451 Research Discovery Report

April 2025

The state of datacenter modernization in an AI-driven world

Commissioned by

S&P Global
Market Intelligence

AMD

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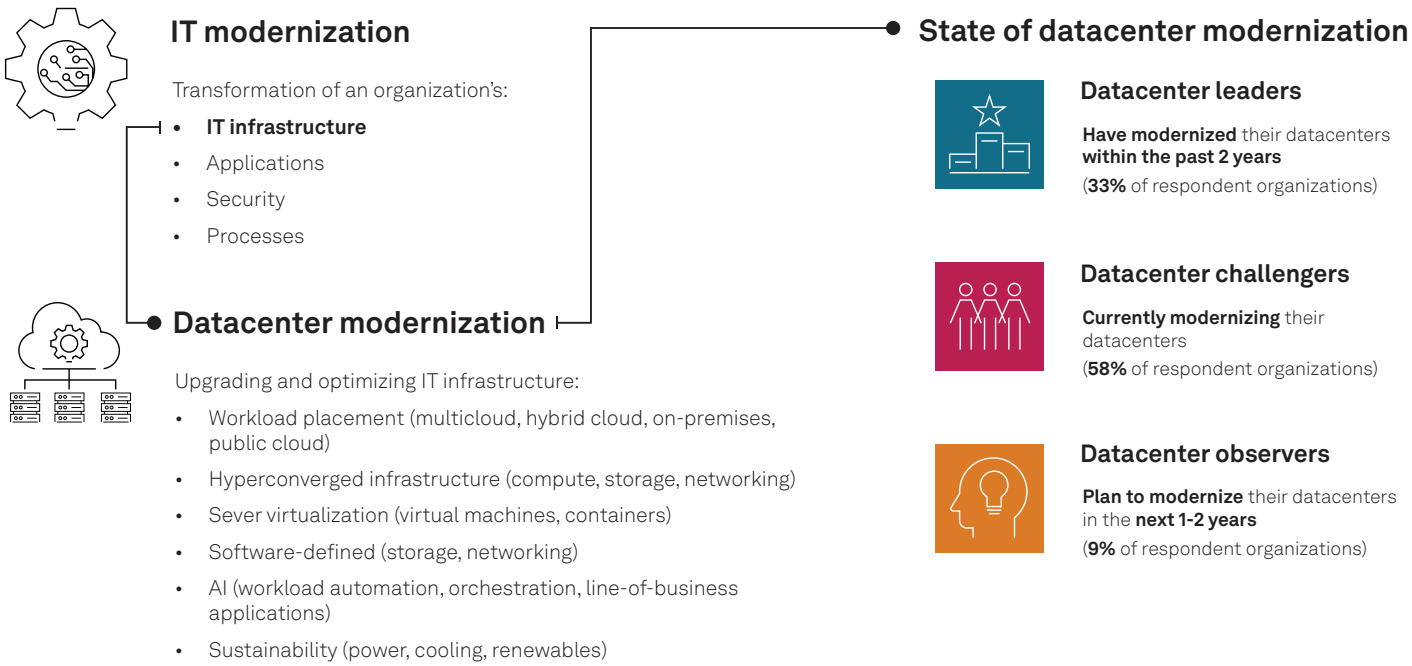
Introduction

Technological forces, particularly those related to AI, are reshaping markets and redefining competitive landscapes. The success of AI and other digital transformation initiatives depends upon the capabilities of the underlying IT infrastructure.

Modernizing IT and datacenter infrastructure has become a top strategic priority as organizations scale their technology deployments, manage vast volumes of data and meet increasing computational demands. AI-driven workloads are intensifying pressure on existing systems, necessitating more scalable, high-performance and efficient infrastructure solutions.

Figure 1: Defining datacenter modernization in 2025



Q. Which of the following best describes your organization's current or planned approach to modernizing its datacenter infrastructure?
Base: Organizations that do not run all workloads in cloud (n=1,217).
Source: S&P Global Market Intelligence 451 Research datacenter modernization survey commissioned by AMD.

One-third of surveyed organizations are leading the way in datacenter modernization, having already completed the process. The remaining two-thirds are either actively modernizing or planning to do so. In this report, we have segmented the datacenter modernization landscape into three key categories:

- **Datacenter leaders (33%)** – Organizations that have fully modernized their datacenters within the past two years.
- **Datacenter challengers (58%)** – Organizations currently undergoing datacenter modernization.
- **Datacenter observers (9%)** – Organizations planning to modernize their datacenters within the next two years.

Significant gaps exist between these groups. For example, 51% of datacenter challengers feel very ready to modernize, compared to just 17% of datacenter observers. Throughout this report, these categories serve as a maturity framework and benchmark to analyze key differences in workload mix, organizational readiness, technology strategies and AI adoption, among other factors.

This research, commissioned by AMD and conducted by S&P Global Market Intelligence 451 Research, is based on a survey of 1,229 IT infrastructure and AI/ML decision-makers and influencers with management responsibilities.

Key findings

1. Organizations place increasing emphasis on the location and mix of IT workloads because these factors have a growing impact on strategic initiatives such as AI, as well as the top and bottom lines. Datacenter leaders rely less on cloud than the survey-wide sample, with slightly greater usage of edge locations (2% higher than the survey average) and significantly greater use of colocation environments (9% higher than average).

2. Half of leadership-level respondents say their organization has successfully modernized its datacenter infrastructure in the past two years, which reflects a more optimistic outlook compared to directors (31%) and managers (17%). This disparity suggests a significant disconnect across the organizational hierarchy regarding datacenter modernization.

3. Further evidence of this organizational disconnect is seen in perceptions of IT and environmental systems. For example, 39% of leadership-level respondents report that networking equipment has been upgraded in the past two years, compared to 33% of directors and only 24% of managers.

4. Among datacenter leaders — organizations that have already modernized infrastructure and are reaping the benefits of AI — 64% say their infrastructure is fully adequate to support AI plans, and they have, on average, 9.2 AI application types in use (out of 16 possible options in the survey).

5. While datacenter leaders are leveraging their first-mover advantage, they face outsized challenges in cloud adoption, IT and environmental systems and organizational alignment stemming from perception gaps. Their rapid pace of modernization has exposed pitfalls, creating an opportunity for datacenter challengers and observers to learn from their missteps and close the competitive gap.

