What Technology Organizations Auditing Their Public Cloud Infrastructure Spending Have Uncovered:

Industry Spotlight
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Research Objectives and Methodology

OBJECTIVES
Few industries are as recognized as being providers of fundamentally essential goods and services to other businesses, organizations, institutions, and consumers as the technology industry. It is an industry that is defined in this survey as spanning both B2B and B2C hardware and software vendors and that places a premium on innovation and competitive differentiation.

Technology firms consistently invest heavily in research and development to establish and maintain an innovation advantage. But organizations have finite resources to allocate to these investments, which underscores the imperative to ensure that capital is efficiently utilized, including performing internal audits to assess their spending on public cloud technologies.

This eBook discusses new research conducted by ESG specifically in the technology industry. The research aimed to uncover trends in three areas:

- Understanding technology organizations’ use of public cloud infrastructure and its impact on IT complexity.
- Measuring if and to what degree public cloud infrastructure spending is outpacing expectations in the technology sector.
- Assessing the forward-looking IT landscape trends among technology organizations as they balance IT costs and requirements.

The goal of this eBook is to give IT and business strategists in the technology industry insights into their peers’ public cloud infrastructure experiences and show how they are adapting IT strategies to best serve the needs of their businesses.

RESEARCH METHODOLOGY
The data in this eBook is derived from a double-blind survey\(^1\) of 202 technology decision makers (CIO/CTO/VP/directors of IT, 60%) and senior members of finance teams (CFO/VPs/directors of finance, 40%) at enterprise-class technology companies. The survey was conducted in the first half of 2022 and was complemented by three, hour-long interviews with cloud strategists at technology companies. All respondents (both survey respondents and interviewees) were required to be knowledgeable about their organization’s cloud infrastructure spending to qualify to participate.

Survey respondents were located across the US (40%), Canada (8%), the UK (17%), Germany (17%), and France (18%).

\(^{1}\)Respondents were anonymous and not informed ESG was conducting the survey or that it was commissioned by Dell Technologies.
Hybrid and multi-cloud approaches dominate in the technology industry:

- On average, technology companies surveyed use 3.2 different infrastructure cloud service providers (CSPs) today.
- But cloud usage drives IT complexity: 63% of respondents say complexity is on the rise.

Technology organizations underestimate the cost implications of their public cloud usage:

- 81% of respondents have found that their actual public cloud infrastructure spending was higher than expected.
- 89% of respondents reported that their cloud cost audit uncovered workloads placed in the cloud that definitively should not have been migrated or launched on public cloud infrastructure.

Cloud cost audits drive organizational action:

- 77% invest in management tools that span on-premises and cloud environments to improve manageability, driving 2.4 full-time employees-worth of improved efficiency.
- 74% institute more cloud procurement controls like centralized buying and additional approval processes.
- 66% report their findings helped spur broad data center modernization projects, which have helped drive a median of 38 workload repatriations to drive savings.

50% of mission-critical applications run on-premises
24% are consumed as SaaS
26% run on public cloud infrastructure

On average, technology companies are spending 28% more per year on public cloud infrastructure than they thought they were prior to their public cloud cost audit.

Respondents most often reported that storage costs, cloud service/application costs, staff costs to monitor and manage workloads, networking costs, and professional services costs tied to migrations contributed to cloud spending that exceeded expectations.
What Technology Organizations Auditing Their Public Cloud Infrastructure Spending Have Uncovered

Technology organizations have a hybrid approach to running mission-critical applications

<table>
<thead>
<tr>
<th>The average percentage of mission-critical applications hosted on-premises, in the public cloud, and at the edge today.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivered as SaaS</td>
</tr>
<tr>
<td>24%</td>
</tr>
</tbody>
</table>

| Running at the edge | Running on-premises in a data center/private cloud/colocation facility | Mission-critical apps that are running on-premises: |
| 21% | 28% | 50% |

Past ESG research has discussed how many organizations are taking a hybrid and multi-cloud approach to IT service delivery today. However, to date, ESG’s data has been horizontal in nature, aggregating all private- and public-sector organizations together.

This research has allowed ESG to understand if this trend extends to technology organizations. As shown, hybrid approaches to mission-critical application delivery are common among technology organizations. This could encompass applications like material requirements planning, product lifecycle management, inventory management, and others. On average, IT respondents in the survey reported 24% of their mission-critical applications are consumed as SaaS, 26% run on public cloud infrastructure, 21% run at the edge (e.g., distributed production facilities), and 28% run in a centralized data center, private cloud, or colocation facility.

