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Info Snapshot
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Closing the Infrastructure Gap in Physical AI

More Than 60% of Organizations Have Taken Steps Toward Prescriptive or Autonomous Maturity in Physical AI.



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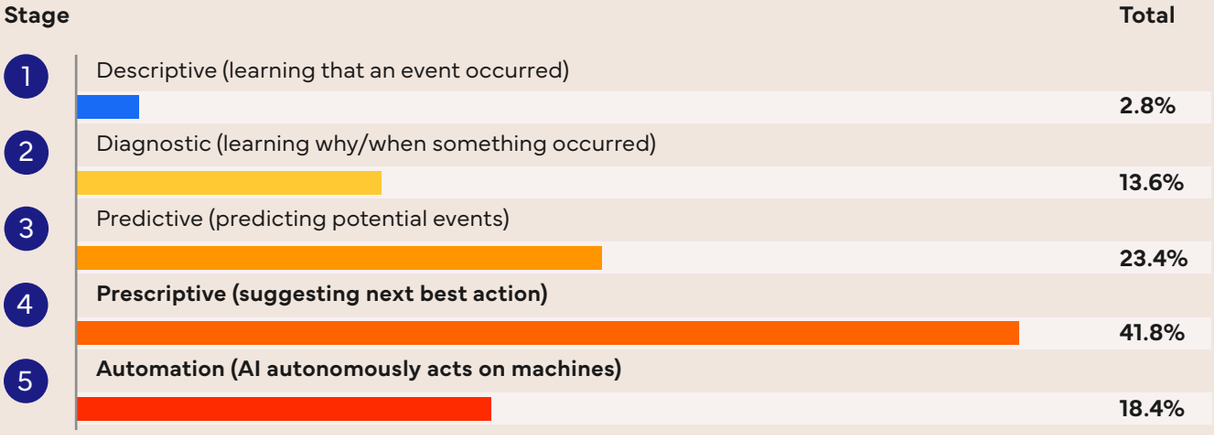
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Physical AI readiness and adoption journey

Which stage most accurately describes where your company is on its IoT journey augmented with AI algorithms today?



n = 603; Base: Industrial sector, director level and above; Source: IDC's *Worldwide IoT Decision-Maker Survey*, December 2025

Key insight:

The largest single group (41.8%) is at Stage 4 (prescriptive), and an additional 18.4% have reached full automation. **Combined, 60.2% of organizations have adopted AI that can either recommend next steps reliably or operate machines autonomously.**

Physical AI is the convergence of real and simulated data and AI algorithms (machine learning, computer vision, natural language processing) with robotics, sensors, and actuators, enabling a system to perceive its environment, reason about it, and act on it in real time.

- **Sensing (the IoT layer):** Cameras, LiDAR, radar, microphones, IMUs, and pressure/proximity sensors feed raw environmental data into the system. Physical AI depends on this IoT foundation to perceive conditions.
- **Reasoning (the AI and cloud layer):** This sensor data runs through ML, deep learning, and neural networks to identify patterns, make decisions, and generate predictions in real time. Onboard compute handles the low-latency inference and actuation demands; however, cloud computation is what trains and continually retrains those models, aggregates data across fleets of devices, and runs the heavier reasoning workloads too costly or slow to run at the edge, making the cloud the backbone that makes each local decision smarter over time.
- **Actuation (the physical output):** Decisions convert into real-world action via motors, robotic arms, wheels, or grippers, closing the loop from sensing through reasoning to physical response.

The accompanying figure illustrates survey respondents' progression across five stages of IoT-plus-AI maturity, ranging from descriptive capabilities, where organizations use data to understand what has already occurred, to automation where AI can independently trigger actions on machines without human intervention.

IDC data shows that adoption rises steadily through Stage 3, peaks at Stage 4, and declines at Stage 5, reinforcing the report's central finding: **A majority of organizations are at the cusp of deploying fully autonomous machines. A significant minority (18.4%) have already achieved this level of automation with AI.**

This progression also reflects an organization's readiness for physical AI, where intelligent machines, robots, and autonomous systems depend on the ability to safely sense, reason, and act in real time.