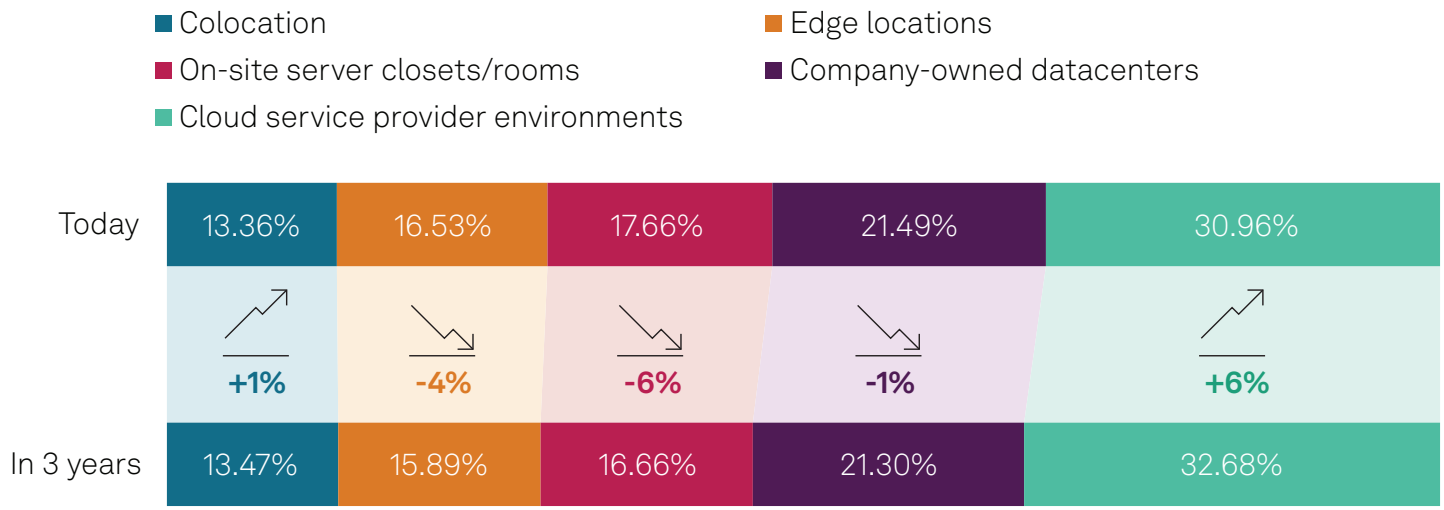
Most workloads remain outside of cloud

The cloud remains the dominant single workload venue, yet most applications remain in other IT environments, including colocation facilities, company-owned datacenters, edge locations and on-site server rooms. These can be defined as:

- **Cloud service provider environments:** Computing services including infrastructure as a service, platform as a service and software as a service delivered via the internet and allowing organizations to manage resources without ownership of physical IT infrastructure.
- **Company-owned datacenters:** Physical facilities owned and operated by an organization that include IT infrastructure such as servers and networking equipment.
- **On-site server closets/rooms:** Smaller, controlled and localized IT environments on company premises.
- **Edge locations:** Datacenters or other IT infrastructure in proximity to users such as in offices, retail spaces or warehouses.
- **Colocation:** Leased space in third-party operated datacenters leveraging provided IT infrastructure and environmental systems.

This workload distribution is expected to remain largely stable in the near term. Cloud service provider environments are projected to experience a modest increase from 31% of workloads today to 33% in three years. This may be alternately calculated and described as a 6% net increase (final value – initial value / initial value). Slight declines are anticipated in company-owned datacenters, on-site server closets and edge locations. Workload allocation to colocation environments is expected to grow slightly, reflecting a shift in workload placement strategies.

Figure 2: Workload mix: Today and in three years



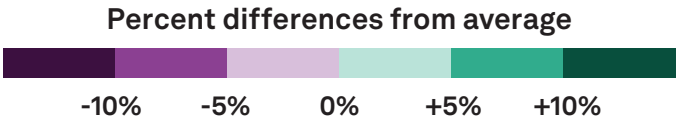
Q. What percentage of your workloads — referring specifically to the distribution of virtual machines (VMs), applications, or instances across various operational venues — currently run in the following venues?
Base: All respondents (n=1,229).
Source: S&P Global Market Intelligence 451 Research datacenter modernization survey commissioned by AMD.

These trends underscore the reality that certain applications are — and will remain — better suited for on-premises environments rather than the cloud. Key factors driving this preference include migration complexity, cost predictability, existing infrastructure investments, mission-critical latency requirements, operational risk, compliance, data security, performance needs and customization.

Notably, respondents with 45% or more of their workloads in centralized IT environments (colocation + company-owned datacenters) report higher adoption of compute- and latency-sensitive AI applications compared to organizations that are cloud-heavy (60%+ workloads in cloud environments).

Figure 3: Workload mix by maturity

Environment	Average	Datacenter leaders	Datacenter challengers	Datacenter observers
Cloud service provider	**30.96%**	29.98%	31.14%	26.26%
Company-owned datacenters	**21.49%**	21.16%	21.82%	21.51%
On-site server closets/rooms	**17.66%**	17.45%	17.49%	22.19%
Edge locations	**16.53%**	16.80%	16.49%	17.46%
Colocation	**13.36%**	14.62%	13.07%	12.59%



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Surprisingly, datacenter challengers report a slightly higher percentage of workloads in cloud service provider environments (just over 31%, or just under 1% above average) compared to datacenter leaders (just under 30%, or 3% below average). However, datacenter challengers' cloud workload placement remains significantly higher than that of datacenter observers (just over 26%, or 15% below average).

Datacenter leaders demonstrate slightly above-average usage of edge locations (2% higher than average) and a significantly greater reliance on colocation environments (9% above average). In contrast, datacenter observers report a substantially higher-than-average proportion of workloads in on-site server closets and rooms (26% above average), highlighting a more traditional infrastructure approach compared to their counterparts.

Datacenter leaders select edge and colocation

Datacenter leaders report slightly higher use of edge locations (2% higher than average) and significantly greater use of colocation environments (9% higher than average).

Modernization obstacles, budget and strategy

Figure 4: Obstacles to aligning datacenter modernization strategy with broader organizational goals

Q. What are the primary obstacles your organization faces in aligning your datacenter modernization strategy with broader organizational goals?
Base: All respondents (n=1,229).
Source: S&P Global Market Intelligence 451 Research datacenter modernization survey commissioned by AMD.

Datacenter modernization presents a complex landscape of challenges spanning operational, strategic, financial, vendor and organizational domains. Key business risks associated with mission-critical applications include potential data loss, security vulnerabilities, service disruptions, operational downtime and increased implementation costs.

A significant perception gap exists regarding datacenter modernization, indicating a misalignment between IT and business goals. This is often rooted in differing priorities, a lack of IT understanding of business needs and poor communication between IT and business teams.

Datacenter observers face budget challenges

Datacenter observers' most significant obstacle to aligning datacenter modernization with organizational goals is a limited budget for strategic initiatives (18%) — cited at a higher rate than among datacenter leaders (11%) and datacenter challengers (10%).

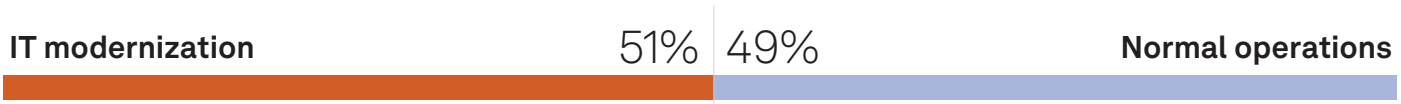
Quantifying the return on investment for modernization projects is challenging due to their multifaceted nature. While initial capital expenditures (hardware, infrastructure), migration (integration, downtime) and operating expenditures (operations and maintenance, software subscriptions) are relatively straightforward, assessing the benefits or business value is more complex. Benefits can include:

- **Workforce productivity:** Increased IT efficiency, reduced operational overhead
- **IT infrastructure:** Reduced downtime, improved workload efficiency
- **IT footprint:** Lower real estate costs
- **Sustainability:** Reduced energy consumption, more efficient power and cooling
- **Growth:** Faster time to market, enhanced scalability, rapid feature deployment
- **Risk mitigation:** Reduced cybersecurity, brand and operational risks, minimized regulatory penalties

Notably, organizational and workforce-related challenges such as a lack of skilled resources or resistance to change are less prominent concerns.

