Forbesinsights

The Modern Data Center

How IT Is Adapting To New Technologies And Hyperconnectivity

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Table Of Contents

Introduction

The data center must evolve with the pace of technology.

Although most enterprises have adopted strategies that include the cloud and colocation, more change will unfold as a new level of connectivity from sensors and devices that acquire data expands enterprise networks and pushes data capture and processing to the edge. As innovation takes shape, IT leaders and engineers will need to address the challenges of more complex network environments.

Overcoming those challenges, however, can lead to stronger business insights and outcomes. Capitalizing on 5G and edge computing-fueled opportunities will depend largely on the ability of IT leaders and engineers to update their data centers.

The question facing IT leaders and engineers: How do they transform the data center of today into one that enables the organization to fully leverage connectivity capabilities and the explosive growth in the amount of data?

Decentralization that ultimately brings data centers at or near the edge will continue to unfold. New strategies might involve data centers being deployed at the edge—in a retail backroom or remote locations, for instance. An increasing focus on self-configuring and self-healing data centers is likely as well, because engineers simply won't be able to be on-site.

To understand the current data center landscape and what's changing—and to pinpoint the challenges and solutions available to IT leaders as they rethink their data centers—we surveyed 150 senior IT executives and data center managers for their perspectives on the future of the data center.

Key Findings

Only 11% of C-suite executives—and just 1% of data center engineers—believe their data centers are updated ahead of current needs. Overall, survey respondents say security (45%) and bandwidth/speed (43%) are areas where their data centers need to be upgraded.

The trend towards hybrid IT is accelerating with the range of data locations for enterprises increasing. Feedback from respondents pointed to an increasing percentage of future data being located in public cloud, private cloud and hybrid cloud. There will be more data overall—due to IoT and other drivers—and it will be located in a greater variety of hybrid IT destinations including on-premise/local, colocation, public cloud and emerging edge sites.

Self-configuring and self-healing data centers will become a bigger part of data centers. Almost a quarter (24%) of executives report that over 50% or more of their data centers will be self-configuring by 2025—and about one-third (32%) say that more than 50% of their data centers will be self-healing by then.

Introduction of new technologies, such as 5G-enabled edge computing, will have an impact on IT staffing. Almost three-quarters (74%) of C-suite executives believe staffing will be reduced or handled by external cloud or edge service providers.

Top features in the data center that will lead to competitive advantage include security (43%), the ability to implement new technologies (28%) and bandwidth (27%).

The Data Center: Moving Toward Solutions

Most enterprises have moved (or plan to move) beyond local data centers toward a distributed approach that mixes various architectures— private cloud, public cloud, hybrid—along strategic lines.

Many still keep their most sensitive information, such as customer data and intellectual property, within their own on-premise facilities; many tap into the power and cost benefits of cloud computing to develop new or better products and services.

Forbes Insights research explored current data center strategy and assessed how it might evolve in five years. Results suggest a shift from local data centers to cloud and edge. On average, 32% of data is stored in local data centers today, but respondents plan to shift to more distributed computing—including local data centers, edge and hybrid cloud.
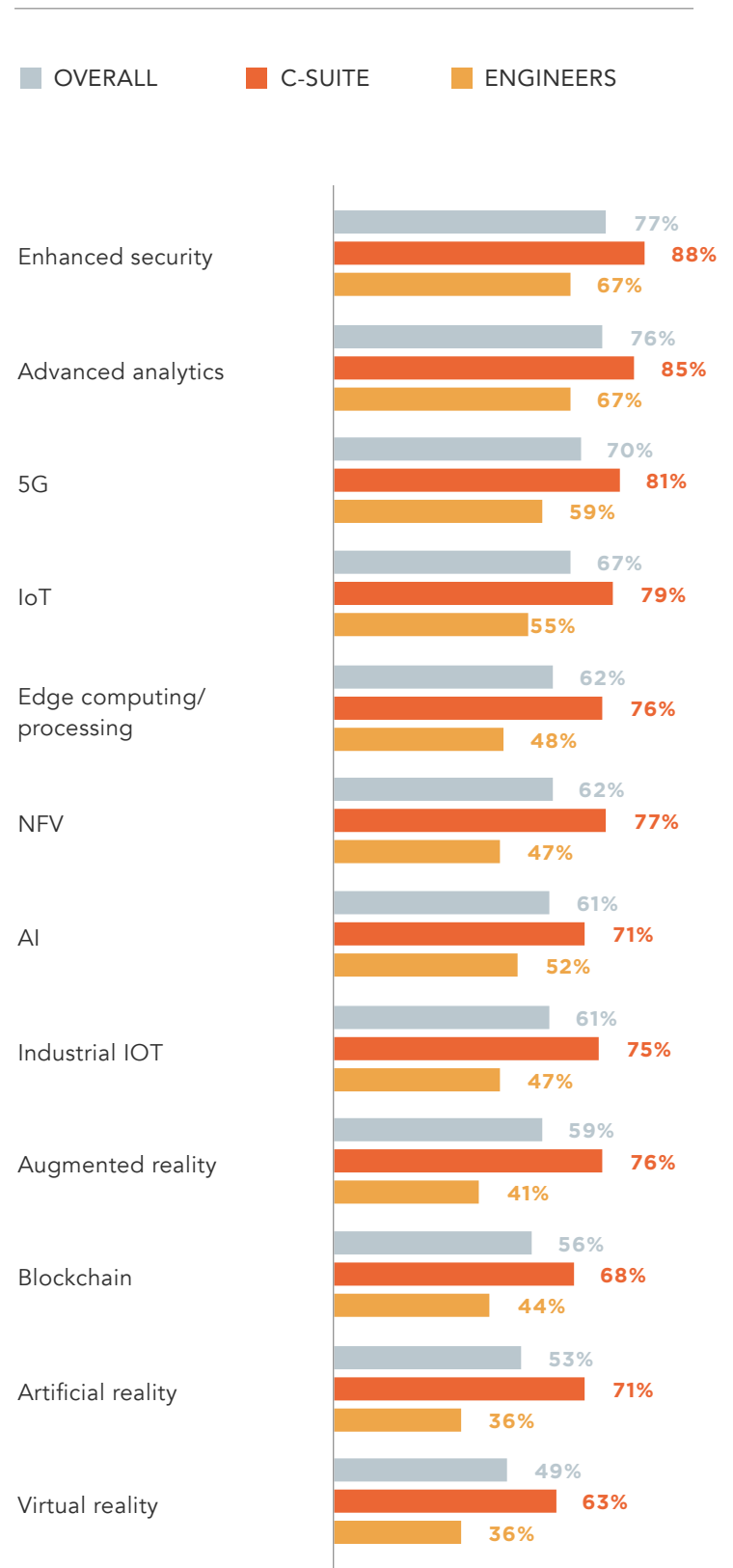
New technologies, new types of data centers.
IT leaders and engineers grasp the importance of emerging technologies. Advanced analytics from AI technologies, 5G, IoT and edge computing are considered the most important, although the C-suite is particularly focused on security (88%), analytics (85%) and 5G (81%).

