evolved past early trials and is rapidly establishing itself as a key building block of enterprise connectivity.

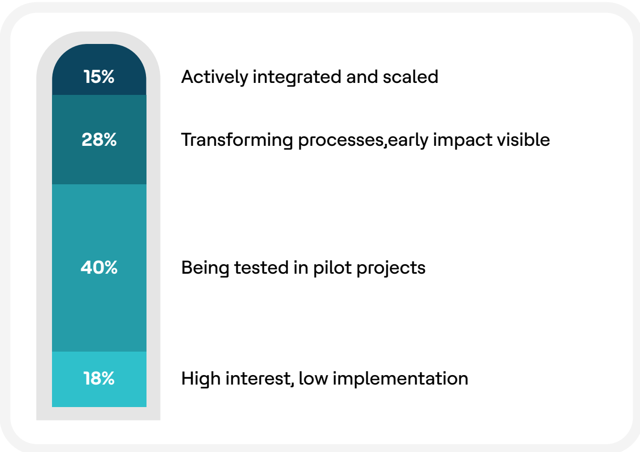
What makes LEO especially transformative is how it integrates with existing infrastructure: enterprises can now blend satellite and terrestrial networks into a hybrid fabric that elevates resilience, reduces single-point failures and sustains performance even under stress. As capacity scales and partnerships mature across operators, cloud providers and telecom carriers, LEO moves beyond gap-filling and becomes an enterprise-grade layer of the connectivity ecosystem, supporting real-time operations, IoT expansion and intelligent edge deployments.

Exhibit 4.1

Global coverage, resilience, and low latency emerge as the strongest motivators behind LEO uptake.



LEO adoption stages among organizations in 2025



Industries with the highest operational exposure are adopting LEO first.

Within LEO's industry adoption split, below sectors are gathering momentum fastest (see exhibit 4.2).

- **Telecom** leads decisively at **20% adoption,** reflecting a shift in how operators themselves are rethinking the future network: as a hybrid of terrestrial and non-terrestrial pathways. For them, LEO is no longer an external add-on, but an integral part of next-generation service portfolios and future 6G-aligned architectures.

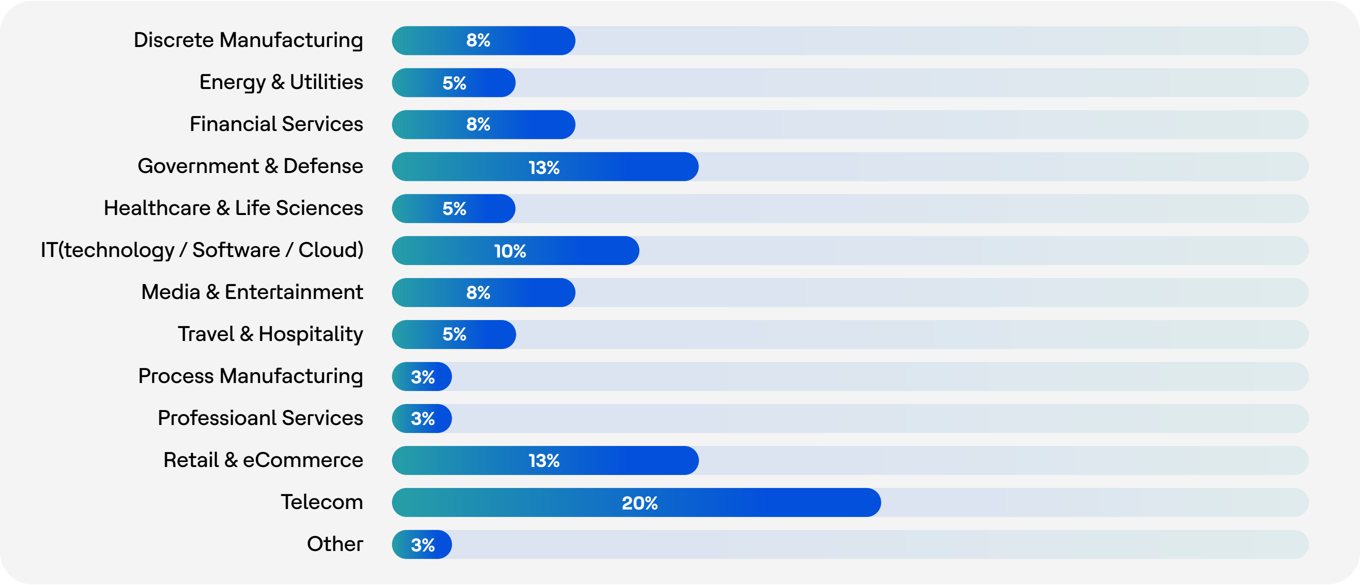
- **Government & defense and retail & eCommerce** follow at **13% each,** driven by two very different imperatives: sovereign resilience on one hand, and real-time, geographically dispersed customer fulfilment on the other. Both rely on connectivity that holds steady across borders, terrains and stress conditions-something terrestrial routes alone cannot guarantee.

- **IT/Software, financial services, and media (8–10%)** represent another cluster: industries built on continuous digital engagement where latency, uptime, and distributed cloud-edge workflows directly shape customer experience. Here, LEO is emerging as a stabilizer, enabling seamless operations even when teams, workloads, or users are globally dispersed.

The pattern is unmistakable: the more distributed, high-stakes, or latency-sensitive an industry is, the faster LEO moves into its core network design. This industry-led maturity gradient signals where the next breakthroughs will emerge and where competitive advantage will surface earliest.

Exhibit 4.2

Telecom, government, and retail—industries that most need resilience and reach—are leading the LEO adoption curve.



The first proof points of a borderless network

LEO's value becomes clearest when you look at where enterprises are applying it first- in environments where connectivity gaps have the highest operational cost. **59%** (exhibit 4.3(a)) of organizations are piloting LEO in remote areas, transforming mines, offshore rigs, construction zones and rural facilities into fully connected extensions of the enterprise. These are locations where traditional networks fail to deliver the uptime required for real-time monitoring, IoT telemetry, safety oversight and remote diagnostics. Another **30%** are activating LEO as urban backup, reinforcing resilience as terrestrial networks face rising pressure from outages, congestion, climate events and cyber incidents.

This early clustering reflects a broader architectural shift: organizations are redesigning operations around the assumption that connectivity must be continuous, location-agnostic and fail-safe. That is why the strongest benefits appear in mission - critical digital processes. From exhibit 4.3 (b), **85%** cite improvements in data backup and **78%** report stronger connectivity uptime - foundational capabilities for industries that run real-time edge operations or 24/7 digitally mediated workflows. Where downtime once dictated the limits of the business, LEO now creates new degrees of freedom for automation, sensing, analytics and remote management.

Impact is also visible in other areas: **22%** already see gains in logistics and fleet management, leveraging LEO to maintain visibility across long-haul trucking corridors, maritime routes and cross-border distribution networks where cellular connections break down. **11%** report improvements in emergency response, hinting at how LEO can support life-critical coordination, rapid deployment and high-bandwidth data flows in disaster zones or infrastructure failures- situations where terrestrial networks are often unreliable or unavailable.

Taken together, these signals show that LEO is not just filling coverage gaps - it is reshaping the operating envelope of industries. As satellite ecosystems mature and intelligence shifts to the edge, enterprises are preparing for continuous connectivity that underpins faster decisions, safer operations and more scalable growth.

Enterprise confidence in LEO is accelerating with **68%** recognizing it as a technology driving meaningful process change right now.

Exhibit 4.3 (a)

Early LEO experimentation is centred in remote operations and urban failover paths.

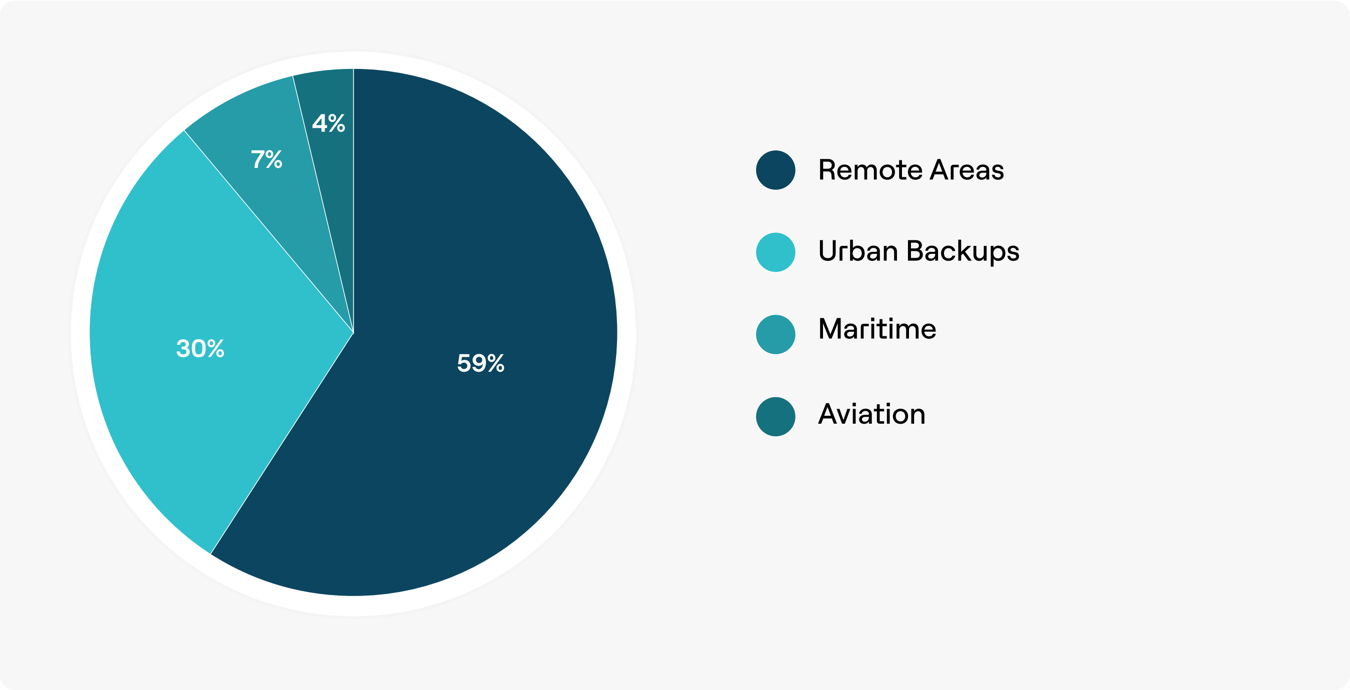
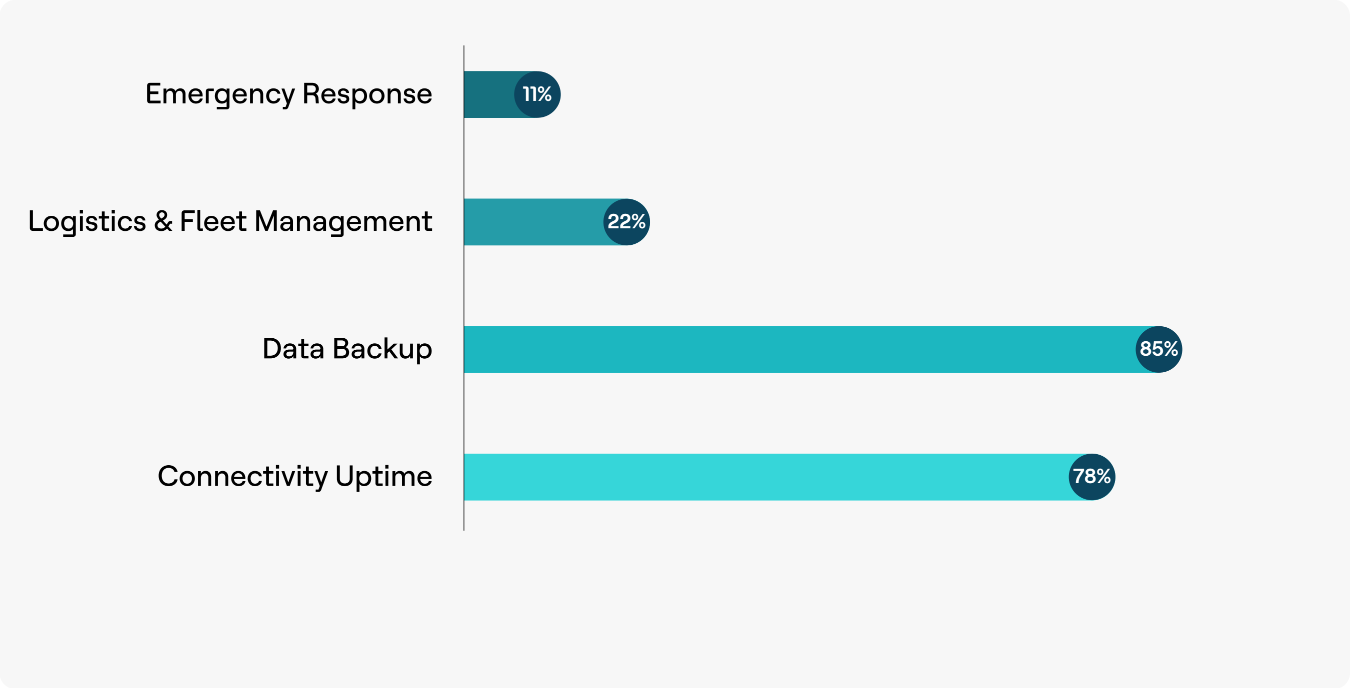


Exhibit 4.3 (b)

Today LEO helps the enterprises most by making them stay online and safeguarding data.



Barriers: High costs, complex rules and reliability concerns slow the shift to orbit

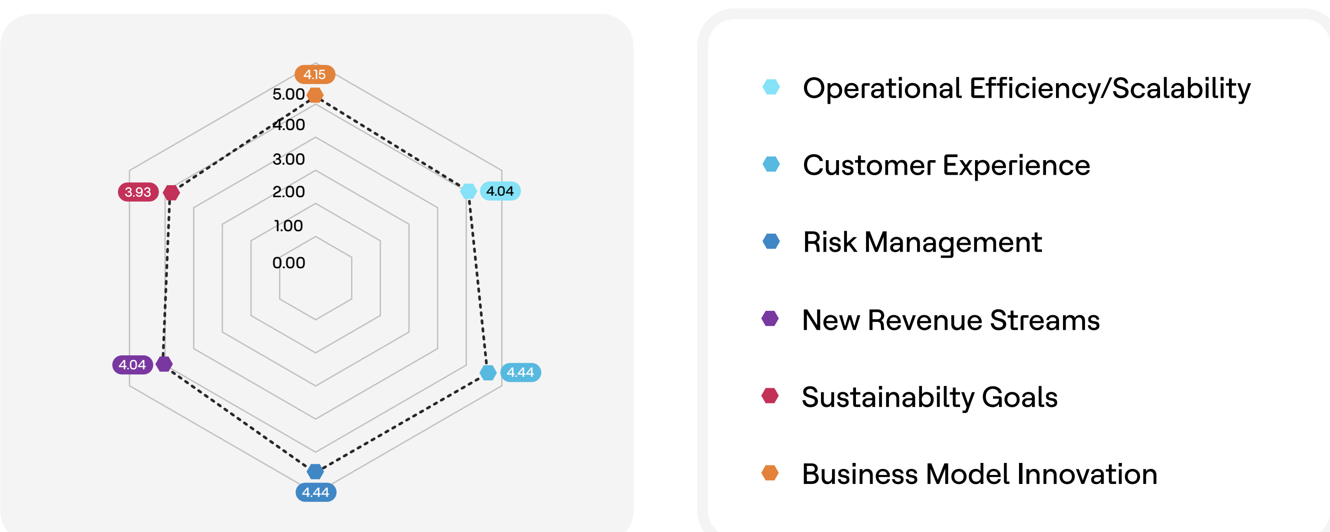
Despite rising enthusiasm, enterprises face real friction in scaling LEO. The biggest obstacle is cost, with **59%** citing upfront expense as the primary barrier to widespread adoption. This is amplified by regulatory hurdles, as spectrum policies, licensing frameworks and cross-border governance still lag the pace of satellite innovation.

Another **11%** call out technology reliability, reflecting concerns around service consistency, constellation maturity, terminal durability and integration patterns with existing networks. Another **7%** highlight limited awareness, signalling that many organizations still lack a clear understanding of when and where LEO meaningfully outperforms terrestrial alternatives.

Beneath these surface blockers, deeper structural dependencies emerge. LEO's strategic value depends heavily on the integration maturity of enterprise networks, the readiness of edge and cloud architectures and the ability to orchestrate consistent quality across multi-network paths. Many organizations are discovering that while LEO solves the coverage problem, scaling it requires rethinking resilience, routing logic, security posture and network governance.

Combined, these barriers don't diminish LEO's promise - they illuminate what must evolve for LEO to become a dependable, enterprise-grade foundation rather than a specialized add-on.

Exhibit 4.4
LEO– Mesh of Possibilities



The shift isn't in distance- it's in what becomes possible when distance no longer matters

The LEO impact radar highlights a connectivity layer delivering far more than extended reach. Customer experience **(4.44)** and risk management **(4.44)** emerge as the strongest impact zones, demonstrating LEO's ability to stabilize operations and maintain service quality in environments where traditional networks falter. But the pattern extends deeper: enterprises are beginning to use LEO as a catalyst for business model innovation **(4.15),** enabling new remote-first services, real-time sensing models and continuity-driven offerings across dispersed geographies.

Taken together, the radar shows LEO evolving from a gap-filling technology into a strategic enabler of uninterrupted, distributed and data-rich operations, expanding what enterprises can deliver and where they can deliver it.

The Road Ahead

- **Modernize network architecture and multi-path resilience:** Enterprises need hybrid routing, intelligent failover and cloud-integrated architectures to fully leverage LEO as a first-class continuity layer - not an add-on backup.
- **Build the skills and structures for satellite -integrated operations:** Teams need capabilities in satellite network integration, edge orchestration, and hybrid connectivity management as LEO blends with terrestrial 5G and future 6G systems.
- **Strengthen regulatory and governance readiness:** With 23% citing regulatory hurdles as a barrier, organizations must prepare for spectrum rules, cross-border compliance and data-sovereignty requirements inherent in LEO-driven connectivity.
- **Accelerate integration with cloud, edge, and IoT ecosystems:** LEO's real value emerges when paired with distributed compute — enabling digital twins, remote analytics, real-time monitoring and automation across remote or mobile environments.
- **Treat LEO as an innovation engine, not just a connectivity upgrade:** LEO enables new offerings — mobile command centers, autonomous field operations, globally synchronized workflows — that reshape how organizations deliver value.

As LEO dissolves the last gaps in the map, enterprises gain something far greater than coverage: They get freedom to extend operations into places once off-limits, to design workflows that never pause, and to build intelligent systems that respond in real time to how the world moves.

Coming Soon: 6G

Paving the way for networks that think, sense and respond.

6G, the sixth generation of wireless networks, is being designed not just as a faster version of 5G, but as an intelligent, all-purpose connectivity backbone that blends ultra-high throughput, ultra-low latency, pervasive coverage and built-in intelligence in a way no previous generation has. As industry and consumer demands evolve, from immersive virtual reality and digital twins to massive IoT ecosystems and autonomous mobility, 6G is gaining traction because it promises to support a fully cyber-physical future where devices, machines and people communicate, sense and act together in real time.

6G + AI: Building the nervous system of a digital planet?

6G and AI are beginning to converge into something far more powerful than a communications upgrade, together, they resemble the early formation of a planet-scale nervous system. In the survey, nearly 80% of organizations exploring 6G are also investing in AI, indicating that the enterprises leaning into advanced connectivity are the same ones preparing for intelligence everywhere.

Exhibit 4.5
How well are enterprises prepared for 6G in the coming future?

50% say **leadership buy-in** is at a mid-level, suggesting executives recognize the strategic significance of 6G but have not yet translated that intent into capability-building or large-scale transformation programs.

35% report partially mature **infrastructure and tools,** showing that most enterprises still rely on 5G-era foundations - well short of the distributed, sensing-enabled, AI-native architectures 6G will require.

40% of organizations say their **talent capability** is only partially ready, indicating that while awareness of 6G is rising, the workforce not equipped to design, integrate, or operate next-generation network architectures.

6G is being architected as an AI-native network capable of sensing, interpreting and acting, not just transmitting. It blends sub-millisecond responsiveness with massive device density, integrated sensing and distributed compute - the foundational traits for real-time digital twins, hyper-automation and autonomous industry systems.

Together, AI and 6G signal the shift from networks that connect information-to-networks that understand and respond. If connectivity has been the bloodstream of the digital enterprise until now, the fusion of AI and 6G begins to look like its nervous system- perceiving the environment, analysing stimuli and triggering action in real time. It is early, complex and far from universally deployed- but the direction is clear: the next decade belongs to organizations ready to operate in a world where intelligence is not added to the network, but embedded into it.

USD 110.46 billion by 2036, at a compound annual growth rate (CAGR) of **46%**

Source: MarketsAndMarkets

Building the foundations for an intelligent, everywhere network

6G may still sit on the horizon, but the window to prepare is already open. The shift from today's networks to tomorrow's AI-native, sensing-enabled, ultra-reliable connectivity won't happen overnight and enterprises that wait for 6G to arrive will be too late to benefit from it. The organizations that move early will not just deploy 6G, they will shape how intelligence, automation and connectivity converge across their business.

Signals from the field show that expectation is rising faster than readiness. In a recent poll, **60%** of respondents believe their enterprises will be ready to adopt 6G within three years and an additional **22%** expect readiness in four to six years. The world is assuming a faster leap but the underlying capabilities, from talent to infrastructure to orchestration, trail far behind. Enterprises see the promise; now they must build the foundations.

To close that gap, leadership teams must advance on three transformation pathways concurrently:

1. Build the foundations for an AI-native network

6G won't function on today's architectures. Organizations must begin shifting to cloudified, distributed and programmable network designs, where compute and intelligence sit closer to the edge. This means modernizing data planes, strengthening APIs, investing in zero-trust fabrics and preparing for the integration of sensing, localization and compute-aware routing.

2. Engineer a network that senses, computes and communicates as one system

6G will unify communication, sensing and computation into a single integrated fabric - enabling precise localization, environmental awareness and ultra-reliable performance at scale. Enterprises must begin preparing for architectures that can fuse sensor streams, process data at the edge and support sub-millisecond responsiveness.

3. Build the talent, partnerships and governance now

Preparing for 6G means cultivating cross-functional expertise across network engineering, AI, edge computing and cybersecurity. It also means forging early partnerships with ecosystem players, shaping regulatory pathways and building governance frameworks for data sovereignty, spectrum usage and autonomous network behaviours.

People Pulse #4

How soon do you think enterprises like yours will be ready to adopt 6G, as AI helps reduce connectivity challenges?

60%
said: within 3 years

22%
said: between 4-6 years

5%
said: 7+ years

14%
said: Not sure

> "Austria is advancing technological innovation in various strategic sectors. Advanced connectivity, connected aerospace technologies and precision automation enable scalable space missions and efficient city mobility, while engineering expertise supports iconic infrastructure projects, demonstrating cross-border collaboration and driving excellence in technology and strategic capabilities."
>
> Ajay Singh
> Head – Technology Innovation, Austrian Embassy, India

Are organizations prepared for a world where the network never steps out of the equation?

The rise of advanced connectivity marks a fundamental shift in how enterprises design, operate and secure their digital ecosystems. LEO closes the world's last coverage gaps; 6G promises intelligent, sensing-driven, ultra-reliable networks. Together, they redefine not just where organizations can operate but how they must govern, integrate and orchestrate systems in a borderless, always-on environment.

In this transition, new questions move to the forefront:

- When networks become ubiquitous, **how do enterprises safeguard reliability, sovereignty and control across geographies and providers?**
- As connectivity becomes intelligent and self-optimizing, **what happens to accountability when decisions occur autonomously at the edge?**
- **Can organizations blend satellite, terrestrial and cloud networks** without creating new fragmentation or security vulnerabilities?
- **What skills and architectures are needed** when operations depend on a multi-layer fabric, one that spans land, sea, air and orbit?
- **How do organizations expand borderless connectivity** while maintaining clear accountability, predictable cost and disciplined risk management?

Advanced Connectivity isn't an upgrade; it's a re-architecture of the enterprise. It moves organizations from relying on networks to structuring operations around them - requiring stronger governance, tighter integration, and a resilience-first strategy.

Megatrend 5: Quantum Mechanics

Dawn of applied quantum advantage.

Quantum is entering its first breakthrough decade- with quantum sensing already live in **1 in 3** organizations, while Quantum-as-a-Service accelerates the path to scalable quantum advantage.

Unlocking precision, prediction and power

Quantum technologies are stepping out of the lab and into early enterprise value, marking the beginning of a decade where precision sensing, accelerated simulation and cloud-delivered quantum capabilities reshape business and scientific frontiers.

Quantum sensing is the first wave of this shift - already active in one-third of organizations and showing early traction in high-value domains such as energy, environmental monitoring, medical diagnostics and navigation. These systems offer measurement accuracy and stability beyond classical limits, enabling insights that conventional instrumentation cannot achieve. As testbeds mature and hardware becomes more robust, sensing is rapidly evolving from niche pilots to a foundational capability for industries that depend on real-time, high-resolution physical intelligence.

Quantum-as-a-Service (QaaS) represents the second wave- a cloud-based, democratized model that allows enterprises to experiment with quantum algorithms, optimization routines and material simulations without investing in specialized hardware. Early proofs-of-concept show promising gains in supply-chain optimization, cryptographic resilience and complex modelling- all emerging through flexible, vendor -supported quantum platforms.