IT decision-makers face significant challenges in budget allocation, balancing the demands of routine operations with the need for IT modernization. While the budgetary differences between these areas may appear minimal, shifting by even a few percentage points can translate to substantial financial implications, often amounting to millions of dollars.

Figure 5: Average annual IT budget split



IT modernization includes investments aimed at improving or transforming IT capabilities:

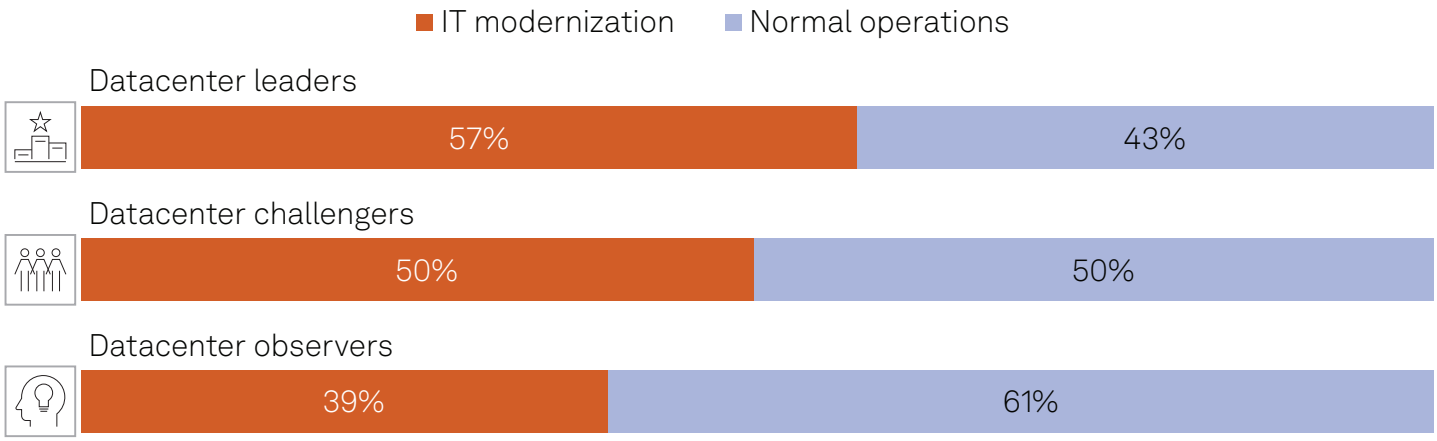
- Upgrading or replacing legacy systems
- Cloud migration
- Digital transformation initiatives, adopting new technologies (e.g., AI/ML, automation)
- Implementing new software solutions enhancing IT infrastructure to support growth and innovation.

Normal operations include the ongoing costs required to maintain and operate current IT infrastructure:

- Hardware and software maintenance
- Day-to-day support services
- Network management
- Security operations
- IT staff salaries

Q. What percentage of your overall annual IT budget is dedicated to IT modernization efforts, versus normal operations?
Base: All respondents (n=1,229).
Source: S&P Global Market Intelligence 451 Research datacenter modernization survey commissioned by AMD.

Figure 6: Annual IT budget split by maturity



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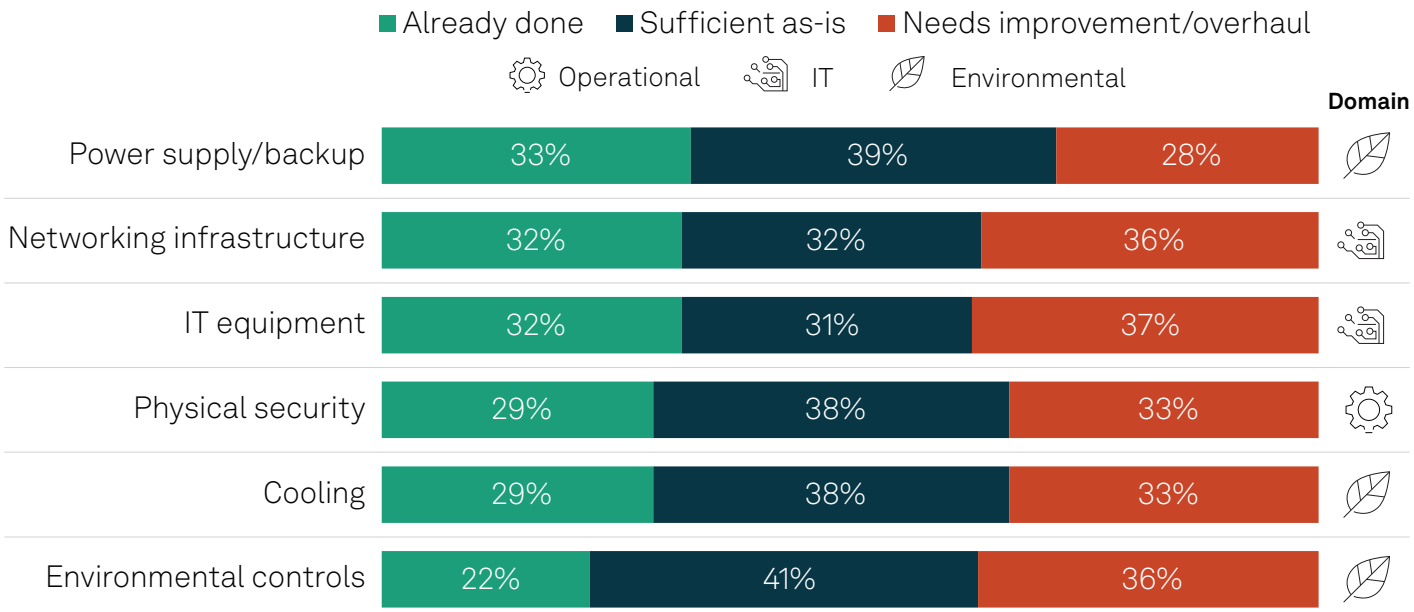
Base: All respondents (n=1,229).
Source: S&P Global Market Intelligence 451 Research datacenter modernization survey commissioned by AMD.

The most substantial variance in responses to the budget question manifests among maturity groups. Datacenter leaders, allocating 57% of their budget to IT modernization, are likely making greater investments in digital transformation initiatives, software upgrades to their IT infrastructure and AI initiatives. In contrast, datacenter observers tend to focus their budget on maintaining current systems. Datacenter leaders, with their more modernized and self-sufficient infrastructure, can allocate greater time and resources to innovation, further distancing themselves from their competitors.