This is creating a blend of IT and data center strategy. "We've taken our IT strategy and our innovation strategy and intertwined them," says Steve Hess, chief information officer at UCHealth, a Colorado-based network of hospitals, clinics and health providers. "Our IT strategy is our innovation strategy and our innovation strategy is our IT strategy."

45% of respondents believe the complexity of regulations has been increasing.

Figure 1.

How important are the following technologies and capabilities to the success of your organization? (important or very important)

OVERALL C-SUITE ENGINEERS

Technology	OVERALL	C-SUITE	ENGINEERS
Enhanced security	77%	88%	67%
Advanced analytics	76%	85%	67%
5G	70%	81%	59%
IoT	67%	79%	55%
Edge computing/processing	62%	76%	48%
NFV	62%	77%	47%
AI	61%	71%	52%
Industrial IOT	61%	75%	47%
Augmented reality	59%	76%	41%
Blockchain	56%	68%	44%
Artificial reality	53%	71%	36%
Virtual reality	49%	63%	36%

Forbes Insights data shows that to benefit from emerging technologies like IoT, machine learning and augmented reality, 92% of CIOs and CTOs say their business will require faster download and response time in the near future. Centralized IT infrastructures will not be the most effective way to take advantage of those technologies and their users—and, in many instances, it won't be the ideal way to handle increased connectivity. The question is how to build a holistic data center solution—from the rack through energy consumption and security—that's powerful and flexible enough to manage data from more sources.

"Enterprises are pushing their capacity out in order to provide better-quality service," says Martin Olsen, vice president, global edge and integrated solutions at Vertiv. "That's really the theme for the coming years: decentralized compute, or the ability to process and analyze data really at the source—or as close to the source as possible."

Edge data processing will occur between devices and sensors that generate or receive data at the source and edge processing devices that connect to the cloud. Equipment and infrastructure will "go into remote sites that could be unmanned or difficult to access," says Olsen.

Connectivity. Cisco predicts that there will be 28.5 billion connected devices by 2022—more than half of them machine-to-machine—and, in 10 years, the company predicts 500 billion connected devices. In just two years, the busiest hour of internet traffic could be six times more active than the forecast average.[1]

Bandwidth. According to KPMG, 5G networks could carry 10,000 times the traffic of current 4G networks— with significantly higher speed and a latency as low as one millisecond.[2]

[1] Cisco, Virtual Networking Index, November 2018.
[2] KPMG, Move to 5G Telecom Networks Will Unlock $4.3 trillion in Economic Value, May 2019.

Opportunities At The Edge

Latency has been a barrier to progress across industries, but 5G networks could make room for vast opportunities.

Just a few use cases: A technician in the field can be guided seamlessly by engineers on the other side of the globe; a doctor can perform surgery from another continent; smart cities that connect everything from lampposts to parking meters to traffic lights will add new levels of efficiency; wearables and other sensors will make today's data flows look like a trickle. In the move to the edge, being able to process and move data will be crucial—and data center strategy is at the core of the transition.

Hess explains how UCHealth is developing its connected healthcare environment. Like many organizations, the hospital has evolved its data center over the past decade. Five years ago, the hospital leased space in a colocation facility for its data center needs.

The move ultimately helped enable the hospital's connected care offering. Today, the hospital can capture medical data from wearable-equipped patients to improve its services.

"That wearable is sending data through a 5G phone or a 5G hub in their home to their cloud," Hess says. "The future of healthcare from a data center perspective is really about a disparate but connected cloud, whether it's private or public, multitenant or another architecture. We're going to link data in the wearable vendor's cloud and the smartphone vendor's cloud. We'll commingle it appropriately with our data—all with different purposes, different databases, different use cases. And our job from a healthcare IT perspective is to pull it all together to feed our algorithms."