In the aggregate, about half of these key workloads run on-premises and half run in the public cloud. Complementary ESG research shows organizations are broadly adopting a “hybrid forever” mindset. Three years from now, organizations still anticipate splitting their business-critical applications evenly across on-premises and off-premises environments.

While hybrid approaches dominate, public cloud IaaS usage is in flux

On average, a meaningful 26% of technology organizations’ mission-critical applications run on public cloud IaaS today. And while that percentage may not be expected to significantly shift over time, the number of IaaS cloud service providers (CSPs) partnered with over time is poised to increase.

When ESG asked IT respondents how many different public cloud IaaS providers they use today, 85% reported more than one. This validates that technology companies are indeed following a multi-cloud IT strategy today.

However, public cloud IaaS diversification is poised to increase significantly over the next 24 months: While 35% reported using four or more IaaS CSPs today, 67% expect to do so 24 months from now.

Said another way, on average, technology companies surveyed use 3.2 different IaaS CSPs today but expect that to increase to 4.4 IaaS CSPs over the next two years.

When ESG asked IT respondents how many different public cloud IaaS providers they use today, 85% reported more than one.”
Distributed applications are poised to disrupt the cloud status quo

Will distributed applications make inroads into the technology industry over the next 24 months?

- Distributed application architectures will be the norm for business-critical workloads: 55%
- Distributed application architectures have several use cases and will be employed in a material fashion: 42%
- Distributed application architectures have niche use cases and will only be employed sporadically: 3%

"No one says let’s run this on-prem; it’s more of a discussion on if we can move to cloud based on the cost/revenue model and security requirements and making the decision looking at all those factors.”

- Cloud COE Director, technology company with more than 4,000 employees

To date, while many organizations operate in a hybrid and multi-cloud manner, their workloads have tended to be mostly self-contained; the entire workload—infrastructure, database, web front end, etc.—tends to reside in a single environment.

As technologies like containers, and improvements in their orchestration, enable a shift toward microservices-based architectures and cloud-native development models, organizations are able to break down workloads into their component parts, running each component in the environment best suited for it.

The research delved into seeing if technology companies are exploring these distributed applications. As the data shows, 55% of respondents say distributed applications will become the norm in the technology industry, while 42% say distributed applications will be used in a material fashion.

This shift in architectural approach may be a driving force behind the uptick in the number of public cloud CSPs expected to be in use over the next 24 months and adds another layer of complexity for IT organizations navigating hybrid and multi-cloud IT realities.
IT complexity is ratcheting up, driven in part by multi-cloud fragmentation

While more changes are on the horizon for IT with respect to the number of IaaS CSPs in use today and the adoption of distributed application architectures, when we asked respondents to look backward, it was clear that the past few years have brought significant changes as well.

When asked how the state of IT complexity today compares to two years ago, 63% of respondents at technology organizations reported an increase in complexity, nearly 4x the rate of respondents reporting that complexity had been reduced.

The data also shows a correlation between significant increases in complexity and the number of public cloud IaaS providers in use. As organizations bring more public cloud IaaS providers into their environment, they tend to see greater increases in IT management complexity.

Among respondents at organizations using 1 public cloud IaaS CSP, only 12% reported a significant uptick in complexity, 14% of those organizations using 2-3 CSPs today reported a significant uptick, and 23% of those at organizations using 4+ CSPs today reported the same.
Solving for effective multi-cloud management is mission-critical in its importance

The importance of continuously improving IT’s ability to manage multi-cloud environments to meet long-term business and technology goals.

- Somewhat important, 8%
- Important, 51%
- Critical, 41%

92% of respondents in the technology sector said this improvement was important or critical.

Solving the complexity problems introduced by multi-cloud IT operations is essential. ESG asked respondents how important it is to their businesses’ long-term goals that they continuously improve their ability to manage a multi-cloud environment. In total, 92% of respondents in the technology sector said this improvement was important or critical.

And it is significant to note that this importance extends beyond IT goals like infrastructure flexibility, scaling agility, or a reduction in capital expenditures. The importance respondents ascribe to effective multi-cloud management includes both long-term business goals like time to market and revenue or profitability considerations (in addition to technology goals).

