FUTURUM RESEARCH

DATA SERVING AND COMPUTING
THE HYBRID VALUE PROPOSITION

Uncovering the drivers, challenges, and value of hybrid data serving and computing architectures

Evaluating the state of six critical issues that are defining the present and future of data serving and computing within the global enterprise market

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RESEARCH COMMISSIONED BY IBM

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BACKGROUND INTRODUCTION

Data serving and computing are required to support any business process or technology that is digital in nature or involves the creation of data.

We live in an increasingly digital economy, where the ability to store and process data serves as the underlying foundation of value creation for emerging technologies and business processes. But while much attention is directed towards understanding the value and growth of technologies, such as artificial intelligence, predictive analytics, and edge computing, we believe the current state and future growth of the data serving and computing markets—as required to support these and other emerging technology and business needs—is not well understood at this time.

In the rush to advance new technologies, and in the face of a massive migration of data to the cloud (that many incorrectly assume is a true commodity), the fundamentals of how data storage and computing infrastructure are evolving, the choices between on- and off-premises implementations, and the value proposition of designing, implementing, and managing the right blend of data serving and computing resources *that match the current and future needs of a specific enterprise* are often overlooked.

We believe that overlap, or commonality, between key barriers and evaluation criteria is inhibiting the adoption of secure data serving and computing strategies.

To understand and analyze the dynamics of this market, and to better inform our base of enterprise and services clients, Futurum Research designed and implemented a primary research program designed **to address the following issues and questions**:

- *What are the different approaches to data serving and computing being implemented by enterprises today, and how will those models change over the coming years?*
- *Who is responsible for the development of data serving and computing strategies, and how are these systems managed between information, operations, and business unit teams?*
- *What are the strategic drivers of data serving and computing plans, and how are they viewed alongside other initiatives, such as Digital Transformation?*
- *What are the primary concerns or barriers to the successful implementation and management of data serving and computing systems, and which are considered the most critical to overcome?*
- *How are enterprises evaluating the providers of and different approaches to data serving and computing solutions?*

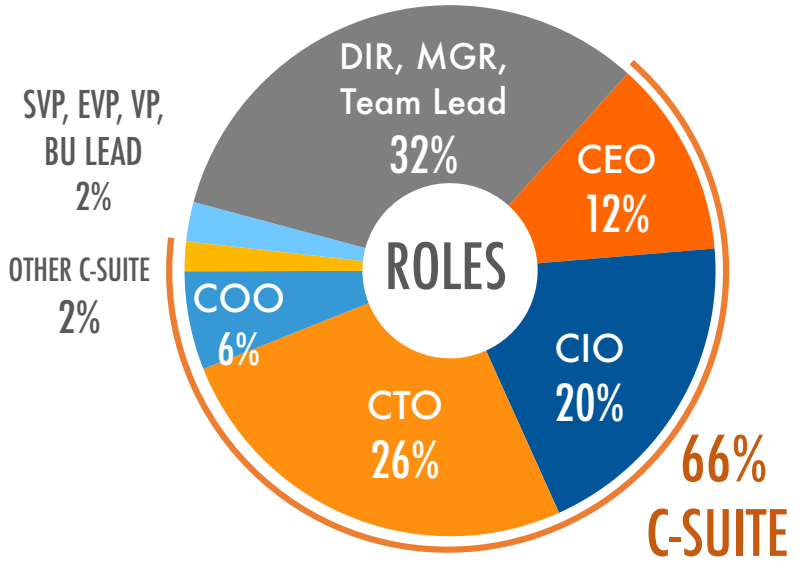
- *How will the use of data serving and computing systems increase or decrease over the coming years, and are enterprises sufficiently planning for the acquisition and management of these systems?*

There are many options for how on- and off-premises architectures can be blended and there is no one-size-fits-all approach that is more or less ideal than any other, highlighting the need for solutions that are personalized, or tailored, to the specific needs of an enterprise.

