Gartner

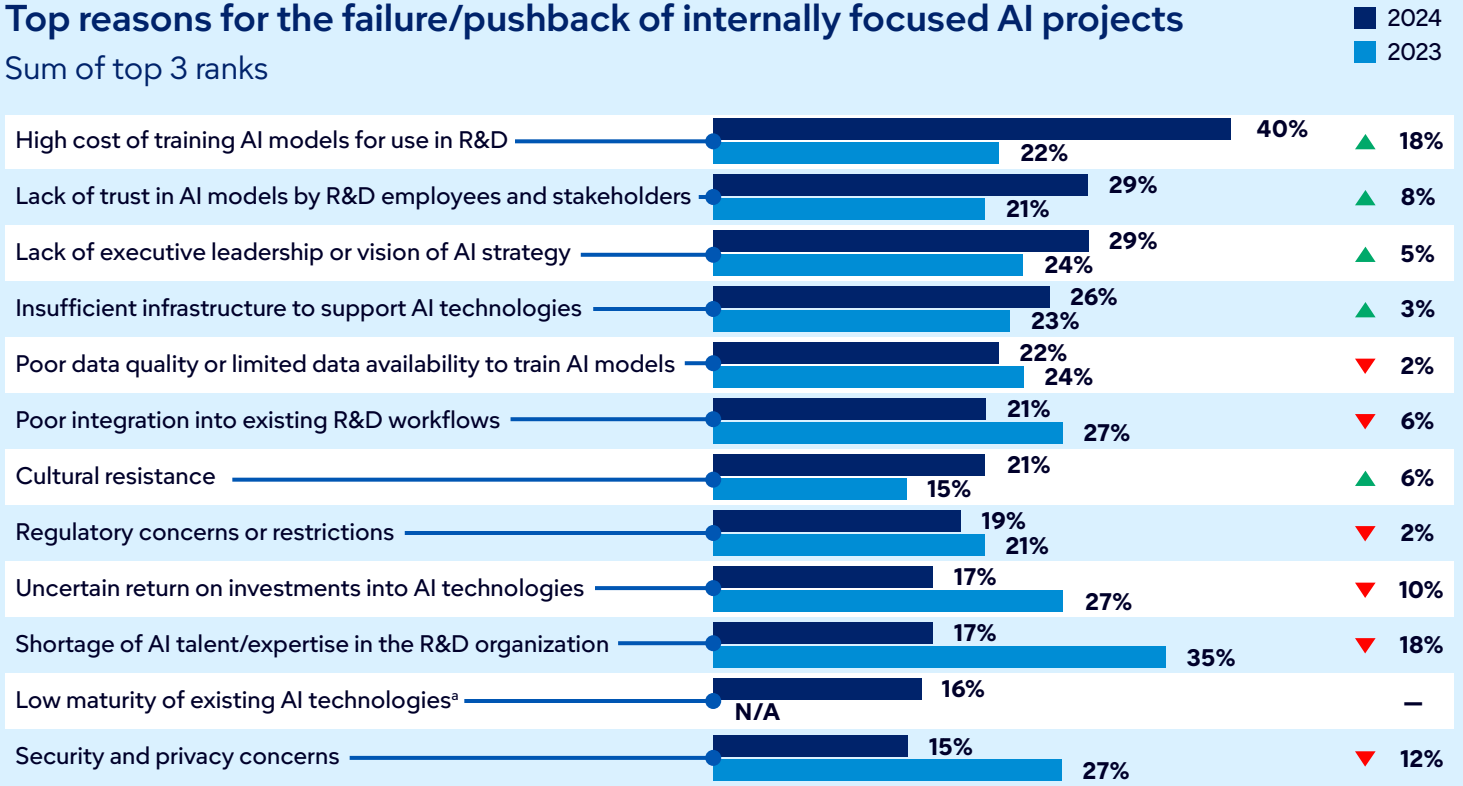
Top AI Insights for R&D Leaders

Introduction

AI is no longer an experimental tool in R&D — it's rapidly becoming central to how organizations innovate, discover and deliver new solutions. Early adopters are already reaping significant advantages in knowledge, speed and intelligence, while those waiting for formal strategies risk falling behind more agile competitors. Sixty-two percent of CEOs in R&D-intensive industries see AI as the defining technology of the next business era, but only 27% feel their organizations are ready to harness its potential. The real challenge isn't just adopting new technology, it's fundamentally rearchitecting workflows, data strategies and talent models to fully leverage AI. As R&D faces shifting pressures from talent shortages and cost constraints to persistent data and infrastructure barriers, the need for decisive leadership and a clear AI vision has never been more urgent. Keep reading to learn the most urgent questions R&D leaders are asking Gartner about AI and the answers you need to act now.