Together, these trends signal a two-speed quantum era: sensing delivering impact now in mission-critical operations, and QaaS emerging as the gateway to broader quantum advantage. Over the next cycle, quantum will transition from an experimental technology to a strategic enabler of precision, prediction and performance across industries.

Why it matters?

Key findings

Foundational readiness for quantum is stronger than perceived: Across talent, tools, leadership alignment, vendor ecosystems and budget, **50–60%** of organizations signal that enterprises are quietly building capability stacks even before broad deployment.

Quantum Sensing is moving faster than expected: With **33%** of organizations reporting active deployment and **93%** sitting in high-interest or pilot phases, sensing is emerging as one of the most accelerated deep-tech plays.

QaaS attracts near-universal strategic interest despite low current adoption: Only **15%** have QaaS in live use today, but **100%** rate their interest at 4/5. The model is seen as the safest and fastest path to quantum readiness.

Supply chain emerges as the first process showing measurable transformation: Respondents unanimously cite supply-chain planning and optimization as the earliest area with visible QaaS-enabled improvements, ahead of R&D, finance or security functions.

Quantum Computing shows balanced global interest with a European lead: As a mega trend, quantum demonstrates broad geographical engagement, with Europe at **30%** slightly ahead.

Emerging Now: Quantum Sensing

The technology that sees what your systems can't.

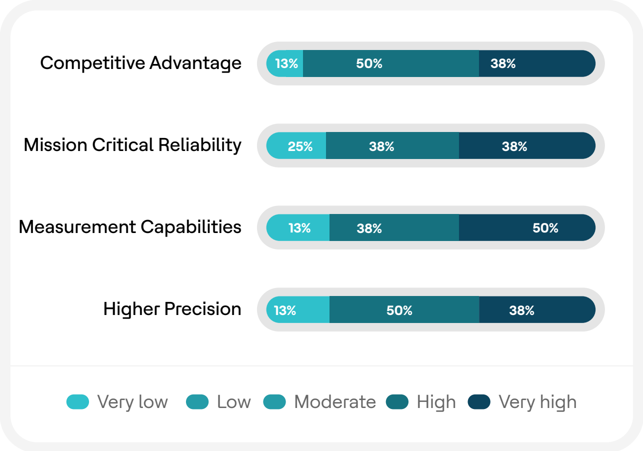
Imagine if your organization could see what classical sensors miss - the underground faults before they occur, microscopic biological changes in real time or subtle magnetic shifts signalling risk long before traditional systems react. That is the promise of quantum sensing, a capability that turns extreme precision into a practical advantage.

Today, businesses aren't interested in quantum sensing because it sounds futuristic; they're drawn to it because it solves real, stubborn problems. From exhibit 5.1, a majority of organizations see **higher precision (88%)** as one of its strongest advantages and many also highlight its ability to deliver **new measurement capabilities** that classical sensors simply cannot achieve. This makes quantum sensing not just a refinement of today's tools, but an enabler of entirely new categories of insights. The appeal extends to competitiveness and resilience.

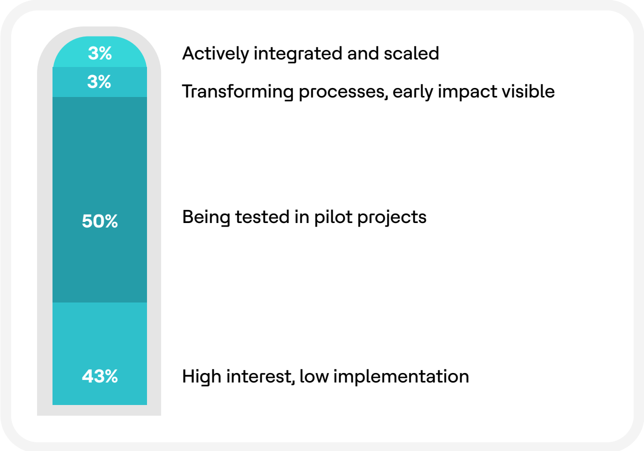
Nearly **half** of surveyed organizations see quantum sensing as a concrete competitive advantage, particularly in mission-critical sectors where precision and reliability are non-negotiable. The technology's ability to detect extremely small variations is especially valued in environments where minor deviations can lead to outsized consequences—such as energy infrastructure, aerospace systems, industrial operations, and medical diagnostics.

Despite this strong strategic interest, adoption remains at an early stage. Most organizations are still evaluating quantum sensing rather than deploying it at scale, with many running targeted pilots to assess its impact in high-precision use cases. Only a small subset has progressed toward deeper operational integration, suggesting that quantum sensing is beginning to move beyond experimentation and into real-world application —but selectively and within specific domains.

Exhibit 5.1
Quantum sensing interest is driven by precision, new insights and mission-critical reliability



Quantum sensing adoption stages among organizations in 2025



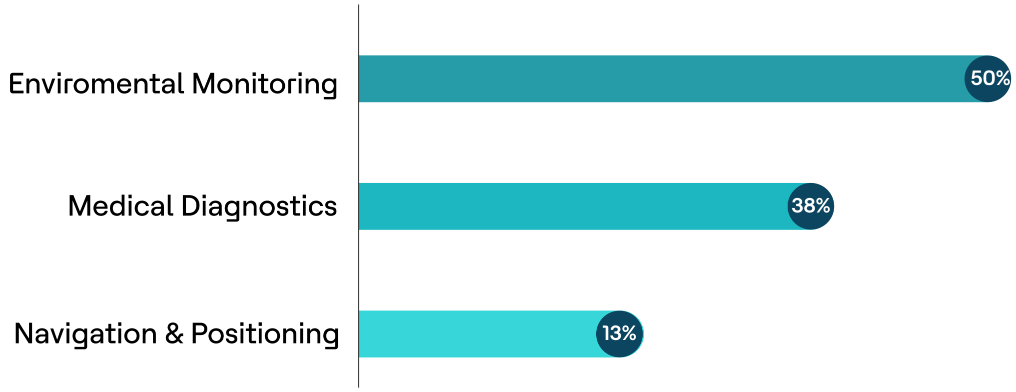
Nearly **50%** of organizations are already testing Quantum Sensing in pilots, signalling that the technology is moving beyond curiosity into real, high-impact experimentation.

Quantum sensing transforms the barely detectable into the highly actionable.

Quantum sensing is beginning to show where it can deliver real, measurable value and the early signals are strikingly clear. The strongest traction is forming in domains where traditional instruments have long struggled to provide dependable accuracy. Environmental monitoring, chosen by **50%** (see exhibit 5.2) of early adopters, has emerged as the leading proving ground, reflecting the need to detect subtle atmospheric, chemical or geophysical changes that classical sensors often miss. Medical diagnostics follows closely at **38%,** where quantum-level sensitivity opens the door to identifying biological markers earlier and with greater confidence.

What makes this significant is not just improved precision, it is the ability to unlock entirely new categories of measurement that reshape how organizations perceive and manage physical systems. Research across sectors highlights that quantum sensors can detect magnetic, gravitational or molecular signatures at sensitivities far beyond classical thresholds, enabling earlier warnings, sharper anomaly detection and more informed interventions. This positions quantum sensing as a powerful differentiator in industries where failure is costly and reliability is paramount-from energy grids and mobility networks to industrial plants and hospitals.

Exhibit 5.2
Quantum sensing is gaining its earliest traction in environmental monitoring and medical diagnostics.



From early pilots to predictive intelligence

Importantly, these early pilots are demonstrating that quantum sensing can accelerate the shift from reactive to predictive operations. By surfacing anomalies faster and with higher fidelity, organizations can intervene earlier, reduce downtime, and strengthen safety. As ecosystems mature—linking quantum devices with cloud platforms, digital twins, and AI-driven analytics—the value of sensing expands beyond isolated insights to system-wide intelligence.

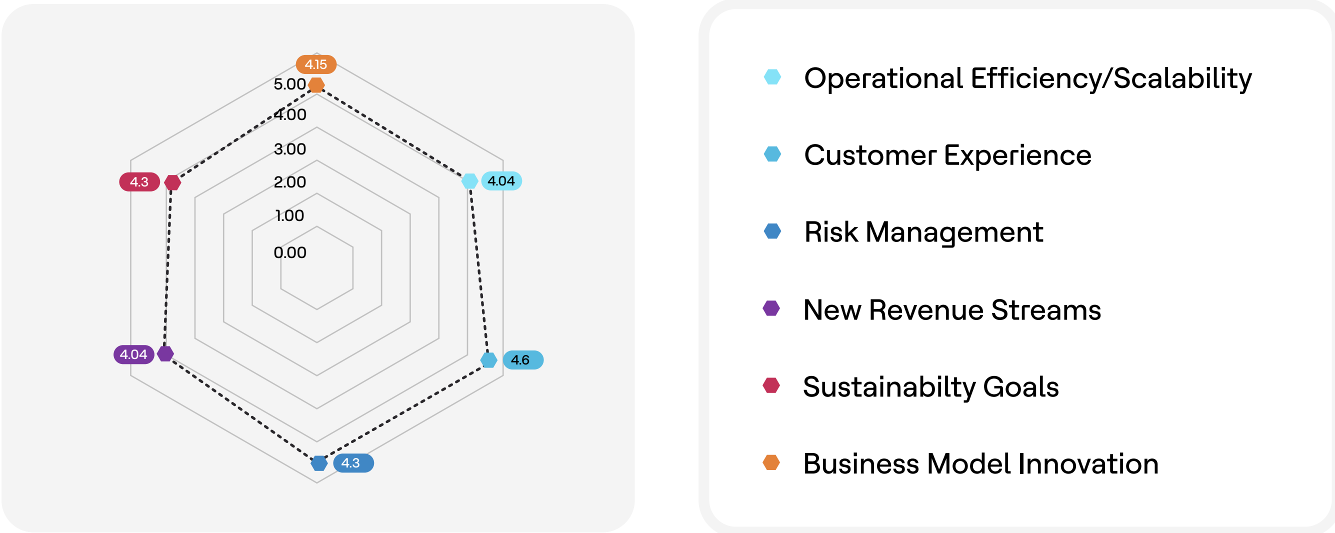
In this way, quantum sensing is evolving into a foundational capability: one that deepens visibility into complex environments, strengthens resilience, and equips organizations to act sooner, faster, and with greater precision.

Barriers: Hardware bottlenecks, fragile supply chains and an immature ecosystem

Quantum sensing is progressing through early pilots, but scaling these efforts into stable deployments remains challenging. While **75%** of organizations have access to testbeds and labs, many still lack the supporting capabilities required to move beyond prototypes. Access to controlled environments does not yet translate into readiness for field use, where reliability, repeatability, and maintenance become critical. Manufacturing and supply constraints further slow progress. Only about **half** of organizations report access to fabrication facilities or dependable component supply chains, limiting their ability to build, test, and refine hardware at scale. Collaboration across the ecosystem also remains limited. Although partnerships with academia and government are common, broader industry coordination is rare, with just **13%** participating in consortia. This fragmentation hinders the development of shared standards, interoperability, and common system architectures.

Integration into existing operational environments presents an additional hurdle. Quantum sensors produce data that differs in structure, volume, and sensitivity from conventional systems, requiring changes to data platforms, workflows, and analytics pipelines. For many organizations, the business case is still emerging: high system costs and uncertain commercial models make large-scale adoption difficult outside select, high-impact use cases. Together, these constraints suggest that broader adoption will depend less on sensor performance alone and more on advances in manufacturing, ecosystem coordination, and operational integration.

Exhibit 5.3
Quantum Sensing – Mesh of Possibilities



…the intelligence layer that modern enterprises didn't know they needed

The impact assessment for Quantum sensing signals a clear shift: what was once a physics experiment is rapidly becoming an enterprise capability with meaningful business value. Organizations report strong impact potential across the board- from **customer experience (4.6) and risk management (4.3) to business model innovation (4.1).** These scores reflect a growing recognition that sensing at quantum-level precision is more than technical sophistication; it reshapes how companies detect change, anticipate disruptions and act with confidence. Early adopters are already finding that the ability to observe what classical sensors overlook, unlocking new avenues for decision advantage, operational reliability and differentiated offerings.

The Road Ahead

- **Build integration-ready sensing architectures:** Quantum sensors generate richer and more sensitive data streams. Companies will need upgraded digital foundations like analytics pipelines, digital twins, real-time processing, so insights can move seamlessly from device to decision.
- **Strengthen the industrial backbone:** Progressing beyond pilots requires more dependable supply chains, fabrication readiness and standardized approaches to packaging, calibrating and maintaining quantum systems.
- **Prioritize mission-critical use cases first:** Early traction in environmental monitoring and medical diagnostics shows that quantum

sensing delivers the fastest ROI where precision directly shapes safety, uptime or regulatory outcomes.

- **Evolve cross-sector collaboration**: With few industry consortia in place, accelerating scale will depend on shared standards, common testing frameworks and collaborative commercialization models to reduce duplication and risk.
- **Translate precision into value**: The competitive edge will come not just from measuring more accurately, but from using quantum-derived insights to redesign workflows, optimize interventions and reveal new revenue pathways.

The shift ahead is not just about sharper sensors, but sharper strategies. Organizations that internalize quantum-grade awareness will outperform by anticipating change, not reacting to it.

Coming Soon: Quantum-as-a-Service (QaaS)

When quantum computing becomes browser ready.

Imagine quantum computing not as a lab only experiment but as a cloud service you tap into when needed. No hardware, no massive upfront investment, just on demand quantum power delivered through the internet. That is the promise of Quantum-as-a Service.

QaaS unlocks the heavy potential of quantum processors ranging from optimization and materials simulation to cryptography and advanced machine learning and makes it accessible far beyond specialized research labs. Cloud providers now offer quantum hardware simulators and developer tools that let firms experiment, iterate and solve complex computational problems with new levels of speed and flexibility. As a result, companies no longer need to own quantum devices. They just need the right problem and the willingness to explore.

Exhibit 5.4
How well are enterprises prepared for Quantum-as-Software in the coming future?

36% say their **talent capability** is ready, reflecting a growing pool of practitioners who are beginning to understand how to work with quantum platforms, even though deeper expertise is still developing across most organizations.

36% report **partially mature infrastructure and tools**, showing that while foundational cloud environments are in place, many enterprises have yet to build the more robust data and integration layers required for production-grade quantum workloads.

40% rate **leadership alignment** as partially ready, suggesting that executives have not yet fully committed to sustained sponsorship or transformation initiatives needed for broader adoption.

Is quantum an albatross, or are we wearing it like one?

Many C-suite executives and industry watchers genuinely question whether enterprises are prepared for quantum and with good reason. Studies show that factors like organizational resistance, lack of regulatory clarity and immature infrastructure remain significant adoption barriers. Moreover, some critics doubt whether current quantum technology is robust enough for real - world workloads; a recent industry-wide assessment concluded that while quantum systems are advancing rapidly, "commercial adoption remains limited."

Yet, despite these valid concerns, the broader market data and real-world signals paint a different story- one where quantum is quietly shifting from speculative science to emerging enterprise capability.

The global market for QaaS was worth about USD 3.0 billion in 2024 and is expected to grow rapidly to nearly USD 22 billion by 2029, at a CAGR approaching ~50%.

Examples are already emerging: Cleveland Clinic's dedicated quantum system for medical research, Volkswagen's traffic optimization trials and HSBC's quantum risk simulations all signal that real adoption has begun- just not where most executives are looking.

Many enterprises may not yet have every box checked but quantum is racing ahead. The technology is evolving, cloud-based delivery models are democratizing access and use cases that exploit quantum's strengths are already emerging. The hesitancy around readiness may reflect more about legacy mindset and organizational inertia than about quantum's actual potential. So the real question becomes not "*Is quantum ready?*" but *"Are we ready for quantum?"*

USD 22.13 billion by 2029, at a compound annual growth rate (CAGR) of **49.1%**

Source: Research and Markets

Getting ready for the coming quantum curve

Quantum-as-a-Service may still feel like a technology of the future, but signals from the field suggest the transition is already underway. Nearly half of organizations **(48%)** say they are actively exploring cloud-based quantum solutions, and another **22%** plan to begin soon. That momentum reflects a growing realization: waiting for "fully mature quantum" will mean missing the early advantages. Much like early cloud adoption a decade ago, the organizations that lean in now will not just use quantum when it matures- they will shape how it transforms industries. Yet readiness gaps remain.

To convert curiosity into capability, leadership teams must move on three strategic pathways in parallel:

1. Modernize digital foundations for hybrid quantum–classical workflows
Quantum will not replace classical computing; it will complement it. Enterprises must begin strengthening cloud architectures, data pipelines and orchestration systems so quantum tasks can plug in seamlessly when needed. This includes building API-ready environments, investing in simulation tools and preparing software teams for hybrid execution models that blend classical speed with quantum depth.

2. Start identifying quantum-ready problems, not quantum-ready products

2. Start identifying quantum-ready problems, not quantum-ready products
Quantum-as-a-Service is evolving fast, but its value will appear first in tightly scoped domains- advanced optimization, molecular simulation, complex scheduling, risk analytics. Enterprises should start mapping these high-friction, high-complexity problems now. The goal is not to deploy quantum everywhere, but to understand where quantum offers disproportionate advantage long before competitors do.

3. Build early partnerships and governance muscle
With the vendor landscape still maturing, organizations cannot afford to navigate quantum in isolation. Leaders should establish early partnerships with cloud providers, quantum hardware startups and academic ecosystems. At the same time, they must develop governance frameworks for security, data integrity and algorithmic transparency- ensuring that quantum capabilities can be deployed safely and responsibly as they scale.algorithmic transparency- ensuring that quantum capabilities can be deployed safely and responsibly as they scale.

Rather than waiting for quantum technology to fully mature, organizations can create advantage by preparing their systems and teams to adopt it incrementally. Those that take early steps—through pilots, architectural planning, and ecosystem engagement—will be best placed to turn future quantum capabilities into practical, near-term outcomes.

> "
> Quantum computing in Finland is moving from research to real-world application through sustained investment, a clear roadmap, and an integrated ecosystem. State-backed programs, open-access platforms, and strong collaboration across academia, research, and industry enable applied use cases in materials, energy, and advanced manufacturing.
>
> **Siddharth Naithani**
> Senior Advisor- ICT, South Asia
> Embassy of Finland, India

People Pulse #5

How ready are you to adopt cloud-based quantum solutions?

48%
said: Already exploring

22%
said: Planning soon

15%
said: Still learning

14%
said: Not relevant

Are enterprises asking the right questions about quantum or just the easy ones?

Quantum's broad adoption will depend on disciplined experimentation, careful orchestration and a clear understanding of where quantum truly adds value. For leaders, the strategic task now is not to bet on "quantum everywhere," but to prepare for a future where quantum quietly enhances select decisions, workflows and mission-critical operations. In this emerging landscape, more grounded questions take center stage:

- As quantum begins to outperform classical tools in specific tasks, **how do leaders identify problems that genuinely warrant quantum over existing methods?**
- When quantum insights become more sensitive or more granular, **what safeguards ensure that interpretation, governance and decision rights remain sound?**
- As cloud platforms democratize access to quantum capabilities, **how do enterprises avoid fragmented pilots that fail to scale or integrate with core systems?**
- If quantum sensing becomes embedded in operational workflows, **what new resiliency standards, failure modes and maintenance models must leaders anticipate?**
- With quantum adoption uneven across industries and functions, **how can organizations pace their investments to stay prepared without overcommitting ahead of maturity?**

The opportunity lies in approaching it with clear intent: start small, learn fast, integrate thoughtfully and build the architectural and organizational muscle that will matter when the technology matures.

Megatrend 6: Energy & Sustainability

Rise of intelligent, decentralized and circular energy systems.

Every **1 in 3** organization is already redesigning operations around decentralized or low-carbon energy systems-setting the foundation for scalable sustainable advantage.

Systems that produce, store and regenerate value

The next era of industrial transformation is being shaped by how enterprises generate, distribute and conserve energy, not just how they consume it. The Energy & Sustainability megatrend marks a decisive shift from centralized, carbon-intensive infrastructures to intelligent, distributed and circular systems that strengthen resilience while reducing environmental impact.

Decentralized energy is moving from experimentation into mainstream strategy. Advances in renewable generation, behind-the-meter storage, microgrids and digital energy orchestration are enabling enterprises to localize supply, withstand volatility and optimize consumption in real time. As organizations confront rising energy uncertainty and sustainability mandates, distributed systems are becoming a foundational operational capability.

Green manufacturing, meanwhile, is emerging as the next horizon-redefining production with low-carbon materials, energy-efficient processes, AI-enabled resource optimization and closed-loop value chains. As regulatory pressure and customer expectations intensify, manufacturers are re-engineering factories around circularity and carbon transparency, positioning sustainability as a core driver of competitiveness rather than a compliance exercise.

Together, these shifts signal the rise of an industrial landscape where energy efficiency, resilience and regenerative design converge-reshaping how enterprises operate and grow.

Why it matters?

Key findings

Energy, IT and manufacturing emerge as sustainability front-runners: Sectors with high energy demand or large operational footprints are advancing fastest on sustainability imperatives.

Decentralized energy is reaching enterprise-scale adoption: With **45–55%** of organizations already deploying on-site renewables and storage, decentralized systems are shifting from backup roles to strategic assets that help enterprises manage price volatility, grid instability and decarbonization commitments.

Energy autonomy is becoming a critical operational differentiator: Early deployments show tangible gains, with **64%** reporting higher energy efficiency and **50%** reduced downtime, positioning distributed systems as essential for uptime, resilience and continuity.

Green manufacturing poised for scale, not yet realized: High interest but low execution defines today's green manufacturing landscape with pilots dominating **(45%)** and scaled adoption still at infancy levels **(3%).**

Regulation and efficiency are the strongest catalysts for green manufacturing: Environmental regulations **(60%)** and energy efficiency **(60%)** are the dominant drivers pushing enterprises toward green manufacturing.

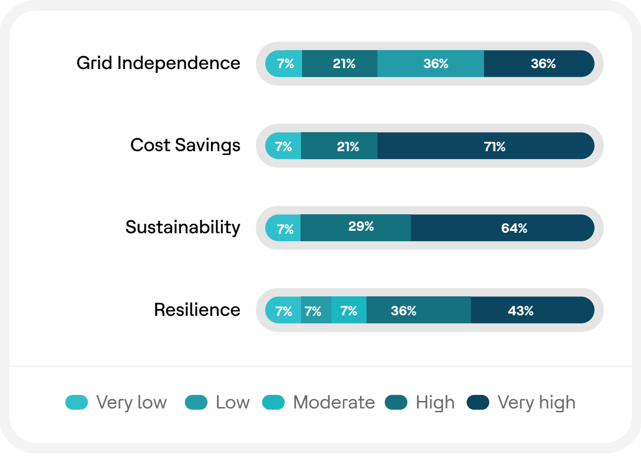
Emerging Now: Decentralized Energy

Rewiring resilience, autonomy and sustainability for the next era of operations.

Decentralized energy refers to the distributed generation and management of power close to the point of use, rather than relying solely on large, centralized grid stations. It encompasses solar rooftop arrays, microgrids, energy storage, combined heat and power (CHP) and other localized generation assets that can operate independently or in coordination with the main grid. This shift moves energy from a one-way delivery model to an agile, multi-nodal system that can self-balance supply and demand locally, reduce transmission losses and improve continuity.

Organizations aren't just experimenting with decentralized energy anymore, they're prioritizing it as a strategic asset. Inherent climate risk, volatile grid reliability and rising energy intensity across distributed operations are driving this shift. Decentralized energy isn't simply an environmental choice; it is increasingly a business continuity, cost optimization and operational resiliency imperative.

Exhibit 6.1
Cost savings and sustainability are now the primary engines of decentralized energy adoption.



Responses indicate that interest is primarily driven by economic and environmental considerations (see exhibit 6.1). Over **70%** of leaders rate cost savings as a high or very high motivator, and **64%** report sustainability at the same level of importance.

Resilience and grid independence also emerge as core drivers, with a majority rating these dimensions as high impact - signalling that enterprises view decentralized energy not only as a financial lever but as a way to insulate operations from grid volatility, extreme weather events and supply chain disruption.

The energy shift has started and every sector is charting its own path.

Many industries are already embedding decentralized energy into their operating models, but the pace of maturity varies (See exhibit 6.2).

- **Telecom and process manufacturing report some of the most advanced integration,** with **50%** of organizations in each sector actively integrating and scaling decentralized energy systems. Their high energy consumption and mission-critical uptime needs are accelerating deeper adoption, supported by an additional

25% in each sector that are already seeing early transformation impact.

- **IT (Software/Cloud) players are actively testing decentralized systems,** with **33%** currently in pilot projects and another **33%** already transforming processes. This reflects the sector's push to strengthen data-center flexibility, support edge workloads and reduce dependency on centralized power sources.

- **Energy & utilities are balancing traditional grid roles with transformation pilots, showing an even distribution across maturity levels - 33%** actively integrating, **33%** piloting, and **33%** at early interest stages. This mix points to hybrid pathways where centralized operations and decentralized energy models evolve together to enhance grid stability and operational flexibility.