Figure 7: A mix of strategies for datacenter infrastructure systems



Q. How would you evaluate the capability of your organization's datacenter infrastructure to accommodate changes across all locations?
Base: Organizations that do not run all workloads in cloud (n=1,217).
Source: S&P Global Market Intelligence 451 Research datacenter modernization survey commissioned by AMD.

A significant portion of the IT modernization budget is often allocated to specific datacenter infrastructure systems. These investments can be substantial, especially when considering the variety of IT and environmental systems within an organization's IT estate.

Each category presents opportunities to implement emerging trends and technologies. Environmental systems are increasingly adopting innovations such as liquid and immersion cooling, AI and IoT-enabled thermal management and more sustainable power sources, including wind, solar, hydrogen and heat reuse. Additionally, datacenter infrastructure management (DCIM) tools are being used to monitor and optimize energy consumption and cooling efficiency.

On the other hand, IT systems must adapt to the growing demands of AI workloads, distributed IT environments, hybrid cloud and edge computing, cloud-native applications, zero-trust cybersecurity and high-speed networking.

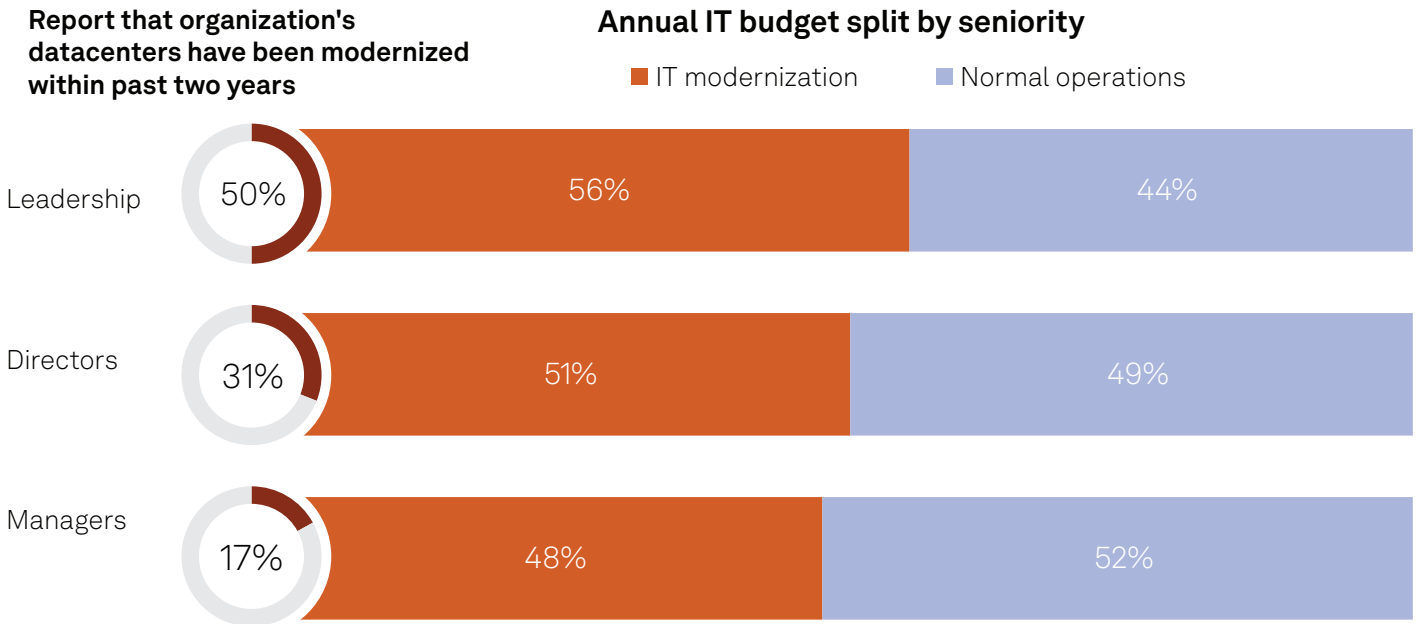
In terms of sufficiency, environmental systems are slightly more likely to be deemed adequate compared to IT and operational categories, led by environmental controls (41%), power supply/backup (39%) and cooling systems (38%). Environmental systems play a crucial role in maintaining optimal operating conditions in datacenters, including the power supply for IT equipment such as servers and switches.

Modernization, datacenter and AI perceptions vary across the organizational hierarchy

The survey reveals significant variations in responses based on respondents' seniority. Strikingly, half of the leadership group report that their organization successfully modernized its datacenter infrastructure in the past two years, much higher than among directors (31%) and managers (17%).

This perception gap is consistent across various topics, as leadership (including C-level executives) exhibit a more favorable outlook and report more mature technology programs. In contrast, directors and managers express greater skepticism regarding their organizations' projects and identify more substantial challenges. This discrepancy is somewhat understandable; leadership typically has a broader view of all projects, while managers are more focused on daily operations and the associated difficulties. However, misalignment between organizational and IT goals and a lack of shared clarity regarding the true state of an enterprise's IT estate may result in significant challenges.

Figure 8: Perceptions regarding modernization and budget differ by seniority



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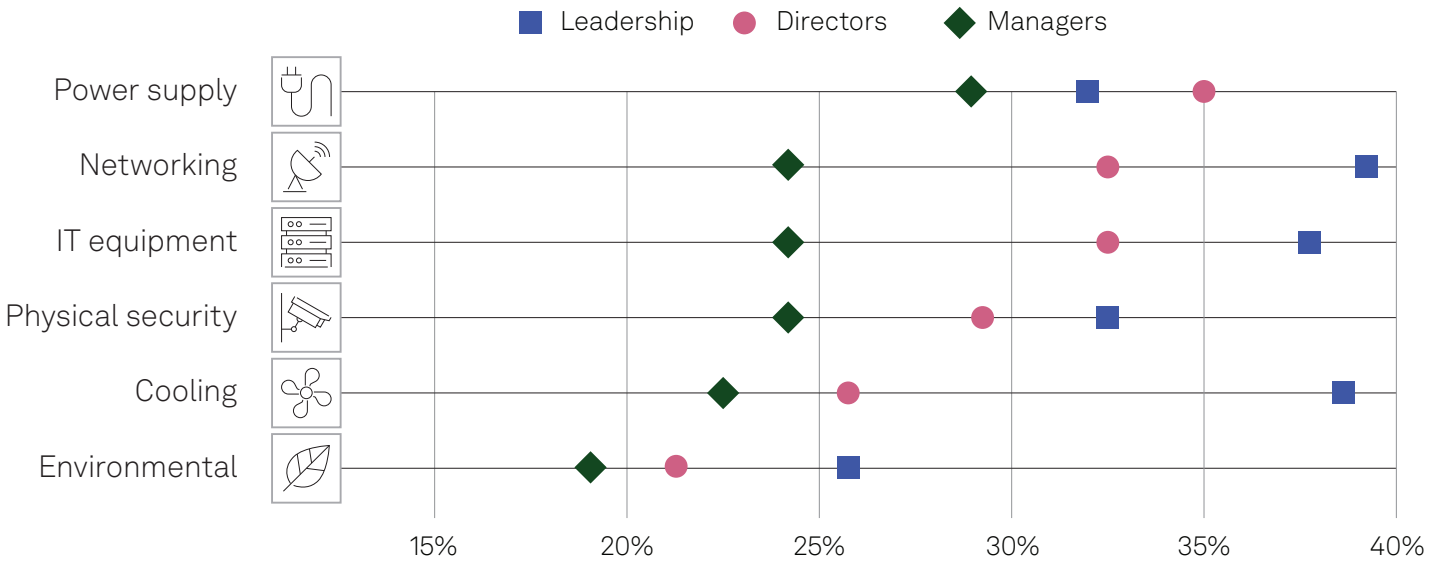
Q. What percentage of your overall annual IT budget is dedicated to IT modernization efforts, versus normal operations?
Base: All respondents (n=1,229).
Source: S&P Global Market Intelligence 451 Research datacenter modernization survey commissioned by AMD.