Challenges: The Speed Of Technology

The dependence of an enterprise on distributed computing increases as applications proliferate and as its network grows, putting pressure on IT teams to ensure availability for critical tasks.

Users—internal teams or customers and other stakeholders—expect quick access. And in healthcare, data can be life-critical.
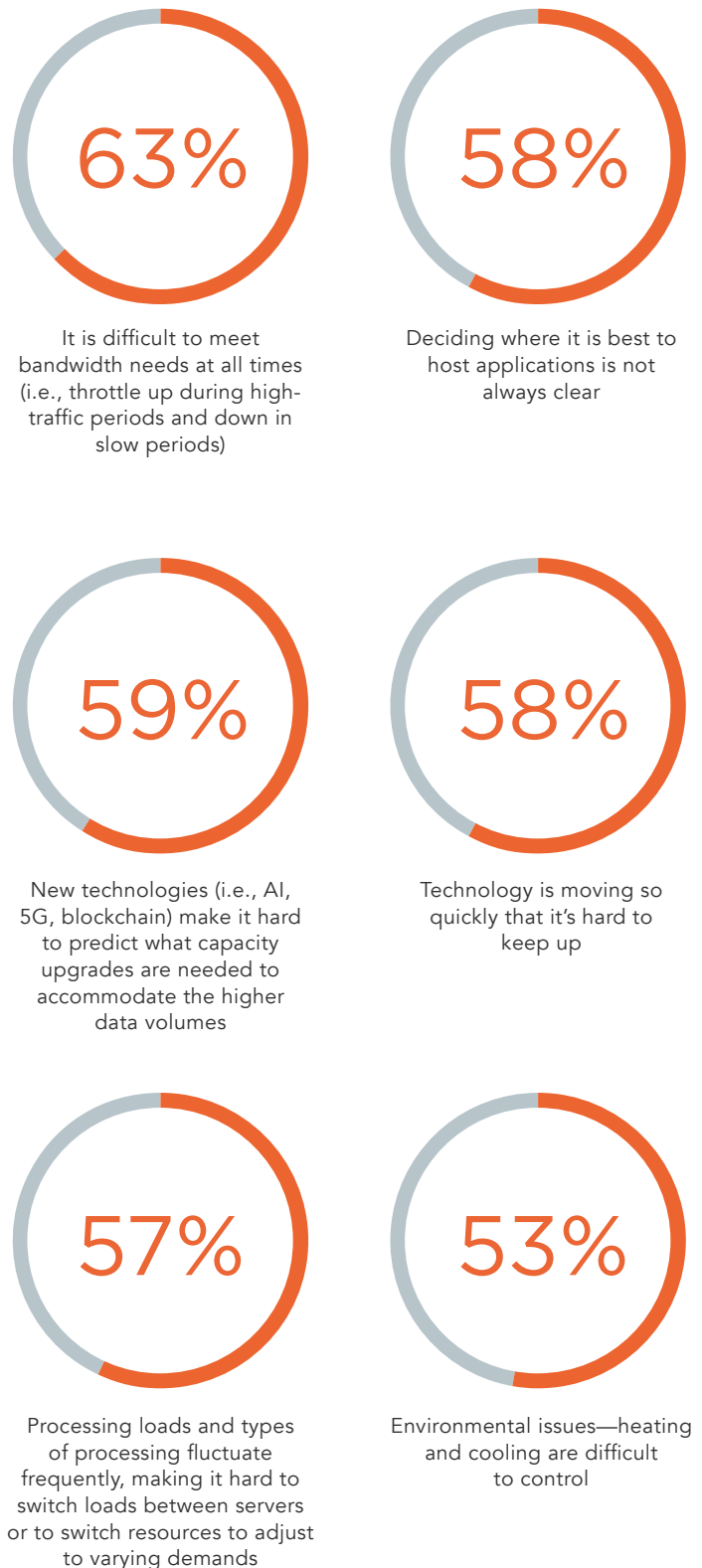
What are the pain points? Managing the fluctuation of processing loads (and various types of processing) is a challenge for more than half (57%) of respondents. Indeed, 63% say it's difficult to meet bandwidth needs at all times. More than half (53%) say heating and cooling are difficult to control.

Executives have particularly acute concerns. Most (76%) have a hard time predicting what capacity upgrades are needed to accommodate new technologies and higher data volumes—compared with 41% of engineers. And 69% of executives have difficulty deciding where to host applications.

Overall the top-ranked challenge of widely utilizing edge computing is cybersecurity of devices/equipment **(17%),** followed by managing costs **(14%).**

Figure 2.

To what extent do you agree with the following statements about challenges in your data center(s)? (agree or completely agree)

63%

It is difficult to meet bandwidth needs at all times (i.e., throttle up during high-traffic periods and down in slow periods)

58%

Deciding where it is best to host applications is not always clear

59%

New technologies (i.e., AI, 5G, blockchain) make it hard to predict what capacity upgrades are needed to accommodate the higher data volumes

58%

Technology is moving so quickly that it's hard to keep up

57%

Processing loads and types of processing fluctuate frequently, making it hard to switch loads between servers or to switch resources to adjust to varying demands

53%

Environmental issues—heating and cooling are difficult to control

Self-Configuring And Self-Healing Data Centers

Self-configuring or self-healing data centers feature infrastructures that, to a certain extent, allow for real-time maintenance, configuration and issue resolution. These features are an enabling feature of edge processing.