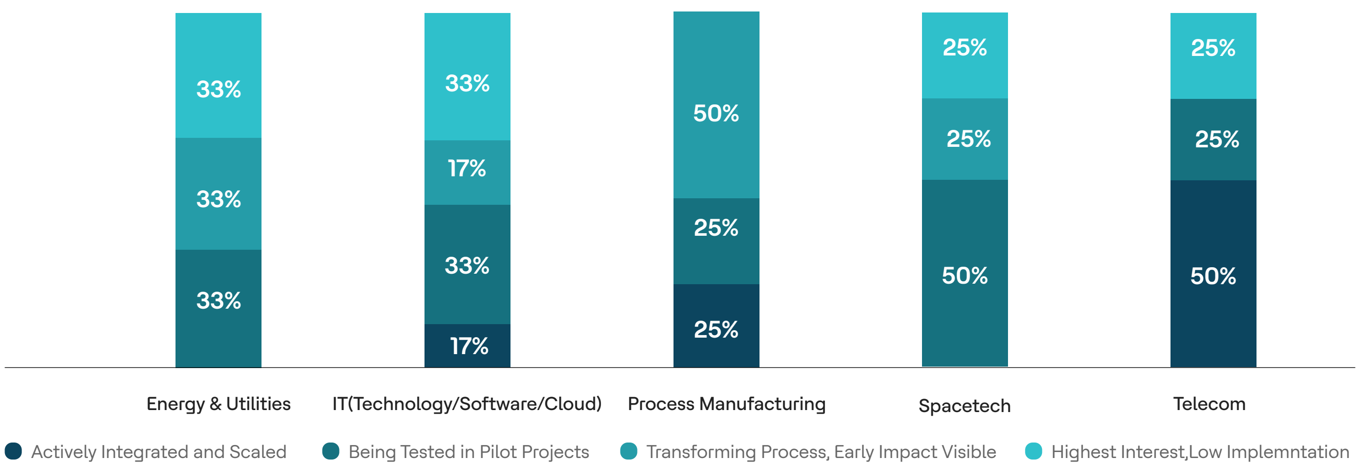


Exhibit 6.2
Telecom and manufacturing lead the charge as decentralized energy maturity accelerates.

As a recent case-in-point, BASF India has partnered with CleanMax to deploy a 27 MW wind–solar hybrid captive energy system, supplying renewable power directly to its manufacturing operations. The decentralized setup is expected to cut BASF's CO_2 emissions by over 30,000 tonnes annually while reducing exposure to grid volatility - a clear signal of how process manufacturers are leveraging hybrid, on-site energy models to drive resilience, cost stability and sustainability at scale.

> "Energy is moving from centralized supply to intelligent orchestration: thousands of distributed assets, steered by AI-driven software, stacking value across markets. Intelligent, decentralized and circular systems are how we keep costs predictable, grids stable and climate goals credible."
>
> **Stefan Bovy,**
> Group Head - Energy, Proximus

Beyond Pilots: Decentralized energy is evolving into an intelligent operating layer.

As decentralized energy moves beyond early pilots into strategic deployment, enterprises are beginning to think not just in terms of discrete assets but in terms of dynamic energy ecosystems that adapt and respond to internal and external forces. Decentralized energy systems (DES) inherently reduce dependence on centralized fossil-fuel generation and long transmission chains, lowering transmission losses and improving eco-efficiency - a pattern already visible in how organizations prioritize renewable integration over other sources. The growing use of smart contracts and energy storage systems (at **36% each,** from exhibit 6.3 (a)) points to an emerging emphasis on orchestration intelligence - where distributed energy resources communicate, self-balance supply and demand, and optimize across units rather than operate in isolation.

What distinguishes the leaders is their recognition of decentralized energy as an operational nervous system rather than a mere sustainability add-on. Organizations are reporting measurable performance uplifts – From exhibit 6.3 (b), **64%** observing improved energy efficiency and **57%** seeing carbon-footprint reductions - that align with academic insights showing how decentralized generation, when coordinated with local loads, can dramatically improve system performance and eco-efficiency. In practice, this translates into more resilient production floors, agile data centres and grid-independent operational zones that are better prepared for volatility, policy shifts and grid -independent operational zones that are better prepared for volatility, policy shifts and climate-induced disruptions.

This broader reframing - from siloed installations to adaptive networks - highlights a fundamental shift: enterprises are building energy systems that function like multi-node ecosystems, capable of dynamically reallocating capacity, buffering shocks and leveraging local conditions. As these capabilities advance, decentralized energy will increasingly serve as a foundation for operational autonomy, digital transformation and long-term value creation - not just as a way to generate power, but as a way to reimagine how energy flows across every corner of the modern enterprise.

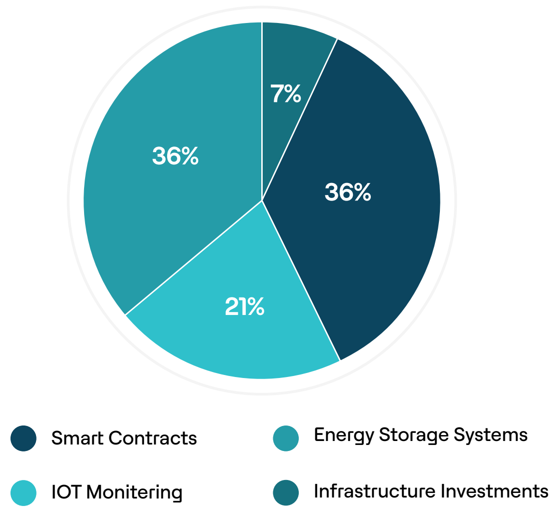


Exhibit 6.3 (a)
Energy scaling enters a new era - digitized, decentralized and storage-driven.

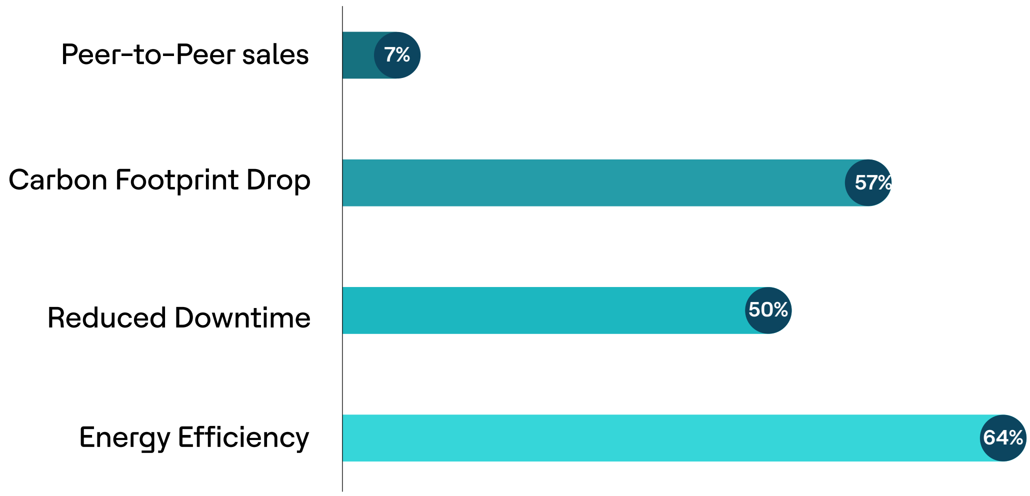


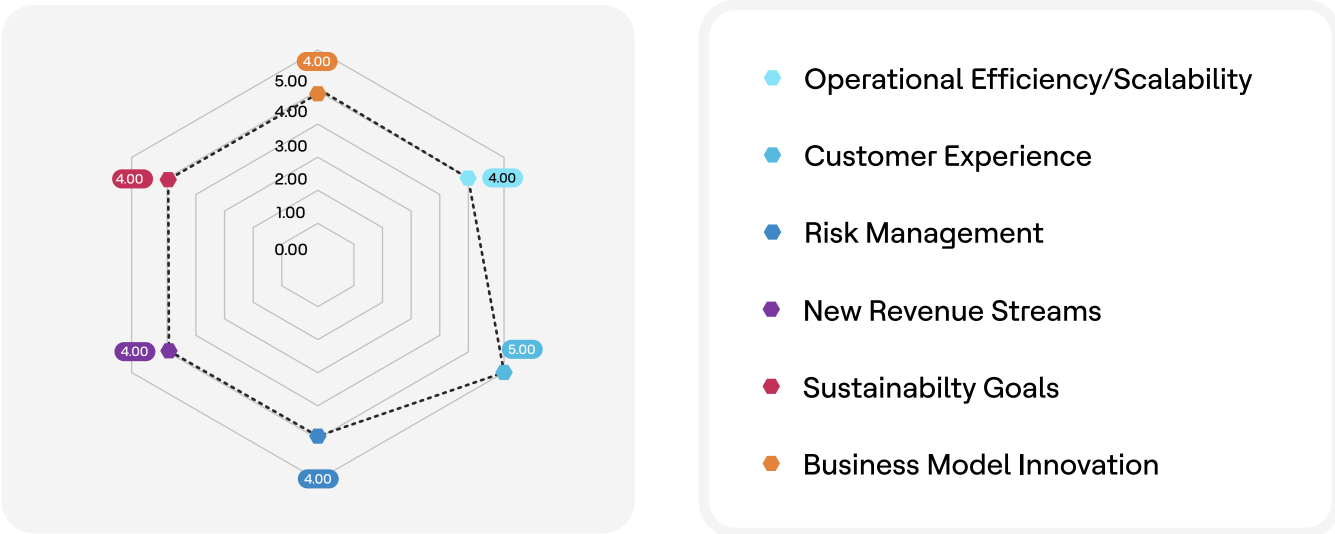
Exhibit 6.3 (b)
Decentralized energy delivers tangible performance gains across efficiency, uptime and carbon reduction.

Barriers: Fragmentation, readiness gaps and governance hurdles slow the move to decentralized energy

Even with rising enthusiasm, scaling decentralized energy remains challenging. The biggest barrier is system complexity - enterprises must integrate diverse assets like renewables, storage and smart controls into a coordinated, multi-node ecosystem. Many lack the interoperability and orchestration maturity required to operate these systems efficiently. Infrastructure and investment readiness also lag. While research shows decentralized systems deliver higher eco-efficiency and lower transmission losses when generation and load are closely aligned, many organizations still lack adequate storage, digital control layers and site-level upgrades needed to capture these gains.

Finally, organizational and governance gaps pose real friction. Decentralized energy requires cross-functional decision-making and data-driven operational management - capabilities still nascent in many enterprises. This leaves advanced mechanisms like smart contracts or automated energy balancing underutilized, slowing movement from pilots to scalable architectures. These barriers don't diminish decentralized energy's promise; they clarify what must evolve for it to become a resilient, enterprise-grade energy foundation rather than a collection of isolated projects.

Exhibit 6.4
Decentralized Energy – Mesh of Possibilities



The win is beyond sustainability – it's an enterprise engineered for resilience and intelligence

The decentralized energy impact radar (exhibit 6.4) reveals a landscape where DES is evolving far beyond localized generation. Customer experience **(5)** emerges as the strongest opportunity zone, underscoring how uninterrupted, self-balanced energy systems can unlock new service models, improve on-site reliability and reshape operational workflows. Close behind, business model innovation **(4)**, operational scalability **(4)**, risk management **(4)** and new revenue streams **(4)** signal that decentralized energy is increasingly viewed not just as an infrastructure choice but as a strategic engine for differentiation.

Taken together, the radar shows DES shifting from a sustainability-driven initiative to a multi - dimensional value platform - one capable of improving eco-efficiency, powering real-time digital operations, stabilizing enterprise risk profiles and enabling energy autonomy.

The Road Ahead

- **Build an intelligent orchestration layer**
  Enterprises must unify storage, smart controls, and automated balancing to turn fragmented assets into a coordinated, self-optimizing energy fabric.
- **Strengthen infrastructure and digital readiness**
  Eco-efficiency improves when local loads and generation align; scaling DES requires upgraded site infrastructure, expanded storage, and real-time monitoring.
- **Close capability gaps and modernize energy governance**
  DES success depends on new skills and

- cross-functional governance that treats energy as a strategic, data-driven enterprise asset—not a utility expense.
- **Integrate DES with cloud, edge and IoT systems** Pairing DES with IoT, edge compute and AI elevates its value, enabling dynamic load management, predictive operations and resilient distributed workflows.
- **Position decentralized energy as a transformation engine** Leading organizations use DES to redesign operations - from resilient production lines to grid-independent remote sites - expanding what the enterprise can deliver and how it performs.

As DES evolves, enterprises gain more than low-carbon energy - they gain a strategic lever that strengthens resilience, unlocks new value pools and redefines how operations scale in a volatile world.

Coming Soon: Green Manufacturing

Cleaner processes driving smarter performance.

Green manufacturing, the practice of producing goods in ways that use fewer resources and create less waste, is reshaping how industries think about efficiency and sustainability. Instead of treating cleaner operations as optional, manufacturers are now baking eco-efficiency into the heart of production, using smarter processes, better materials and real-time data to cut emissions and optimize energy use.

The payoff is bigger than a reduced footprint: green manufacturing is helping companies lower costs, strengthen resilience and meet the rising expectations of customers and regulators. As digital tools and circular practices mature, the factory floor is evolving into a greener, faster, and more future-ready engine of growth.

Exhibit 6.5
How well are enterprises prepared for Green Manufacturing in the coming future?

35%

say **budget and investment readiness is still maturing,** revealing that funding for energy-efficient equipment, decarbonization technologies and circular manufacturing capabilities is present but not yet at scale.

47%

say their **talent availability is not yet ready,** highlighting a significant skills gap in areas such as advanced process optimization, energy-efficient operations and green technology integration.

47%

cite an **underdeveloped vendor ecosystem,** showing that organizations still struggle to access integrated partners, certified suppliers and technology providers needed to accelerate green manufacturing adoption.

USD 422.12 billion by 2030, at a compound annual growth rate (CAGR) of **11%**

Source: Grand View Research

Green Manufacturing's global push accelerated by digital ambition and regional urgency.

Green manufacturing is entering a decisive phase of global expansion - one shaped not just by regional uptake, but by the strategic motivations driving it. **LATAM** and **APAC,** which together represent the largest share of upcoming adopters in the dataset, point to a market where regulatory tightening, volatile energy markets and the need for resource efficiency are accelerating action. These regions aren't merely adopting greener processes - they are using them to hedge against supply risks and build future-ready industrial capacity.

The digital maturity profile of these adopters adds another layer to the story. More than **55%** of organizations fall into Transforming or Innovation Leader tiers, signalling that green manufacturing is increasingly being built on digital-first foundations - from AI-driven efficiency gains to automated material recovery and real-time emissions intelligence. The presence of nearly **25%** early-stage enterprises suggests an emerging democratization of green manufacturing, where even less mature organizations view sustainability as a springboard for modernizing outdated production systems, not just for meeting environmental expectations.

Taken together, these trends reveal a shift from green manufacturing as a compliance-oriented upgrade to a strategic modernization pathway - a way for enterprises to redesign industrial workflows, de-risk production, improve operational intelligence and compete in a low-carbon economy. The global distribution of interest, coupled with digitally ambitious players leading the curve, signals that the next wave of industrial transformation will be simultaneously greener, smarter and more globally synchronized than anything we have seen in prior manufacturing cycles.

The shift isn't just to low-carbon factories - it's to adaptive, data-led industrial systems

Green manufacturing is gaining real traction and the shift feels different this time: it's not just about cleaner factories - it's about smarter, more adaptive industrial systems. Leaders are increasingly tying sustainability to digital capability, operational resilience and long-term competitiveness. Our People Pulse data reveals what's shaping this momentum: data-driven insights **(45%)** and cloud and AI platforms **(23%)** are emerging as the real engines behind future-ready manufacturing because they shift sustainability from a static goal to a dynamic, continuously optimized system. When manufacturers can see exactly how energy is used, where materials are wasted, or which processes generate the most emissions, they can redesign operations in ways that were simply not possible before - adjusting production schedules based on energy intensity, choosing lower-carbon inputs, or automating efficiency improvements across the line. Cloud and AI systems make this scalable by centralizing data, running real-time analytics and enabling predictive models that guide smarter decisions on throughput, quality and resource consumption.

To translate rising intent into measurable advantage, enterprises should focus on three strategic pathways:

1. Make data the heartbeat of greener operations
Manufacturers need deeper visibility into energy flows, emissions, and process efficiency. Strengthening cloud and AI foundations turns sustainability from a reporting exercise into a real-time, performance-driven capability.

2. Build production models that waste less and learn more
Circular practices may sit lower on today's priority list (11%), but they are fast becoming essential for cost control and resource resilience. The winners will be those who design products, materials and processes that regenerate value rather than consume it.

3. Shape the ecosystem that will carry green manufacturing forward
As policies gain influence and technology landscapes evolve, manufacturers need partners - technology providers, clean-energy players, regulators and skill-development networks - to help them navigate the shift. This isn't a solo journey; it's a system change.

People Pulse #6

What will be the biggest driver of green manufacturing in the next 5 years?

45%
said: Data-driven insights

23%
said: Cloud & AI platforms

22%
said: Policy regulations

11%
said: Circular economy models

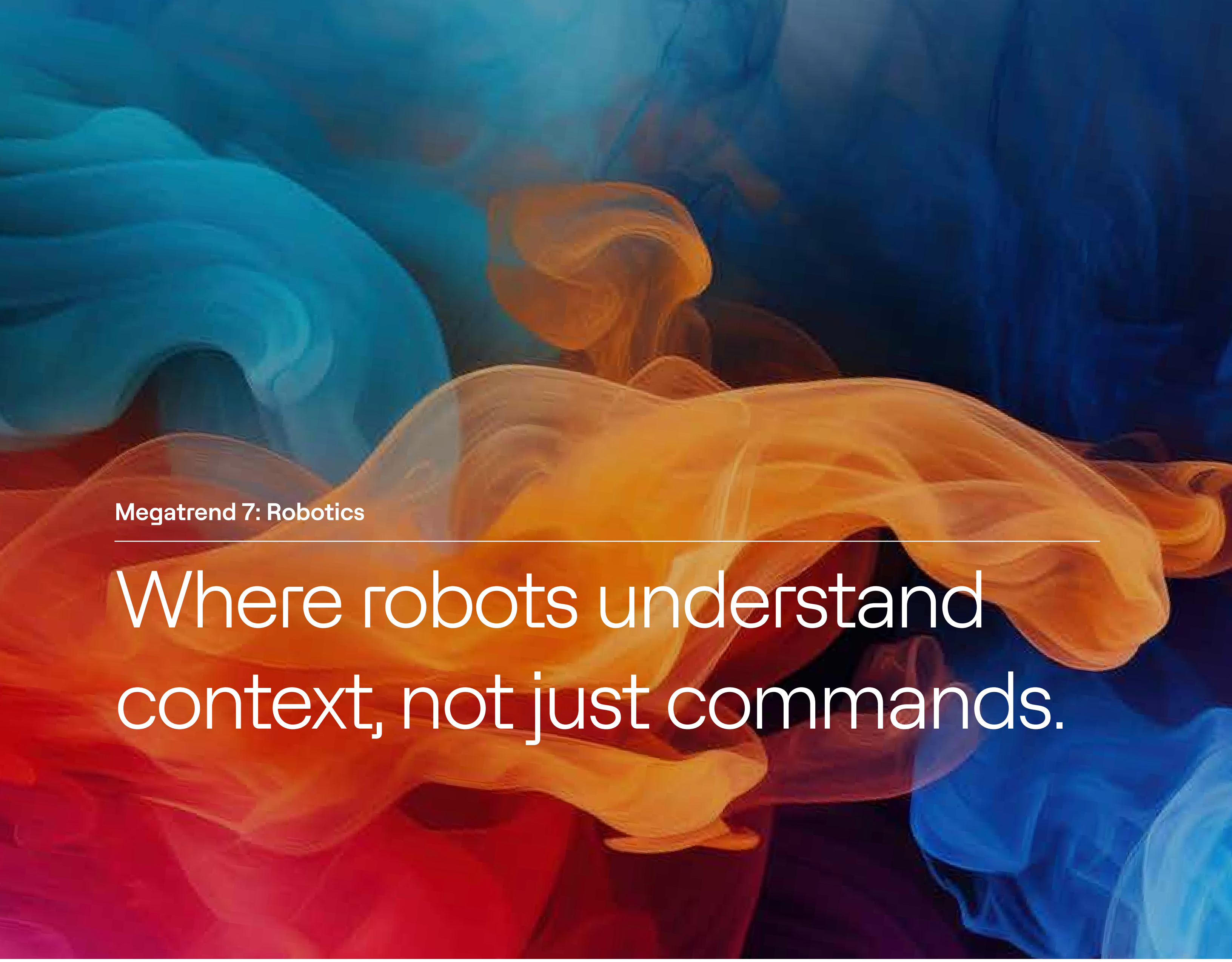
Before energy becomes intelligent, enterprises must become intentional.

One thing is pretty clear: the enterprises that win the next decade will be those that approach energy not as an operational input, but as a strategic, intelligence-driven system. Decentralized energy, green manufacturing and circular production models are no longer experiments - they are shaping how industries compete, scale, and build resilience.

Yet this shift brings a new set of questions that leaders must confront before they can truly accelerate.

- As energy systems become programmable and autonomous, **how should leaders decide which operations go off-grid and which stay connected?**
- With storage, IoT and smart contracts advancing unevenly, **what governance models will keep distributed energy secure, synchronized and dependable?**
- As green manufacturing scales, **how can enterprises redesign materials, processes and supply chains without disrupting cost or quality?**
- With regulations tightening, **how ready are organizations to deliver real-time reporting, traceability and emissions transparency at scale?**

The next era of energy won't reward passive adopters. It will favour enterprises willing to confront difficult questions about how they generate power, reduce carbon, reinvent manufacturing and govern distributed systems. Those that do will define the blueprint for a smarter, more adaptive industrial landscape.



Megatrend 7: Robotics

Where robots understand context, not just commands.

More than **9 in 10** organizations are already engaging with the next era of robotics - driven by active cloud robotics deployments and widespread cognitive robotics experimentation.

Intelligence distributed, decisions automated, experiences enhanced

The next phase of enterprise transformation is being shaped by how organizations augment physical operations with intelligent, connected machines, not just how they automate routine work. The robotics megatrend marks a decisive transition from standalone, pre-programmed robots to adaptive, cloud-orchestrated and cognitively capable systems that collaborate with humans, respond to changing environments and scale across distributed sites.

Cloud Robotics is rapidly advancing from exploratory pilots to meaningful operational use. By virtualizing compute, leveraging 5G/edge and enabling fleet-level coordination, cloud - connected robots allow enterprises to standardize robotic skills, update capabilities remotely and synchronize distributed workforces. Early deployments across manufacturing, logistics and inspection demonstrate how shared intelligence can unlock higher uptime, faster deployment cycles and better resource utilization.

Cognitive Robotics, meanwhile, is emerging as the next horizon - expanding the role of robots from executing tasks to interpreting context, making decisions and learning over time. Drawing from advances in perception, planning, machine learning and human-robot interaction, cognitive robots are beginning to assist in complex industrial workflows, adaptive production and safety-critical environments. Adoption remains early, yet interest and near-term scale expectations are high, signalling a shift toward robots that reason, not just react.

Together, these signal the rise of an operational landscape where physical automation, cloud intelligence and cognitive decision-making converge - reshaping how enterprises build, move and service their physical world.

Why it matters?

Key findings

Robotics engagement is nearly universal across enterprises: A combined **92%** of organizations are either piloting or deploying cloud robotics and a similar **90%** are actively exploring cognitive robotics -indicating broad momentum across both foundational and frontier capabilities.

Cloud robotics is entering its first wave of real operational impact: With **46%** already in pilots and **21%** reporting early process transformation, cloud-connected robots are moving from isolated trials to coordinated deployments that improve efficiency, task accuracy and multi-site orchestration.

Cognitive robotics is early-stage but accelerating rapidly: Although only **8%** report live deployments, over half expect cognitive capabilities to scale within **18–24 months**, driven by rising demand for adaptive decision-making, safer automation and AI-enriched workflows.

Talent, infrastructure and orchestration remain the primary constraints: Across both sub-trends, a large share of organizations rate themselves only partially ready to scale - highlighting capability gaps in robotics/AI engineering, cloud–edge integration, interoperability and safety governance.

Growth-focused pilots dominate the current robotics agenda: Organizations are experimenting with **swarm coordination, remote navigation, advanced pick - and - place and assisted decision- making** - indicating a shift from simple task automation toward higher-value, multi-robot collaborative scenarios.

Emerging Now: Cloud Robotics

Turning distributed workforces into coordinated fleets.

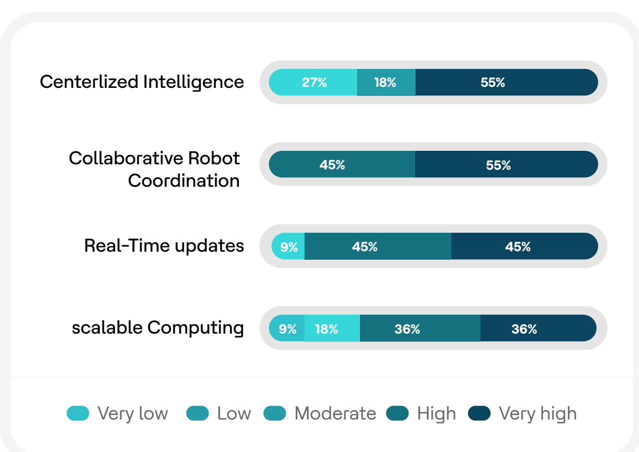
Cloud robotics is reshaping the automation landscape by shifting intelligence from individual robots to a central cloud-and-edge backbone, allowing machines to learn collectively, update instantly and operate as coordinated fleets across plants, warehouses and field environments. A simple illustration makes the shift tangible: in a modern warehouse, if one robot discovers a faster route or encounters a new obstruction, that insight is uploaded to the cloud and immediately shared with every other robot - turning the entire fleet into a continuously improving system rather than a collection of standalone machines. This evolution is resonating strongly with business leaders because it directly addresses long-standing automation limitations. The appeal of centralized intelligence is particularly notable - over **55%** (see exhibit 7.1) of organizations rate it as a top motivator - as they work to replace fragmented, site-specific programming with shared learning models that orchestrate robots consistently across locations.

Interest in collaborative coordination is similarly strong, with **45–55%** highlighting the value of synchronized multi-robot activity in logistics, manufacturing and inspection-driven environments where throughput depends on collective behavior rather than isolated tasks.