We note substantial variance across the organizational hierarchy in responses regarding IT budget allocation. This disparity may be attributed to the fact that managers' daily responsibilities and budgets often center on support, operations and maintenance of IT systems, whereas leadership tends to prioritize long-term, substantial investments in the physical IT footprint.

Perceptions of which IT and environmental systems have recently been improved also vary significantly by seniority. For instance, 39% of leadership-level respondents report that networking equipment has been upgraded in the past two years, compared to 33% of directors and only 24% of managers. While one might expect alignment within the IT organization regarding tangible investments and improvements, a notable divergence in perspectives persists across the board.

Figure 9: Perception gap regarding datacenter infrastructure elements 'improved in past few years'



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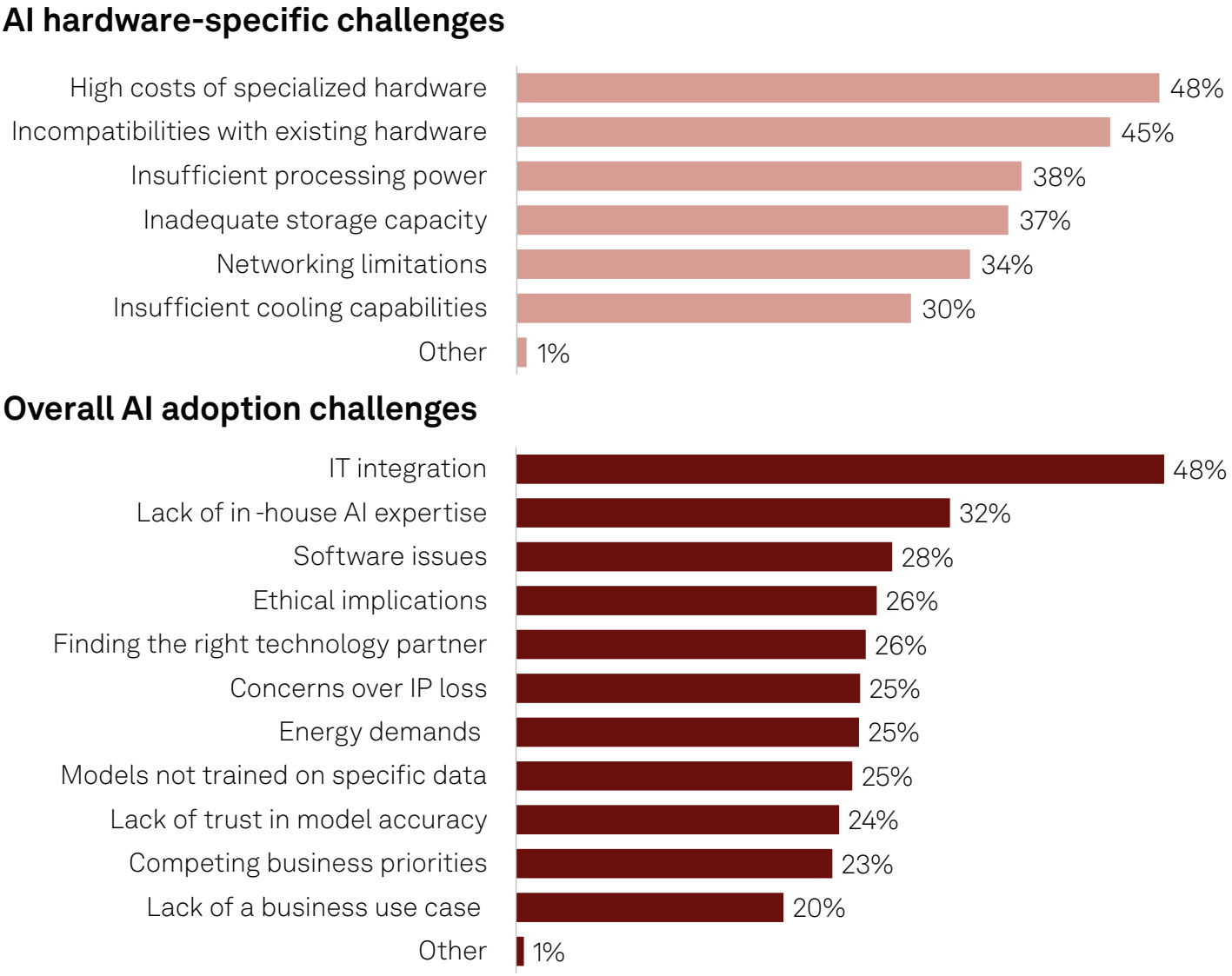
This disconnect may stem from perceptions among managers — those who interact with and manage these systems daily — that improvements have not reached an adequate level. Such misalignment could lead to significant issues if lower-level managers anticipate upgrades to critical infrastructure systems that leadership does not plan to address.

AI challenges and vendor requirements

Current challenges surrounding IT infrastructure and AI hardware have emerged as a global concern. Graphics processing units (GPUs), tensor processing units (TPUs) and specialized AI accelerators are not only expensive but also in short supply and pose significant energy consumption challenges.

