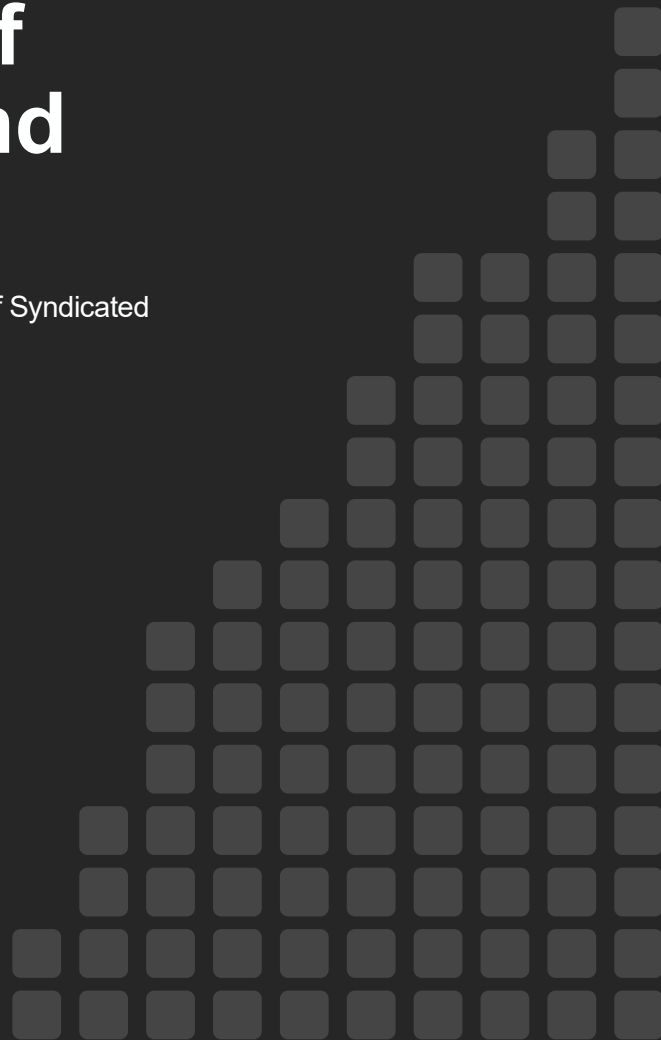


RESEARCH REPORT

Distributed Cloud Series: The Mainstreaming of Cloud-native Apps and Methodologies

By Paul Nashawaty, Principal Analyst and Christian Perry, Director of Syndicated
Research
Enterprise Strategy Group

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Executive Summary

Report Conclusions

TechTarget's Enterprise Strategy Group (ESG) conducted an in-depth survey of 378 IT and DevOps/AppDev professionals in North America (US and Canada) responsible for evaluating, purchasing, building, and managing application infrastructure in their organization. Based on the data collected as part of this project, the report illustrates:

- **Cloud-native strategies increasingly define modern IT.** Modern business moves at breakneck speed, leaving little or no tolerance for sluggish results from IT teams. In turn, investments are pouring into technologies, services, and personnel to support cloud-native architectures, which dramatically improve the agility, scalability, and performance of any IT environment. Organizations are rapidly moving production applications into microservices-based, cloud-native architectures, leveraging transformational tools and methodologies across on-premises environments and multiple cloud services providers.
- **Microservices are fueling rapid transformation.** A core component of highly effective cloud-native environments are microservices, which help organizations finely tune their application development and delivery approach. The survey results are eye-opening here, as 87% of organizations said microservices improve their infrastructure independence, while 82% said they improve application portability, which the study also confirmed is a crucial requirement of cloud-native environments.
- **Organizations are continuing their transition to new technology stacks and methodologies.** DevOps is now entrenched as a go-to methodology for optimizing collaboration between application developers and IT operations teams, but substantial growth is still to come. For example, 35% of organizations said they are employing DevOps methodologies extensively, a rise of 30% from the 2022 study.¹ This shift into more intensive DevOps usage will continue as organizations better optimize their processes and organizational resources. The study also found that infrastructure-as-code (IaC) templates are being used more extensively, with 27% of organizations reporting heavy usage, a rise of 35% from the 2022 study. The impact of this more extensive usage of cloud-native methodologies and technologies is readily apparent, as 33% of organizations report they are deploying new code to production environments several times per day, a remarkable rise of 74% from the 2022 study.
- **Challenges are common in cloud-native environments.** Most transformational technologies and supporting methodologies carry challenges, and cloud-native architectures are no different. For example, security and cost management were identified as challenges for nearly a third of organizations, while a slightly smaller contingent of organizations identified other challenges such as meeting and maintaining compliance requirements, organizational barriers, and/or management of multiple clouds. Microservices-specific challenges were also evident, including issues with integrating them into current environments, applying consistent security policies, and a lack of engineering skills. Despite the presence of challenges, comparisons with the 2022 study show that fewer organizations are reporting challenges with cloud-native applications and microservices across key areas, indicating these technologies/platforms are improving.
- **Plans to expand and optimize cloud-native environments are plenty.** Most organizations plan to increase their cloud-native spending over the next 12 to 18 months, showing that this market is ripe for substantial growth moving ahead. Along with investments, organizations are targeting specific actions to optimize their cloud-native environments, including improving collaboration across developers and IT operations and implementing cross-cloud management and observability. Along the way, organizations will need guidance from their vendors and service providers, as the study also found that organizations are increasingly grappling with complexity in their cloud-native environments.

¹ Source: Enterprise Strategy Group Research Report, [Cloud-native Applications](#), May 2022. All references to previous iterations of this study are from this research report.

Introduction

Research Objectives

In today's fast-paced business landscape, organizations must be sufficiently agile and flexible to meet the evolving needs of their customers. However, many still rely on legacy applications that can struggle to handle the demands of modern-day business requirements. This can create significant challenges for IT departments that are tasked with maintaining business operations while transitioning to more modern approaches that drive their organizations forward. To overcome these challenges, organizations are increasingly turning to a "cloud-first" strategy for their digital transformation initiatives. This approach involves prioritizing cloud-based, developer-friendly solutions over traditional on-premises software and infrastructure, allowing organizations to leverage the scalability, flexibility, and cost-effectiveness of cloud computing to improve their operations, increase agility, and meet the needs of their customers more effectively.