DEMOGRAPHICS

This survey was conducted during the second half of 2018, consisting of a multi-part questionnaire comprised of 19 core questions plus additional demographic and qualification questions. The survey was completed by 501 respondents (501n survey panelists) that met the following criteria:

Management Role Requirement: Our survey targeted individuals actively involved in the ongoing management of business or technology systems, having a minimum qualification of being at the Director, Manager, or Team Lead. Operational staff were disqualified during the evaluation process. 66 percent of our respondents were members of the C-suite, with 2 percent at the SVP, EVP, VP or Business Unit Lead level and 32 percent at the Director, Manager or Team Lead level, as follows:



SURVEY PANEL BY TITLE/ROLE

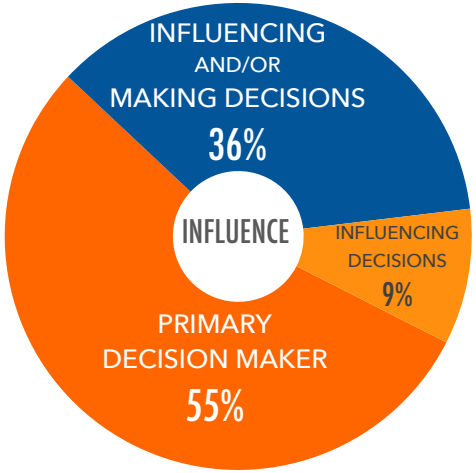
Technology Involvement Requirement: To further qualify our survey panel, we required all participants to be actively influencing decisions relating to the planning, implementation, management, or oversight of hardware and/or services related to data storage and/or data computing. Our survey panel is comprised of three distinct decision/influence categories:

Primary Decision Makers having a very high level of involvement in decisions, including being the primary or sole decision maker.

Decision Influencers having a moderate level of involvement, influencing but not making decisions.

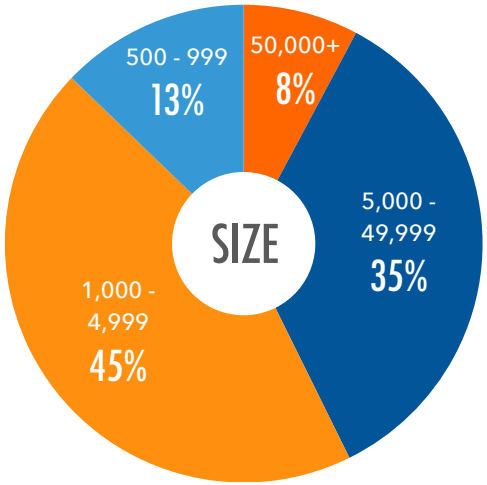
Dual Influencers/Decision-makers having a high level of involvement in both influencing and making decisions but not being considered a Primary Decision Maker.

The breakdown of influence for our survey panel is as follows:



BREAKDOWN OF INFLUENCE/DECISION CATEGORIES

Size of Organization Requirement: We established a minimum organizational size (across all global locations) of 500 employees, with a further quota limitation that no more than 25 percent of our survey panel would be outside our core target of between 1,000 and 49,999 global employees.

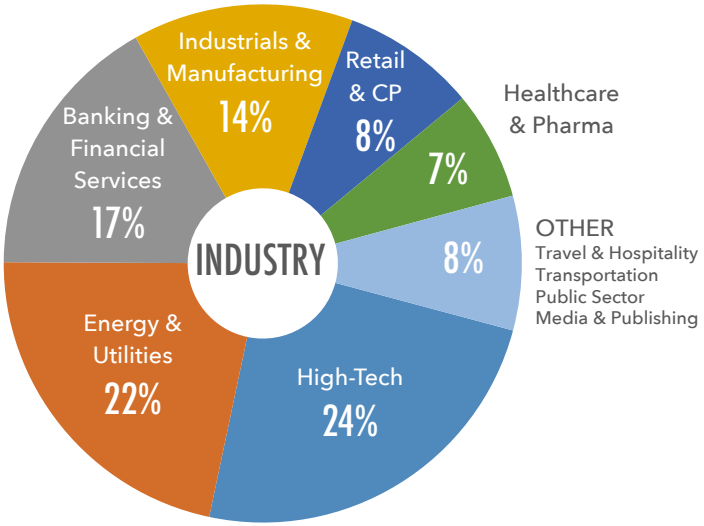


SIZE OF GLOBAL ORGANIZATION

Our survey also included questions designed to verify that the respondent's organization was actively using data serving and computing technologies and/or services, and that the respondent had a working knowledge of the subject.