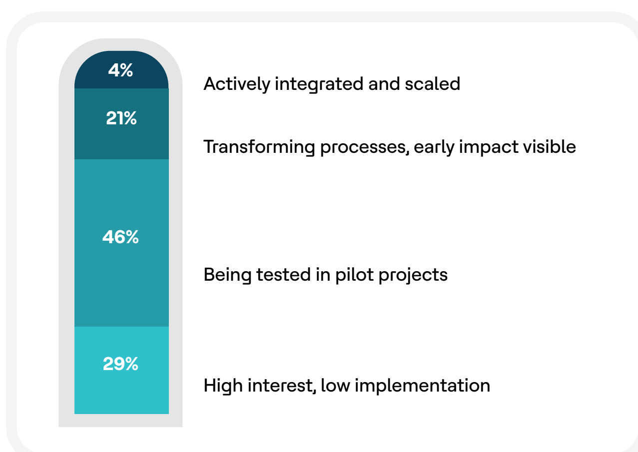
These motivations reflect the current stage of robotics adoption. Organizations are piloting **(46%)** cloud-enabled robots in areas such as navigation, pick-and- place, and remote operations, where shared learning and real-time updates deliver immediate value. Early adopters **(21%)** are already seeing process gains as cloud orchestration improves coordination and reduces downtime, reinforcing confidence in scalable, connected robotics models.

Exhibit 7.1

Enterprises prioritize shared intelligence and multi-robot collaboration as cloud robotics takes shape



Cloud robotics adoption stages among organizations in 2025



> Israel has emerged as a leading deep-tech hub, converting advanced research into deployable AI, quantum, robotics, space and cybersecurity technologies. With industry-ready systems, strong startup networks, technical talent, and strategic government support, the country prioritizes integrated, dependable solutions that deliver tangible impact across defence, enterprise, and critical infrastructure.

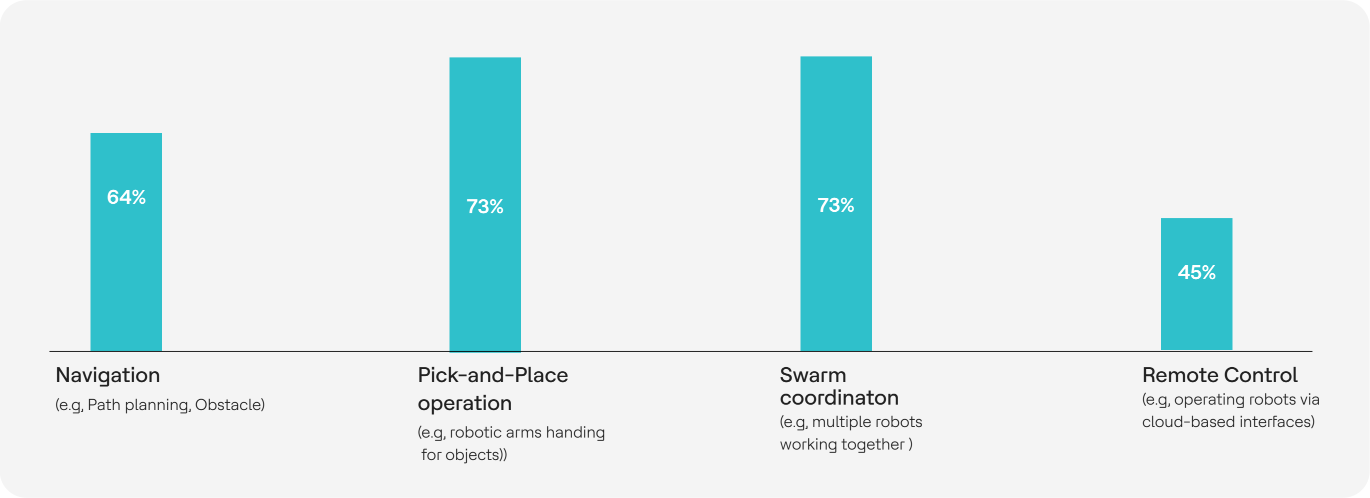
Ms. Ofir Amami
Economic Counsellor Embassy of Israel, India

A fleet that learns together, leaps together...

Cloud robotics is moving beyond prototype territory and evolving into the coordination layer for intelligent operations. The clearest evidence lies in the types of pilots being prioritized (see exhibit 7.2): **advanced pick-and-place (73%), swarm coordination (73%) and autonomous navigation (64%)** - all environments where real-time awareness and synchronized action matter far more than and synchronized action matter far more than scripted logic. These choices show that organizations aren't testing the easy parts of robotics; they're pushing directly into tasks that demand shared intelligence,

Exhibit 7.2

Intelligent coordination is becoming the proving ground for cloud robotics, with enterprises prioritizing complex, high-judgment tasks first.



dynamic adaptation and fleet-level coherence.

As robots start depending on the cloud for perception, planning and decision updates, connectivity becomes the decisive factor. This is where 5G is emerging as a transformational enabler rather than a marginal upgrade. With dramatically lower latency and more stable throughput, 5G allows robots to offload computation, refresh models and coordinate actions with a fluidity that previous networks simply couldn't sustain. The result is a robotics architecture that behaves less like a set of individual machines and more like a **distributed intelligence system** - continuously learning, continuously synchronizing and continuously improving.

Enterprises are already adjusting their infrastructure around this reality. Many are pairing 5G with hybrid cloud-edge orchestration and optimized routing to ensure that robots can tap into cloud intelligence exactly when they need it. Together, these shifts mark the beginning of a new robotic operating model - one where autonomous behavior isn't limited by hardware, but unlocked by the network itself.

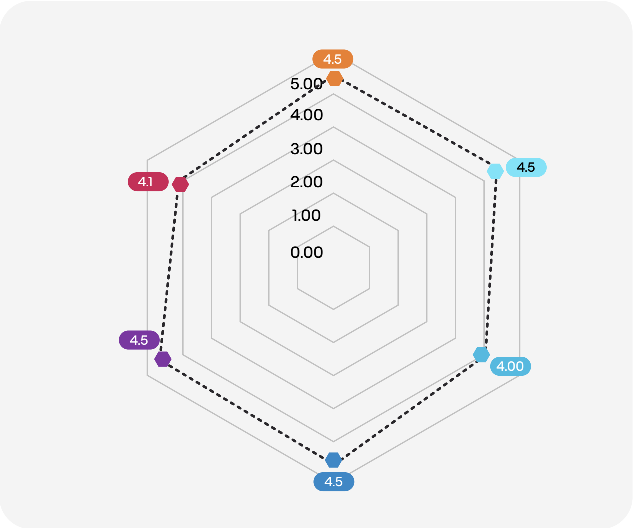
Ultimately, cloud robotics marks a shift from automating tasks to orchestrating intelligence at scale. As fleets become software-defined and network-driven, success hinges on how effectively organizations manage coordination, learning, and change across environments.

Barriers: Orchestration limits, connectivity demands and capability gaps slow cloud robotics from scaling

Scaling cloud robotics remains challenging because the underlying system demands far more robust upgrades - it requires coordinated orchestration across robots, cloud platforms, edge compute and real-time decision logic. Many enterprises are not yet architecturally equipped for this, reflected by the sizeable portion still in early-interest stages **(29%).**

Connectivity readiness adds another layer of friction. As robots increasingly depend on the cloud for perception and planning, they require networks capable of delivering consistent low-latency performance. While some organizations have begun adopting 5G/6G integration **(36%),** most still operate on infrastructures not built for synchronized fleet behavior or continuous cloud–edge model refresh cycles. Organizational capability gaps further slow the transition from pilots to scaled deployments. Cloud Robotics blends robotics engineering with AI pipelines, network architecture and hybrid cloud– edge operations - skill sets still emerging in many enterprises. Without these foundations, early wins remain isolated experiments rather than enterprise automation

Exhibit 7.3
Cloud Robotics – Mesh of Possibilities



- Operational Efficiency/Scalability
- Customer Experience
- Risk Management
- New Revenue Streams
- Sustainabilty Goals
- Business Model Innovation

The next advantage won't come from individual robots, but from robotic ecosystems that learn as one

The cloud robotics impact radar (exhibit 7.3) reveals a technology shifting from discrete automation into a multi-dimensional engine of enterprise value. Operational efficiency/scalability **(4.5),** shows that cloud-connected robots are already reshaping throughput, uptime and workflow synchronization. Business model innovation and new revenue streams **(each at 4.5)** signal that cloud robotics is no longer being viewed as an operational add-on, but as a platform capable of enabling entirely new service models - from remote managed operations to robotics-as-a-service ecosystems. There is still work to be done at the customer experience and risk management areas before this goes mainstream.

The Road Ahead

- **Build a cloud–edge orchestration backbone**
  Enterprises must unify cloud intelligence, local edge compute and real-time fleet coordination to ensure robots operate as one adaptive network rather than isolated units.
- **Strengthen connectivity and latency readiness**
  Adoption depends on upgrading network foundations. 5G/6G pathways, optimized routing and resilient connectivity stacks must be embedded to unlock synchronized multi-robot performance.
- **Tighten robotics-AI capability gaps**
  Scaling cloud robotics requires cross - functional skills spanning robotics engineering, AI/ML pipelines, safety frameworks and hybrid cloud–edge integration. These capabilities must mature in parallel.

- **Integrate cloud robotics into digital operations**
  Pairing cloud-connected robots with IoT, digital twins and predictive analytics accelerates responsiveness, reduces downtime and embeds robotics into core operational loops.
- **Position Cloud Robotics as a strategic growth engine**
  Leading organizations will use cloud robotics not just to automate workflows but to redesign operating models - enabling remote operations, outcome-based service models-enabling remote operations, outcome-based ervice models and more resilient physical systems.

Cloud robotics is teaching enterprises a new way to operate: one where machines learn from each other, adapt as a system and continually raise the ceiling of what's possible.

Coming Soon: Cognitive Robotics

Where machines stop repeating and start reasoning.

Cognitive robotics represents the moment robots evolve from task executors into context-aware partners capable of perceiving the world, reasoning through uncertainty and adapting their actions in real time. Unlike traditional automation, these robots integrate advanced sensing, machine learning and decision-making models to interpret situations rather than merely react to them. This allows them to navigate dynamic environments, collaborate safely with people, coordinate with other machines and continuously refine their behavior through experience. In essence, cognitive robotics brings judgment, learning and autonomy into the physical enterprise - enabling operations that grow smarter, safer and more resilient with every task performed.

Exhibit 7.4
How well are enterprises prepared for cognitive robotics in the coming future?

23% of enterprises say their **talent** is not ready and **32%** report only partially mature **infrastructure,** the combined picture shows that foundational capability gaps, both human and technical, remain the largest barriers to advancing cognitive robotics.

27% cite uneven **leadership buy-in,** indicating that while some executives champion cognitive robotics, many organizations have not yet established the sponsorship, governance or cross-functional alignment required for scaled deployment.

14% say that they have the **budget and investment,** suggesting that only a handful are leading this space while most enterprises have not yet allocated the sustained funding.

USD 97.62 billion by 2032, at a compound annual growth rate (CAGR) of **40.2%**

Source: Data Bridge

As AI awakens in robots, the enterprise gains a new kind of mind at work.

AI is no longer an add-on to robotics - it is becoming the capability that defines what robots can perceive, understand and decide. This strategic convergence is already reshaping executive priorities: **60%** of leaders who prioritize AI also prioritize robotics, a clear sign that enterprises now view robotics as the physical extension of their AI ambitions.

The shift is visible in the field. Israeli cognitive robotics startups such as cogniteam are deploying AI-driven autonomy stacks that let robots interpret environments, plan actions and adapt their behavior without constant human oversight. Their unified Cloud-based AIoT & Robotics platform, for example, enables remote model updates, real-time perception improvements and continuous behavioural tuning — demonstrating how AI can be injected directly into robotic systems to make them more capable from day one. Such solutions show what happens when AI becomes the operational core rather than a peripheral enhancement: robots gain contextual understanding, learn quickly from new data and collaborate more naturally with humans and other machines.

For enterprises, this convergence marks a turning point. As AI powers the reasoning layer and robotics executes in the physical world, organizations unlock a new class of intelligent systems that improve themselves through experience. The implication is profound: cognitive robotics becomes the mechanism through which AI steps off the screen and into real operations, enabling responsive, adaptive and judgment-driven workflows that traditional automation could never achieve. This is the pivotal point that leaders are preparing for - not just smarter AI, but smarter machines that bring AI's intelligence into the flow of work itself.

When robots read context instead of code, industries open new pathways of possibility.

Cognitive robotics is entering a new phase — defined less by automation and more by understanding. Instead of simply following programmed instructions, robots are beginning to sense their environment, infer context, and modify their actions as situations evolve. Advances in perception, reasoning, and learning are enabling machines to function with far greater autonomy, allowing them to operate effectively in dynamic, unstructured settings where predictability can no longer be assumed.

But the real catalyst for adoption isn't technical capability alone - it's human comfort and trust. Our People Pulse insights reveal this tension clearly: while **36%** respondents say they would trust a robot that learns from them if it is secure, a significant portion remains wary or uncomfortable. This mix of openness and hesitation signals an important truth: **Cognitive robotics can scale only if learning is paired with transparency, control, and reassurance.**

Cognitive robotics is ultimately about amplifying - not replacing - human judgment, enabling operations that respond to context, recover from surprises and elevate decision quality across the physical enterprise.

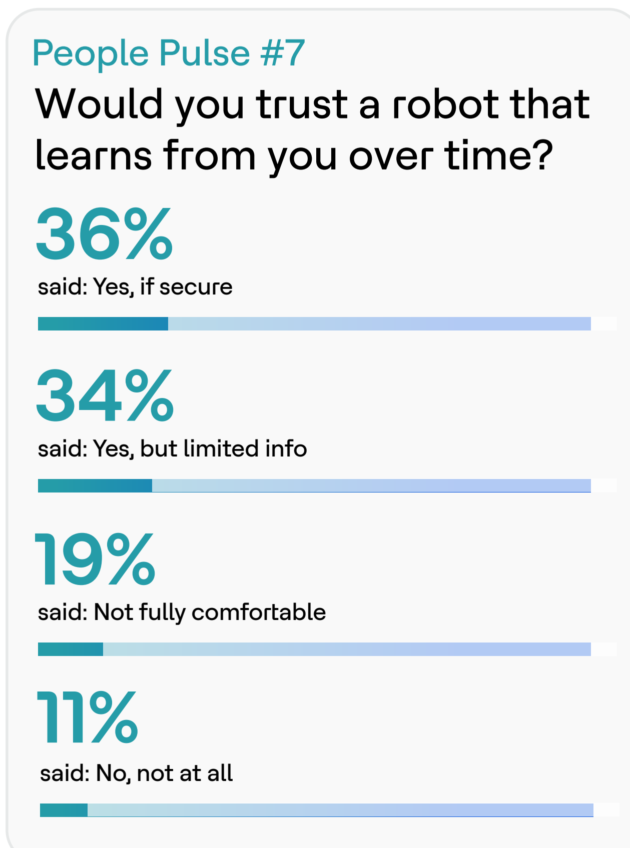
To translate this potential into measurable advantage, leaders should double down on three strategic pathways:

1. Build transparent and trustworthy learning systems
Cognitive robots must show what they learn and why they act. Mechanisms for explainable perception, responsible adaptation, and safe human–robot collaboration will be essential to earning confidence.

2. Design workflows that enhance human expertise
Use cognitive capabilities to strengthen decision clarity, reduce cognitive load, and support frontline teams in high-stakes environments. When robots interpret context, humans can focus on oversight and higher-order reasoning.

3. Shape a governance framework for adaptive autonomy
Cognitive robots evolve over time. Organizations need policies that monitor behavioral drift, validate emerging capabilities, and set ethical boundaries for data use and learning loops. Governance becomes the backbone of trusted autonomy.

Cognitive robotics is likely to benefit organizations that approach it as a shift in operating logic rather than a future enhancement. In this model, robots augment human work by learning from experience, interpreting context, and adjusting actions accordingly. Over time, this enables a more responsive and insight-driven approach to operations.



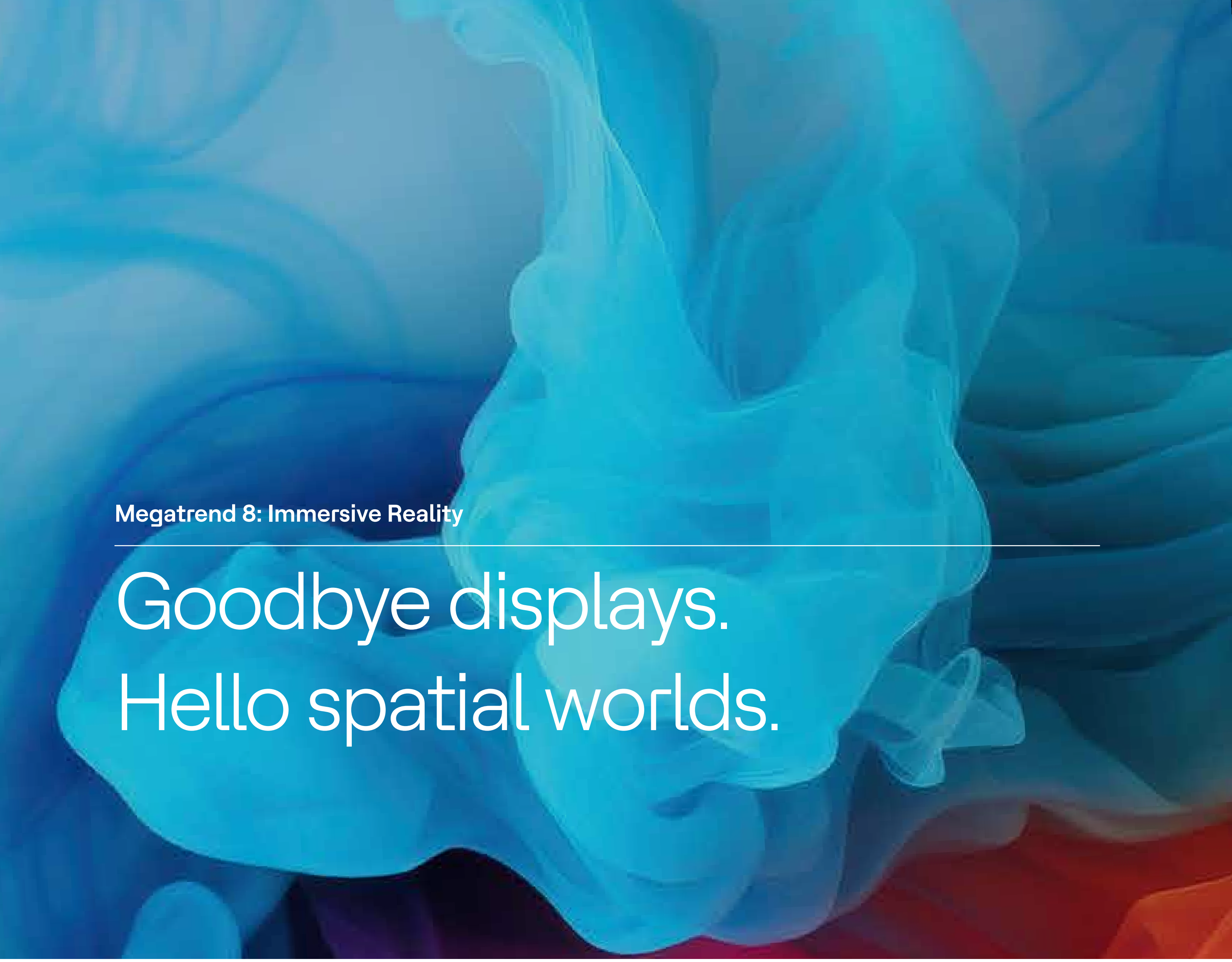
What will it mean when machines begin interpreting the world as we do?

One reality is becoming impossible to ignore: the organizations that benefit most from the Robotics megatrend will be the ones that treat robots not as automated equipment, but as a strategic extension of intelligence into the physical world. Cloud robotics is turning machines into coordinated, connected fleets; Cognitive robotics is enabling them to understand, interpret and adapt.

This evolution introduces a new set of questions leaders must confront before they can responsibly scale robotics across their enterprise:

- As robots become both connected and context-aware, **how should enterprises decide which decisions stay human-led and which can be delegated to autonomous systems?**
- As shared intelligence moves across cloud, edge and fleet-level orchestration, **what mechanisms will ensure robots act consistently, safely and in alignment with organizational intent?**
- As human–robot collaboration deepens, **how must workflows be redesigned so robots enhance human judgment rather than create new cognitive or safety burdens?**
- As trust becomes the gateway to adoption, **what level of transparency will teams need from learning robots - whether in how they coordinate or how they interpret context?**
- As investment accelerates in both cloud coordination and cognitive capability, **how should leaders pace funding to stay ahead without locking themselves into rigid architectures?**

Robotics won't transform the enterprise simply through better machines - it will transform it through the clarity, governance and vision.



Megatrend 8: Immersive Reality

Goodbye displays. Hello spatial worlds.

More than **7 in 10** organizations are already advancing their immersive-tech agenda - with spatial computing moving into real workflows today and every enterprise signalling maximum strategic importance for next-generation holographic displays.

From viewing information to entering it.

A new wave of innovation is emerging as enterprises move past flat screens and begin engaging with information in three-dimensional, spatially aware environments. Immersive Reality represents a step-change in how people experience technology - where digital content gains form, presence and context and where interactions can happen naturally within the world rather than inside a confined display.

Spatial Computing is at the centre of this shift. It blends cloud intelligence, environmental sensing and 3D interfaces to allow teams to walk around a design instead of viewing it, rehearse high-risk scenarios in safe virtual spaces or layer real-time insights onto physical settings. With a majority of organizations already exploring or deploying Spatial Computing, it is quickly becoming a foundation for more intuitive, embodied ways of working.

Holographic displays extend visual communication by rendering high-fidelity imagery that appears to exist within physical space. While commercialization is still in its early stages, interest continues to build across industries. From engineering collaboration and immersive presentations to spatial storytelling, holography signals a shift in how complex ideas are shared, explored, and brought to life.

Together, these capabilities introduce a future where digital and physical layers interact seamlessly - where work can be visual, spatial and shared; where decisions are made inside the experience, not around it; and where enterprises can reimagine how they train, design, operate and connect.

Why it matters?

Key findings

The strategic narrative is shifting from "interface design" to "experience design": Across Spatial Computing and holography, pilots are dominated by experience-led use cases - immersive meetings, design engineering and guided spatial interactions - indicating that enterprises increasingly view immersive systems as a new medium for engagement, not just a new way to display information.

High adoption but a clear gap to scale: Despite **64%** already using Spatial Computing, no organization has scaled it enterprise-wide - capability gaps in talent, integration and governance continue to hold back full deployment.

Holography becomes a strategic priority: With **100%** of leaders rating visualization efficiency at the highest level, Holographic Displays are moving from innovation showcases to board-level conversation and strategic planning.

Immersive adoption is concentrated in innovation-forward regions: Immersive Reality adoption is strongest in **LATAM+MEA (36%) and Europe (29%)**, where enterprises show greater appetite for breakthrough, next-interface technologies.

Governance and data readiness are becoming gating factors: Immersive systems depend on spatial maps, object intelligence and environmental data but fragmented governance around security, privacy and access is slowing scalable, trusted adoption.

Emerging Now: Spatial Computing

Recasting digital work into live, dimensional experiences.

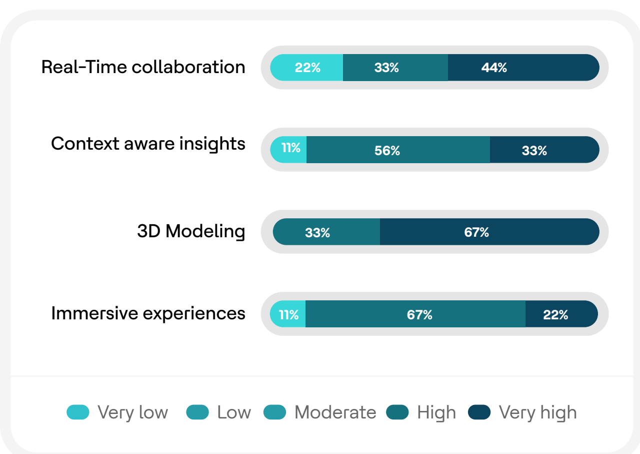
Spatial computing signals a quiet but profound shift: digital information is no longer something we look at - it's something we step into. Instead of confining insight to rectangles of glass, organizations are beginning to orchestrate environments where data, objects and people coexist in a shared spatial layer. These environments behave more like "places" than "interfaces", inviting teams to inhabit their work rather than simply consume it.

Adoption is being driven by the practical gains in perception that spatial computing brings to industrial workflows. High-fidelity 3D modeling stands out, with **nearly two-thirds** (exhibit 8.1) of organizations rating it at the highest level of importance, reflecting its value in design, simulation, and prototyping. Real-time collaboration is similarly prioritized, with over **three-quarters** assigning it high or very high importance as teams increasingly rely on shared spatial environments to review designs and make decisions across locations. Together, these capabilities move spatial computing beyond visualization, enabling complex work to be explored and validated before real action is taken.