To assess the landscape for cloud-native applications and methodologies, Enterprise Strategy Group surveyed 378 IT and DevOps/AppDev professionals in North America (US and Canada) responsible for evaluating, purchasing, building, and managing application infrastructure in their organization. This study sought to answer the following:

- What percentage of production applications are currently based on a microservices cloud architecture today?
- Where are organizations deploying (or planning to deploy) cloud-native applications?
- What are the biggest challenges with cloud-native applications?
- How are microservices improving processes across the organization? What are the most impactful benefits?
- What are the biggest challenges or concerns with applications based on a microservices architecture?
- How many containers are supported within today's environments? What is the preference for orchestration?
- What approaches are organizations employing to manage multi-cluster and multi-namespace deployments?
- What is driving the use of serverless functions?
- What types of tools and technologies are used to build and deliver cloud-native applications?
- What is the adoption status of infrastructure-as-code (IaC) templates?
- How do organizations distribute their development team's time across tasks?
- How extensively are organizations using DevOps methodologies?
- What is the maturity level of organizations' continuous integration and continuous delivery (CI/CD) initiatives?
- How extensively are organizations using GitOps approaches to automate application builds?
- How often do organizations typically deploy new code to production environments?
- What individuals or groups have the most influence on decisions around cloud-native applications?
- What are organizations' perceptions around the effectiveness of their development teams?
- How confident are organizations in their development team's ability to ship secure code at an efficient pace?
- How will spending on cloud-native technologies, services, and personnel change over the next 12-18 months?
- What actions will organizations take to optimize their cloud-native application development strategies?

Survey participants represented a wide range of industries, including manufacturing, technology, financial services, and retail/wholesale. For more details, please see the *Research Methodology* and *Respondent Demographics* sections of this report.

Research Findings

Cloud-native Strategies Continue to Drive Modernization Initiatives

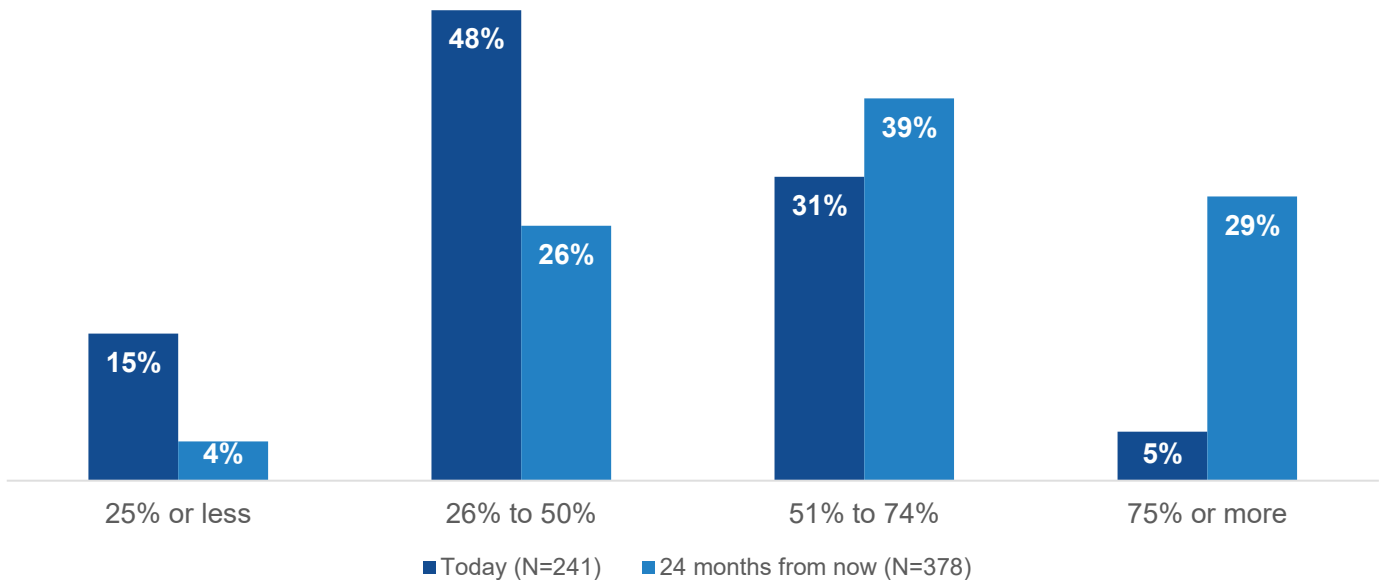
Digital transformation strategies are widely sustained by architectures designed to support cloud-native, microservices-led application development today. Yet, despite the strong current penetration of these architectures, substantial growth is yet to come.

Applications Continue Their Migration to Public Cloud

Just 36% of organizations said that more than half of their production applications are currently based on a microservices, cloud-native architecture, but that percentage will rise significantly in 24 months to 68% (see Figure 1). Traditional approaches to IT that do not inherently support the agility and speed of cloud ecosystems struggle to keep pace with modern business requirements, in turn driving organizations to fully modernize their architectures—whether that means replacing legacy architectures with cloud-native technologies or integrating those technologies into existing environments.

Figure 1. Production Application Delivery Is Increasing Defined by Cloud-native Architectures

Approximately what percentage of your organization’s production applications are based on a microservices, cloud-native architecture today? How do you expect this to change, if at all, over the next 24 months? (Percent of respondents)



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

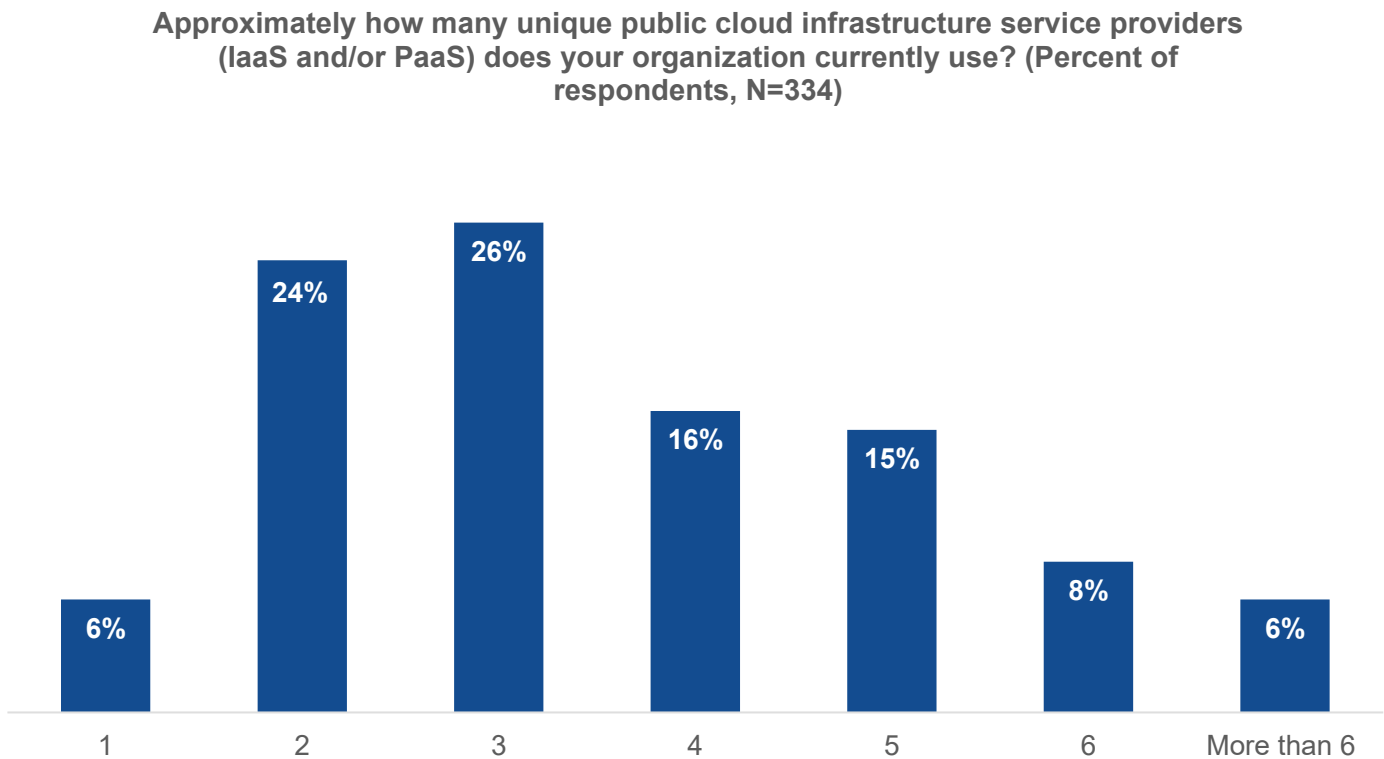
Multi-cloud Is Now the Norm as Production Applications Shift Off Premises