A minority of the market is still analyzing, not acting

Only 2.8% of organizations identify as being at Stage 1, where they are focused on understanding that an event has occurred. Another 13.6% have progressed to Stage 2, using AI to diagnose the causes, conditions, and timing behind those events. Nearly one-quarter (23.4%) have reached Stage 3, applying AI to predict potential outcomes before they occur.

Together, 39.8% of respondents remain focused primarily on analysis and prediction. These organizations have invested in foundational capabilities, including sensors, data pipelines, and AI models (incorporating computer vision, generative AI, and physical AI) needed to gain visibility and anticipate operational changes. These organizations need to take the next step toward more meaningfully employing AI in automated, real-time action.

The center of gravity: prescriptive AI

The largest share of respondents (41.8%) place themselves at Stage 4 (prescriptive), making it the dominant category for IoT-plus-AI maturity. At this stage, AI goes beyond monitoring and prediction to recommend the next best action, whether that means adjusting a process parameter, scheduling equipment maintenance, or optimizing production workflows.

This level of adoption shows meaningful progress beyond dashboards and alerts toward AI-assisted operational decision-making. While organizations are increasingly using AI to guide decisions, execution still largely depends on human validation and intervention rather than fully autonomous action.

The trend toward full automation

A significant minority, 18.4% of respondents, report reaching Stage 5, in which AI can autonomously execute actions on machines without human intervention. **In other words, more than 60% of organizations have made headway in closing the loop between AI-generated insights and autonomous execution by robots.**

The transition from Stage 4 to Stage 5 represents more than a technical milestone. It requires that organizations in Stage 4 are well positioned to achieve full automation in physical AI. They need to establish confidence in AI decision-making through robust governance, reliable models, resilient infrastructure, and clearly defined operational safeguards.

Looking ahead: Enabling physical AI with cloud services

As organizations expand investments in robots, humanoids, autonomous vehicles, drones, and other physical AI embodiments, the ability to move from AI-generated recommendations to trusted autonomous execution will become increasingly important. This is where cloud services become essential.

For robot builders, cloud and AI infrastructure provide the necessary underlying compute, storage, managed services, and workflows. For robot buyers, cloud and AI infrastructure form the layer upon which their robots run in production, get updated (software), and provide data back to the robot builder for optimizing AI models further. It takes a tremendous amount of underlying infrastructure and managed services to collect real-world and simulated data at scale, update a robot model or policy, and run evaluations to meet performance benchmarks. This includes workflows for video synthetic data generation, robot policy training, and evaluations as a service; services for Kubernetes and Slurm orchestration; and GPU-accelerated compute for world, vision-language-action, and other AI models. Organizations that establish these cloud foundations today will be better positioned to scale the next generation of autonomous machines.

Key takeaways

- More than 60% of organizations have made progress in closing the infrastructure gap in physical AI. They are already using AI to provide prescriptive guidance or enable autonomous operations.
- The next phase of physical AI adoption depends on advancing AI models and robotics for unstructured environments. This requires massive amounts of compute, storage, networking, managed services, and operational safeguards to deploy trusted robots at scale.
- Closing the gap from Stage 4 to Stage 5 increasingly depends on the customer's specific needs and infrastructure. As customers approach full autonomy, use cases will be tailored to areas that benefit most from instant data analysis, self-directed decision-making, and self-learned behaviors. Beyond just using robot hardware, Stage 5 operations require cloud infrastructure to train, simulate, and measure intelligence that augments the human in the loop.

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Message from the sponsors

Nebius and NVIDIA are scaling the cloud to meet the surging global demand for intelligence. Nebius capabilities, powered by NVIDIA, automate workflows for every stage of the data flywheel in physical AI. Learn more about the full-stack cloud from Nebius at nebius.com/solutions/phy.

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