Almost one-quarter (24%) of C-suite executives say that more than 50% of their data centers will be self-configuring by 2025—and 32% say that more than 50% of their data centers will be self-healing by 2025. However, 29% of engineers say they don't know what percentage of their data centers will be self-configuring or self-healing.

Leaders are aware of the opportunity: 71% of C-suite executives say these data centers will reduce costs, with 8% saying that they will greatly reduce costs.

"Self-healing infrastructures are types of technologies that enable an IT team to do a better job in providing a robust and resilient service to their sort of internal stakeholders."

JORIS POORT

CEO, Rescale

Is The Data Center Ready For Tomorrow?

The challenges facing organizations suggest that most organizations are unprepared for the near future. The way that executives and engineers view the capabilities of their data centers also indicates a lack of readiness.
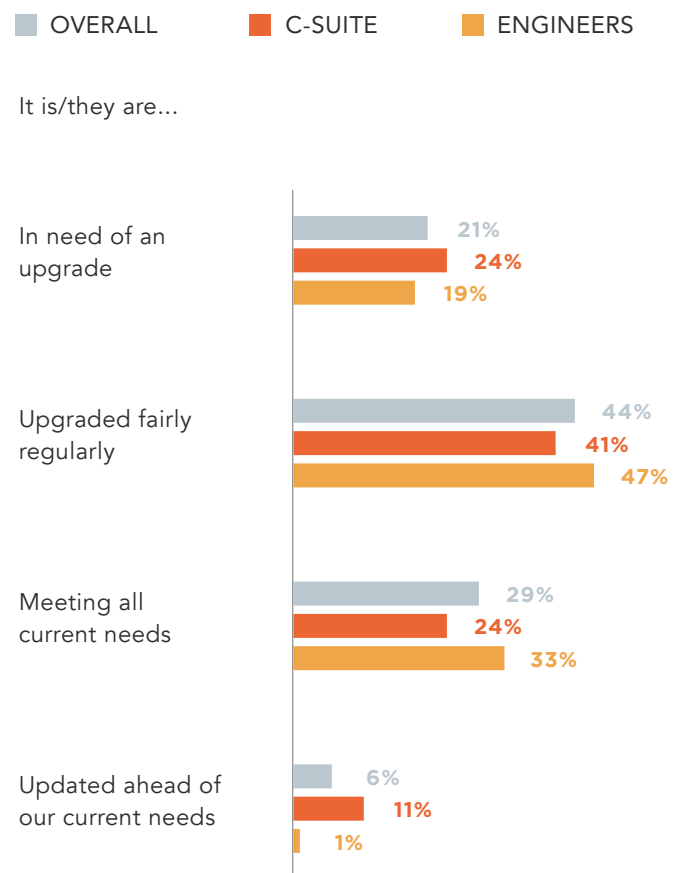
Overall, 44% say that their data centers are updated regularly and only 29% say that their data centers meet current needs. This suggests that most organizations are not ready for the onslaught of data and connectivity—and they won't have adequate processing power to leverage the edge and 5G, unless they commit to planning for future requirements.

It's interesting to compare the views of engineers and executives here. While 11% of executives believe that data centers are updated ahead of current needs, only 1% of engineers feel the same way. More executives believe that their data centers are in need of an upgrade—almost one-quarter (24%) of executives, compared with about one-fifth (19%) of engineers.

Given advancements to come, it's crucial for organizations to be prepared ahead of current needs. That very few respondents believe they are at that level suggests that many organizations are not prepared to adapt.

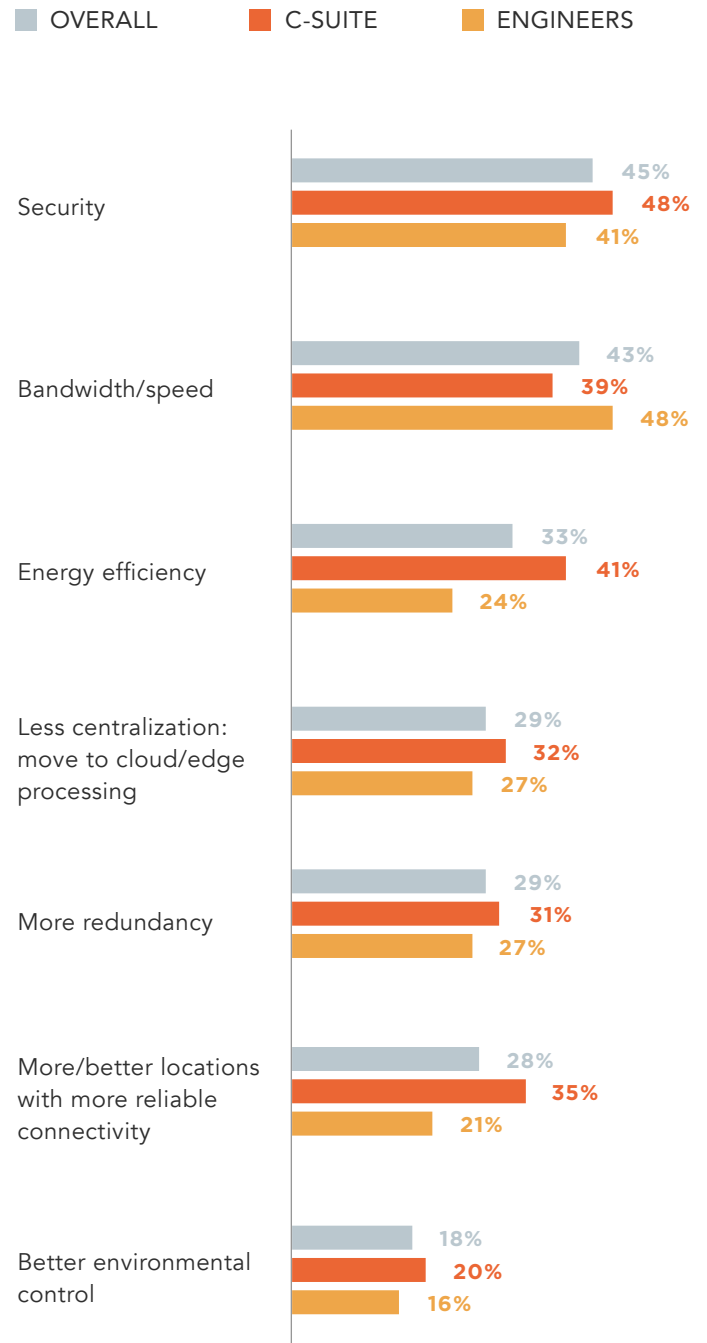Figure 3.