Most organizations now place public cloud services at the forefront of their infrastructure strategies, as shown by the 94% of organizations that said they are using two or more cloud providers (see Figure 2). Nearly all of these organizations currently run (or plan to run) at least some production applications on these services, and we now see

many organizations leveraging different providers for specific benefits, from costs and usage discounts to application-specific performance enhancements and developer-friendly ecosystems. Due to this presence of multiple cloud providers in most environments, organizations also reported that it is very important or even critical that applications are portable because IT teams and developers alike need the flexibility to shift applications and associated data between deployment locations such as on-premises data centers, cloud services, and even the edge.

Although public cloud services are a natural (and perhaps obvious) fit for cloud-native applications, it is important to note that these applications are being deployed everywhere. For example, 42% of organizations said their cloud-native applications are (or will be) deployed in a combination of cloud platforms and private data centers.

Figure 2. Nearly All Organizations Are Using Two or More Cloud Infrastructure Providers



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

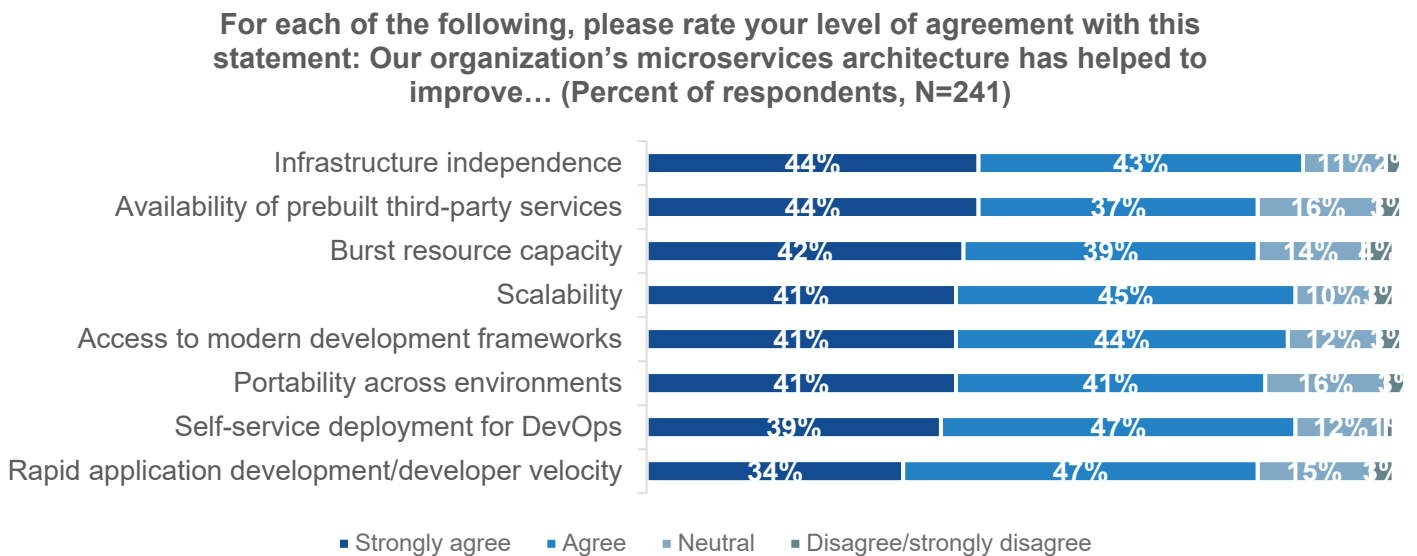
Microservices Accelerate IT Modernization Despite Ongoing Cloud-native Challenges

The impact of microservices on transformation is significant and cannot be overstated under almost any circumstance. Whereas some technologies serve as minor contributing factors to digital transformation strategies, microservices are rapidly altering the landscape of IT processes. But while microservices are driving a wide selection of improvements to IT, organizations continue to face challenges with cloud-native applications and microservices.

Microservices Architectures Bring Freedom and Flexibility to IT Ecosystems

Organizations widely agree that microservices are highly transformative. For example, 87% said that microservices have improved their infrastructure independence, 86% said they improve scalability, and 81% said they improve the availability of prebuilt third-party services (see Figure 3). Infrastructure independence is particularly noteworthy, as microservices inherently support wide multi-cloud diversity across programming languages, frameworks, and tools. Also worth noting are the 82% of organizations that said that microservices improve portability, which this study found is a critical requirement for organizations implementing cloud-native architectures.

Figure 3. Microservices Have a Game-changing Impact on IT Environments



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Organizations Continue to Grapple With Challenges Around Cloud-native Applications

Along with the myriad benefits delivered by cloud-native applications comes a range of challenges that organizations will inevitably face on the road to modernization. Security and managing costs were most commonly identified as the biggest challenges with these applications, followed by issues with shadow IT and the lack of full automation in the CI/CD pipeline (see Figure 4). However, when compared against the 2022 study, some challenges appear to be less common, suggesting that cloud-native applications and supporting architectures are maturing and improving. For example, 34% of organizations identified security as a challenge in 2022, compared with 29% in 2023. Other notable declines were seen in citing the lack of performance monitoring and observability (29% in 2022 versus 23% in 2023) as a challenge as well as in identifying retaining full-featured functionality and capabilities (27% in 2022 versus 22% in 2023).