Figure 10: Challenges to AI adoption



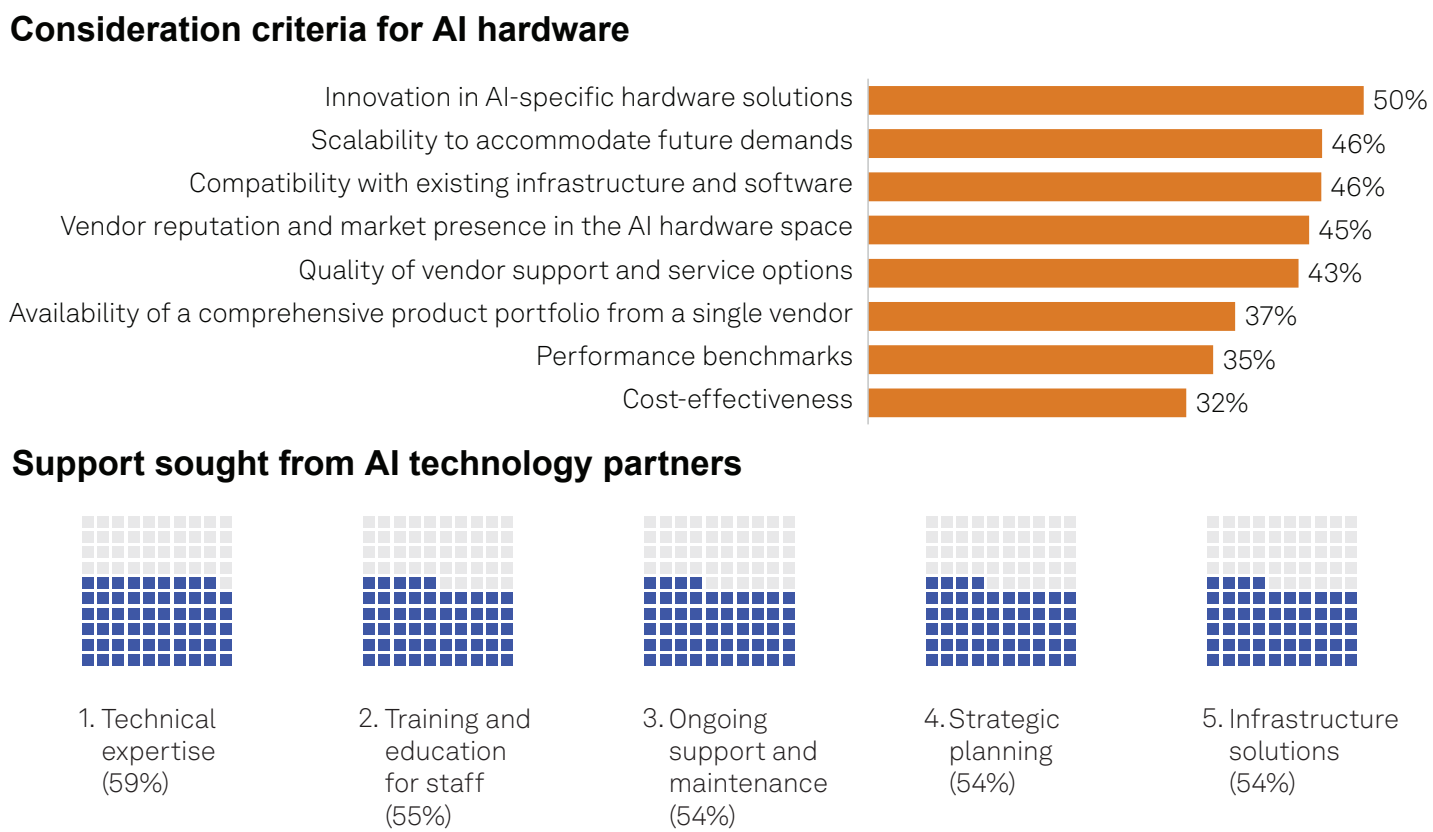
Q. What specific hardware challenges has your organization encountered while implementing AI solutions? Base: Organizations that do not run all workloads in cloud (n=1,217).
Q. What is the biggest challenge(s) your organization faces with respect to AI adoption? Base: All respondents (n=1,229).
Source: S&P Global Market Intelligence 451 Research datacenter modernization survey commissioned by AMD.

High costs for specialized hardware (48%) represent the leading hardware-related challenge in implementing AI solutions. These costs encompass both initial capital expenditures necessary to scale up clusters for AI training and inference and ongoing operational expenses required to support these power-hungry processors. Challenges associated with energy consumption evidently compound with scaled out AI infrastructure: Datacenter leaders cite insufficient cooling as a challenge at a higher rate than datacenter challengers and datacenter observers.

Another significant challenge, cited by 45% of respondents, is the incompatibility of AI hardware with existing systems. This issue arises at least in part from the proprietary technologies, architectures (such as memory and data throughput), and closed ecosystems (including AI frameworks, libraries and software development kits) that different AI hardware providers employ, which complicates efforts to maintain interoperability and interconnectivity.

Similarly, IT integration (48%) is the most commonly reported challenge to AI adoption, outpacing other technical, organizational, vendor and sustainability issues. Lack of in-house AI expertise (32%) is a distant but notable second challenge as organizations struggle to recruit talent and develop an internal skill base for the sought-after but scarce AI skillset. Datacenter leaders (28%) are less likely to report in-house skills shortage as a challenge compared to datacenter challengers (34%) and datacenter observers (31%).

Figure 11: Hardware features and partner support desired for AI initiatives



Q. What criteria do you consider when selecting hardware vendors for your AI projects? Base: Organizations that do not run all workloads in cloud (n=1,217).
Q. What type of support do you seek from technology partners to enhance your AI initiatives? Base: All respondents (n=1,229).
Source: S&P Global Market Intelligence 451 Research datacenter modernization survey commissioned by AMD.

To address these challenges, organizations are increasingly seeking external support from technology providers, systems integrators, consultancies and other partners.

When contemplating hardware for AI projects, innovation in AI-specific hardware (50%) tops organizations' wish list. This innovation encompasses various factors, including performance (floating-point operations per second [FLOPS]), efficiency (power consumption), accelerators (GPUs, TPUs), customization (application-specific integrated circuits [ASICs], field-programmable gate arrays [FPGAs]), latency, architectures and software capabilities.

The exponential growth of AI models and the processor clusters required for training and inference has made scalability (46%) a top-cited capability for AI hardware. This scalability includes the flexibility to run AI workloads across multiple environments — such as on-premises, in the cloud, at the edge and in hybrid architectures — and the ability to support a diverse range of AI applications with varying requirements.