In addition to the qualification requirements set forth above, we set certain quota requirements to ensure an industry and geographical balance and the validity of the survey results.

Industry Breakdown: Our survey targeted 6 key industries, or sectors. Additionally, we noted non-core sectors, including Travel & Hospitality, Transportation, Media & Publishing, and the Public Sector, within the Other category. Industry definitions follow the breakdown:



INDUSTRY/SECTOR BREAKDOWN

What defines an industry or sector? Our survey respondents are asked to self-identify with a set of standard definitions.

Banking & Financial Services Includes capital markets, investment banking, insurance, etc.

Energy & Utilities Includes water, electric, oil, gas, renewable, & nuclear; discovery, extraction, production, distribution, consumption, & disposal, etc.

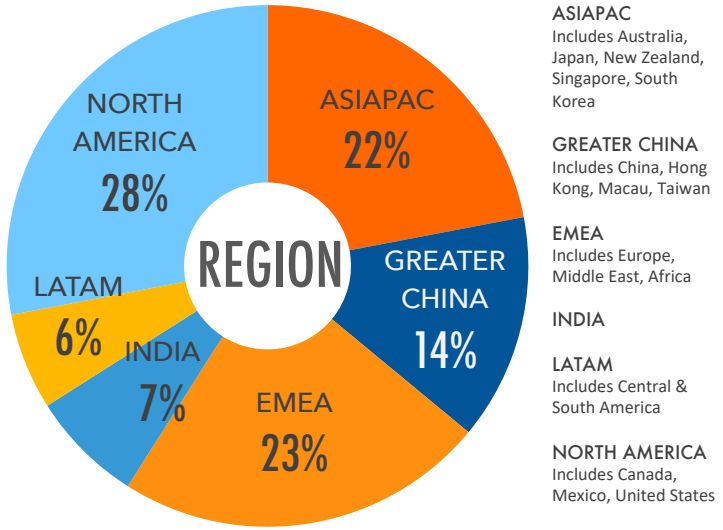
Healthcare & Pharma Includes medical, medical equipment, diagnostics, professional services, R&D, etc.

High-Tech Includes telecom, communications, computing, cloud, mobile, software, hardware, semiconductors, etc.

Industrials & Manufacturing Includes capital goods, manufacturing, machinery & production equipment; chemicals, construction materials, metals & mining, & paper, etc.

Retail & Consumer Products Includes discretionary products, automotive, household goods, apparel, hardware, retail, e-commerce, etc.

Geographical Breakdown: Our survey was designed to be global in nature, and we sought to balance our respondents between four primary and two secondary markets as noted below. Note that prospective survey panelists were required to demonstrate they could answer the survey in English.



RESPONDENTS BY GEOGRAPHY

501
EXECUTIVES & TECHNOLOGY PROFESSIONALS SURVEYED DURING Q4 2018

55%
PERCENT OF RESPONDENTS ARE PRIMARY DECISION MAKERS

66%
PERCENT OF RESPONDENTS ARE EXECUTIVES WITHIN THE C-SUITE

88%
PERCENT OF RESPONDENT'S ORGs WITH > 1,000 GLOBAL STAFF

EXECUTIVE SUMMARY

What is the state of data serving and computing in the global enterprise today? It's hybrid, it's growing, and it's driving value for other technology initiatives, including Digital Transformation.