On the other hand, some challenges are becoming more common. One of these is the rise of complexity (19% in 2022 versus 24% in 2023), which is understandable as organizations transition larger portions of their overall IT environment to cloud-native architectures. Vendors and service providers should keep this in mind as they improve more granular elements of their products and services because a continued trend toward increased complexity could leave some organizations questioning continued investment into cloud-native architectures.

Figure 4. Security Tops a Daunting Roster of Cloud-native Application Challenges



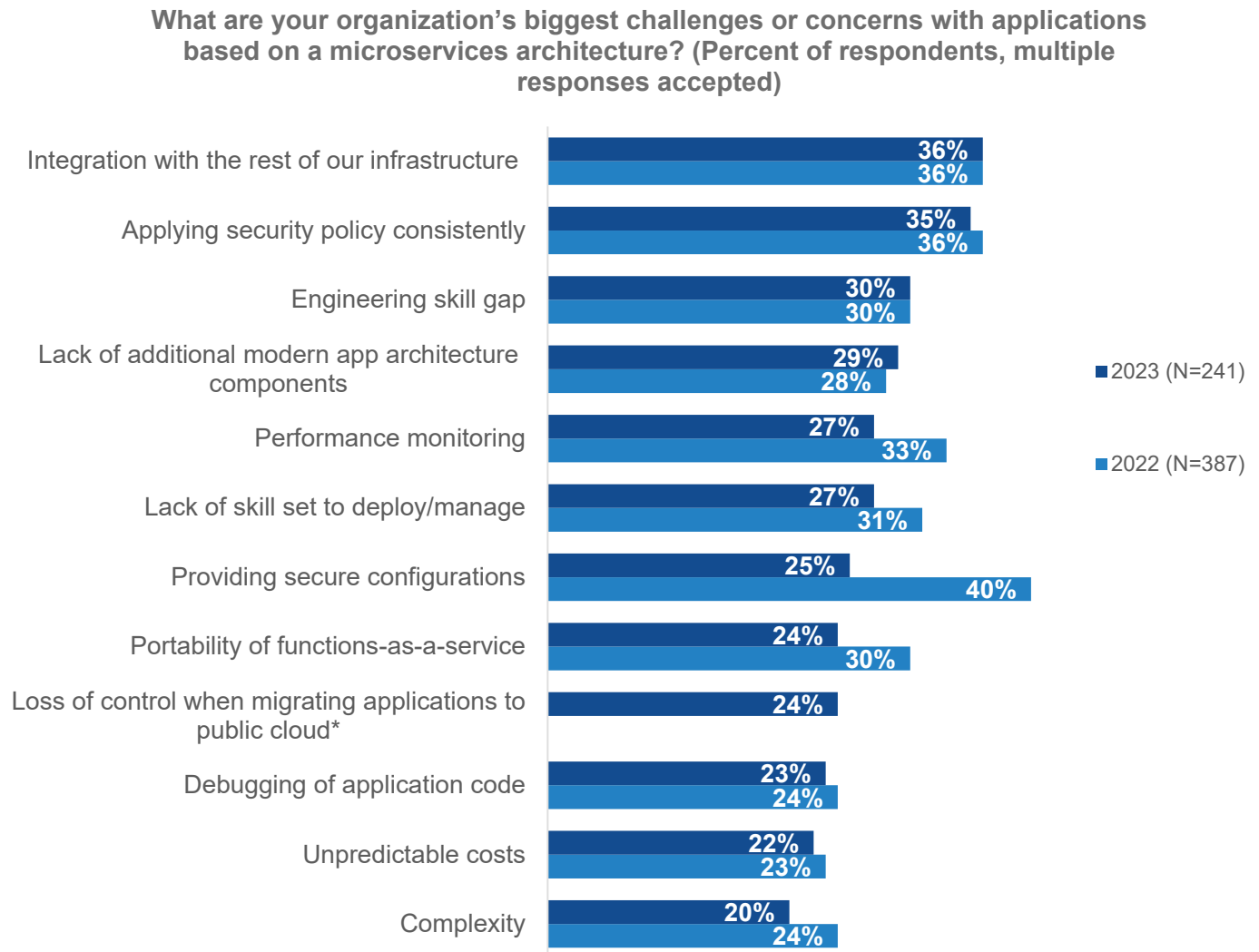
Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Integration and Security Consistency Continue to Trouble Microservices Adopters

Microservices are well-established as a critical building block of cloud-native architectures, but they include potential pitfalls that organizations continue to encounter. These include problems integrating microservices with existing infrastructure, applying consistent security policies, and engineering skills gaps (see Figure 5). Keeping pace with emerging skills required to meet evolving business requirements is no easy feat for many IT teams, so providers should work with customers to ensure they understand the operation and implications of microservices across their environments. But as with cloud-native applications, fewer organizations are noting issues with security. In 2022, 40% of organizations said they encountered issues with providing secure configurations, but this number dropped

significantly to 25% in 2023, suggesting that organizations are becoming more adept at the task of securing their cloud-native environments.

Figure 5. Microservices Challenges Continue But Ease Across Several Areas



*Response option not included in 2022 study

Source: Enterprise Strategy Group, a division of TechTarget, Inc.

The Transition to New Technology Stacks Continues in Earnest

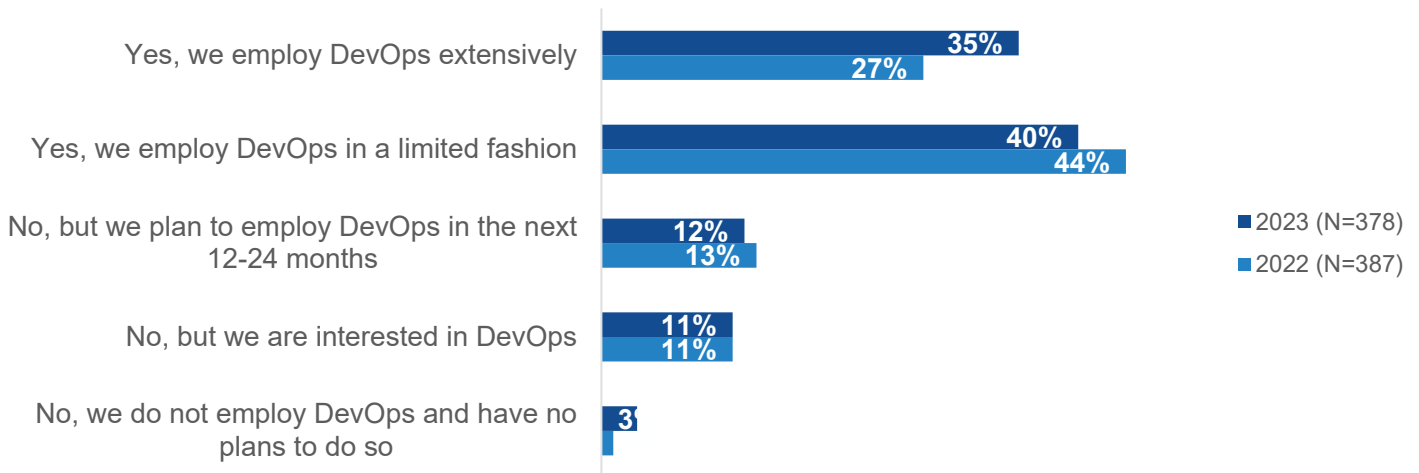
As the transition to cloud-native architectures barrels along, DevOps and associated practices are becoming well-entrenched in today's modern organizations. While development teams and IT operations are not yet fully in lockstep across all organizations, they are closer than ever before thanks to the substantial improvements in collaboration and integration afforded by highly transformational practices and the groundbreaking technology stacks that support them.