Different challenges for datacenter leaders

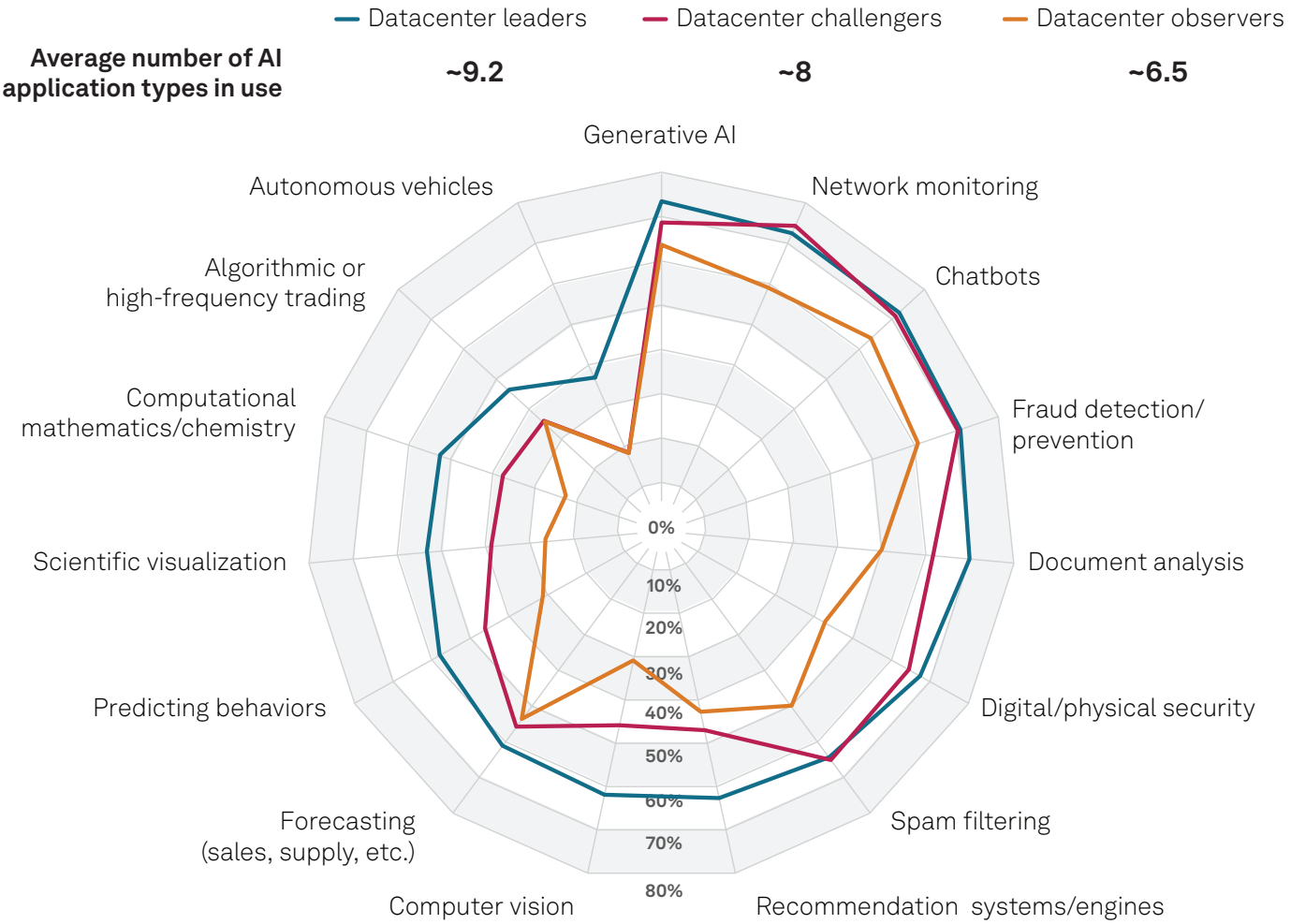
Datacenter leaders report high cost of specialized AI hardware (43%) and incompatibilities (43%) as equally challenging; they report insufficient cooling capabilities (37%) as a challenge more frequently than datacenter challengers (27%) and datacenter observers (21%).

The aforementioned scarcity of in-house AI expertise is driving many organizations to seek external technical support (59%). Additionally, there is strong demand for upskilling opportunities through training and education for existing staff. Organizations are increasingly seeking a comprehensive range of support from partners, with only marginal differences in responses regarding the types of support sought. These include ongoing maintenance, strategic planning and infrastructure solutions.

Datacenter leaders show stronger appetite, preparedness and enthusiasm for AI

The benefits of enhanced datacenter modernization extend beyond IT infrastructure, impacting the broader business. Datacenter leaders demonstrate broader adoption of AI applications compared to their counterparts: Datacenter leaders report 9.2 AI application types in use, on average, out of 16 options in the survey, versus 8 for datacenter challengers and 6.5 for datacenter observers.

Figure 12: AI application types in use by maturity



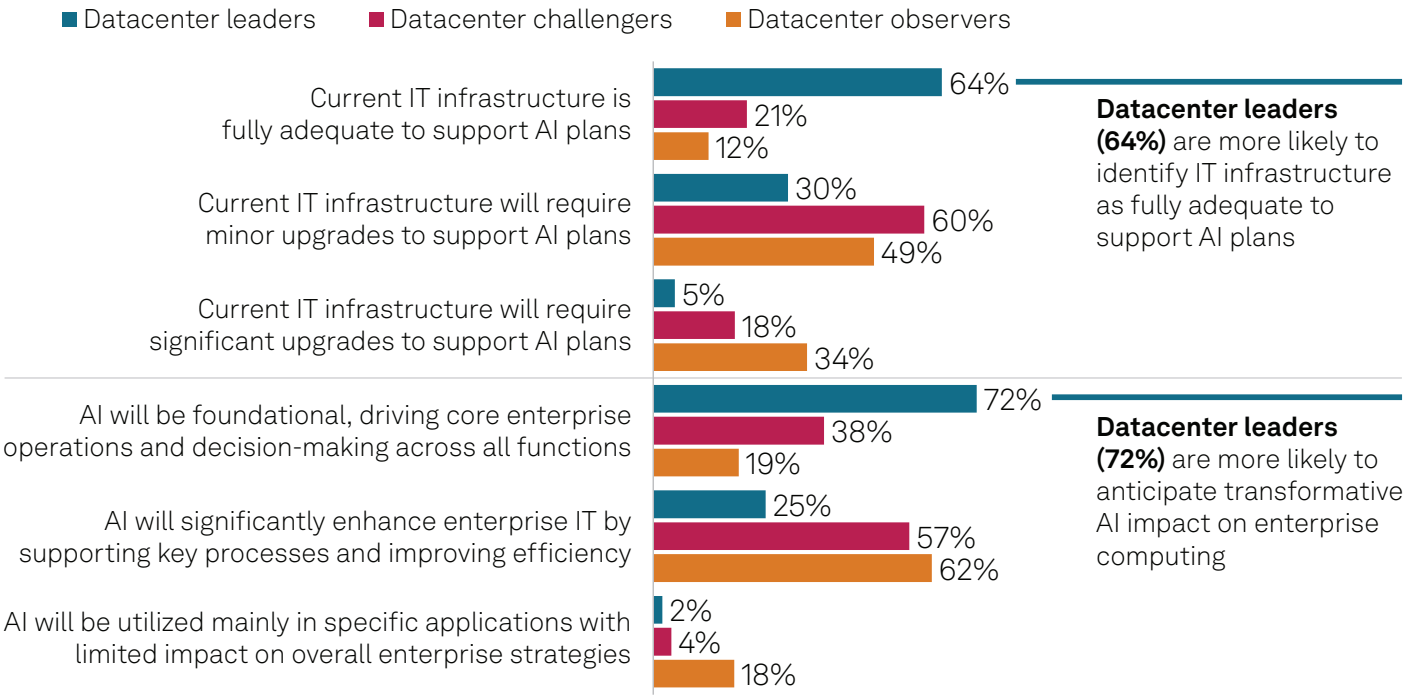
Q. Which AI/ML applications are you currently using, and which ones do you intend to use in the next two years?
Base: All respondents (n=1,229).
Source: S&P Global Market Intelligence 451 Research datacenter modernization survey commissioned by AMD.

The gap between datacenter leaders and datacenter challengers is relatively narrow for IT-oriented applications such as network monitoring, fraud detection/prevention, digital/physical security and spam filtering. However, the gap widens significantly for line-of-business and department-specific AI applications, many of which operate in latency-sensitive and compute-intensive environments, including computer vision, scientific visualization and computational mathematics.