When it comes to technology in the enterprise there are plenty of hot, and perhaps even over-hyped, topics. Artificial intelligence. Edge computing. IoT. The list is long. But none of these technologies could thrive in the enterprise without the right underlying infrastructure to provide data storage, serving, and computing resources. For much of the past two decades these technologies have been overshadowed by the "shift to the cloud" movement and the desire to replace legacy owned infrastructure with consumption-based services. In the process, hybrid networks (both off-premises cloud and on-premises data centers) became a necessary step towards the cloud. But that's not the whole story.

After gathering data and researching the market, we see a different model emerging, one where hybrid architectures are a necessary step but a desired architecture that offer greater flexibility, agility, and optimization of resources than any one on or off-premises model. Data security, data awareness, and data availability are all important factors that need to be considered.

Specifically, and within this survey, *we identify the following top findings:*

1 ON THE TOPIC OF ADOPTION MODELS

***There is no winning model, only winning models**. The world of data serving and computing is solidly a hybrid (on-premises/off-premises) world, with a third of enterprises surveyed expecting to increase their use of on-premises solutions over the coming three years. That's a good sign, particularly for CSPs offering hybrid cloud/on-premises managed solutions as 81 percent of enterprises surveyed currently us a combination of both public cloud and private cloud as well as on-premises solutions (including provider-owned/managed equipment).*

2 ON THE TOPIC OF OWNERSHIP AND MANAGEMENT

IT and OT need to work on simplifying both technology and their working relationship. *Centralized IT leads data serving & computing strategy about a third of the time but manages data serving & computing systems over two-thirds of the time. While we believe IT must play a larger role in defining overall strategy, we also believe (coupled with the significance of security), that systems that are fundamentally less complex to manage and secure will be critical over the coming years.*

3 ON THE TOPIC OF STRATEGY DRIVERS

Security, Data Protection, Availability & Business Performance are the top drivers of strategy.. *If it's not inherently secure, performance and availability won't have the opportunity to drive value. This is an important point as 95 percent of enterprise execs and technology leaders say that data serving and computing systems are key to the success of their Digital Transformation initiatives.*

4 ON THE TOPIC OF BARRIERS

Management issues can derail even the best of plans. *Security may be a critical concern, but management-related issues such as lack of executive support, operational management challenges, and budget planning highlight an unexpected barrier to successful data serving and computing initiatives.*

5 ON THE TOPIC OF EVALUATION FACTORS

Don't underestimate niche or premium offerings and on-premises hardware management. *There is strong consensus in the value of CSPs, data awareness, and hybrid on/off-premises solutions (with three-quarters of enterprises believing Hybrid on/off-premises solutions offer the greatest operational flexibility), but there are gaps that need to be bridged during the evaluation, selection and negotiation phase of data serving and computing implementations.*

6 ON THE TOPIC OF PLANNING AND BUDGETS

Budgets are a concern as growth lags overall IT and security and management issues continue to be problematic*. A majority of respondents anticipate increasing their use of data serving and computing services by more than 25 percent over the coming 12 to 24 months, with a subset of 23 percent anticipating an increase in excess of 50 percent. We believe this will strain even the best budget plans and strategies. Significant concerns surrounding security will continue to exist and eat into budgets. And while operational teams may be the primary drivers of strategy and acquisition, centralized IT resources, that are being tasked with managing these systems, are already stretched thin from both a resource and budget perspective. We believe that operational and IT teams must be equally involved in up-front strategy to ensure the most efficient use of capital and talent resources.*

ISSUE ONE ADOPTION

The world of data serving and computing is solidly a hybrid (on-premises/off-premises) world, with a third of enterprises surveyed expecting to increase their use of on-premises solutions over the coming three years.

When it comes to the storing and processing of data, the cloud is a relative recent addition to the mix. Historically, organizations that wanted to store and process data had to build out their own data centers and computer resources. But with the rise of the cloud in the mid-2000s, this changed. With cloud providers offering scalable data storage and computing resources, priced based on actual consumption, many organizations shifted their attention, and their data, to the cloud.

But the could isn't as pervasive or dominant any many might think. Many applications were never designed to operate in a cloud-based environment, and the transition from owned datacenters to shared clouds often overlooked the value of onsite ownership and existing investments.