DevOps and Infrastructure-as-code Continue Their Rapid Penetration Into Modern Business

Organizations looking to automate the CI/CD pipeline and process increasingly leverage the “infinity loop” to create a DevOps-centric approach to the build, release, and operation cycles of application delivery. While the impact of DevOps depends on the implementation and organizational context of each deployment, there is no doubt that organizations are leaning more heavily on this practice. For example, 35% of organizations said they use DevOps extensively, a rise of 30% compared with the 2022 study (see Figure 6). The 2023 study also found continued heavy adoption of technologies that support the DevOps process, including containers, serverless functions, container orchestration, and WebAssembly.

Figure 6. Extensive DevOps Users Are Becoming More Common

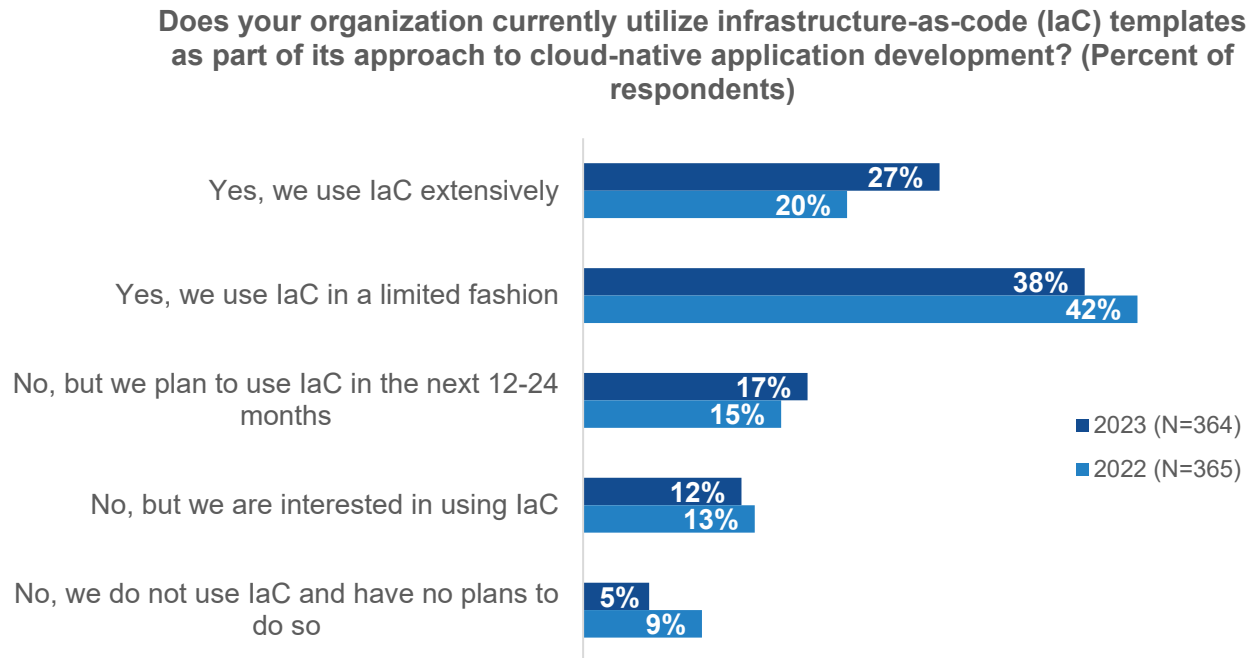
Does your organization employ a DevOps methodology to automate the continuous integration and continuous delivery (CI/CD) of code and application infrastructure? (Percent of respondents)



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

As with DevOps, infrastructure-as-code (IaC) is now more commonly used extensively. In this study, 27% of organizations said they use IaC templates extensively, a rise of 35% over the organizations that said the same in 2022 (see Figure 7). Organizations using IaC typically encounter improved results with consistency and compliance, along with a decreased need to use highly skilled staff to deliver basic infrastructure changes. Further, these templates can deliver the repeatability often required across organizations to ensure efficient code delivery.