When it comes to funding AI projects, datacenter leaders are more impacted by the availability of external funding or strategic partnerships for their AI initiatives, with 42% reporting this challenge compared to 32% of datacenter challengers and 31% of datacenter observers. All three groups are affected by company-wide cost-saving initiatives or financial pressures, with 32% of datacenter leaders citing this issue, compared to 29% of datacenter challengers and 28% of datacenter observers. Overall, AI budgets are becoming a more significant part of IT expenditures; 64% of respondents classify the AI budget as part of the broader IT budget.

Datacenter leaders are leveraging the advanced maturity of their IT infrastructure to support the growing number of AI applications across their organization. Nearly two-thirds (64%) report that their IT infrastructure is fully adequate to support AI plans, compared to 21% of datacenter challengers and 12% of datacenter observers. This substantial advantage is further compounded by the costly challenges associated with AI hardware procurement and numerous other technical, organizational and strategic obstacles that inhibit organizations from rapidly scaling up AI applications.

Figure 13: Datacenter leaders better prepared and more optimistic regarding AI



Q. To what extent is your current IT infrastructure (networking, servers, storage, etc.) sufficient to support your company's planned AI initiatives?
Q. How do you perceive the future role of AI in enterprise computing?
Base: All respondents (n=1,229).
Source: S&P Global Market Intelligence 451 Research datacenter modernization survey commissioned by AMD.

While innovations such as those represented by DeepSeek may reduce the infrastructure requirements and barriers to ramp-up AI applications, organizations with inferior infrastructure will hit ceilings for their AI projects as applications require high-quality and innovative systems throughout the IT stack. Such bottlenecks can include lower-performing processors prolonging AI model training tasks, sub-optimal storage incapable of supporting the real-time processing of some AI applications, and limited-bandwidth networking infrastructure incapable of quickly transferring large amounts of data.

Conclusion

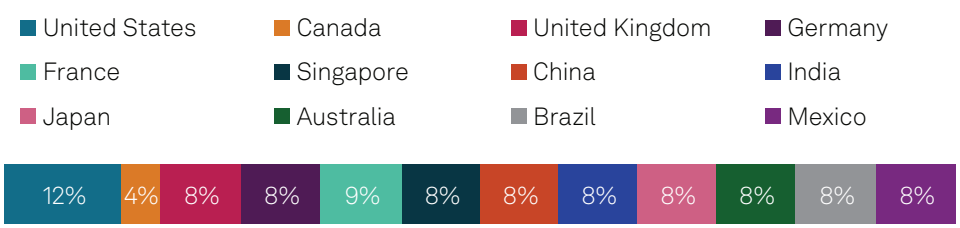
Datacenter leaders are leveraging their first-mover advantage to drive business-altering digital transformation and market-shaping AI initiatives. However, the realities of cloud deployment hurdles, dissatisfaction with existing IT and environmental systems, and perception gaps across organizational hierarchies create challenges — leaving scar tissue from early adoption by datacenter leaders and providing valuable lessons for datacenter challengers and observers.

True IT modernization begins with strategic and tactical alignment to ensure that key stakeholders — including IT teams that manage daily infrastructure operations — are integrated into the planning process. Prioritizing investments with a long-term vision is critical to overcome past challenges and unlock the full potential of next-generation datacenters.

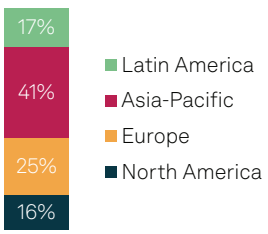
Research firmographics

The findings presented in this report draw on a survey fielded in North America, Latin America, Europe and Asia-Pacific in the first quarter of 2025. The survey targeted 1,229 IT infrastructure and AI/ML decision-makers and influencers, filtering for respondents with management responsibilities. Respondents came from 16 different industries: automotive, biotechnology, e-commerce, energy & utilities, financial services, government (federal and state), healthcare, manufacturing, pharmaceuticals, retail, technology, telecommunications, travel/hospitality, transportation and other. The most common respondent job roles were IT leadership-oriented. This report also draws on contextual knowledge of additional research conducted by S&P Global Market Intelligence 451 Research.

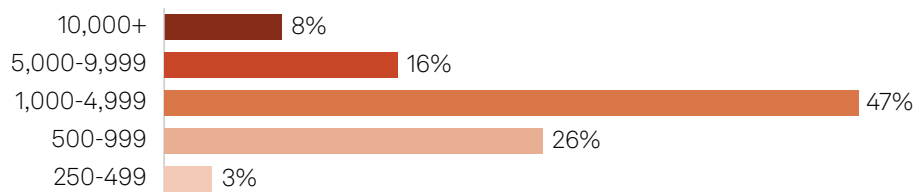
Country



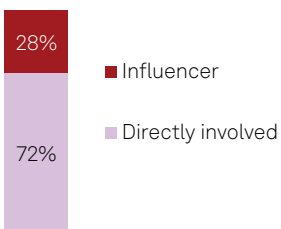
Region



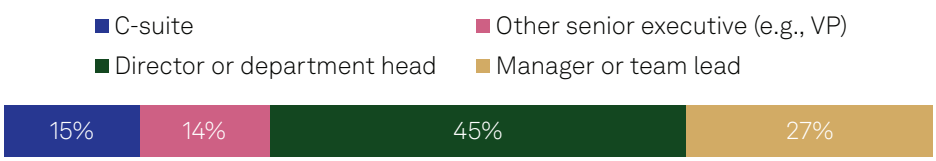
Employee count



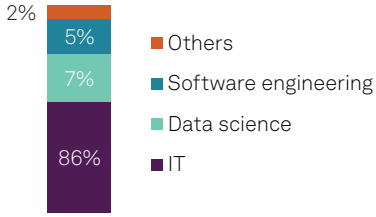
IT infrastructure decision-making



Seniority



Department



About the authors

Dave Immerman

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David Immerman is a consulting analyst at S&P Global Market Intelligence 451 Research. He is responsible for executing on a range of custom research initiatives and development of thought leadership across technology sectors including industrial IoT, digital transformation, edge computing, AI/machine learning and fintech, among others, and verticals such as manufacturing and automotive.

Dan Thompson

Principal Research Analyst

Dan Thompson is a principal research analyst in the 451 Research technology research group within S&P Global Market Intelligence. He leads the Datacenter Services and Infrastructure team, which is charged with keeping tabs on the datacenter industry globally to better understand its trends and growth areas. His research includes analyses of datacenter providers, market size and supply/demand in key and emerging markets around the world. Dan also covers datacenter providers offering services beyond colocation, such as managed and cloud-type services. In addition, Dan provides research on the sustainability of the datacenter industry. Beyond renewable energy purchasing and carbon offsetting, he has been investigating full life-cycle emissions, including supply chain emissions as well as efficiency gains and water usage.

About this report

A Discovery report is a study based on primary research survey data that assesses the market dynamics of a key enterprise technology segment through the lens of the "on the ground" experience and opinions of real practitioners — what they are doing, and why they are doing it.

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