Top reasons for the failure/pushback of internally focused AI projects

Sum of top 3 ranks



n = 200; all respondents, excluding "don't know"/"none of the above"
Q. When internally focused AI projects received pushback or failed to achieve the goals set by your R&D organization, what were the top three reasons for this?
Source: Gartner
[a] Not tested in 2023

Which AI use cases will yield the most value for our R&D efforts?

AI in R&D delivers value across three distinct use-case types that span from everyday R&D productivity gains to game-changing disruptions. These can't be assessed by a single currency of value. Instead, R&D leaders should categorize AI use cases into distinct types, each requiring its own value realization approach:

- **Defend** AI tools that improve individual productivity. They are easier to deploy and will become baseline expectations. Their value is best measured by how teams reinvest saved time.
- **Extend** AI systems that enhance core R&D processes. These can be tied to direct cost savings or throughput gains. Measure these use cases through ROI and process-level KPIs.
- **Upend** AI-driven breakthroughs. Their impact is strategic and long-term and is best measured by new revenue streams or innovation portfolio expansion.

Understanding AI use-case types helps R&D assess value more precisely, but to realize value, R&D leaders must proactively define and own their specific AI visions rooted in existing business problems. The business problems will help identify use cases that should be prioritized based on their value and feasibility. When articulating your AI vision, be clear about what you want to reasonably accomplish and what you are willing to leave unchanged until the next iteration.

GenAI business case types

Illustrative

	Defend	Extend	Upend
Competitive ambition	Augment individual productivity to maintain competitive parity	Transform existing process/team for competitive differentiation	Disrupt by creating new products, value propositions, markets
Expected return	**Return on employee** Improved well-being and employee NPS	**Return on investment** Financial return	**Return on future** Strategic bet
Examples	Office productivity, coder productivity	Customer service re-org, transformed claims process	Drug discovery, AI creates investment fund
Cost per year (in 2024)	$500 (per worker)	$250K to $5M	$20M to $250M+

Source: Gartner

Where in R&D workflows can AI deliver the biggest impact, and which technologies are best suited to those opportunities?

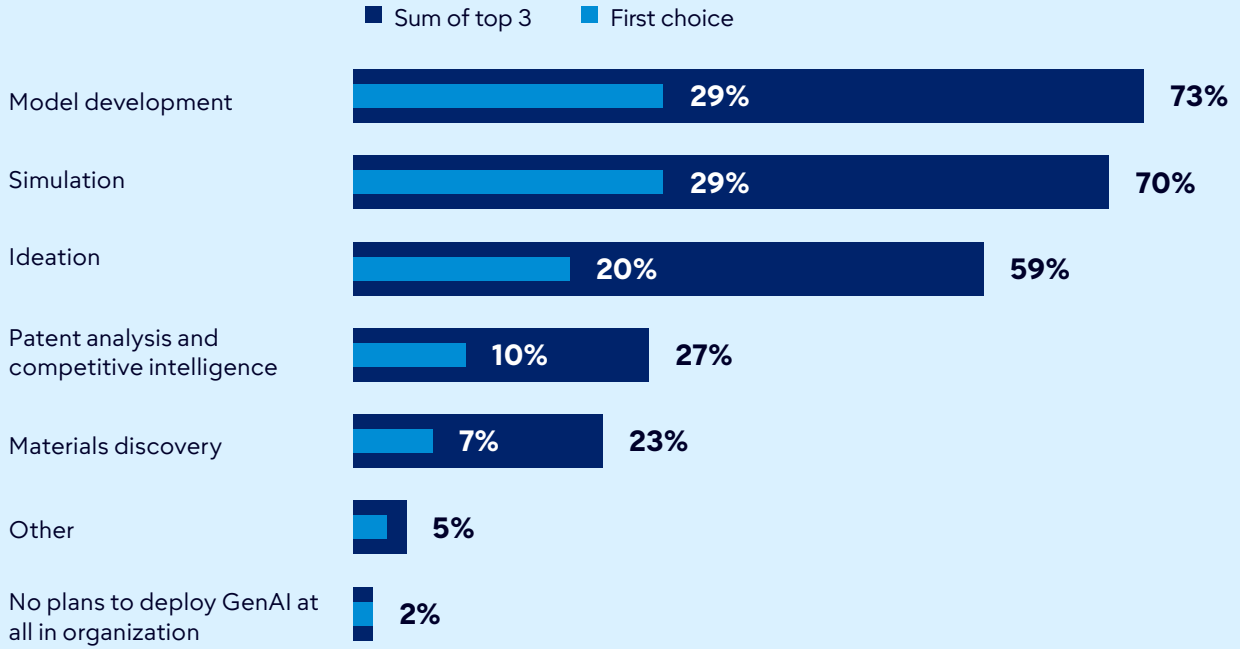
The biggest early wins from AI in R&D are coming from efficiency enablers: automating literature reviews, patent scans and simulation prep. But the biggest long-term gains won't come from eliminating drudgery; they'll come from augmenting human creativity. AI will help scientists design better, explore more boldly and optimize products in ways that were previously impossible.