Figure 7. Organizations Increasingly Leverage IaC Templates

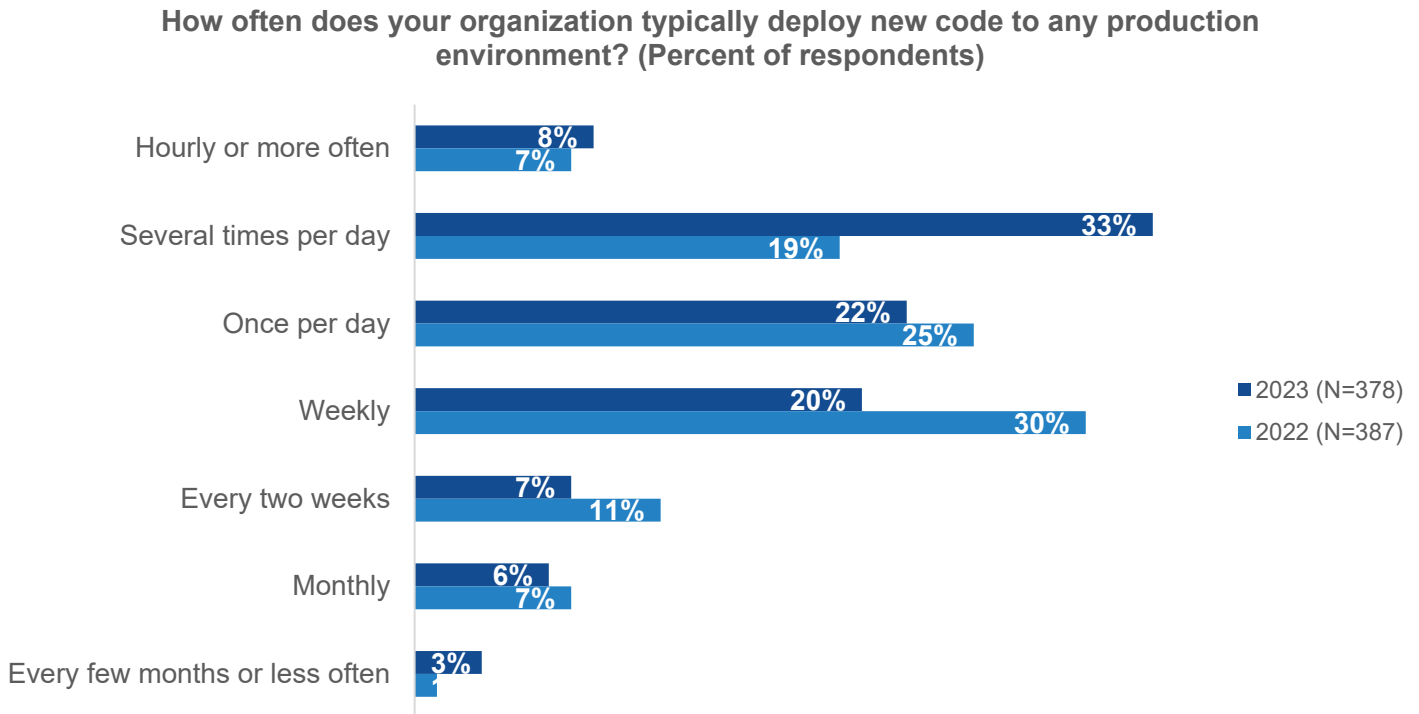


Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Code Enters Production Rapidly for a Rising Percentage of Organizations

DevOps, IaC, and other approaches have drastically altered the landscape for application development, whereby developers can now enter code into production on a more consistent, rapid basis. This trend toward faster releases continues, with 33% of organizations indicating they deploy code to production environments several times per day (see Figure 8), a rise of 74% compared with those who said the same in the 2022 study. Internal and external stakeholders increasingly expect reliable, up-to-date software that meets their requirements, and organizations that cannot deliver on this expectation risk falling behind their competitors. By adopting a more frequent code release cadence, organizations can stay ahead of the curve.

Figure 8. Code Is Increasingly Deployed to Production Throughout the Day



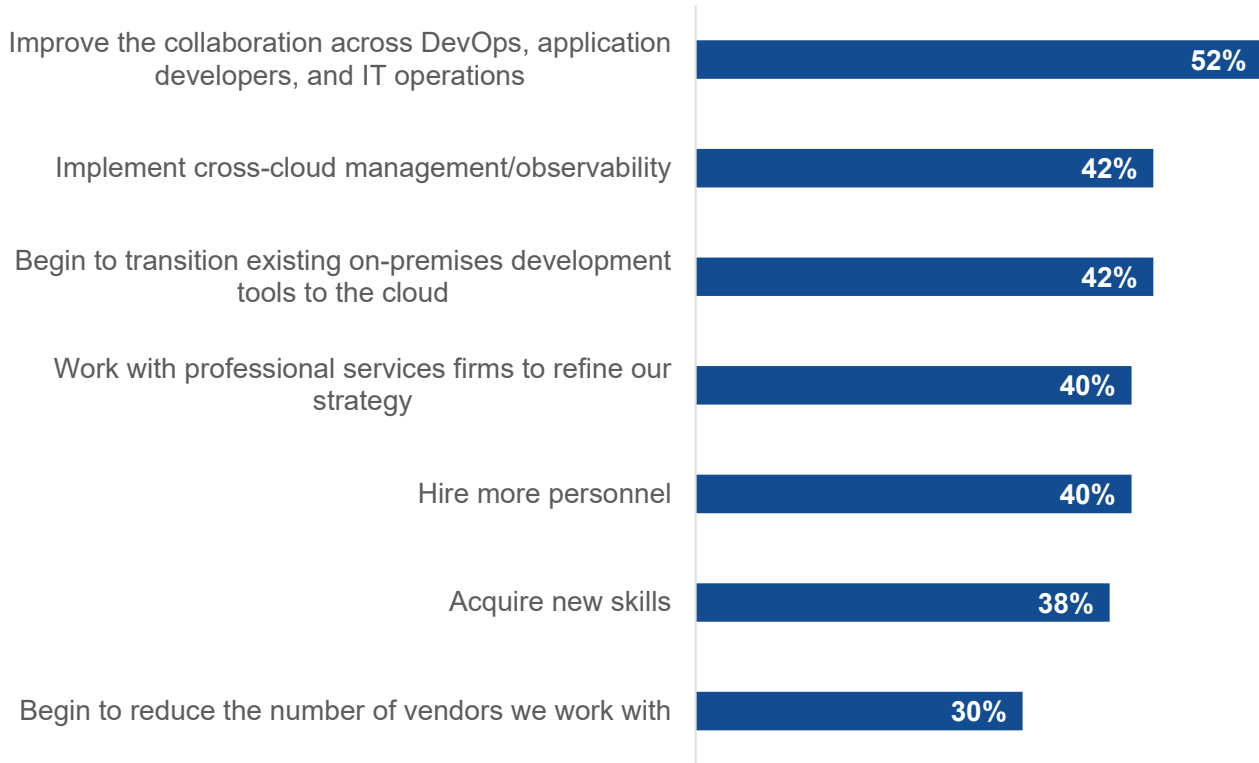
Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Extensive Plans Are in Place to Optimize Cloud-native Environments

Even small, initial deployments of cloud-native architectures can help organizations reap substantial benefits. But once they get started with these modernization efforts, organizations continue to expand and optimize the processes and technologies that support those architectures. This study found that most organizations will increase their cloud-native spending over the next 12 to 18 months, and many plan specific actions to optimize their environments. For example, 52% of organizations plan to improve collaboration across developers and IT operations, while 42% plan to implement cross-cloud management and observability and/or start to transition on-premises development tools to the cloud (see Figure 9).

Figure 9. Cloud-native Optimization Plans Reveal a Wide Range of Requirements

Which of the following actions do you believe your organization will take over the next 12-18 months to optimize its cloud-native application development strategy? (Percent of respondents, N=378, multiple responses accepted)



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Conclusion

The mainstreaming of cloud-native applications and methodologies in the distributed cloud continues to bring significant advancements and benefits to both IT and business. The success rate of cloud-native strategies is strong across implementations, despite the inevitable rise of complexity as organizations integrate highly effective—but also disruptive—technologies into their cloud environments. Cloud architecture and associated methodologies are now mainstays in environments of digital leaders, which will ultimately drive cloud laggards to modernize their ecosystems just to remain competitive.