Which best describes your current data centers?

OVERALL   C-SUITE   ENGINEERS

It is/they are...

In need of an upgrade
- OVERALL: 21%
- C-SUITE: 24%
- ENGINEERS: 19%

Upgraded fairly regularly
- OVERALL: 44%
- C-SUITE: 41%
- ENGINEERS: 47%

Meeting all current needs
- OVERALL: 29%
- C-SUITE: 24%
- ENGINEERS: 33%

Updated ahead of our current needs
- OVERALL: 6%
- C-SUITE: 11%
- ENGINEERS: 1%

1 "Worldwide Blockchain Spending Forecast to Reach $2.9 Billion in 2019, According to New IDC Spending Guide," March 4, 2019

What upgrades are needed? Almost half of respondents overall say security is most in need of upgrade, a view shared by the C-suite (48%) and engineers (41%). Bandwidth/speed (43%), the very heart of the challenge and opportunity, is also a top area in need of upgrade. In this area, engineers express more concern over the situation: Half (48%) believe that their data centers are not ready for the future; the C-suite is a bit more confident (39%).

Compare Figure 4 and Figure 5. The takeaway: The areas of the data center most in need of upgrade are among the top keys to competitive advantage—notably, security and bandwidth.

Figure 4.

In which ways does your data center most need to be upgraded?

OVERALL   C-SUITE   ENGINEERS

Security
- 45%
- 48%
- 41%

Bandwidth/speed
- 43%
- 39%
- 48%

Energy efficiency
- 33%
- 41%
- 24%

Less centralization: move to cloud/edge processing
- 29%
- 32%
- 27%

More redundancy
- 29%
- 31%
- 27%

More/better locations with more reliable connectivity
- 28%
- 35%
- 21%

Better environmental control
- 18%
- 20%
- 16%

Competitive Advantage

Upgrading the data center and working with vendors and partners who offer solutions focused on the edge is a priority.

"Think about all the building blocks and how critical IT is in the overall objective of these enterprises," says Joris Poort, CEO of Rescale, a hardware infrastructure and software company, speaking of clients focused on scientific and engineering simulations. "Not adopting the latest technologies will certainly put a lot of these companies far behind their competition and potentially even put their entire business at risk."
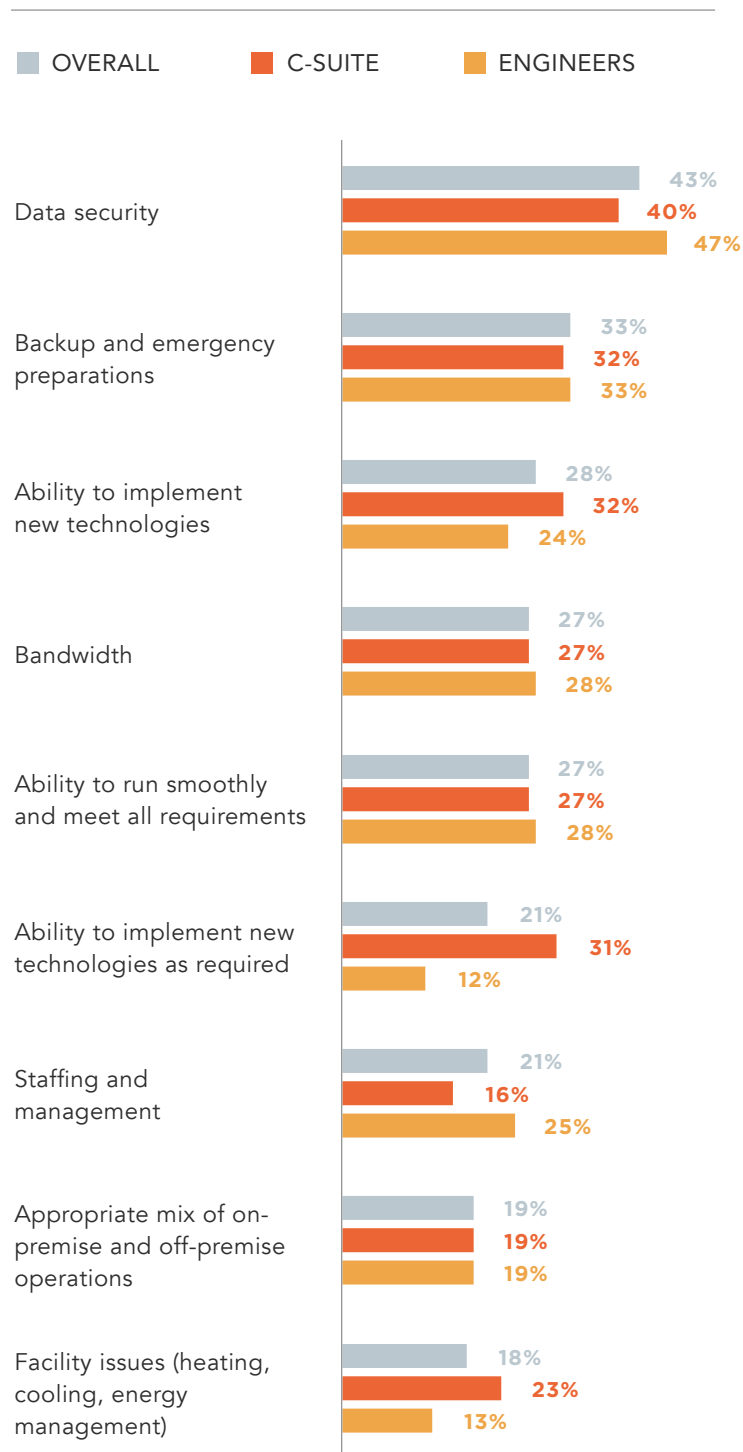
What characteristics of the data center will be critical for competitive advantage?