Multi-cloud is a necessary evil…it’s hard but I also don’t know how to get away from it. And migrating from one cloud to another is very difficult.”

- Cloud COE Director, technology company with more than 4,000 employees
Public Cloud Infrastructure Spending Audits:
What Surveyed Technology Companies Have Uncovered
Technology organizations are closely monitoring public cloud infrastructure spending

Has your organization conducted a thorough audit of public cloud infrastructure spending (e.g., egress costs, storage costs, compute costs, adjacent monitoring and management services, API costs, etc.) in the last 24 months?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, we audit these costs on an ongoing basis</td>
<td>46%</td>
</tr>
<tr>
<td>Yes, we have done at least one ad hoc audit</td>
<td>33%</td>
</tr>
<tr>
<td>No, but we are planning to conduct this type of audit soon</td>
<td>16%</td>
</tr>
<tr>
<td>No, but we are interested in conducting this type of audit</td>
<td>4%</td>
</tr>
<tr>
<td>No, and we are not interested in conducting this type of audit</td>
<td>0%</td>
</tr>
<tr>
<td>Don’t know</td>
<td>1%</td>
</tr>
</tbody>
</table>

Before delving into what public cloud infrastructure audits reveal, it is instructive to note that nearly four out of five technology companies we surveyed are paying close attention to their public cloud infrastructure costs: 79% of respondents surveyed reported their organization had conducted a thorough audit of all costs across the business in the last 24 months. In fact, the plurality of organizations (46%) report auditing these costs on an ongoing basis. Organizations without a clear picture of these costs trail their peers.

As for why organizations are paying such close attention to these costs, the reasons were multifaceted: 63% reported the discovery of one or more redundant investments prompting further inspection, 49% reported that they knew spending was high but needed to develop a more formalized understanding, and 49% of respondents reported that a surprise overrun or inaccurate forecasting led to more due diligence.

79% of respondents surveyed reported their organization had conducted a thorough audit of all costs across the business in the last 24 months.
Technology companies find actual cloud spending exceeds their estimates

Among technology companies that have audited their public cloud infrastructure spending, most have found they were underestimating their costs: 81% of respondents said that actual spending was higher than they expected, compared to 18% of organizations that estimated costs accurately and just 1% that found they were actually overestimating their cloud spending.

In precise terms, on average, technology organizations report actual public cloud spending was 28% higher than expected prior to the audit.

“With so many enterprises having relationships with multiple hyperscalers, and each hyperscaler having its own cost calculators which may not be accurate with respect to the organization’s negotiated pricing, **continuous and automated audits are really required to get an accurate picture.**”

- Global Head of Cloud Advisory & Solutions - Insights & Data Practice, Enterprise Architecture, technology consulting company with more than 20,000 employees
What does a 28% undercounting of cost look like? Technology companies surveyed are spending ~$6.8M more than they thought.

To model the magnitude of public cloud spending overruns among technology organizations, ESG looked at the average revenue of organizations participating, the typical allocation of revenue to IT spending, the percentage of IT budget that typically is allocated to IT technology (versus staff costs), and the actual proportion of IT budgets determined to be allocated to cloud infrastructure post audit.

<table>
<thead>
<tr>
<th>Mean revenue of organizations represented</th>
<th>Percentage of revenue allocated to IT*</th>
<th>Percentage of IT spending on technology versus staff **</th>
<th>Percentage of IT technology spending on cloud (post-audit actual)</th>
<th>Actual cloud IaaS spending</th>
</tr>
</thead>
<tbody>
<tr>
<td>$3.25B</td>
<td>3.7%</td>
<td>65%</td>
<td>40%</td>
<td>$31.3M</td>
</tr>
</tbody>
</table>

In total, ESG found that the average technology organization is spending $6.8M more per year on cloud infrastructure than they thought they were prior to their cloud cost audit.

<table>
<thead>
<tr>
<th>Mean revenue of organizations represented</th>
<th>Percentage of revenue allocated to IT*</th>
<th>Percentage of IT spending on technology versus staff **</th>
<th>Percentage of IT technology spending on cloud (post-audit actual)</th>
<th>1 + the percent that spending was underestimated</th>
<th>Estimated pre-audit cloud IaaS spending</th>
</tr>
</thead>
<tbody>
<tr>
<td>$3.25B</td>
<td>3.7%</td>
<td>65%</td>
<td>40%</td>
<td>1.28</td>
<td>$24.5M</td>
</tr>
</tbody>
</table>

*Assumption based on ESG’s secondary market research into the technology industry. **Assumption based on ESG’s syndicated primary market research.
What drives cloud cost overages?