The pace of AI integration depends on the current maturity of your R&D organization. Teams with well-integrated data and flexible systems will move faster. Others will need to start by digitizing data assets, improving data quality, breaking down silos and building foundational capabilities.

Despite the promises made by AI vendors, existing R&D environments often can't support scalable, impactful AI. R&D leaders must therefore do their own groundwork to rigorously assess the maturity and velocity of emerging innovations, understand where these technologies sit on the Gartner Hype Cycle™ framework of adoption, and cut through the noise of vendor hype.

GenAI use cases in R&D

Top 3 ranks vs. first choice



n = 164; has R&D organization's use and future plans for generative AI (Q32), excluding not sure/unaware of any generative AI plans for organization
Q. What are the top 3 use cases leveraging generative AI within your organization?
Source: Gartner

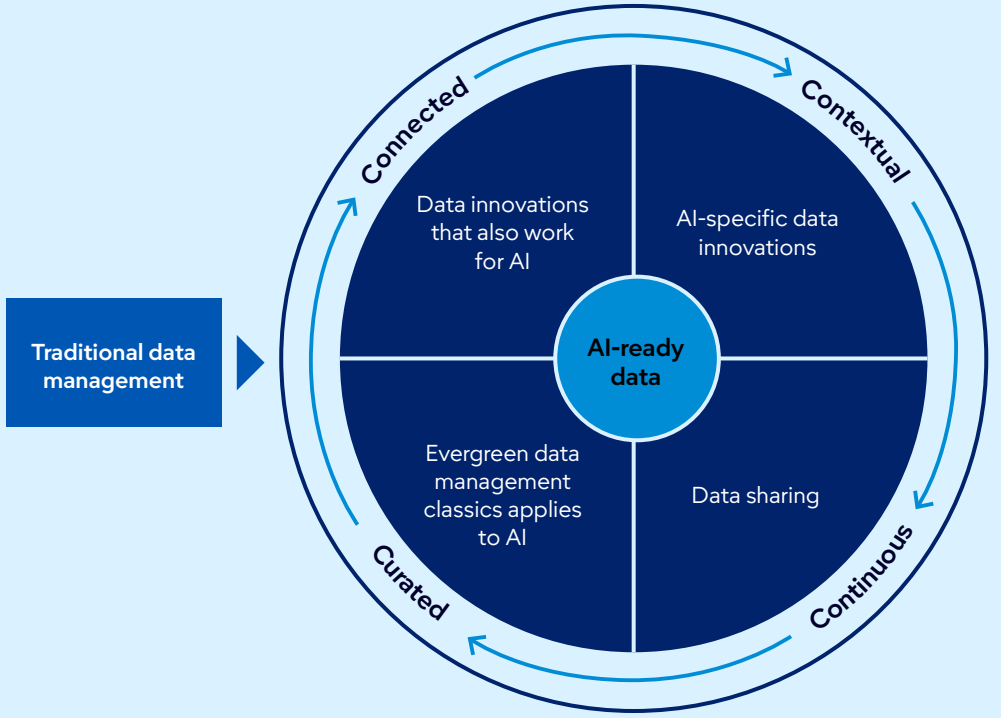
How do we build the R&D data foundation AI needs?

Most R&D teams are still operating with traditional data management strategies never designed for AI. R&D functions are unique in that they're inherently exploratory and their data is often trapped across disconnected systems, making it nearly impossible to fuel modern AI models.

AI can't deliver value in R&D unless the data behind it is usable, trustworthy and protected. But R&D data is different given the abundance of hidden and shadow IT, lack of consistency in format, complex relationships and IP concerns.

AI needs data engineered for learning, simulation and scale, so the focus must shift from siloed, rigid data management to connected, curated, contextual and continuous data management. This involves making metadata active and intelligent; strategically sourcing diverse data, including external and synthetic data, to fill in gaps; diligently preparing data pipelines; and implementing an adaptive, use-case-driven governance framework. This continuous evolution will also require close collaboration between R&D and IT teams.

Evolving from data prep to AI-ready data



Source: Gartner

How do we prepare our R&D talent for the shift in roles and skills that AI is driving without losing expertise or creating resistance?