This research shows that cloud-native application development and associated practices are an effective vehicle for digital transformation, but the journey is not always easy or streamlined. Organizations are advised to familiarize themselves with the core concepts and benefits of cloud-native methodologies outlined in this research, with an eye on the following recommendations:

- **Embrace cloud-native development.** To accelerate digital transformation and associated IT modernization initiatives, organizations should invest in cloud-native application development practices and methodologies that can boost agility, scalability, and resilience in the era of distributed cloud.
- **Lean on microservices to gain freedom and agility.** Distributed cloud ecosystems generally do not effectively support highly rigid and inflexible architectures. As this research shows, microservices provide the key to infrastructure independence across the cloud and allow organizations to implement highly portable applications.
- **Utilize emerging methodologies to optimize collaboration and code releases.** Cloud-native initiatives tend to spark challenges across a range of crucial areas, from security and cost management to shadow IT. Organizations are advised to lean on methodologies and technologies designed specifically to foster tighter collaboration, such as DevOps to unify developers and IT operations, as well as IaC templates, GitOps, and agile software development. Organizations using these are more quickly deploying new code to production environments.
- **Participate in the cloud-native community.** The cloud-native journey can be daunting due to the influx of new technologies and approaches. Organizations should engage with industry peers, participate in open source projects, and contribute to the development of cloud-native technologies and standards to ensure interoperability, avoid vendor lock-in, and drive innovation.

Embracing cloud-native approaches in the distributed cloud empowers organizations to maximize the potential of cloud technology and achieve greater efficiency and competitiveness.

A Message from the Sponsor

Nutanix is a leader in hybrid multi-cloud computing with enterprise features and storage services to accelerate the adoption of Kubernetes running both at scale and cost-effectively. Nutanix Cloud Platform (NCP) supports all leading Kubernetes container platforms, has built-in infrastructure as code capabilities, and is enhanced with data services for modern applications. These features allow DevOps teams to accelerate application delivery with the performance, governance, and flexibility while allowing customers to maintain control of their IT operating costs. Nutanix has a proven track record of putting our customers first and consistently achieved a 90+ Net Promoter Score (NPS). The result is more time, saved resources, an attractive TCO, and a long-term IT partner committed to your success.

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Research Methodology

To gather data for this report, ESG conducted a comprehensive online survey of IT and DevOps/AppDev professionals from North America's private- and public-sector organizations (United States and Canada) between January 19, 2023, and February 9, 2023. To qualify for this survey, respondents were required to be responsible for evaluating, purchasing, building, and managing application infrastructure in their organization. All respondents were incentivized to complete the survey through cash awards and/or cash equivalents.

After filtering out unqualified respondents, removing duplicate responses, and screening the remaining completed responses (on several criteria) for data integrity, we were left with a final sample of 378 professionals.

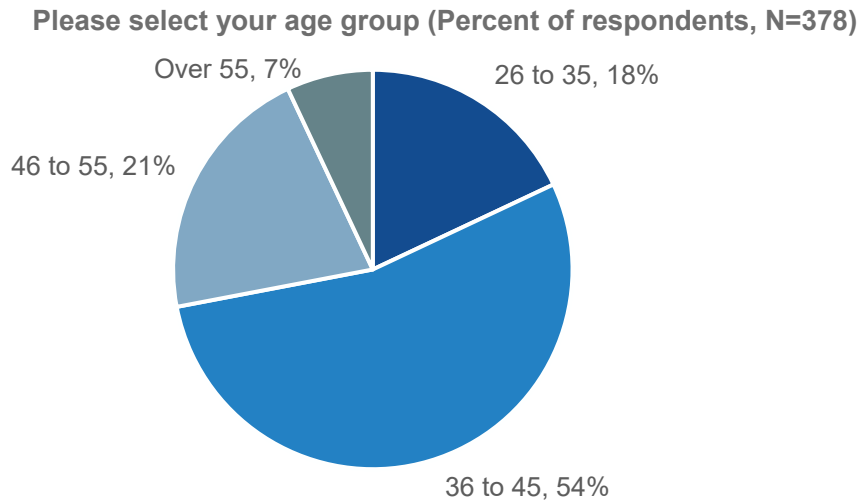
Please see the Respondent Demographics section of this report for more information on these respondents.

Note: Totals in figures and tables throughout this report may not add up to 100% due to rounding.

Respondent Demographics

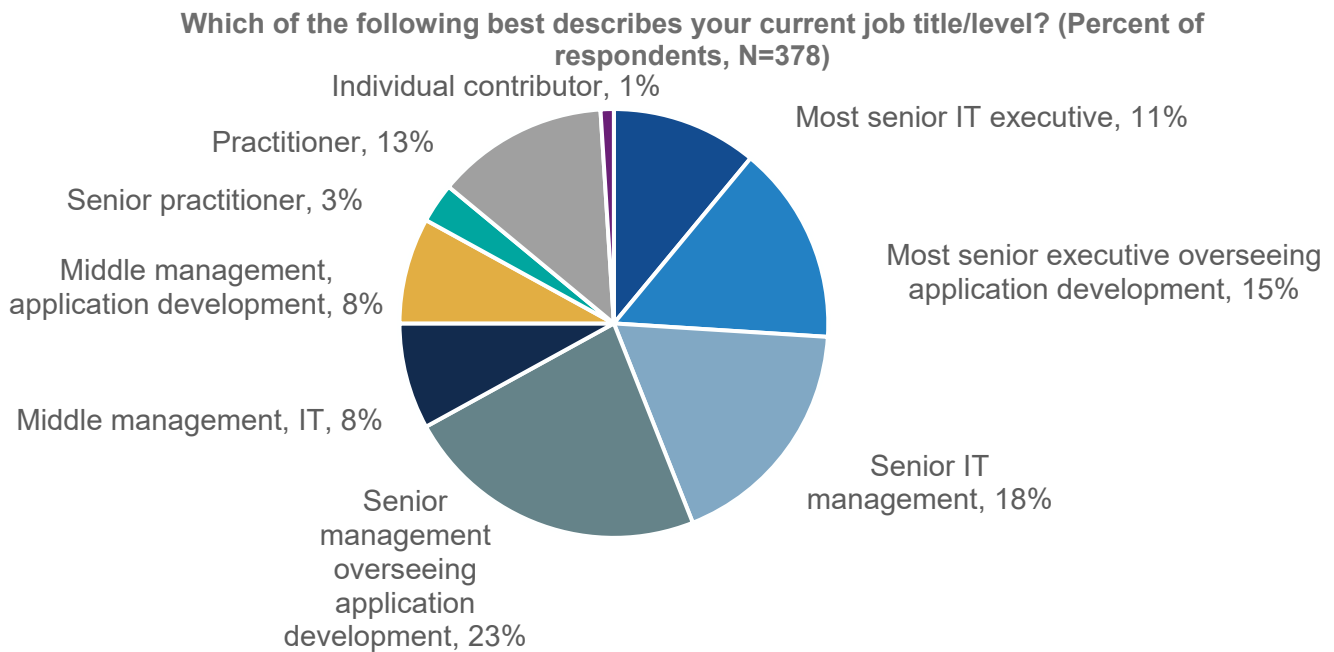
The data presented in this report is based on a survey of 378 qualified respondents. Figure 10 through Figure 14 detail the demographics of the respondent base at an individual and organizational level.