Categories of costs that contributed to actual public cloud costs being higher than expectations among technology companies.

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage costs</td>
<td>53%</td>
</tr>
<tr>
<td>Cloud service/application costs</td>
<td>50%</td>
</tr>
<tr>
<td>Management/monitoring/troubleshooting OpEx</td>
<td>45%</td>
</tr>
<tr>
<td>Networking costs</td>
<td>44%</td>
</tr>
<tr>
<td>Professional services for migration</td>
<td>39%</td>
</tr>
</tbody>
</table>

Categories of costs that contributed to actual public cloud costs being higher than expectations among technology companies.

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application development</td>
<td>40%</td>
</tr>
<tr>
<td>Backup and recovery</td>
<td>34%</td>
</tr>
<tr>
<td>High-performance computing</td>
<td>33%</td>
</tr>
<tr>
<td>Big data and analytics</td>
<td>29%</td>
</tr>
<tr>
<td>Artificial intelligence/machine learning</td>
<td>26%</td>
</tr>
</tbody>
</table>

"There is an annual exercise—how much do we think we’re going to spend on cloud next year. It’s pretty difficult to forecast. For example, there was a group that was supposed to spend a few thousand per month [on public cloud services], and it has turned out to be 30k per month."

- Cloud COE Director, technology company with more than 4,000 employees

After conducting their public cloud cost audit and comparing actual spending to expectations, organizations achieve clarity into where and why their expectations deviated from reality. ESG research delved into two aspects of this deviation:

1. The cloud services that most drove overages. Respondents in the technology industry often reported that storage costs, cloud service/application costs, staff costs to monitor and manage workloads, networking costs, and professional services costs tied to migrations contributed to cloud spending that exceeded expectations.

2. The workloads most responsible for cloud cost overruns. In this area, respondents often reported that workloads like application development and home-grown solutions, backup and recovery, high-performance workloads, big data and analytics, and AI/ML workloads were behind cost overruns.
Many organizations discover workloads in the cloud that shouldn’t be run there

Did your organization’s cloud cost audit uncover any workloads running in the cloud that definitively should not be run on public cloud infrastructure?

- Yes, many applications/workloads, 52%
- Yes, but just a few applications/workloads, 36%
- No, 11%
- Don’t know, 1%

88% of respondents reported that their cloud cost audit uncovered workloads placed in the cloud that definitively should not have been migrated or launched on cloud infrastructure. Why? Most of them reported issues with performance (e.g., latency) (40%), an inability to meet functionality or usability expectations (39%), and wild cost fluctuations (37%).

Each of these considerations makes sense. If your app is your product, as is the case for many in the tech industry, a shortfall on either infrastructure performance or functionality is going to be a major problem. And this research showed us that tech companies allocate more of their IT budget than manufacturers (as a point of comparison) on public cloud technologies. So, large fluctuations in public cloud costs are amplified.
Public Cloud Audit Actions: What Organizations Do After They Audit Cloud Infrastructure Costs
Cloud cost audits are spurring action

ESG research went beyond what technology companies auditing their cloud spending have found to explore what they plan to do next. The research finds that many invest in technology to help resolve the issue:

- Many (77%) invest in management tools that span on-premises and cloud environments to improve administrator visibility and allow for better, more holistic infrastructure management.
- Similarly, 74% report new investments in cloud cost estimator software to improve how they aggressively act on their cost forecasting, and 66% report their findings helped spur broad data center modernization projects to motivate application repatriation.
- Additionally, many respondents reported their organizations had instituted new processes like staffing a cloud center of excellence (73%) or, alternatively, undertaken application modernization projects to repatriate portions of workloads (73%).

"Cloud cost management should be continuous, it’s a part of cloud management that should be part of the way you live and breathe, and it has to be automated."