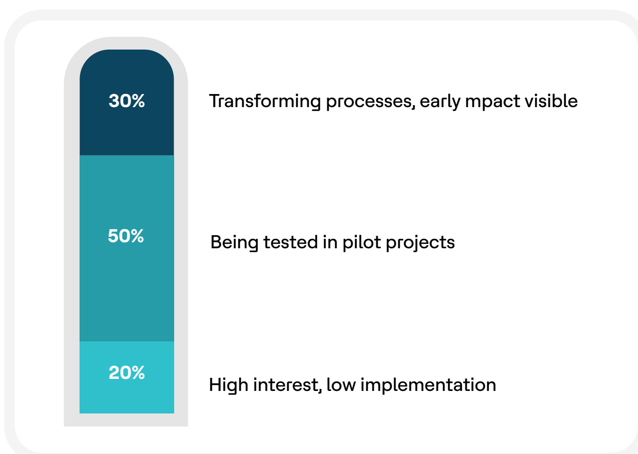
Enterprise adoption patterns indicate that spatial computing is moving steadily from exploration toward measurable impact. Half of surveyed organizations **(50%)** are currently running active pilots, applying spatially enabled workflows to functions such as design, training, and planning. A further **30%** report early impact, citing improvements in decision speed, error reduction, and shared understanding as a result of embodied interaction. Together, these findings suggest growing validation of spatial computing as an enterprise-relevant capability.

Exhibit 8.1

Enterprises prioritize 3D modeling and real-time collaboration over experiential features



Spatial computing adoption stages among organizations in 2025



The value proposition of spatial computing is closely tied to the interaction modes it enables, including collaborative engagement without physical co-location and more intuitive interpretation of complex information. As advances continue in cloud intelligence, environmental sensing, and spatial semantics, organizations are expected to progress from discrete immersive use cases toward more persistent spatial systems that support collaboration, operations, and knowledge exchange across physical and digital contexts.

In this evolution, work is no longer confined to what can be viewed or clicked, but to what can be experienced within shared spatial contexts.

The early domains reshaped by spatial intelligence

As organizations progress from early exploration into hands-on deployment, spatial computing is beginning to reveal where its strengths naturally surface first. The earliest signals point toward domains where physical intuition and embodied understanding matter most - places where a flat interface has always been an imperfect substitute. Unsurprisingly, the earliest impact is getting realized in workforce training, where immersive practice environments allow teams to rehearse decisions, movements and coordination without exposing real operations to risk. Simulation follows closely, becoming an interpretive bridge between digital models and lived experience - where prototypes can be inspected, processes can be walked through and complex systems can be understood from the inside out rather than from a distance.

The pilot landscape echoes this pattern of adoption. Design and engineering groups **(44%)** are stepping into spatial environments as naturally as they once stepped into CAD models - mirroring moves by leaders like BMW, which now uses large-scale spatial digital twins to let engineers walk through and refine entire production lines before a single physical change is made. Retail teams **(44%)**, meanwhile, are using immersive layers to choreograph customer journeys in ways traditional tools cannot express, exploring store layouts, flows and experience cues at full scale. Remote work collaboration **(11%)**, though still emerging, is beginning to reshape expectations of presence - hinting at futures where meetings happen within shared worlds rather than atop flat screens and where co-presence becomes as natural as co-location.

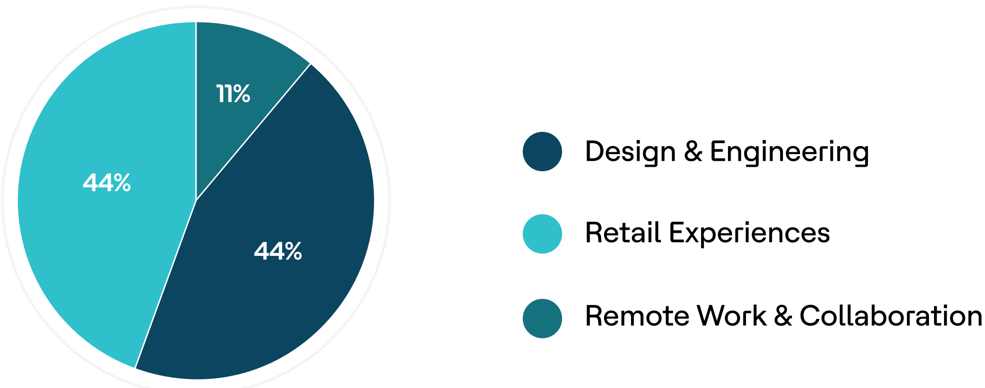
What stands out across these early deployments is not the technology itself, but the shift in cognitive posture it creates. Spatial environments change how people perceive complexity, how they align with one another and how decisions take shape. They introduce clarity where ambiguity once dominated, and they unlock a sense of immediacy that no two-dimensional interface can reproduce.

If the first phase of spatial computing was about proving the medium, the phase ahead is about understanding its expressive power - how it reshapes learning, redesigns workflows and redefines shared understanding. These early domains are simply the first to feel the pull of a more embodied digital future.

Spatial Computing is gaining real momentum, with **80%** of enterprises already piloting or seeing early impact beyond initial interest.

Exhibit 8.2

Early spatial computing is led by design and retail, with collaboration still emerging.



Barriers: Fragmented data controls, immature spatial stacks and skill shortages hinder scale

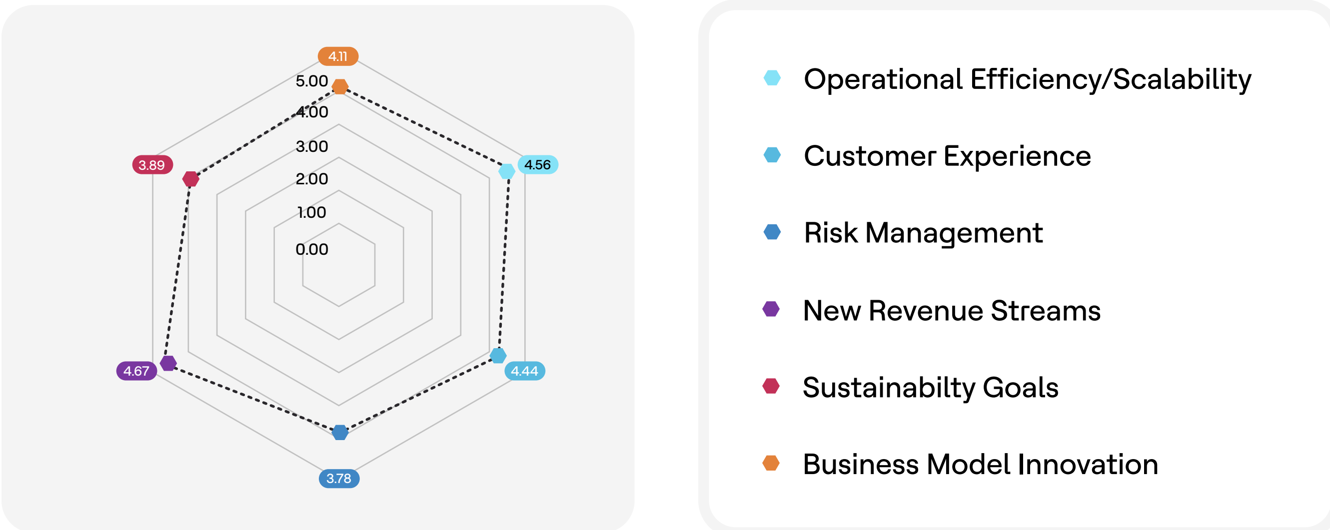
spatial computing depends on capabilities that many enterprise environments are still building—reliable spatial mapping, device interoperability, and continuous spatial data exchange. This is reflected in outcomes: organizations report strong pilots and early impact, yet scaled deployments remain absent.

Data governance is the most immediate constraint. Controls rely mainly on anonymization (**67%)** and basic encryption **(22%),** while access-based policies and edge processing are limited. Without stronger protection for spatial maps, object data, and environmental context, expanding beyond contained deployments remains difficult.

Technical readiness is also uneven. Spatial pipelines, reusable 3D assets, and dependable device–cloud coordination are still maturing, which limits integration into core systems.

Finally, delivery capability is fragmented. Spatial computing requires XR development, perception and mapping, and security architecture, but these skills are rarely integrated within a single operating model—resulting in solutions that are hard to replicate across teams and sites..

Exhibit 8.3
Spatial Computing– Mesh of Possibilities



Stop dragging and dropping. Start stepping and doing.

The spatial computing impact radar shows a technology evolving from intriguing experiments into a multi-dimensional enabler of enterprise value. Gains in operational efficiency **(4.56)** and new revenue generation **(4.67)** emerge as the strongest opportunity zones, reinforcing that spatial environments are not just user-experience upgrades - they reshape how work is performed and how value is created. Close behind are improvements in customer experience **(4.44)** and business model innovation **(4.11),** suggesting that spatial layers will influence how organizations design, market, sell and service in ways that traditional interfaces cannot match.

The Road Ahead

- **Build a spatial-intelligent foundation**
  Enterprises must develop consistent spatial maps, 3D asset systems and cross-device interoperability.
- **Establish stronger spatial data governance**
  Organizations must advance beyond basic protections and implement structured access ontrols and edge-based processing to support secure, real-time spatial intelligence.
- **Develop cross-disciplinary spatial talent**
  Develop integrated teams that combine XR, 3D, perception/mapping, and security skills to deliver scalable spatial solutions.
- **Integrate spatial computing into core workflows**
  By pairing spatial layers with digital twins, IoT data, operational analytics and enterprise platforms, organizations can shift spatial computing from a supplemental tool to a primary mode of interaction across design, operations and customer-facing functions.
- **Position spatial computing as a strategic value engine**
  Use spatial environments not only to refine

- processes but to reimagine how products are showcased, how teams collaborate and how entirely new revenue models emerge—from immersive retail engagement to spatially guided services.

Work is shifting from being observed on screens to being experienced in space. Spatial computing enables people to engage with data and decisions in a shared, three-dimensional context, making complex ideas easier to explore and act on. Organizations that adopt this approach will reshape how "digital work" is designed and delivered.

Coming Soon: Holographic Displays

Visual intelligence that lives in space, not pixels.

Holographic displays are turning visualization into a working surface—bringing digital content into the room as stable, three-dimensional forms. Instead of translating complex information through interfaces, teams can inspect, discuss, and validate the same visual object together, at true scale and from any angle. This strengthens design reviews, speeds alignment, and improves how products and experiences are communicated to customers.

As AI-based rendering and mixed reality hardware improve, holography is moving from "wow" demos to repeatable enterprise workflows—supporting remote product reviews, quicker iteration from prototype to production, and new ways to differentiate through experience. For early adopters, the value is not the display itself, but the shift it enables clearer decisions, faster cycles, and stronger shared understanding.

Exhibit 8.4
How well are enterprises prepared for holographic displays in the coming future?

42% **leadership buy**-in is strengthening, reflecting growing executive confidence in holography's strategic potential.

50% report **talent readiness** remains only partial, underscoring the need for deeper skills in immersive design, advanced rendering and optical engineering.

25% indicate **budget allocation** being done, suggesting sustained investment for enterprise-wide holographic deployment has already started.

USD 10.02 billion by 2030, at a compound annual growth rate (CAGR) of **18.11%**

Source: Mordor Intelligence

Where holography can redefine enterprise value in the next 12-24 months.

Holography is drawing strong interest and moving into real-world testing, but enterprise impact is still early. Many organizations are experimenting, and **~50%** are already running pilots, yet only **7%** report early transformation. The pattern suggests clear perceived value, alongside a measured approach as the technology matures into a repeatable, enterprise-grade capability.

In the near term, holography's impact will surface most clearly in areas where spatial clarity meaningfully accelerates decision-making. **Engineering and design workflows** are early beneficiaries. Siemens, for example, has used mixed -reality holographic previews to validate engineering concepts and reduce redesign cycles - demonstrating how volumetric visualization can sharpen alignment long before physical prototypes exist. These practical gains, not large-scale deployment, will be the story of the next 12–24 months.

Customer engagement is another area poised for lift. Holographic product showcases, spatial walkthroughs and immersive service explanations allow organizations to communicate value with higher fidelity and emotional resonance.

Finally, **collaboration,** still in its early stages, will begin to shift as teams explore spatial environments that enable shared presence around real-scale content. Even modest improvements in how global teams align around complex decisions can yield meaningful business outcomes, well before holography becomes a mainstream enterprise tool.

Over the next two years, holography won't redefine operations end-to-end—but it will reshape the moments that decide outcomes. Where decisions hinge on clarity and alignment, shared 3D presence will become a practical edge.

When holograms become useful, ways of decisioning and engaging change.

Holographic Displays are gaining momentum not because they are visually striking, but because they offer a more natural way for teams to understand and communicate complex ideas. Our People Pulse shows this shift clearly: while 20% would opt for hologram-based meetings today, 42% say they would adopt both holographic collaboration and immersive training - highlighting a growing appetite for spatial, experience-led engagement rather than traditional screen-based interactions.

Still, high sentiment does not equal immediate scale. Holography will advance only where it improves clarity, sharpens decisions and strengthens customer understanding. Enterprises that approach it as a practical tool - rather than a futuristic showcase - will find early, repeatable value.

To steer this transition effectively, leaders should focus on three priorities:

1. Identify high-impact, low-friction use cases
Prioritize scenarios where spatial clarity meaningfully improves outcomes - product walkthroughs, training, design review and customer demonstrations. Early wins create the confidence and muscle memory needed for broader adoption.

2. Make holographic interactions intuitive and human-centered
Ensure holographic sessions support natural communication, intuitive gestures and shared presence. When holograms make collaboration feel more fluid, not more complex, employees and customers adopt them faster and more willingly.

3. Establish trust through clear governance
Define standards for holographic data quality, environment mapping, privacy boundaries and accuracy of representation. As holograms become part of decision workflows, trust and reliability will determine whether they scale.

Holography won't transform operating models overnight - but it will shape the moments where precision, persuasion and shared understanding matter most.

People Pulse #8

If one of these became affordable tomorrow, which would you choose first?

27%
Said: Touch and feel training tools

20%
Said: 3D Hologram Meetings

42%
Said: Both Equally

11%
Said: Neither

What will it mean when digital experiences break free from screens and surround the enterprise?

Immersive reality is forcing a new leadership conversation: when information gains depth, presence and context, the way enterprises learn, decide and collaborate fundamentally changes. Spatial computing is making digital content behave like part of the physical world; holographic displays are turning communication into shared spatial experiences.

As organizations explore these technologies, the core question is no longer about device readiness – it's about enterprise readiness for a more perceptual, immersive way of working.

This shift raises a new leadership agenda built around trust, adoption, governance and long-term value creation.

- When data is no longer flat, **how should enterprises determine which decisions benefit from immersive insight – and which remain better on traditional channels?**
- As spatial data maps real environments, **what safeguards ensure accuracy, privacy and ethical use without slowing innovation?**
- As immersive training accelerates skill-building, **how should operational workflows evolve to capture gains while avoiding cognitive overload or misuse?**
- As holographic engagement raises customer expectations, **how should leaders modernize product storytelling and service delivery without overextending investment?**
- With spatial infrastructure, content pipelines and platforms still maturing, **how can leaders pace funding to remain future-ready while avoiding lock-in?**

Immersive reality won't transform enterprises through visual novelty – it will transform them through better alignment, clearer decisions and more meaningful experiences.

Megatrend 9: Advanced Semiconductors & Computing Architectures

The new bedrock of digital power.

Chiplets have moved from concept to core, with **92%** of respondents reporting active enterprise deployment. Neuromorphic processors, by contrast, remain emerging - **85%** of executives expect adoption in the near term, pointing to strong potential as integration and scale mature.

Rewiring the foundations of compute

In a hyperscale data center, an AI workload is decomposed and routed across specialized silicon, while another system processes signals the way a human brain would be learning from patterns rather than following fixed instructions. This is not a distant future, it is how compute is beginning to evolve today.

For decades, computing architectures were built around monolithic chips and general-purpose processing. Today, the frontier is defined by disaggregation and specialization. **Chiplets** are breaking processors into modular building blocks, allowing enterprises to mix, match and scale performance with greater efficiency, flexibility and speed.

At the same time, **Neuromorphic processors** explore an entirely different horizon a hardware paradigm designed for event - driven, brain-inspired intelligence using artificial neurons and synapses, mimicking neural systems. While still early in stages, these processors hint at a future where efficiency, adaptability and contextual learning are baked directly into silicon, reshaping the relationship between hardware and intelligent applications.

Together, these architectures mark a tectonic shift in computing philosophy. The era of one-size-fits-all silicon is giving way to a world of purpose-built, adaptive systems. The critical question for enterprises is no longer whether to embrace this transformation, but whether they can anticipate, design and operationalize for the architectures that intelligence itself will demand.

Why it matters?

Key findings

Chiplets are reaching early maturity: Adoption is underway with **9 in 10** executives indicating active adoption, driving efficiency and modularity in advanced compute systems.

Chiplets racing ahead on the adoption curve: 86% of respondents indicate that chiplet-based designs are either already in use or will be mainstream within **2–3 years,** highlighting the technology's fast-moving trajectory.

Multiple bottleneck slowing neuromorphic adoption: With **64%** signaling hardware maturity and cost as biggest constraint in adoption of Neuromorphic processors, waiting for the right infrastructure, software and ecosystem alignment.

Neuromorphic Processors remains on horizon: 100% respondent expect Neuromorphic processors to take **>2 years** to reach mainstream adoption.

Scaling with focus on supply and innovation: As organizations scale advanced semiconductors & computing architectures, priorities are clearly shifting toward resilience and growth**,** with **72%** focusing on supply chain robustness and expanding into new product lines.

Emerging Now: Chiplets

Building blocks of the next-gen processor.

Chiplets are a modern processor design approach where a single large chip is broken into smaller, specialized components, that work together as one system. Instead of building one monolithic piece of silicon that does everything, chiplets allow designers to assemble processors like modular building blocks, each optimized for a specific function.

For example, a data center AI accelerator can integrate compute-heavy chiplets alongside ultra-efficient memory and I/O blocks, achieving flexibility that traditional chips cannot match.

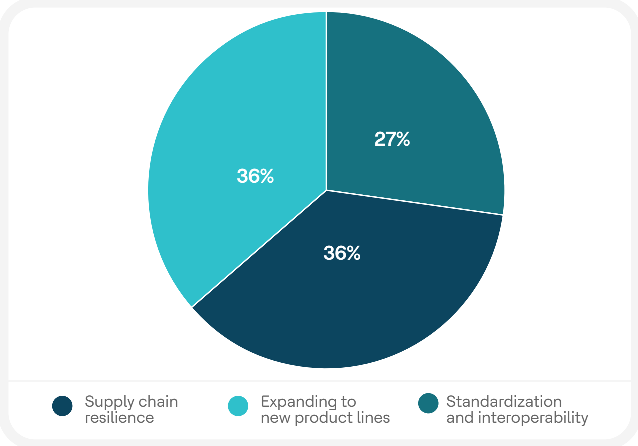
By decoupling functionality from a single die, chiplets transform processors into adaptive, purpose-built platforms. They not only accelerate performance but also pave the way for heterogeneous, workload-driven computing, redefining what is possible in AI, HPC and cloud infrastructure.

Chiplets are increasingly being adopted as a core architectural approach, enabling enterprises to rethink how compute systems are designed and scaled. By disaggregating compute, memory, and acceleration functions and integrating heterogeneous process nodes, organizations are moving away from monolithic fabrication toward system-level optimization. This shift supports faster design cycles, improved yields, and greater flexibility in how silicon platforms are assembled and evolved.

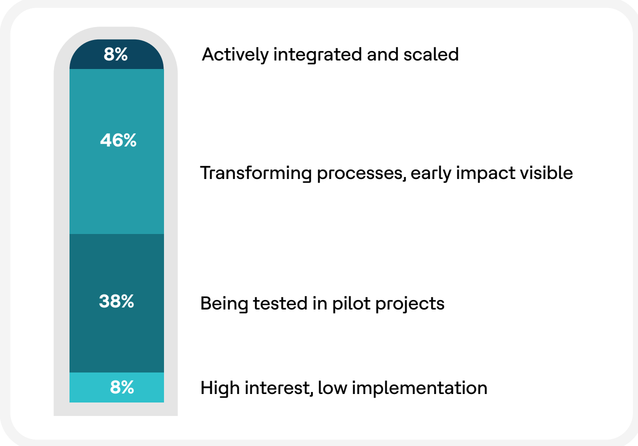
As adoption scales, enterprise priorities are becoming more defined. Data from exhibit 9.1 shows an equal emphasis on supply-chain resilience and product expansion, each cited by

Exhibit 9.1

Organizations are prioritizing product expansion and supply chain resilience over cost optimization as they scale chiplet adoption.



Chiplets adoption stages among organizations in 2025



36% of respondents. Rather than treating chiplets primarily as a cost lever, organizations are using them to manage fabrication constraints, reduce dependency on single foundries, and create more adaptable product roadmaps through modular design and proactive capacity planning.

Taken together, these patterns point to a broader strategic realignment. Chiplets are being positioned as an enabler of long-term scalability and innovation—supporting AI and edge expansion while buffering operations against manufacturing and geopolitical uncertainty—rather than as a short-term efficiency play.

Adoption patterns show that chiplets have moved beyond proof-of-concept into ecosystem-level commitment. With **84%** of organizations in pilot or process-transformation stages and only **8%** yet to engage, chiplets are rapidly becoming a baseline for high-performance and AI-driven systems. This marks the start of a long-term shift toward modular, scalable computing architectures.

De-risking silicon: Shifting from performance-first to resilience-first architecture

The chiplet market has moved decisively from experimentation into broad-based execution. Adoption levels indicate that monolithic design is no longer the default for high-performance silicon, as enterprises actively transition toward modular architectures in response to economic, manufacturing, and supply-chain pressures.

This shift is already producing tangible outcomes. Nearly half of organizations **(46%)** report **process transformation** and **early impact,** signaling that chiplets have progressed beyond validation into operational use. For this segment of the market, feasibility is no longer the question; attention has shifted to scaling, integration, and long-term value realization.

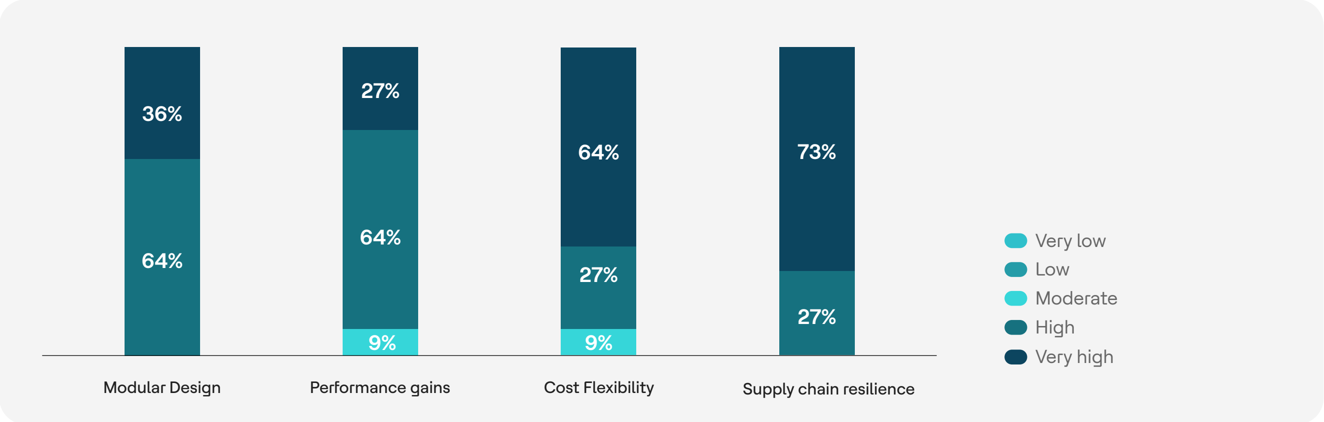
Enterprise priorities further clarify how chiplets are being applied. Data from exhibit 9.2 shows that **supply-chain resilience (73%)** and **cost flexibility (64%)** rank as the leading high-value use cases, surpassing performance optimization. Modularity and performance gains are now treated as baseline expectations, while chiplets are increasingly deployed to manage geopolitical exposure, fabrication concentration, and the rising R&D costs of advanced nodes. In this context, heterogeneous integration serves as a mechanism for sourcing flexibility and economic control rather than speed alone.

Taken together, these patterns reflect a structural shift in semiconductor strategy. Chiplets are being valued less for incremental engineering gains and more for their role in enabling adaptable product roadmaps and de-risked operations. As a result, modular architectures are becoming the competitive baseline, with organizations that delay adoption facing growing disadvantages in cost management, yield optimization, and supply-chain responsiveness.

92% of organizations have moved past simple observation into active engagement with pilots and integration.