Figure 10. Respondents by Age Group



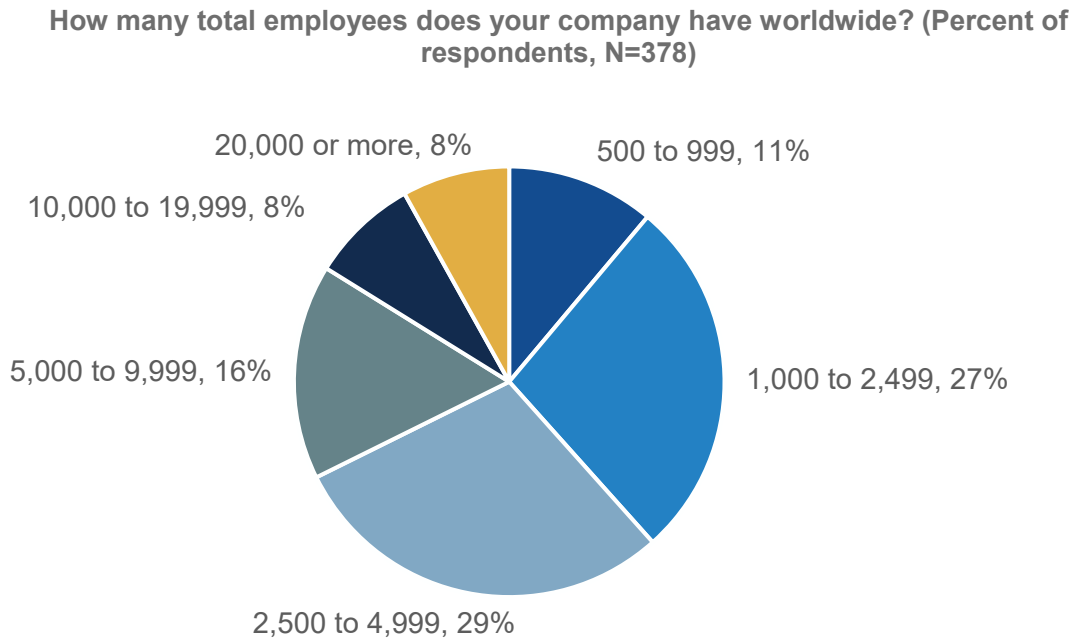
Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Figure 11. Respondents by Current Job Title/Level



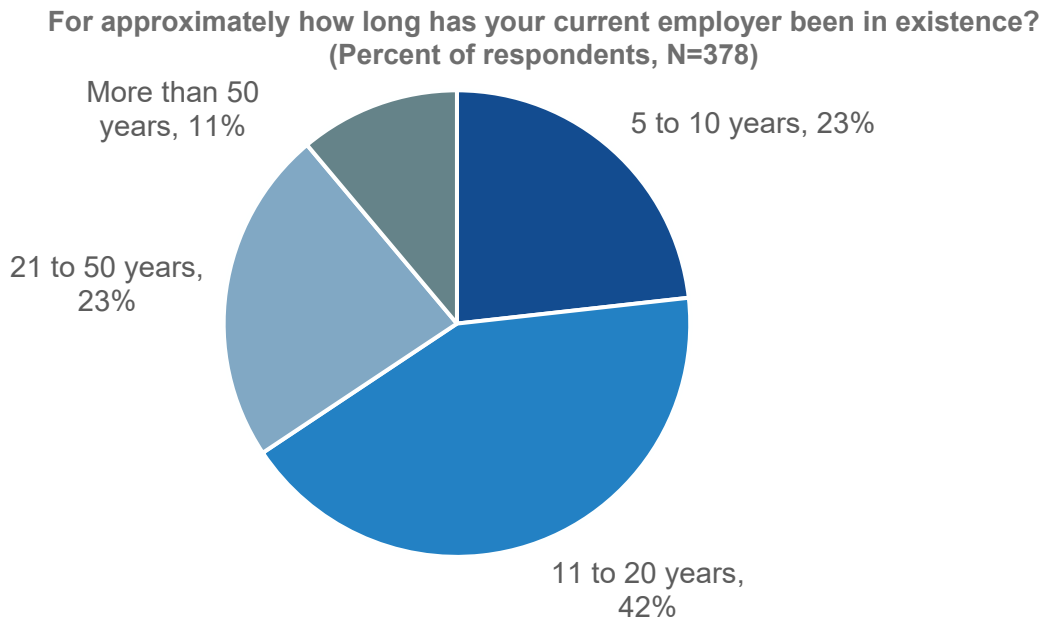
Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Figure 12. Respondents by Number of Employees



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Figure 13. Respondents by Age of Organization

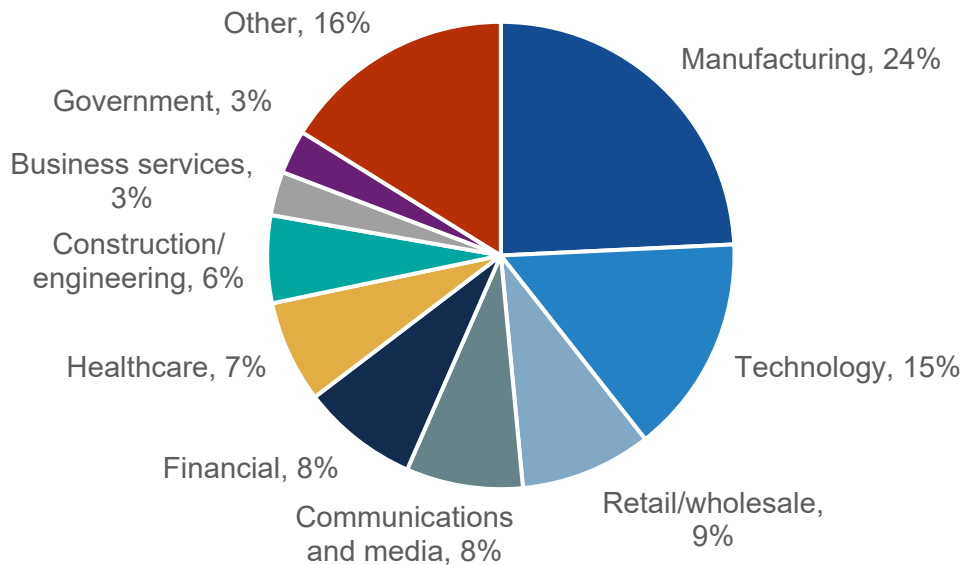


Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Respondents were asked to identify their organization's primary industry. ESG received completed, qualified responses from individuals in 23 distinct vertical industries, plus an "Other" category. Respondents were then grouped into the broader categories shown in Figure 14.

Figure 14. Respondents by Industry

What is your company's primary industry? (Percent of respondents, N=378)



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

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✉ contact@esg-global.com

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