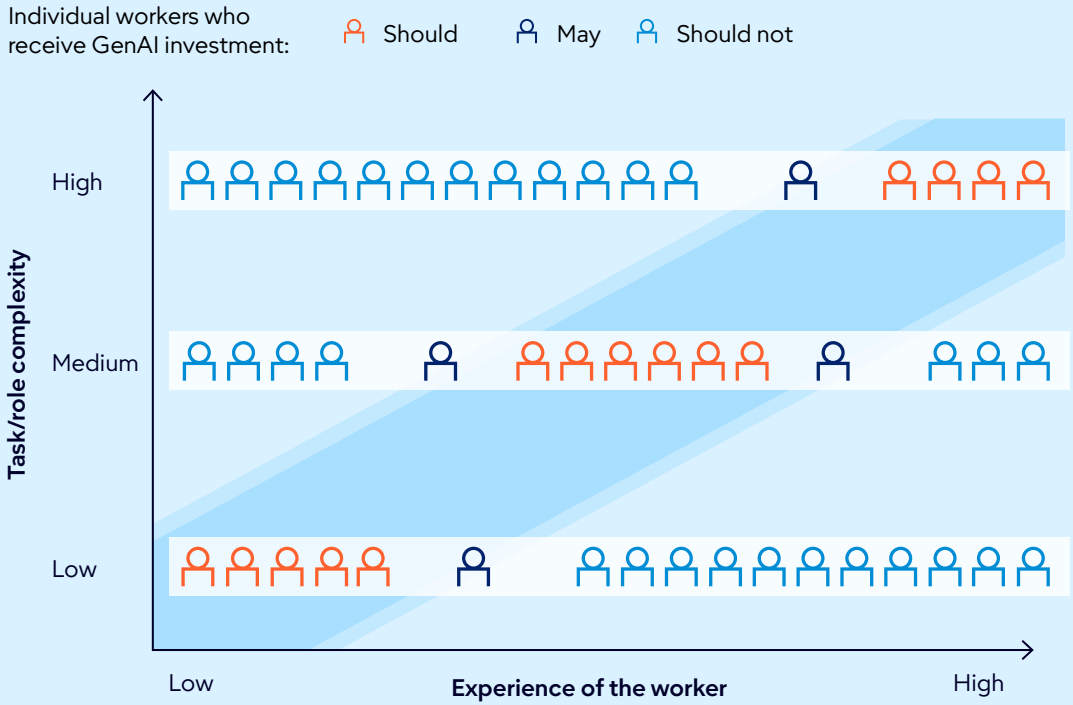
AI requires new skills, and it also changes what R&D roles do. Traditional roles like R&D lab scientist, design engineer and formulation chemist are changing from creators to integrators and validators of AI-generated output.

Shifting roles are having a near-term impact, particularly on entry-level R&D roles. In the longer term, as more R&D staff start roles with more complex tasks, peer-to-peer interactions between experienced and novice staff are reduced, and staff miss out on foundational learning opportunities, leading to long-term skill erosion. R&D leaders must rethink how knowledge is transferred, how mentorship happens and how learning is embedded in AI-augmented workflows.

Preparing R&D talent for AI is also about building trust in technology and the change it brings. Despite high organizational readiness, R&D and product-development employees show low enthusiasm for adopting new technologies, despite having the skills. This disconnect highlights a challenge for R&D leaders: Technical readiness and STEM expertise do not guarantee adoption. R&D leaders must proactively address these concerns through transparent communication, training and upskilling employees, role evolution and change management to ensure AI initiatives are both accepted and impactful.

Where to deploy GenAI to realize productivity gains

Illustrative



Source: Gartner

Actionable, objective insights

Explore these additional complimentary resources and tools on R&D:

Webinar

Improve Productivity and Product Development Using AI in R&D

Develop a comprehensive strategy and roadmap for integrating AI into R&D.

Watch Now

Tool

AI Use Case Insights

Explore, evaluate and prioritize 1,000+ proven AI use cases and real-world case studies.

Learn More

Insights

2026 Top Strategic Priorities for R&D

Navigate 2026 by addressing your top strategic imperatives and associated challenges.

Read Now

How We Help

Gartner for R&D

Explore insights, guidance and tools to enable you to drive growth through product innovation.

Learn More

Already a client? Get access to even more resources in your client portal. Log In ↗

Connect with us

Get actionable, objective business and technology insights that drive smarter decisions and stronger performance on your mission-critical priorities.

U.S.: 1 855 322 5484

International: +44 (0) 3300 296 946

Become a Client

Learn more about Gartner for R&D
gartner.com/en/research-development

Stay connected to the latest insights

Gartner®