Exhibit 9.2

Supply chain resilience and cost flexibility emerges as the top-priority use case for chiplets

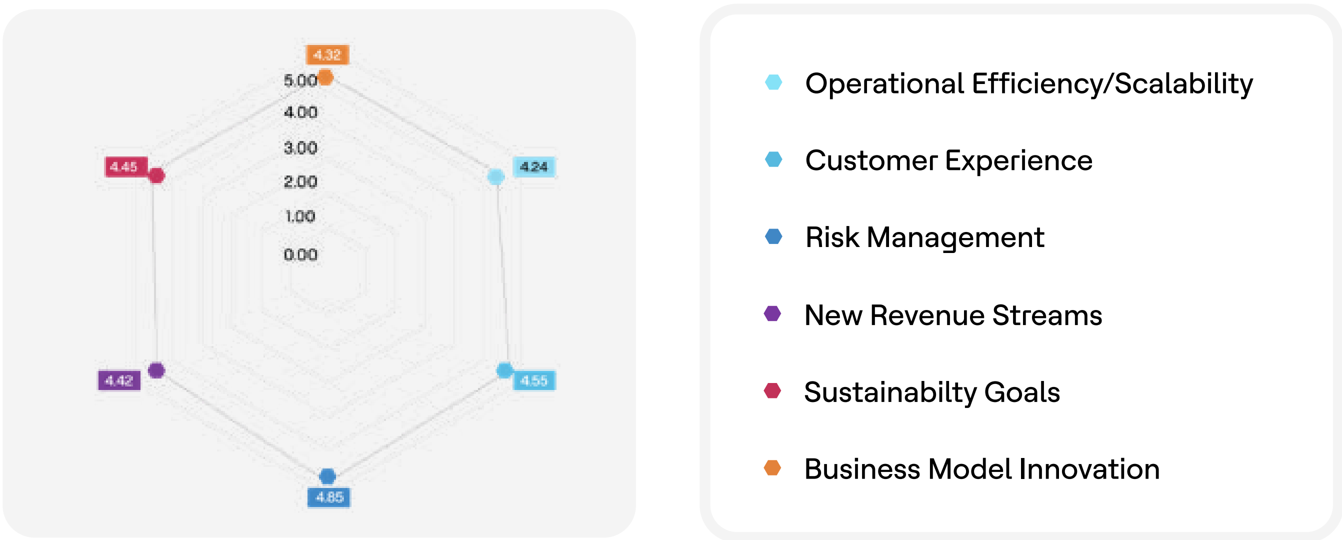


Barriers: Fragmented standards, integration complexity and ecosystem mismatch slow chiplet scaling

The most material barriers to scaling chiplets lie in incomplete standardization, multi-party integration complexity and fragile coordination across the semiconductor value chain. Although standardization and interoperability are identified as a priority by roughly **27%** of organizations, progress remains uneven across interfaces, packaging approaches, and design flows. This lack of consistency increases integration cost, lengthens development cycles and limits the practical reuse of chiplets across vendors and product families. In effect, many chiplet programs still function as tightly controlled ecosystems rather than open, modular platforms, constraining the economic and strategic upside that chiplets are intended to unlock.

At the same time, executive focus is shifting toward supply-chain resilience and expansion into new product lines (both cited by **36%**), revealing a growing gap between ambition and enabling infrastructure. While chiplets are viewed as a lever to diversify sourcing and accelerate portfolio expansion, the supporting capabilities - particularly in advanced packaging capacity, system-level validation, and lifecycle governance across multiple suppliers - are not yet mature or uniformly accessible. This misalignment introduces execution risk as organizations attempt to scale across markets and geographies. Without stronger coordination across standards bodies, ecosystem partners and system integrators, chiplets are likely to remain a high-impact but selectively deployed solution, rather than evolving into a broadly scalable foundation for next-generation semiconductor platforms.

Exhibit 9.3
Chiplets Mesh of Possibilities



Modularity with Meaning

The radar highlights risk management as the strongest impact area for chiplet adoption **(4.86),** reflecting how modular architectures reduce dependence on single fabs, nodes, or suppliers and make systems easier to adapt when disruptions occur. Customer experience **(4.56)** and sustainability **(4.46)** also score highly, as chiplets enable more precise performance tuning and energy-aware design. Overall, the pattern shows that chiplets are creating value first by improving architectural control and flexibility, with broader operational benefits emerging over time.

The Road Ahead

- **Foster ecosystem partnerships:** Cultivate alliances among IP providers, foundries and outsourced semiconductor assembly and tests (OSATs) with shared standards and marketplaces to streamline chiplet sourcing and co-design.

- **Leverage AI for design optimization:** Integrate machine learning into exploratory data analysis flows for predictive yield modeling, thermal management and automated partitioning to shorten development cycles.
- **Prioritize advanced packaging synergies:** Advance 2.5D/3D stacking with silicon interposers and hybrid bonding to maximize bandwidth and minimize latency in multi-chip modules.
- **Establish certification frameworks:** Develop industry-wide benchmarks for known good die quality, interface compliance and long-term reliability to build trust in disaggregated architectures.

Chiplets' transformative power emerges in enabling agile, high-density computing beyond monolithic constraints, sparking collaborative innovation, resource efficiency and next-gen performance leaps.

Coming Soon: Neuromorphic Processors

Reimagining intelligence at the hardware layer.

Neuromorphic processors depart from von Neumann architectures by using event-driven spiking neurons to enable highly parallel, energy-efficient computation. By co-locating memory and compute, they reduce data movement and support low-latency intelligence for sensory and edge workloads.

While adoption remains early, advances in spiking neural networks and hybrid integration with conventional AI accelerators are improving readiness. Neuromorphic processors are emerging as a complementary architecture for scenarios where power efficiency, real-time response, and local decision-making outweigh raw throughput.

Exhibit 9.4
How well are enterprises prepared for neuromorphic processors in the coming future?

54% of **leaders are engaging** with neuromorphic processors, but few are fully ready, signaling a market in transition from strategic interest to broader adoption.

62% have at least partially ready **talent** for neuromorphic processors, while 31% remain not ready. Talent gaps remain a key barrier, shaping how quickly adoption can scale.

54% are **well-funded or leading** in investment, signalling strong strategic confidence in neuromorphic processors, even as full-scale investment maturity continues to develop.

USD 11.7 billion by 2030, at a compound annual growth rate (CAGR) of **104.7%**

Source: MordorIntelligence

Brain Inspired AI Chips are slowly gaining the momentum

Neuromorphic processors remain early in enterprise adoption, but the direction of travel is clear: organizations investing now are building capability for AI workloads where latency, power, and continuous sensing matter more than peak throughput. Current activity is best characterized as learning-led—focused on pilots, benchmarking, and integration experiments—rather than immediate production rollout. The objective is to validate whether spiking, event-driven computation can materially improve autonomy, sensing, and adaptive control at the edge.

Importantly, this is no longer a purely academic thread. Major platforms and toolchains are making neuromorphic development more "buildable" in real settings—for example, Intel's Loihi 2 and the Lava software framework have formalized a research-to-ecosystem path, and edge ML tooling has begun to support deployment targets such as BrainChip's Akida development kits. These reference points indicate that neuromorphic hardware, software, and deployment workflows are becoming tangible enough for enterprise prototyping and evaluation.

Survey results also suggest that readiness is uneven across regions. APAC leads with **(23%)** at both active pilots and high interest, while Europe shows stronger interest **(15%)** than execution **(8%)** —indicating that near-term progress is being shaped by ecosystem capacity and execution focus, not awareness alone.

Piloting the future of adaptive processors

Neuromorphic processors remain early-stage, but enterprise intent is clearly forming around structured experimentation. Over half of organizations **(54%)** are already testing prototypes, while **46%** are tracking the space with strong intent to invest—positioning neuromorphic chips as an emerging innovation platform rather than a near-term production standard. This is reinforced by deployment expectations: **100%** of respondents anticipate full-scale rollout only beyond the two - year horizon, indicating that most programs today are designed to learn, benchmark, and build internal readiness.

Momentum is being shaped as much by ecosystem maturity as by architectural promise. People Pulse signals point to hardware maturity as the largest near-term limiter **(35%),** followed by cost and scale **(29%),** underscoring why pilots remain selective and tightly scoped. Software readiness is also material:

programming models **(18%)** and limited toolchains **(18%)** indicate that the developer stack is still forming, often requiring early adopters to act as both evaluators and ecosystem contributors. Even so, the strategic rationale remains strong — ultra-low-power inference, real-time edge decisions, and adaptive workload support are areas where conventional architectures can struggle to deliver efficiency at low latency. To steer this transition effectively, leaders should focus on three priorities:

To accelerate the path from experimentation to enterprise value, organizations should consider three strategic approaches:

1. Cross-industry standardization:
Collaborate with peers, chipmakers, and software providers to align on interoperable hardware and programming standards.

2. Hybrid computing strategy:
Pair neuromorphic chips with classical and GPU-based systems to fit workloads while limiting deployment risk.

3. Domain-specific killer apps:
Prioritize high-impact vertical use cases (e.g., robotics, industrial monitoring, healthcare analytics) where neuromorphic strengths are clear.

People Pulse #9

What's the biggest challenge slowing neuromorphic computing adoption?

35%
Said: Hardware Maturity

18%
Said: Programming Models

29%
Said: Cost and Scale

18%
Said: Limited Toolchains

What happens when silicon stops being one-size-fits-all?

Chiplets and neuromorphic processors together signal a broader shift in computing—from monolithic scaling to architectures optimized for modularity, specialization, and deployment context. Chiplets are already becoming the practical foundation for building flexible, heterogeneous systems, while neuromorphic designs represent the next wave of compute for workloads where power, latency, and continuous sensing define performance.

The leadership question is no longer whether these architectures are "real," but how to translate them into system-level advantage:

- **How should chiplet roadmaps and sourcing strategies be structured** to improve flexibility, yield outcomes, and platform reuse?
- **Where should neuromorphic processing sit alongside CPUs/GPUs/NPUs** to handle edge, event-driven, and adaptive workloads effectively?
- **Which workloads are best matched to modular, heterogeneous integration today**—and which require neuromorphic capability as toolchains mature?
- **What internal capabilities (architecture, co-design, integration, validation) are required** to operationalize both paths without creating fragmented stacks?

Organizations that treat chiplets as the near-term platform and neuromorphic processors as the emerging accelerator—aligning each to clear workloads, talent, and integration plans—will build an architecture advantage that compounds over time.

Megatrend 10: Manufacturing & Digital Fabrication

The end of static manufacturing.

1 in 2 organizations are already simulating production through Digital Twins – with 4D Printing emerging as the next scaling frontier.

When production becomes programmable

Manufacturing is no longer evolving as a set of disconnected automation or prototyping technologies. It is beginning to function as a core operational layer - one that determines how products are designed, factories are run and performance is optimized across their full lifecycle.

This shift is defined by two complementary forces. **Digital Twins** are moving from visualization tools to active operational systems. What started as modelling and simulation is now embedded in real workflows - shaping decisions around throughput, downtime, energy efficiency, asset reliability and risk.

At the same time, **4D Printing** points to the next structural change in fabrication. By enabling materials to adapt, transform, or respond after production, it challenges the traditional boundary between design and manufacturing. While still early, its relevance lies not in replacing 3D printing, but in introducing adaptability into the product itself - opening new possibilities in performance, resilience, and lifecycle value.

Rather than representing a single transformation, manufacturing & digital fabrication is redefining how production decisions are made. Value is moving upstream - into modelling, simulation and design choices that shape outcomes long before materials reach the factory floor. The competitive edge will belong to organizations that treat these capabilities as operating infrastructure, not isolated tools.

Why it matters?

Key findings

Progressing steadily but adoption is on nascent stage: 4D Printing is transitioning from curiosity to capability with strong experimentation but scaling remains at nascent stage with only **33%** moving into pilots and scaled integration.

Data is the bottleneck: Almost **30%** respondents identify data integration as one of the biggest barrier to Digital twin adoption, highlighting challenges around fragmented systems and data readiness.

Interoperability comes first - governance follows as Digital Twin deployments scale: After interoperability, **40%** cite data security and governance as the next priority for scaling Digital Twins.

4D Printing readiness is still early, but scale is approaching : Most organizations anticipate meaningful progress within the next two years, framing 4D Printing as a capability that requires preparation now - particularly in skills, materials expertise and ecosystem partnerships.

Time-to-scale expectations are accelerating across the fabrication stack: Advanced manufacturing initiatives are increasingly expected to deliver operational impact within 18–24 months.

Emerging Now: Digital Twin

Accelerating the future of intelligent industries..

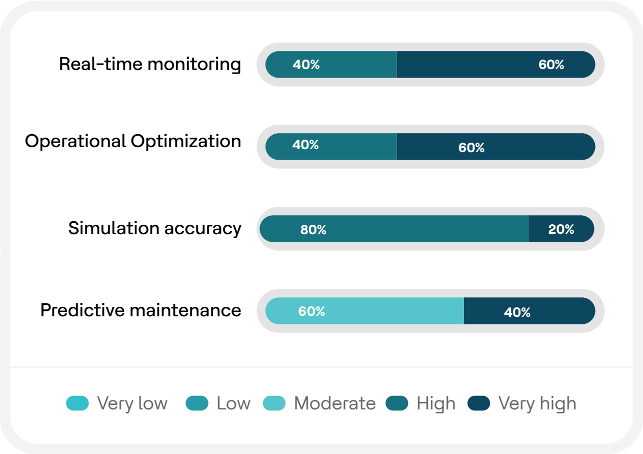
A digital twin is a dynamic, virtual representation of a physical asset, system, or process that is continuously updated with real-world data to simulate behavior, anticipate outcomes, and optimize performance across its lifecycle. What began as a modelling concept has matured into a strategic operational capability, redefining how organizations manage assets, production environments and complex systems. Enterprises are increasingly using digital twins to translate data into actionable insight, shifting focus from observation to measurable operational impact.

In practice, digital twins are changing how operations behave. Rather than responding to issues after they surface, organizations are embedding continuous sensing, simulation and prediction directly into workflows. As digital and physical environments converge, decision - making moves closer to real time - enabling faster adjustments, improved asset reliability, and more resilient operations. The result is a transition from reactive management to adaptive systems that continuously optimize performance.

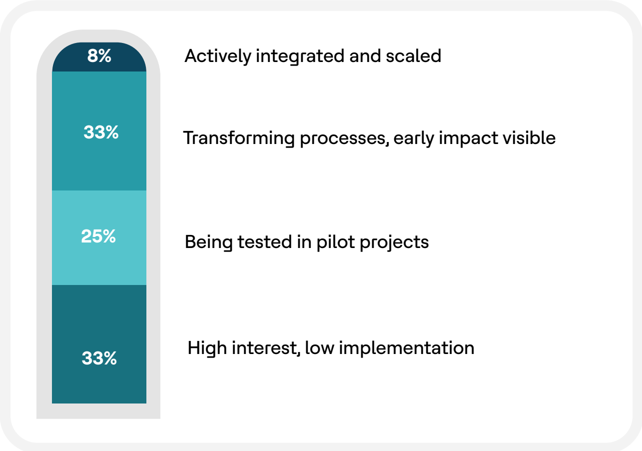
This operational orientation is clearly reflected in where enterprises are concentrating their digital twin efforts. As shown in exhibit 10.1, interest is strongest in simulation accuracy **(80%)** and predictive maintenance **(60%),** highlighting the priority placed on foresight, reliability and risk mitigation. Real-time monitoring and operational optimization also feature prominently, reinforcing the role of digital twins as a control layer for live operations rather than a standalone analytical tool. Together, these focus areas indicate that adoption is being driven by tangible, operations-centric outcomes.

Adoption data further confirms that digital twins have moved beyond early experimentation. A significant share of organizations are already using

Exhibit 10.1
Enterprises are focusing on real time monitoring and optimizing operations for digital twin adoption.



Digital Twin adoption stages among organizations in 2025



them in pilot programs or reporting early process-level impact, demonstrating growing confidence in real-world applicability. At the same time, only a small minority have reached fully integrated, scaled deployment.

This gap does not signal uncertainty about value, but rather reflects the complexity of standardizing data models, integrating across systems and embedding digital twins into enterprise operating models.

41% of organizations indicate that their digital twin initiatives have reached mature stages of adoption.

Digital Twins in the real world.

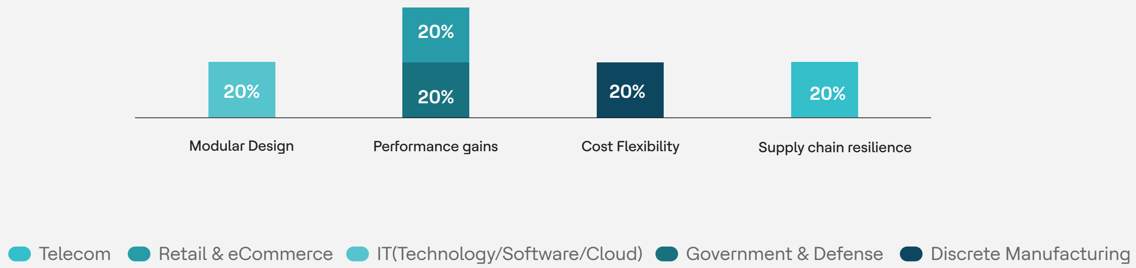
As digital twins mature, their role is becoming clearer: they are no longer analytical add-ons, but decision engines embedded within operations. Where earlier approaches relied on static models and historical data, digital twins now enable continuous synchronization between physical and digital systems. This shift allows organizations to move beyond understanding past performance toward anticipating outcomes and acting earlier.

This transition is already visible in adoption patterns. A meaningful share of organizations report early, process-level impact while another large segment shows strong intent but limited execution depth. Together, this reflects a technology that has validated its value in real environments, yet is still in the process of moving from targeted deployments to enterprise-wide scale. The challenge has shifted from proving feasibility to industrializing success.

Exhibit 10.2 illustrates how leading sectors are approaching this transition. Manufacturing process optimization clearly emerges as the primary entry point, particularly across government & defence and retail, where digital twins are used to establish tighter process control and real-time operational orchestration. This focus signals a decisive move away from passive modelling toward active intelligence layers that directly influence workflows, resource allocation, and performance outcomes.

Other use cases - such as predictive maintenance, smart city and infrastructure management, and healthcare or patient monitoring - appear as more selective deployments. These are being explored where operational pressures are most acute, reflecting deliberate experimentation rather than broad rollout. The pattern suggests that organizations are sequencing adoption based on immediacy of value and operational criticality, not technology novelty.

Exhibit 10.2
Manufacturing process optimization emerges as the top-priority use case for digital twin among government & defence and retail and e-commerce sectors



Barriers: Data integration, high costs and ROI uncertainty holding back adoption

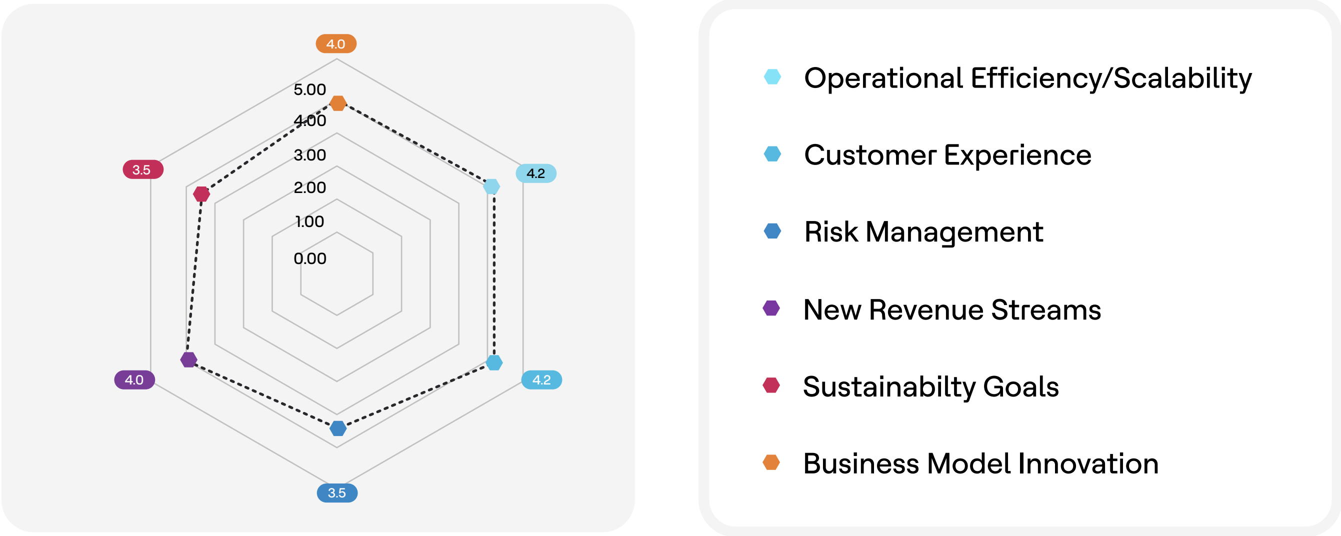
For most organizations, the challenge with is no longer technical feasibility, but enterprise integration and execution readiness. While pilots and early deployments have demonstrated clear operational value, extending these capabilities across assets, plants and functions remains difficult.

Many organizations struggle to measure the impacts with ROI uncertainty cited by over a third of respondents. Without clear business cases and quantifiable outcomes, it risks being confined to experimental initiatives rather than driving transformative operational insights.

Data integration stands out as the most significant structural constraint, cited by **30%** of organizations. Digital Twins rely on harmonizing real-time sensor data, engineering models and enterprise systems that have historically evolved in silos. As deployments expand, fragmentation across data architectures, platforms, and vendors becomes a limiting factor, slowing the transition from localized success to scalable capability. Cost and skills, while present, are secondary concerns, noted by smaller shares of respondents and often emerging later in the adoption journey as initiatives move beyond experimentation.

Taken together, these barriers point to a broader execution gap. Digital Twins tend to stall not because their value is unclear, but because scaling requires coordination across technology, data, and operating teams that many organizations have not yet institutionalized.

Exhibit 10.3
Digital Twin– Mesh of Possibilities



The easy wins are over - the real value begins

Looking at the impact radar **operational efficiency and customer experience (4.17) emerge as the strongest areas,** indicating that enterprises are prioritizing pilots and deployments that optimize workflows, reduce downtime, and enhance stakeholder interactions. Organizations also see digital twin as a lever to unlock new ways of creating value and monetizing insights with a **business model innovation and new revenue streams (4)** becoming the catalysts.

The Road Ahead:

- **Quantify ROI with data-driven KPIs:** Adoption of digital twin depends on implementing metrics that capture predictive maintenance gains, operational efficiency uplift and real-time decision-making.
- **Architect for interoperability and scalability:** Deploy modular, cloud-native digital twin frameworks with standardized APIs, robust data pipelines and reusable components to ensure seamless integration across enterprise systems.
- **Upskill for digital twin fluency:** Cultivate cross-functional expertise in simulation modelling, IoT sensor data analytics, workflow orchestration and AI-driven decisioning.
- **Embed governance and operational rigor:** Establish continuous monitoring, version control and data lineage practices to maintain twin fidelity, reliability and enterprise-grade resilience.

Digital Twin adoption follows a clear maturity gradient: interest is widespread, but the ability to translate experimentation into impact increases with organizational scale. Smaller and mid-sized organizations remain largely exploratory, constrained by capability, investment readiness, and integration complexity, while larger enterprises are better positioned to operationalize and embed them into core processed—highlighting that digital twins reward organizations that can align data, models, and operating discipline at scale.

Coming Soon: 4D Printing

Materials that move, adapt and evolve.

4D printing is an emerging advancement in additive manufacturing that incorporates time - dependent transformation into printed structures. Unlike conventional 3D printing, it utilizes smart, stimuli-responsive materials—such as shape - memory polymers and hydrogels - that are designed to change shape or functionality when exposed to external triggers including heat, moisture, or light. This approach enables the creation of dynamic systems capable of self-assembly, adaptation, or reconfiguration after fabrication, expanding the functional scope of additively manufactured materials.

From a research standpoint, 4D printing is inherently interdisciplinary, combining materials science, engineering design, and computational modeling. Ongoing studies focus on understanding material behavior, optimizing multi-material printing techniques, and improving the predictability and reliability of shape transformation. Its potential applications in areas such as biomedical devices, soft robotics, and aerospace structures highlight its promise, while also emphasizing the need to address challenges related to scalability, durability, and long-term performance.

Exhibit 10.5
How well are enterprises prepared for 4D printing in the coming future?

75% of **leaders** are beginning to recognize the strategic value of 4D printing.

50% of leaders highlighted the **shortage of skilled professionals – talent availability** to develop or deploy 4D printing.

25% of organizations are allocating financial resources for **4D printing** initiatives, even if execution is still in nascent stage.

USD 1.2 billion by 2030, at a compound annual growth rate (CAGR) of **35.8%**

Source: GrandView Research

4D printing is a slow ignition tech with exponential promise

Industry-readiness perspective, these adoption signals reflect a classic early-stage technology diffusion pattern. While **42%** of organizations report high strategic interest, the fact that only **8–17%** have achieved measurable impact or scaled deployments highlights ongoing gaps in material maturity, design standardization, and validation frameworks. Although many stakeholders expect meaningful scaling within the next 12–24 months, this optimism is largely tied to controlled pilots and domain - specific use cases.

A real-world reference point is MIT's Self-Assembly Lab collaboration with Stratasys and Autodesk, which has demonstrated multi-material 4D-printed structures (via Stratasys Connex) that morph from one configuration to another directly off the print bed using simple triggers such as heat or water—effectively embedding actuation and "material logic" into the build.

In biomedical R&D, researchers have also fabricated 4D-printed shape-memory PLA vascular stents and evaluated deployment behavior and degradation under simulated vessel/fluid conditions

Ultimately, 4D printing represents a shift from static fabrication to programmable matter—where intelligence is embedded not in software alone, but in materials themselves. While current limitations around material robustness, standardization, and scale remain, steady progress across research labs and early industrial pilots signals a transition from conceptual novelty to practical capability. As material science, design tools, and manufacturing platforms converge, 4D printing is poised to redefine how products are designed, deployed, and adapted over time—unlocking systems that do not merely exist in space, but actively evolve within it.

Building adaptive advantage in the era of materials that adapt

4D Printing is beginning to shape experimentation and innovation in sectors like aerospace, healthcare and advanced manufacturing signalling 4D printing as a long-horizon yet high-potential technology rather than an imminent mainstream solution. Still in its early adoption phase, the outlook reflects cautious optimism, with **85%** of respondents from the pulse survey expecting a longer runway before widespread adoption materializes.

While most organizations are still experimenting, early adopters are learning how to harness adaptability for supply chain resilience, advanced manufacturing and high-value components. The coming years will separate organisations that learn to engineer dynamic materials from those that remain tethered to static processes.

To move from experimentation to enterprise impact, organisations must focus on three critical priorities:

1. Invest for learning, not scale
Pilot high-value use cases that reveal material behaviour over time. Treat early projects as learning engines rather than immediate production lines.

2. Leverage simulation tools
Use predictive modelling to anticipate how materials respond to environmental stimuli before physical fabrication, reducing risk and accelerating insights.