Consider Figure 5. One thread throughout this report is the expected focus on security (43%) and backup and emergency preparation (33%)—and, given the vast expansion of networks and devices, the priority to secure the network will grow, as will the stakes for companies that fall short. The network in many instances will be the business.

Executives are more focused on the ability to implement new technologies as required (31%) than engineers (12%)—and they're also more focused on facilities issues (23%) than engineers (12%).

Figure 5.

What are the top features or characteristics of your data center(s) that you are focusing on in an effort to give your organization a competitive advantage in the future?

■ OVERALL   ■ C-SUITE   ■ ENGINEERS

Data security — 43% / 40% / 47%

Backup and emergency preparations — 33% / 32% / 33%

Ability to implement new technologies — 28% / 32% / 24%

Bandwidth — 27% / 27% / 28%

Ability to run smoothly and meet all requirements — 27% / 27% / 28%

Ability to implement new technologies as required — 21% / 31% / 12%

Staffing and management — 21% / 16% / 25%

Appropriate mix of on-premise and off-premise operations — 19% / 19% / 19%

Facility issues (heating, cooling, energy management) — 18% / 23% / 13%

Staffing and talent. Over the next decade, one-third of the IT infrastructure workforce will be retiring.[3] This raises a critical issue for enterprises facing a brain drain while aiming to adapt the data center to disruptive forces. The issue really comes down to keeping up with big changes across security, bandwidth, processing power and more.
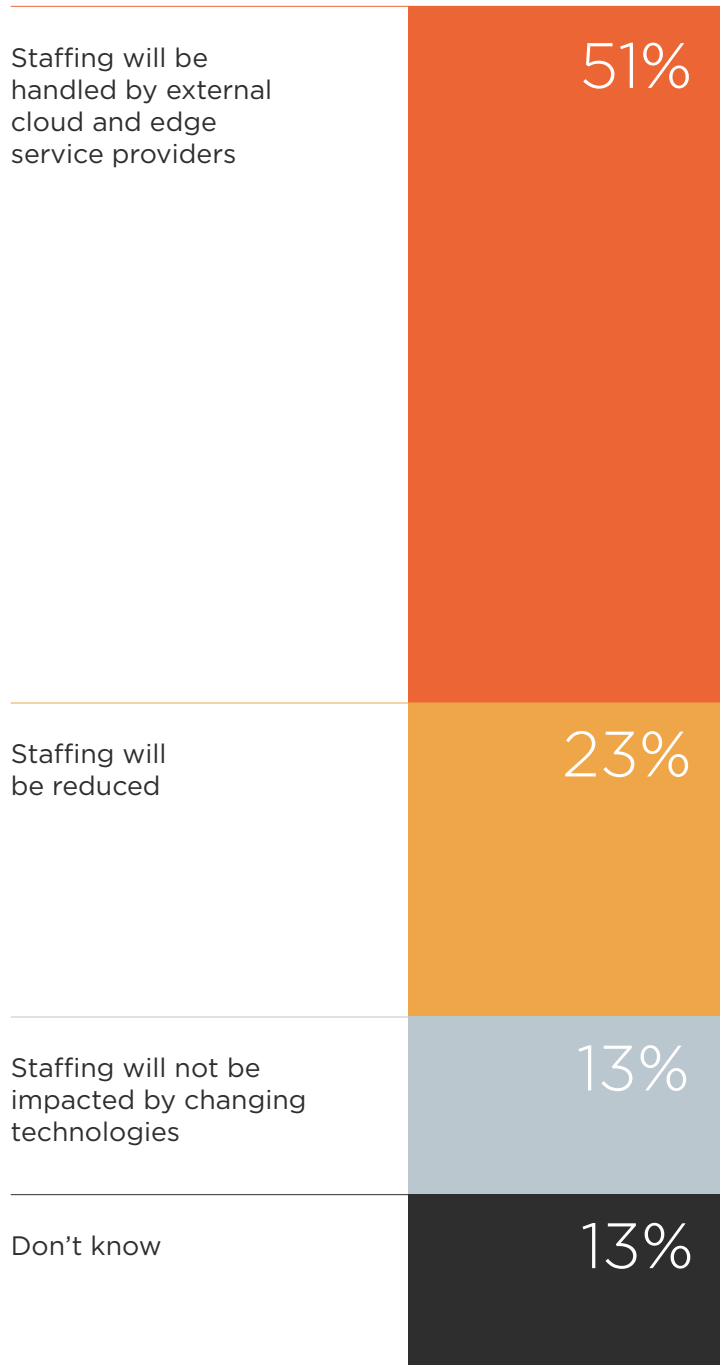
"It hasn't really been that you can't deploy a quality security framework in a hybrid or cloud environment," says Poort. "It's really been that an enterprise has to be ready, that that security team is fluent in how they can handle those situations and they have a proper sort of certification process around that."