- Global Head of Cloud Advisory & Solutions - Insights & Data Practice, Enterprise Architecture, technology consulting company with more than 20,000 employees
The private cloud capabilities that drive workload repatriation

<table>
<thead>
<tr>
<th>What improvements tied to data center modernization have had the biggest impact driving workload repatriation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased levels of self-service provisioning/provisioning agility</td>
</tr>
<tr>
<td>Increased level of self-service management/scaling/deprovisioning</td>
</tr>
<tr>
<td>Improved availability SLAs</td>
</tr>
<tr>
<td>Improvements in AI/ML services offered/supported</td>
</tr>
<tr>
<td>The ability to push code to production more often/on demand</td>
</tr>
<tr>
<td>Improved performance SLAs</td>
</tr>
<tr>
<td>Improved security/reduced risk</td>
</tr>
</tbody>
</table>

Respondents reported having repatriated a median of 38 formerly cloud-hosted workloads. However, the mean number of workloads repatriated was 91.”

For organizations that had initiated a data center modernization project after their cloud audit, the research explored how successful those initiatives had been.

In the aggregate, respondents reported having repatriated a median of 38 formerly cloud-hosted workloads. However, the mean number of workloads repatriated was 91. This means that success was uneven; while some organizations had repatriated many workloads, others had repatriated a more modest number.

For technology organizations, modernization efforts that increased self-service provisioning/provisioning agility and increased levels of self-service management/scaling/deprovisioning were reported to have the biggest impact on workload repatriations, though impacts to improved availability of SLAs as well as AI/ML-offered services and support were also cited by a large proportion of respondents.
What Technology Organizations Auditing Their Public Cloud Infrastructure Spending Have Uncovered

A consistent infrastructure management experience drives significant benefits

Benefits achieved due to the adoption of management tools that improved management experience across clouds.

Reduced risk and enhanced security rose to the top of the list for 88% of respondents, while also reporting an improved ability to better support application developers (81%).

Many efficiencies also were enjoyed, such as accelerated cloud onboarding and migrations (79%), increased management efficiency and simplified operations (79%), and an increase in pace of innovation and service delivery (78%), as well as ease of training (73%).

And when respondents were asked to estimate the improved efficiency impact on the IT organization, they reported saving the equivalent of 2.4 full-time equivalents (FTEs) due to infrastructure management improvements.
The Bigger Truth

It’s clear that technology organizations, much like other industries, have adopted a hybrid and multi-cloud IT philosophy. However, this research shows that many organizations struggle with implementing this strategy in an economically efficient manner and without making workload placement missteps. As a result, ESG research shows that many organizations are working to rein in costs and transform their on-premises environment to both entice repatriations and simplify IT management burdens. Organizations grappling with or questioning if their current cloud usage is optimized would be well-served to carefully audit their public cloud infrastructure usage and follow the lead of their peers, if appropriate, by modernizing their private cloud capabilities and investing in solutions that can provide a more consistent management experience.

How Dell Technologies can help

Dell Technologies helps organizations simplify multicloud by design. Dell APEX bridges the divide between the agility of public cloud and the control of private cloud, offering a truly unified cloud experience that’s more consistent across all environments.

APEX brings simplified cloud experiences – with quick provisioning, seamless scaling, and flexible consumption – wherever applications and data live. Customers can subscribe to Dell’s innovative technologies, consume them as-a-Service, and deploy them wherever needed, including public cloud and on-premises environments.

The APEX portfolio consists of cloud services and custom solutions that satisfy a range of requirements from compute to data storage to data protection with cyber resiliency and more.

APEX makes it easier to get more value from Dell Technologies innovation. Customers can simplify operations, increase agility to capture new opportunities, and maintain control of data – to minimize risk and maximize performance – on their terms.
What Technology Organizations Auditing Their Public Cloud Infrastructure Spending Have Uncovered

Research Methodology

The data in this report was derived from a survey fielded among IT and finance leaders in the technology industry in March of 2022. These figures detail the demographics of respondents to the survey located in North America (N=97) and Western Europe (N=105).

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

The margin of error for a sample size of 202 at the 95% confidence level is ± or - 7 percentage points.
Technology has never been more important than in today's data-driven era, and Dell believes it is an overwhelming force for good. We're committed to helping safeguard technology's role in human progress by helping you plan, prepare, and protect against attacks so you can build your breakthrough with confidence.

Enterprise Strategy Group is an integrated technology analysis, research, and strategy firm that provides market intelligence, actionable insight, and go-to-market content services to the global IT community.