3. Integrate governance tools
Embed safety, traceability, and regulatory readiness into every stage of development to ensure responsible and scalable adoption.

Adaptive advantage will go to organizations that treat 4D printing as a long-term strategic capability, not a short-term manufacturing tweak. Invest early in learning, simulation, and responsible governance to lay the groundwork now. As the tech moves from experiment to impact, teams that can design, predict, and govern dynamic materials will be best positioned to turn long-horizon potential into durable competitive advantage.

People Pulse #10

When do you think 4D printing — materials that adapt and change shape over time — will see mainstream adoption?"

16%
said: Already Emerging

20%
said: In 2-3 years

36%
Said: In 5+ years

20%
said: Still futuristic

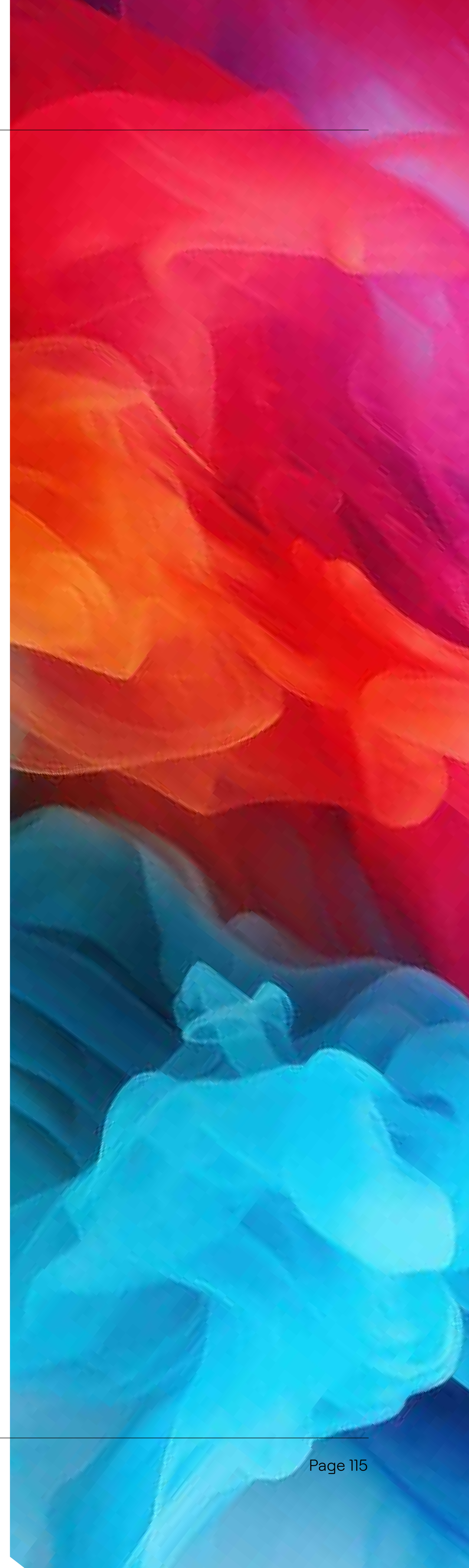
When manufacturing becomes programmable, who is accountable for outcomes?

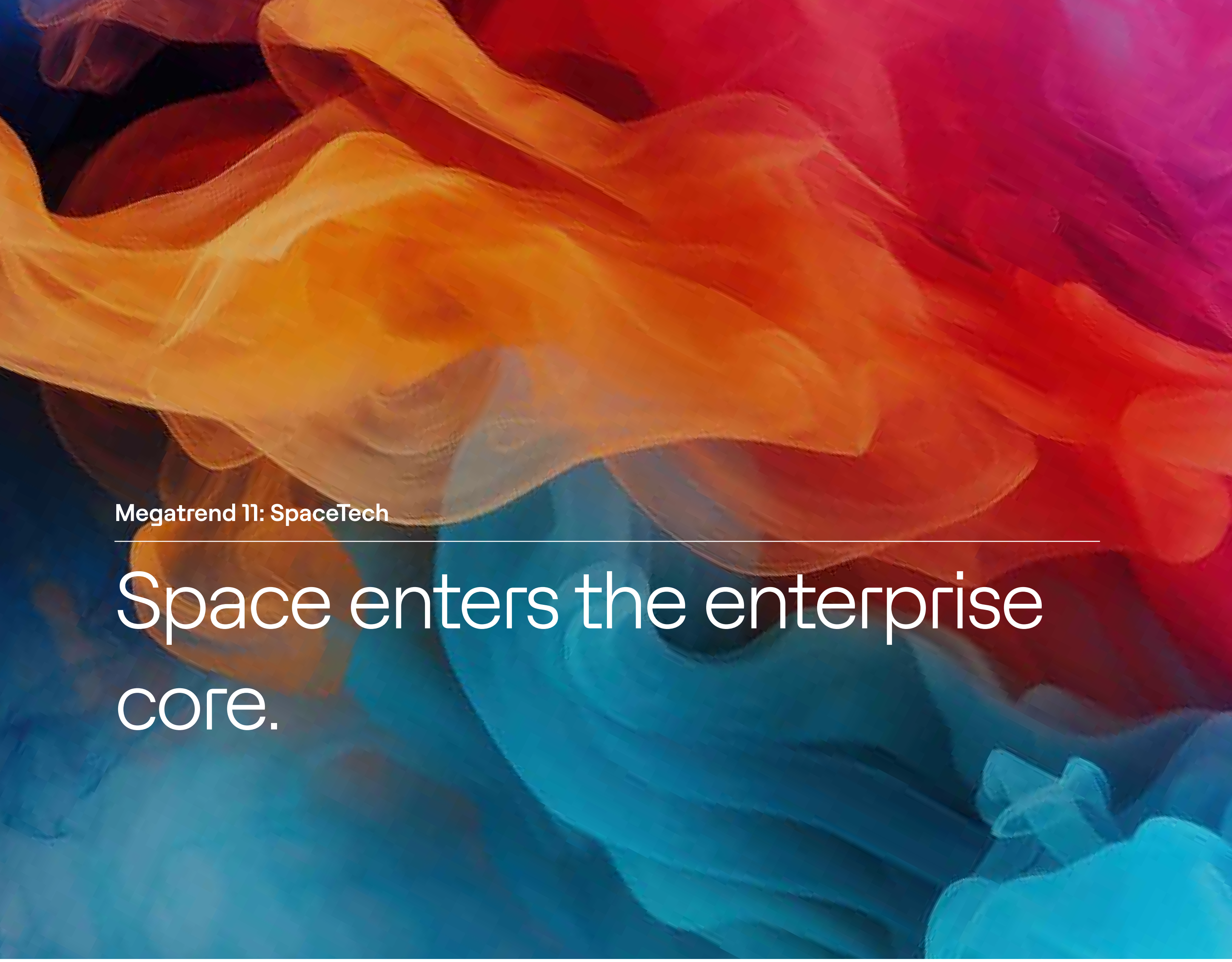
Manufacturing & digital fabrication are shifting from linear production systems to adaptive, intelligence-driven platforms. Within this evolution, 4D printing enables materials and structures to change over time, while digital twins provide the virtual intelligence needed to model, simulate, and govern these transformations across the lifecycle.

As this transition accelerates, the leadership challenge moves beyond adopting individual tools to orchestrating integrated manufacturing capabilities. This raises a new set of leadership decisions:

- **Where should manufacturing & digital fabrication capabilities be scaled aggressively,** and where should experimentation with 4D printing remain within advanced R&D?
- **How can Digital Twins be embedded into fabrication, quality, and lifecycle workflows,** rather than remaining isolated simulations?
- **What governance and assurance models** are needed when products are designed to change form or function after deployment?
- **How must operating models and production controls evolve** to manage time-dependent behavior, variability, and long-term performance?
- **How should investment be sequenced** across smart materials, digital modeling, and integration platforms as ecosystems mature?

Manufacturing & Digital Fabrication will not deliver durable advantage through automation or advanced materials alone. Competitive differentiation will be determined by how effectively leaders align physical fabrication with digital intelligence.





Megatrend 11: SpaceTech

Space enters the enterprise core.

Nearly **90%** of respondents rate their interest in SpaceTech outcomes as high to very high – signalling that miniaturized satellites and earth observation (EO) have moved from niche capabilities to strategic priorities.

When orbit becomes part of the enterprise stack

SpaceTech is no longer advancing as a collection of isolated missions, sensors, or experimental launches. It is beginning to function as a persistent infrastructure layer - one that shapes how organizations extend connectivity, generate intelligence, manage risk and make decisions across physical systems on earth. Space assets are increasingly designed to be modular, scalable, and tightly coupled with terrestrial data platforms, analytics stacks and enterprise workflows. The emphasis is moving from access to space toward value from space.

Two developments define this transition.
Miniaturized Satellites have moved decisively beyond feasibility and cost debates. Advances in design, launch economics and constellation architectures are pushing small satellites from one-off missions into repeatable, constellation -ready platforms. Among active adopters, the focus is now on deployment cadence, coverage reliability, and downstream data integration - treating satellite capability as a programmable asset rather than a bespoke engineering effort.

At the same time, **Earth Observation** is reshaping how insights are generated from orbit. Its value is no longer centered on imagery alone, but on decision support - feeding climate intelligence, agricultural optimization, urban planning and risk monitoring systems.

Together, these shifts signal a broader realignment. SpaceTech is becoming less about exploration and more about execution at scale. The strategic question for enterprises is moving from "Can we access space data?" to "How do we operationalize, govern and scale space-derived intelligence responsibly?"

Why it matters?

Key findings

Strategic belief is already locked in: ~85–90% of respondents rate SpaceTech's impact on risk intelligence, sustainability and operational efficiency as high to very high - confirming strong conviction despite phased deployment.

Miniaturized satellites are ready for use today: More than half of organizations already see them as operational, with leadership support, vendor availability and funding in place. The focus is now on scaling constellations and using the data effectively.

Earth Observation is moving from pilots to decision workflows: 75% expect Earth Observation to scale within 12–18 months, supported by solid internal readiness.

SpaceTech is scaling faster than before: Most SpaceTech initiatives are expected to move from pilots to real-world operations within the next 18–24 months.

Governance maturity is the main brake on scale: While technical readiness is high, governance and ecosystem maturity remains below **~30–35%,** especially around regulation, data stewardship, and cross-border integration—now the dominant limiter.

Emerging Now: Miniaturized Satellites

This is SpaceTech past the experiment phase.

Miniaturized satellites are no longer defined by size or cost efficiency alone. They are increasingly treated as repeatable, scalable systems - designed for deployment speed, coverage expansion and continuous operation rather than bespoke missions.

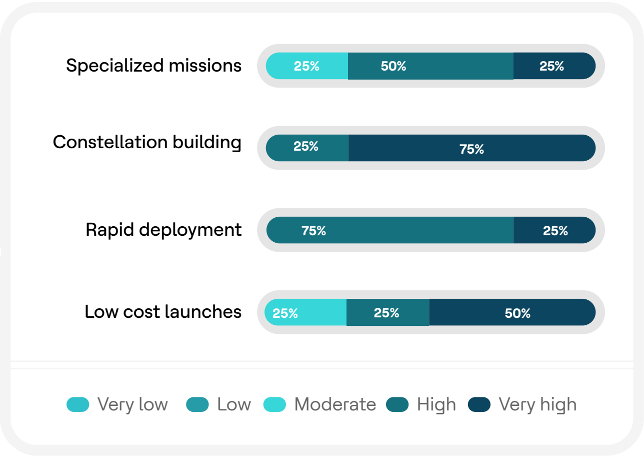
Interest patterns make this shift clear. The strongest demand is cantered on **rapid deployment** and **constellation building,** signalling that organizations are prioritizing system-level capability over individual satellite performance. **Specialized missions** remain relevant, but the emphasis has moved toward architectures that can be expanded, refreshed, and reconfigured as operational needs evolve.

The maturity profile reinforces this transition (see exhibit 11.1). **43%** of organizations are actively testing miniaturized satellites in pilot projects, while a similar number report early operational impact, where processes are already beginning to change. Only **14%** have reached fully integrated and scaled deployment. This distribution places miniaturized satellites firmly past feasibility, but short of full industrialization - no longer experimental, yet not fully standardized.

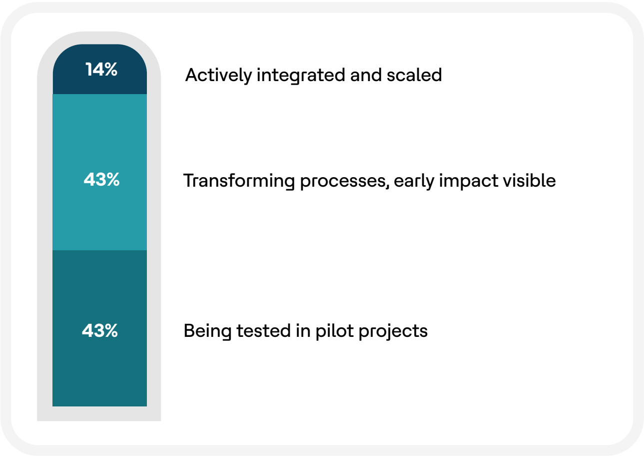
Cost narratives are evolving in parallel. While low-cost launches remain relevant, they are no longer the primary differentiator. Instead, cost is being evaluated through the lens of deployment velocity and lifecycle efficiency—how quickly satellites can be launched, replaced, and integrated into downstream data and analytics platforms.

What makes this phase distinctive is the growing alignment between interest and readiness. High demand for constellation-based models is now matched by leadership commitment, vendor ecosystems, and funding structures. The remaining friction lies less in satellite design and more in

Exhibit 11.1
Miniaturized satellites are being valued for how fast and broadly they can be deployed



Miniaturized satellites adoption stages among organizations in 2025



integration discipline - connecting orbital assets reliably into terrestrial data platforms, analytics pipelines, and governance frameworks.

Miniaturized Satellites are thus becoming the operational backbone of SpaceTech: compact by design, scalable by intent, and increasingly embedded into enterprise and public-sector systems. The next inflection point will be defined not by further miniaturization, but by the ability to industrialize orbital operations at scale.

> Space technologies are fast becoming one of tomorrow's strategic pillars driving innovation, enabling high-value industries and reshaping sectors that are essential to our economy. In Catalonia, we understand the scale of this opportunity. That is why the Government has rolled out a CATALONIA SPACE 2030 Strategy, empowering a highly productive ecosystem with quality jobs and companies capable of delivering solutions that redefine how our strategic industries operate.
>
> **Miquel Samper i Rodríguez**
> Minister of Business and Labour, Catalonia

Turning orbital data into decision speed.

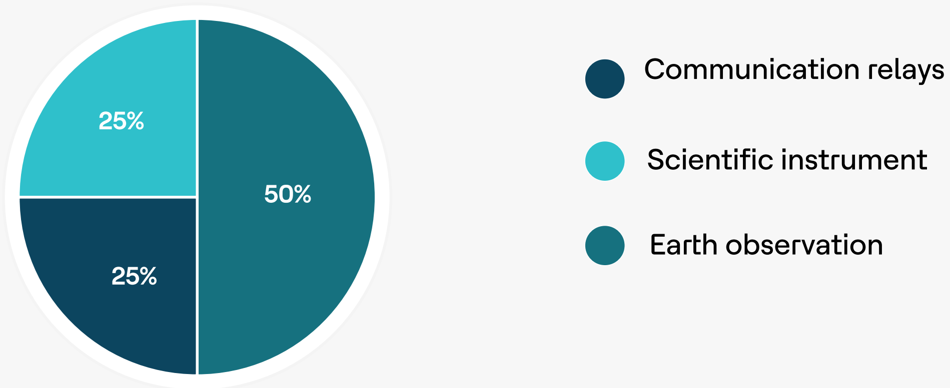
As miniaturized satellites move deeper into live pilots and early operations, the centre of gravity is shifting again. The focus is no longer on whether small satellites can be deployed quickly or affordably - it is on what organizations do with the data once it starts flowing continuously.

Pilot activity reveals a clear pattern (see exhibit 11.2). **Earth Observation** now accounts for half of all miniaturized-satellite pilots **(50%),** emerging as the dominant mission focus not because it is new, but because it is immediately actionable. Organizations are prioritizing missions that translate orbital presence into real-time visibility and situational awareness, rather than abstract technical capability. **Communication relays** and **scientific instruments** still command attention **(25% each),** but momentum is clearly concentrated around decision-facing use cases.

The same logic appears in the data benefits that organizations value most. Early pilots are not being judged on resolution improvements or marginal cost efficiencies - both of which register negligible emphasis. Instead, value is split squarely between **real-time access (50%)** and **coverage expansion (50%)** the ability to see more, more often and with less delay.

What this reveals is a deeper change in expectations. Miniaturized Satellites are increasingly judged by how effectively they integrate into decision loops, not just data pipelines. The question organizations are beginning to ask is no longer "Can we capture this data?" but "Can our systems absorb it, trust it, and act on it fast enough?"

Exhibit 11.2
Earth observation dominates miniaturized-satellite mission priorities.

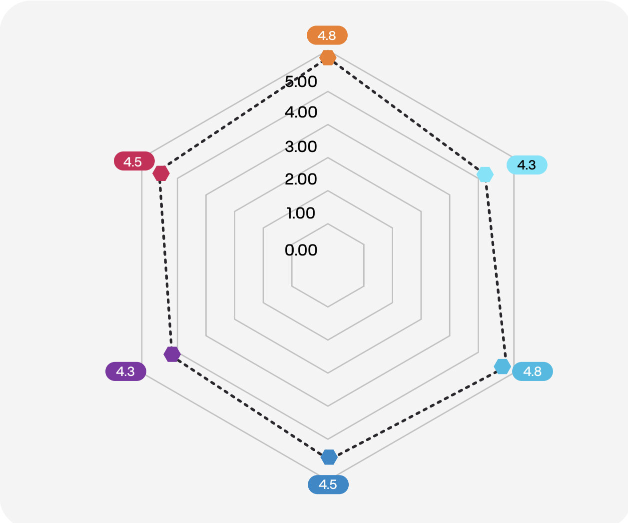


Barriers: Scaling miniaturized satellites is constrained by energy limits and industrial readiness

As miniaturized satellites move from successful pilots into repeatable, constellation-scale operations, the primary constraints are no longer about feasibility but about sustained performance at scale. Power and energy management now emerge as the dominant limiting factor, cited by roughly half of organizations. The challenge is not placing satellites in orbit, but ensuring they can operate continuously and predictably over their intended lifecycles. As form factors shrink and constellations grow, power budgets are increasingly stretched across communications, onboard processing, sensing and autonomy - forcing design trade-offs that directly shape mission reliability and data continuity. In this phase, energy efficiency determines whether satellites function as dependable infrastructure or deliver uneven, episodic value.

Beyond power, thermal control, durability **(25%)**, and manufacturing and supply chain readiness **(25%)** reflect the realities of industrialization. These constraints surface as organizations shift from bespoke missions to repeatable deployment models. Thermal stability, component longevity and consistent build quality become critical when satellites are launched, replaced and refreshed at cadence. Equally, supplier reliability and production discipline are essential to support constellation growth without operational variability. Together, these barriers underscore a common theme: miniaturized satellites succeed at scale only when engineering excellence is matched by industrial rigor - turning orbital capability into predictable, infrastructure-grade performance.

Exhibit 11.3
Miniaturized Satellites - Mesh of Possibilities



- Operational Efficiency/Scalability
- Customer Experience
- Risk Management
- New Revenue Streams
- Sustainabilty Goals
- Business Model Innovation

The capability is real. The operating model is taking shape.

The miniaturized satellites impact radar shows a broad and balanced enterprise value profile, with the strongest impact concentrated in **business model innovation** and customer experience **(both 4.8),** followed closely by **risk management** and **sustainability goals (4.5 each).** This indicates that miniaturized satellites are no longer confined to back-end monitoring or experimental use cases - they are actively shaping how organizations design services, engage users and build resilience into physical and digital operations. **Operational efficiency** and **new revenue streams,** while slightly lower **(4.3)**, still reflect meaningful momentum as satellite-enabled capabilities are integrated into core workflows and decision systems.

Taken together, the shape of the radar suggests an adoption phase where strategic and experiential value is emerging alongside operational discipline, rather than following it.

The Road Ahead

- **Design for repeatable operations, not one-off missions**
  The next phase is about building repeatable, constellation-ready operating models so deployments can scale without being re-engineered each time.

- **Treat power, thermal and manufacturing constraints as strategic design choices**
  With power and energy management emerging as the dominant scaling barrier, followed by thermal durability and manufacturing readiness, success will depend on engineering for endurance and repeatability - not just launch performance.

- **Build integration muscle downstream, not just orbital capability**
  The differentiator will be how seamlessly satellite data feeds into analytics platforms, risk systems, and decision workflows. Operational impact will be won on the ground, not in orbit.

- **Focus investment where impact is already compounding**
  Risk intelligence, sustainability monitoring and coverage expansion are where value is most tangible today. These domains should act as anchors for disciplined scale, rather than spreading efforts thinly across experimental use cases.

- **Measure progress by consistency, not launches**
  Advantage will come less from how many satellites are deployed and more from how predictably they operate, integrate and inform decisions over time.

Miniaturized satellites are becoming a permanent layer of enterprise intelligence. As operational confidence grows, today's internal gains will set the stage for broader commercial and customer-facing impact.

Coming Soon: Earth Observation (EO)

When the planet becomes observable in real time.

Earth observation is rapidly evolving from periodic monitoring to continuous planetary awareness. Instead of relying on delayed reports or fragmented data sources, organizations can now access near-real-time visibility into environmental, climatic, and human activity patterns as they unfold. This shift fundamentally changes how decisions are made - moving from retrospective analysis to proactive, time-sensitive action across complex physical systems.

What sets this phase apart is not the availability of satellite data, but how directly it feeds into operational decision-making. Advances in analytics and AI are making earth observation data easier to interpret and integrate, turning raw imagery into actionable signals. As a result, EO is transitioning from a research-driven capability into a practical intelligence layer - supporting resilience planning, sustainability commitments and risk-aware operations in environments that are increasingly volatile and interconnected.

Exhibit 11.4
How well are enterprises prepared for EO in the coming future?

50% of organizations report **strong leadership confidence,** with earth observation increasingly viewed as a strategic decision layer for climate intelligence, risk monitoring and long-term resilience.

25% highlight **infrastructure and tooling gaps,** pointing to the need for more robust data platforms, processing pipelines and integration with enterprise analytics stacks.

50% signal **budget and investment** maturity remains uneven, suggesting that while funding is sufficient for pilots and targeted deployments, sustained, enterprise-wide scale is still being selectively prioritized.

How early bets are being placed?

Early investment signals show that organizations are anchoring earth observation adoption where decision urgency and systemic risk intersect most clearly. As evident from the people pulse survey 11, **climate monitoring** leads by a wide margin **(41%),** reflecting EO's growing role as a continuous intelligence layer for tracking emissions, land-use change, water stress and extreme weather patterns over time. This dominance suggests that enterprises and governments alike view climate not as a standalone use case, but as a cross-cutting constraint shaping long-term resilience, compliance and capital planning.

Beyond climate, adoption momentum clusters around **agriculture** and **disaster response (27% each)** - domains where EO insights translate directly into operational decisions rather than analytical insight alone. In agriculture, the value lies in anticipatory signals that inform crop planning, yield optimization, and resource allocation. In disaster response, EO is increasingly valued for early warning, situational awareness and post-event coordination, where speed and trust in data materially affect outcomes. **Urban planning trails significantly (6%),** underscoring that EO adoption today is being driven less by long-horizon design optimization and more by near-term risk management and response readiness.

Taken together, the pattern reflects a pragmatic sequencing strategy. Organizations are prioritizing use cases where EO delivers clear, time-sensitive decision advantage, while deferring broader applications that require deeper institutional alignment or longer payoff cycles.

USD 7.20 billion by 2030, at a compound annual growth rate (CAGR) of **6.2%**

Source: Grand View Research

Earth Observation is becoming a signal advantage, not just a sensing capability

Earth Observation is gaining strategic relevance because it changes when and how decisions are made, not simply how much data is available. Its value lies in delivering timely, trusted signals that reduce uncertainty and enable earlier, more coordinated action across complex systems. As adoption advances, the emphasis is shifting from data access to operational confidence - ensuring insights are reliable, interpretable and aligned with how decisions are governed and executed.

What will shape the next phase is not satellite access, but positioning:

1. Treat EO as an early-warning layer
It is not just a monitoring tool. Its advantage comes from surfacing change sooner, when choices still matter.

2. Anchor expansion in climate, agriculture, and disaster use cases
These domains already show the strongest pull and clearest line to action.

3. Move from insight delivery to decision integration
The real differentiator will be how well EO insights feed planning, response, and resource allocation—not how much data is collected.

Earth observation will not reshape decision-making overnight. But it is steadily redefining when insight enters the conversation. The organizations that succeed will be those that view EO not as a remote sensing capability, but as a strategic intelligence layer that shifts decisions earlier - before risk hardens into consequence.

People Pulse #11

Where is Earth Observation data expected to be most valuable in the next decade?

41%
Said: Climate monitoring

27%
Said: Agricultural insights

27%
Said: Disaster Response

6%
Said: Urban Planning

If space is becoming infrastructure, who is accountable for it?

SpaceTech is moving from an exploration-led domain to an enterprise capability challenge. With miniaturized satellites enabling rapid, repeatable access to orbit and EO turning planetary data into decision signals, space is beginning to function less like a frontier and more like an infrastructure layer - one that informs risk, resilience, and resource decisions on earth.