According to Forbes Insights research, 40% of C-suite executives—and 37% of engineers—say they will likely retire in the next 10 years. Additionally, 85% of C-level technology executives see implementation of next-gen cloud technology as a means to advance their own careers. Those IT leaders also thought that the rest of the C-suite was willing to make the necessary investments to ensure that their organization will capitalize on this transformational opportunity.

Almost a quarter of staff (23%) will be reduced, according to executives, and over half (51%) say that staffing will be taken over by external cloud and service providers. How concerned are engineers? Only 5% think they will inevitably lose their jobs. To retain their relevance, one-third (33%) are planning to pursue additional training.

Figure 6.

C-suite: How is your IT staff likely to be impacted/or currently is being impacted by the adoption of new technologies, such as edge processing, 5G and next-gen data centers?

Staffing will be handled by external cloud and edge service providers	51%
Staffing will be reduced	23%
Staffing will not be impacted by changing technologies	13%
Don't know	13%

As distributed and self-healing data centers grow, many IT leaders wonder how their roles will change and even whether they'll exist in the future.
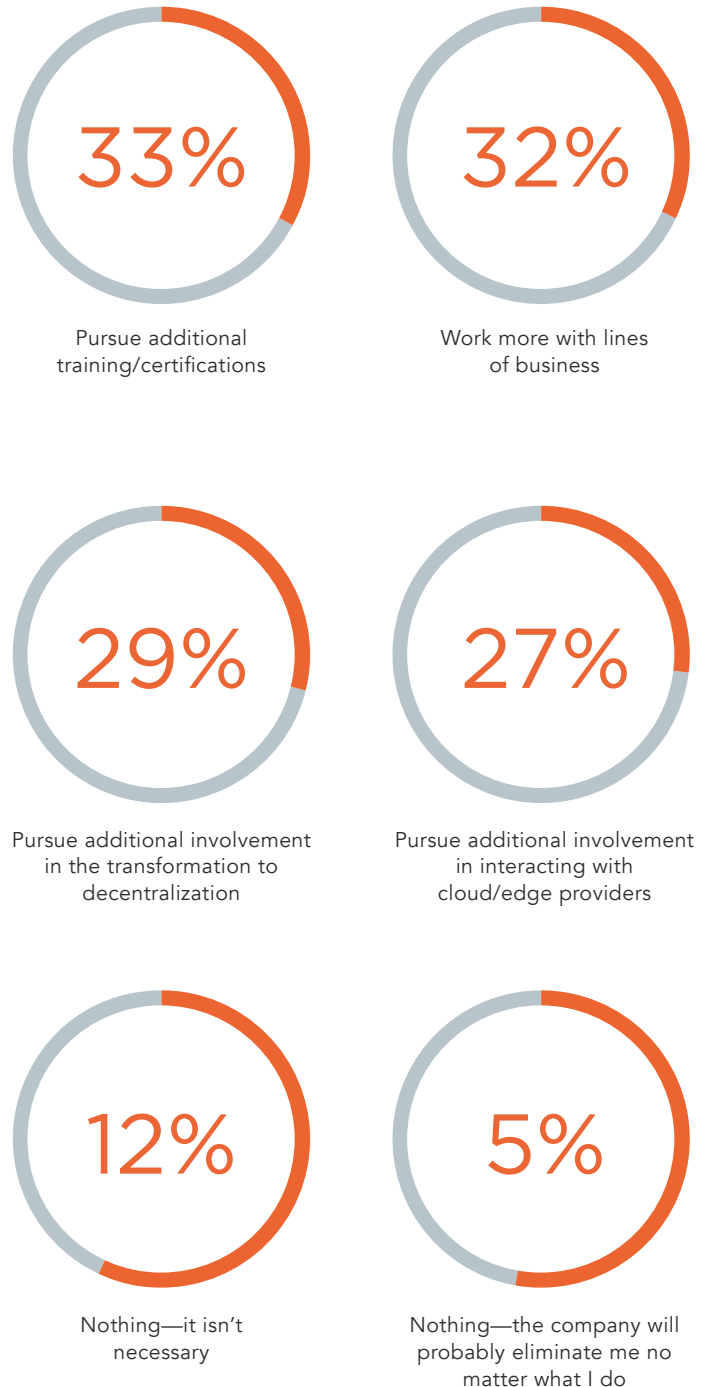
"The stack of self-healing capability, or the ability to tune and optimize workloads to the application, is an increasing level of complexity that needs to be handled and well understood by the IT administrators," Poort says. "And most IT skill sets are probably moving up the stack a little bit with automation software that obviously handles a lot of these capabilities. But that requires expertise to be able to deploy and maintain for a large enterprise. Whether you call it retraining or reskilling, it's critically important to be familiar with the latest IT capabilities. There are a lot of opportunities for IT professionals who adapt to the latest and greatest solutions in the space."