As this transition accelerates, the leadership question shifts. The focus is no longer on launch feasibility or data availability, but on how orbital capabilities are integrated, governed, and scaled inside organizations. Miniaturized satellites demand operating discipline around power, reliability and production repeatability. Earth observation demands clarity on decision ownership, data trust, and regulatory alignment as insights move closer to policy, operations, and public accountability.

In this transition, new questions move to the forefront:

- **Where should miniaturized satellites be scaled aggressively** - and where is selective deployment still prudent?
- **How should earth observation insights be embedded into planning, risk and response workflows** rather than treated as standalone analytics?
- **What governance models are needed** as satellite data increasingly shapes high-stakes decisions around climate, security, and infrastructure?
- **Which operating-model changes are required** to move from mission-based pilots to dependable, repeatable SpaceTech platforms?
- **How should investment be sequenced** as ecosystems, regulation, and standards continue to evolve?

SpaceTech will not create durable advantage through orbital capability alone. Its impact will be defined by how deliberately leaders design the systems, controls, and operating models that turn space-derived data into consistent enterprise value.

Megatrend 12: Bioengineering

From biological insight to engineered outcomes.

More than 70% of bioengineering sentiment reflects high confidence in enterprise impact – even as leaders remain deliberately cautious on governance and execution.

When biology starts behaving like infrastructure

Bioengineering is no longer progressing as a collection of isolated scientific breakthroughs. It is beginning to behave more like an infrastructure layer - one that underpins how organizations design therapies, run diagnostics, improve yields and accelerate biological decision-making.

Two developments define this shift.
Genome Editing has moved decisively beyond feasibility debates. Among active adopters, the focus is now on repeatability, throughput and pipeline productivity. Genome-level modification is increasingly treated as a core capability within R&D and innovation functions, rather than a specialist experiment reserved for a handful of programs.

At the same time, **Lab-on-a-Chip** is changing how and where biological insight is generated. By miniaturizing and automating lab processes, it reduces dependency on centralized infrastructure and shortens the distance between testing, interpretation and action. Its relevance is growing not because it replaces traditional labs, but because it extends biological execution into new settings - clinical, field-based and decentralized environments.

Together, these trends point to a broader realignment. Bioengineering is becoming less about advancing science in isolation and more about embedding biological capability into operational systems. The strategic question for enterprises is shifting from *"Can we do this?"* to *"How do we integrate, govern, and scale it responsibly?"*

Why it matters?

Key findings

Belief in impact is high, even where deployment is still selective: Sentiment analysis shows strong confidence in the long-term value of bioengineering, particularly around precision, speed and outcome quality. This confidence exists despite uneven adoption - a signal that hesitation is driven by execution risk, not scepticism about value.

Genome Editing is treated as a near-term productivity lever, not a distant bet: Organizations already working in genome editing report high internal readiness across talent, tools and funding. The main constraints to scale are regulatory alignment, ethical governance and standardization.

Lab-on-a-Chip is emerging as an enabler of decentralization, not just efficiency: Interest in Lab-on-a-Chip is driven less by cost reduction and more by its ability to relocate biological testing closer to the point of need.

Time-to-scale expectations are compressing across the bioengineering stack: When viewed together, **nearly two-thirds** of bioengineering initiatives are expected to move from pilot to scaled deployment **within 24 months.** This reflects growing pressure to translate biological innovation into real-world outcomes rather than extended experimentation cycles.

Scaling bioengineering now hinges on trust frameworks : Despite high technical readiness, governance and ecosystem readiness scores remain below **30-35%**, particularly around ethics, data stewardship, validation standards and regulatory coordination.

Emerging Now: Genome Editing

What's being redesigned isn't DNA - it's how biology gets operationalized.

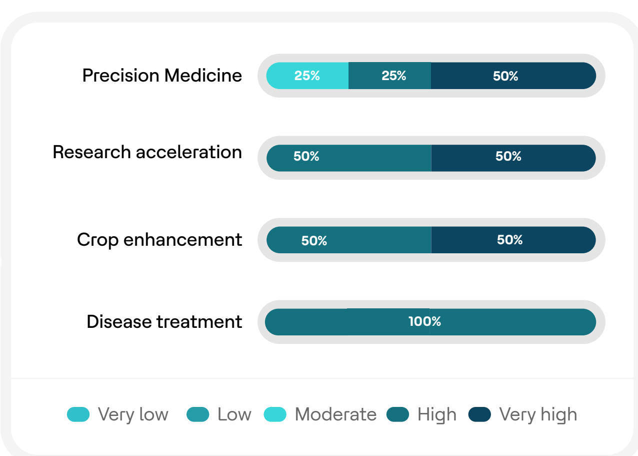
Genome editing is entering a phase where its relevance is no longer questioned only its mode of deployment is. What distinguishes the current moment is not a breakthrough in technique, but a shift in how organizations are positioning genome editing within their broader innovation and operating models.

The strongest signal comes from where interest is concentrated (see exhibit 12.1). Disease treatment has become the unequivocal anchor use case, reflecting a collective view that genome editing is now central to therapeutic ambition rather than peripheral experimentation. Alongside this, genome editing is increasingly valued as a force multiplier - accelerating research cycles and enhancing biological productivity in areas such as crop development. Even in precision medicine, where execution complexity remains high, confidence in long-term impact is being evaluated less as a scientific milestone and more as a strategic lever.

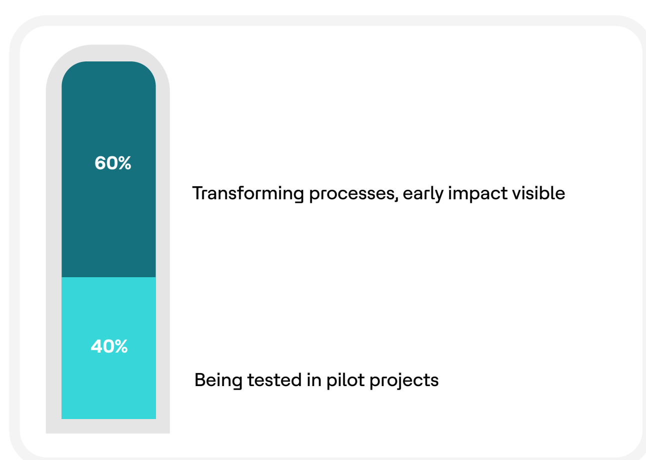
This shift is mirrored in the maturity profile as well. Organizations engaging with genome editing are doing so with intent. There is little evidence of passive curiosity or low-commitment exploration. Instead, activity clusters around two modes: structured pilots and early process transformation. A meaningful share of organizations already report that genome editing is influencing how work gets done - shaping R&D workflows, therapeutic pipelines, or experimental design - even though none have yet pushed it into full enterprise-wide scale.

This is a revealing position to be in. Genome editing has moved beyond proof-of-concept, but it has not yet been industrialized. The absence of large-scale deployment does not signal doubt about value;

Exhibit 12.1
Disease treatment dominates genome editing priorities, with research and crop gains close behind. broadly they can be deployed



Genome editing adoption stages among organizations in 2025



rather, it reflects deliberate restraint. The constraints are no longer technical. They sit in areas such as regulatory readiness, ethical oversight, validation standards and ecosystem coordination - domains where speed must be balanced with responsibility.

Taken together, the interest and maturity signals point to a technology in transition. Genome editing is no longer waiting to prove its impact; that threshold has largely been crossed.

> Engineered biology and next-generation digital health are enabling precise therapies, predictive care, and sustainable bio-industries. Switzerland's convergence of life sciences, precision engineering, and digital trust provides an ecosystem for these technologies to scale, translating scientific breakthroughs into tangible, human-centric solutions through world-class research, clinical capabilities, and collaborative innovation.
>
> **Mr Patrik Wermelinger**
> Chief Investment Promotion Officer and
> Member of the Executive Committee,
> Switzerland Global Enterprise

The next phase of genome editing is about focus, not breadth.

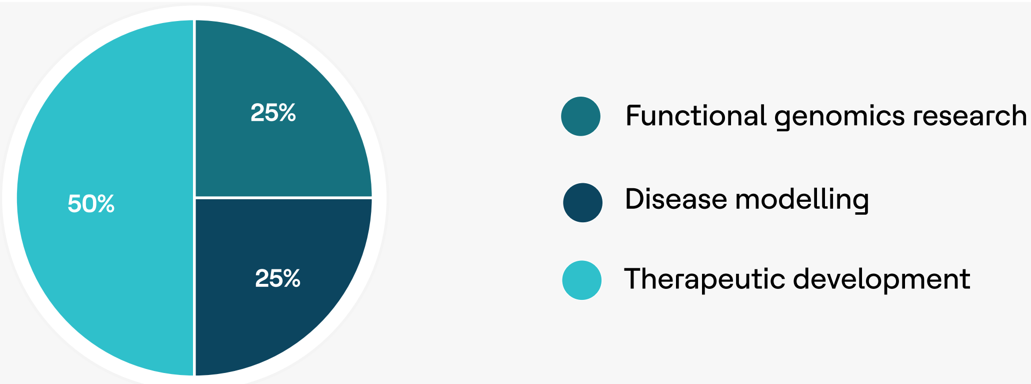
Genome editing is now entering its decision phase. The early signals are clear: organizations are not spreading their bets evenly across domains, nor are they treating genome editing as a generalized scientific tool. Instead, they are making explicit choices about where value is immediate and where risk must be contained.

What emerges clearly is a focused, outcome-driven pattern of use. Genome editing pilots are concentrated in human therapeutics, with selective expansion into agriculture and industrial biotechnology, reflecting a deliberate preference for domains where value is measurable, development timelines are understood, and governance pathways, though complex, are already established.

This focus is reinforced by where R&D impact is already visible **(see Exhibit 12.2).** Early gains are showing up primarily in **therapeutic development** and **disease modelling,** rather than in basic or exploratory research. In these areas, genome editing is helping teams shorten iteration cycles, improve experimental confidence, and reduce uncertainty in development pipelines. Roughly **half** of organizations already report tangible impact in therapeutic programs, with disease modelling and functional genomics following as secondary but meaningful contributors. Together, these signals indicate that genome editing is being applied not to broaden scientific exploration, but to improve execution in high-stakes, decision-intensive use cases.

Taken together, these signals suggest that the next phase of genome editing will not be defined by broader adoption, but by selective deepening. Leaders are choosing where to push forward, where to pause and where to wait for the ecosystem to mature. The competitive advantage ecosystem to mature. The competitive advantage will not come from experimenting everywhere but from building disciplined, repeatable pipelines in a few high-impact domains - then governing them well.

Exhibit 12.2
Genome editing's early impact is concentrated in therapeutic development, with discovery-led use cases close behind.

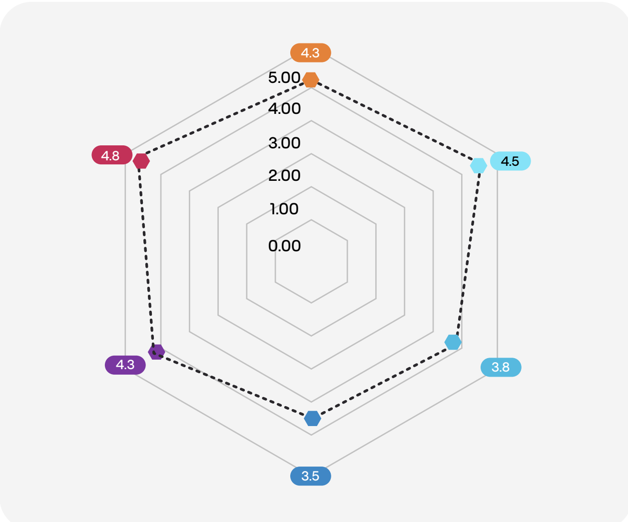


Barriers: Governance gaps and uneven safety frameworks constrain genome editing at scale

Scaling genome editing is now less a question of scientific feasibility and more a test of institutional readiness. While technical capabilities have advanced rapidly, the frameworks required to deploy genome editing safely, consistently and at scale remain uneven. The challenge is no longer whether the science works, but whether organizations are prepared to govern it responsibly.

Safety today is addressed through a narrow lens. Organizations rely primarily on **data privacy controls (50%),** with clinical trials and international standards applied inconsistently and formal ethical advisory mechanisms largely absent. This creates an incomplete safety model. Data protection alone cannot address long-term effects, cross-border regulation, consent or societal impact - issues that become increasingly material as genome editing moves closer to real-world deployment. While these gaps have not yet stalled pilots, they are likely to become significant friction points as initiatives deepen. A broader readiness gap is also emerging. Limited standardization risks fragmenting programs across regions and partners, slowing the transition from pilots to repeatable, multi-site deployment. At the same time, genome editing teams often operate with strong scientific expertise but limited integration across legal, compliance, data governance and ethics functions. Without these guardrails, genome editing remains tightly scoped and difficult to scale.

Exhibit 12.3
Genome Editing - Mesh of Possibilities



- Operational Efficiency/Scalability
- Customer Experience
- Risk Management
- New Revenue Streams
- Sustainabilty Goals
- Business Model Innovation

The science is proven. The system is catching up.

The genome editing impact radar (exhibit 12.3) highlights a technology already delivering broad-based enterprise value, with its strongest signals clustering around **sustainability goals (4.8)** and **operational efficiency** and **scalability (4.5)** .The prominence of sustainability reflects how genome editing is being used to reduce biological waste, improve precision in interventions and enable more resource-efficient development pathways. Impact on **customer experience (3.8)** and **risk management (3.5)** trails slightly, reflecting a deliberate approach: organizations are prioritizing internal value creation and controlled deployment before pushing genome editing into more visible, customer-facing or higher-risk contexts.

- **Break silos across science, data and regulation**
  Genome editing spans R&D, legal, compliance and data governance. Scaling demands coordinated ownership across these functions, not isolated expertise.

- **Double down where value is already proven**
  Rather than broad experimentation, focus investment on domains where genome editing is already improving outcomes - using them as platforms for controlled expansion.

- **Measure success by execution, not the edit**
  Advantage will come less from technical breakthroughs and more from how consistently genome editing is embedded into pipelines, decisions, and strategy.

For leadership, the implication is clear. The next wave of value will not come from isolated breakthroughs or pilot success, but from building the operating models, governance frameworks and cross-functional alignment required to sustain impact over time. Organizations that treat genome editing as a strategic system, rather than a specialized tool, will be best positioned to translate today's momentum into durable advantage.

Coming Soon: Lab-on-a-chip

Shrinking the lab. Speeding the insight.

Lab-on-a-Chip refers to miniaturizing entire laboratory processes - such as sample preparation, testing and analysis - onto a single, compact chip. Instead of sending samples to large, centralized labs and waiting days for results, tests can be performed quickly and closer to where decisions are made. For example, a diagnostic chip can analyze a drop of blood at a clinic or bedside, delivering insights in minutes rather than days. This shift matters because it shortens decision cycles, reduces cost and complexity and enables new models of care, research, and testing.

At a strategic level, Lab-on-a-Chip changes how organizations think about where science happens and how fast it informs action. It allows research and diagnostics to move out of specialized facilities and into distributed, real-world environments - reshaping operating models, accelerating innovation timelines and opening new pathways for scalable, data-driven biological decision-making.

Exhibit 12.4
How well are enterprises prepared for Lab-on-a-chip in the coming future?

67% indicate **leadership readiness** is still below ready, suggesting executive interest exists but has not yet translated into clear ownership, operating models or scale mandates.

66% show **talent and vendor ecosystem** readiness clustered at "not ready," reflecting reliance on niche expertise and fragmented supplier landscapes rather than mature, interoperable ecosystems.

When biology rides the semiconductor curve.

Lab-on-a-Chip is gaining momentum not as a broad diagnostic replacement, but as a precision tool for high-value use cases. Current pilots are concentrated in cancer diagnostics and genetic testing/precision medicine, where speed, accuracy, and miniaturization directly improve outcomes. The immediate transformation is visible in sample processing and data accuracy, rather than throughput or full clinical workflows - signalling that organizations are first using Lab-on-a-Chip to tighten the quality and reliability of diagnostic insight before pushing for scale.

This trajectory closely mirrors advances in the semiconductor industry, where improvements in chip design, fabrication and integration are making complex biological assays smaller, faster, and more reliable. As semiconductor ecosystems mature - particularly in **APAC and parts of Europe,** where chip manufacturing and medical technology clusters overlap—Lab-on-a-Chip is benefiting from shared innovation across materials science, microfluidics and advanced manufacturing. The result is a diagnostic platform that is no longer limited by lab infrastructure, but increasingly shaped by silicon-driven innovation cycles.

Strategically, this positions Lab-on-a-Chip as an enabler of next-generation diagnostics, not mass screening. Its near-term value lies in bringing high-precision testing closer to decision points—oncology labs, research centres and precision medicine programs, while longer-term expansion into broader clinical and chronic-care settings will depend on integration, standardization and regulatory confidence.

USD 11.45 billion by 2030, at a compound annual growth rate (CAGR) of **9.8%**

Source: Grand View Research

Lab-on-a-Chip will change the timing of decisions, not just the size of labs

Lab-on-a-Chip is emerging as a response to a practical constraint: traditional diagnostics are too slow, too centralized, and too detached from where decisions are made. By embedding complex testing capabilities into compact, chip-based systems, organizations can generate biological insight closer to clinicians, researchers, and frontline care environments - without relying on centralized lab infrastructure.

This shift is being interpreted less as a technical upgrade and more as a structural change in healthcare delivery. People pulse data shows a clear majority view compact, on-the-go testing as becoming core to future healthcare models, with additional momentum in remote and decentralized care. The implication is straightforward: diagnostics that can travel will increasingly shape where and when care happens.

At the same time, adoption is selective by design. Current pilots are concentrated in high-precision domains - notably cancer diagnostics and genetic testing - where faster turnaround and higher data fidelity immediately influence outcomes. The first visible gains are in sample processing and data accuracy, not system-wide throughput. This signals a deliberate progression: organizations are validating trust and reliability before pushing Lab-on-a-Chip into broader clinical or population -scale use.

What determines next-phase impact is not miniaturization alone, but execution discipline:

1. Treat Lab-on-a-Chip as a decision infrastructure
Its value comes from shortening decision loops, not replacing labs. Integration with care pathways and data systems is the real differentiator.

2. Expand beyond pilots by standardizing reliability
Scaling will depend on consistent validation, regulatory confidence, and operational integration—especially as diagnostics move closer to patients.

3. Align innovation with semiconductor momentum
Advances in chip design, fabrication, and

3. Align innovation with semiconductor momentum
Advances in chip design, fabrication, and
manufacturing—particularly in regions with strong semiconductor ecosystems—are accelerating Lab-on-a-Chip's feasibility.

Lab-on-a-Chip will not transform healthcare overnight. But it is already reshaping how quickly insight can influence action. The organizations that succeed will be those that see it not as a smaller lab, but as a new diagnostic operating layer.

People Pulse #12

Where could compact, on-the-go testing tools make the biggest difference in healthcare over the next 5 years?

52%
Said: Core to healthcare options

37%
Said: Useful in remote care

6%
Said: Only in special cases

5%
said: No major impact ahead

What changes when biology becomes an enterprise capability?

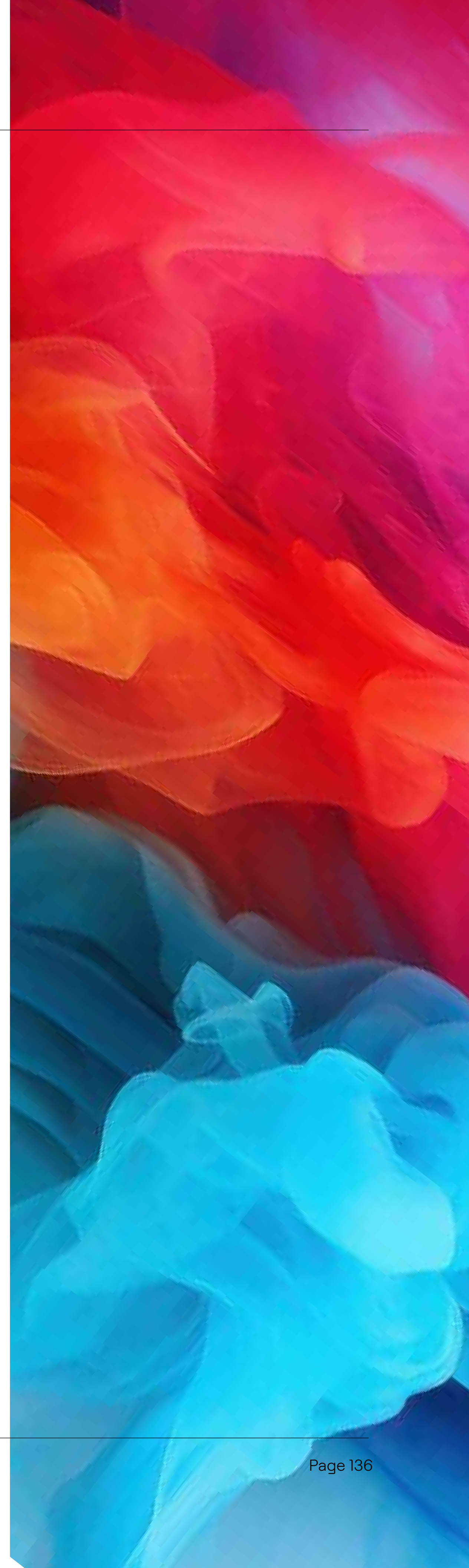
Bioengineering is moving from a scientific frontier to a leadership and operating-model issue. With genome editing enabling precise intervention at the DNA level and Lab-on-a-Chip bringing diagnostics into portable, real-time formats, biology is starting to function as a programmable, deployable capability rather than a lab-bound discipline.

As bioengineering advances, leadership attention must move beyond lab readiness to institutional readiness - encompassing governance, trust, cross-functional integration, and long-term value creation:

This shift raises a new set of leadership decisions:

- **Where should Genome Editing be applied aggressively -** and where is restraint essential?
- **How should Lab-on-a-Chip reshape care pathways, data ownership and accountability** as diagnostics move closer to the frontline?
- **How can organizations balance speed with safety, ethics and public trust** as biological insight outpaces regulation?
- **What operating-model changes are needed** to move from isolated pilots to repeatable bioengineering pipelines?
- **How should investment be paced** while ecosystems and standards are still evolving?

Bioengineering will not transform enterprises through breakthroughs alone. Its impact will be defined by how well leaders build the systems, governance, and discipline required to scale biology.



Conclusion

The next phase of enterprise transformation will not be won by technological superiority alone, but by architectural clarity. As intelligence becomes embedded across experience, data and operations, the real differentiator shifts to how coherently these layers are designed to work together. Enterprises that succeed will treat autonomy not as a feature, but as a system property - one that requires deliberate choices about accountability, governance and adaptability. The future belongs to organizations that can translate complexity into coordinated action, without losing control or trust.

Equally important, no enterprise will navigate this transition in isolation. The research points to a decisive shift from innovation as an internal function to innovation as an ecosystem capability. Co-creation with partners, startups, governments and research institutions is becoming essential - not just to accelerate adoption, but to shape standards, de-risk scale and embed societal expectations into technology by design. Competitive advantage will increasingly emerge from how effectively enterprises participate in, and orchestrate, these ecosystems - aligning global platforms with local realities and shared responsibility.

This is where HCLSoftware's XDO blueprint - Xperience, Data, and Operations - provides a unifying lens for enterprises to design systems that are intelligent yet governed, autonomous yet accountable and scalable yet sovereign. Rather than layering intelligence onto legacy structures, XDO enables organizations to re-compose their core around outcomes, trust and continuous learning. Tech Trends 2026 ultimately challenges leaders to move beyond reacting to change - and instead, to intentionally architect enterprises that can evolve with it, alongside the ecosystems that will define the decade ahead.

> "The challenges of the digital divide—where technologies advance quickly but some populations remain excluded—are so complex that only cooperation and co-innovation will allow us to surmount them.
>
> **Diana Zamora**
> Director, Government Affairs & Policy
> MasterCard

Methodology

To develop HCLSoftware's Tech Trends 2026, we conducted a structured, multi-phase research program over **7- 8 months,** combining secondary research, large-scale sentiment analysis and primary validation. The study is grounded in primary research with **173+ CXOs, VPs, Directors, and senior decision-makers** across industries and geographies, conducted in partnership with MarketsandMarkets. Respondents represented a balanced mix of roles spanning IT, engineering, operations, R&D, strategy, and business leadership, with organizations ranging from mid-sized enterprises to global firms generating over **$1B in annual revenue.** Participants reflected varying levels of digital maturity, from early-stage adopters to innovation leaders, ensuring perspectives across the full transformation spectrum.

The research began with broad signal scanning across analyst reports, industry publications, academic research, market data, and technology roadmaps to identify emerging technology domains. These signals were refined through proprietary sentiment analysis to assess momentum, relevance, and time-to-impact. Each shortlisted mega trend was then structured into two sub-trends: "Emerging Now," where impact is already being witnessed in enterprise environments, and "Coming Soon," where meaningful impact is expected within the next 2–3 years. Insights were further validated through a six-month LinkedIn polling campaign across HCLSoftware's global leadership handles, capturing live sentiment from practitioners and ecosystem participants. In parallel, discussions with open innovation ecosystem stakeholders, including public-sector and government-facing entities, were incorporated to reflect broader policy, sovereignty and societal considerations around emerging technologies.

All findings were synthesized through expert review to evaluate adoption maturity, enterprise interest, strategic impact, and readiness to scale. For clarity and consistency, percentages shown across charts and visualizations are rounded to the nearest whole number; as a result, totals may not always sum to exactly 100%. The outcome is not a prediction of distant possibilities, but an evidence-based view of the technologies shaping enterprise priorities in 2026 and beyond - designed to help leaders distinguish between immediate action and near-term preparation.

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If you'd like to connect with us and know more, please feel free to get in touch at **sync@hcl-software.com.**

Tech Trends 2026

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