In a world where a portion of data center locations will be remote, virtual reality will become an increasingly important interface. "We're obviously seeing that in order for augmented reality to evolve, especially in the training setting, we've got to get to full in-band capability where you're directly connected," says Olsen of Vertiv. "An engineer could be sitting in St. Louis, for example, collaborating with a technician who's in Manila working on a system in real time. The technician might be in a rural area that might not have wireline connections, so 5G wireless connectivity becomes important."

Figure 7.

Engineers: What do you plan to do to increase your value to your organization?
(Select all that apply)

33%
Pursue additional training/certifications

32%
Work more with lines of business

29%
Pursue additional involvement in the transformation to decentralization

27%
Pursue additional involvement in interacting with cloud/edge providers

12%
Nothing—it isn't necessary

5%
Nothing—the company will probably eliminate me no matter what I do

Conclusion:
The Power Of
Partnerships

Getting the data center upgraded and ready is a mission-critical objective. Being able to manage data and extract value and insights from complex, connected environments is a competitive advantage that emerges from data center strategy. Few organizations can do this on their own. As the CIO of a healthcare network, Hess thinks competitive advantage requires appropriate access to the right data and being able to manage it effectively for patients and their families.

Partnering with external third parties is a central part of the data center journey in the age of hyperconnectivity. "We can really transform the way we deliver care by turning all that data into intelligence," Hess says. "The data center—your storage, your processing, your data architecture—all become this toolbox of tools that can be leveraged as a competitive advantage when you turn it all into intelligence."

The data center of tomorrow will not be defined by one strategy or configuration—it will be defined by each organization's goals and the imperative to react and adapt ahead of the curve. With edge processing and 5G—and the deepening of IoT overall—it's clear that organizations need to act quickly. And yet, many organizations are treading water, upgrading data center strategies to meet their current needs. Few believe they're ahead. Continuous effort to update the data center will be integral to business success.
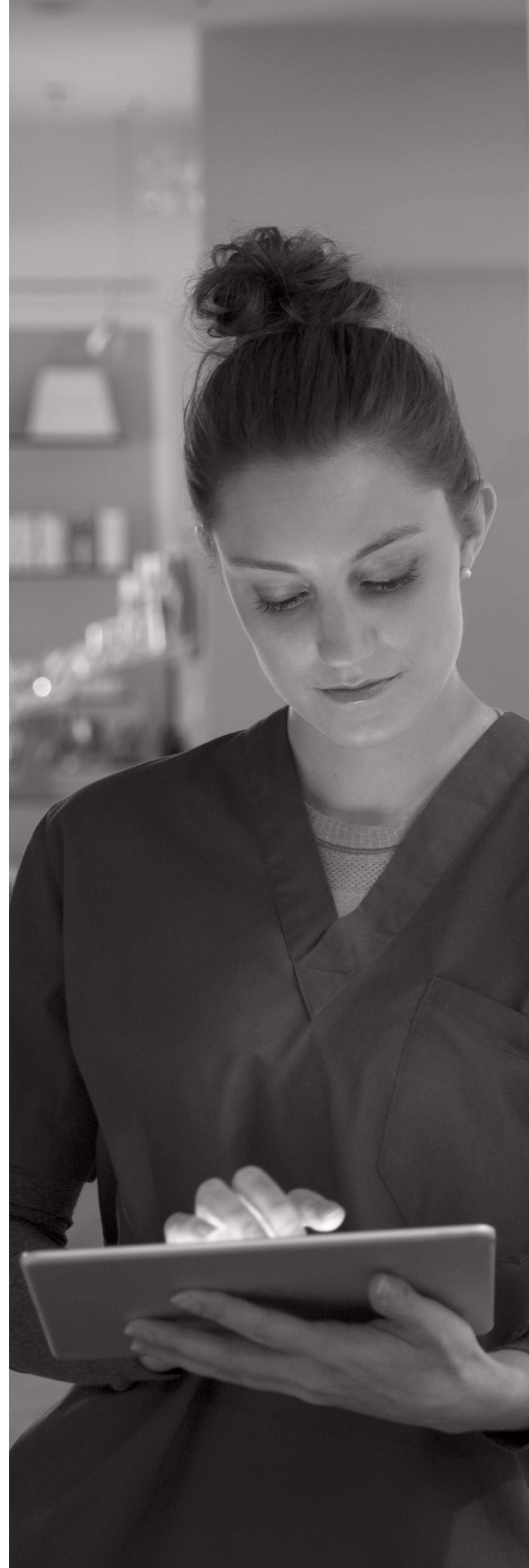
Survey
Methodology

In October 2019, Forbes Insights surveyed 150 technology experts in the Americas, Asia and Europe—half in senior positions responsible for overall IT strategy, and half in data center management and strategy positions—about their views on emerging technologies and the evolution of the data center. Respondents came from a range of industries, including financial services, manufacturing, retail and technology.

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