To establish a baseline for this survey, we wanted to gain an understanding of the current models, or architectures, currently deployed for data serving and computing. Specifically, we were interested in understanding user preferences and plans for both on- and off-premises deployments as well as preferences in management of these assets (for those data storage and computing systems still on-premises). We were also very interested in establishing how common mixed public cloud, private cloud, and on-premises implementations are today and how enterprises anticipate that changing over the coming 3 years.

CURRENT USAGE PATTERNS

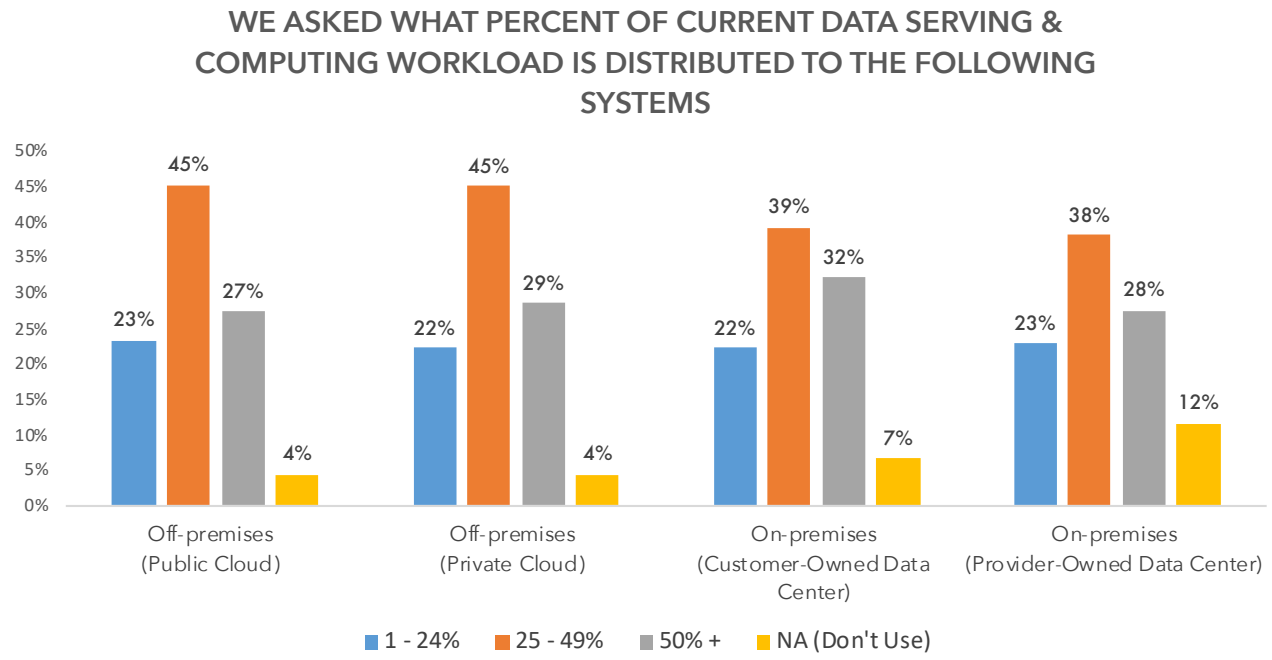
To gauge frequency of use, we asked our panel to identify which models were currently in use, and further how much of their current data serving and computing workload was assigned to each model. Specifically, *Please estimate your use of the following models within your organization for data serving and data processing computing systems:*

81%

Percent of respondents that indicate they use a combination of public and private cloud concurrently with both customer- and provider-owned assets on-premises.

OBSERVATION

46 percent of this "use all" group expect to increase their reliance on private cloud over the coming 3 years, while only 39 percent expect to increase their use of provider-owned on-premises assets over the same period.



In line with expectations, 81 percent of enterprises are using a combination of all four models, with on-premises (provider-owned) being the least used overall. But surprisingly, only 12 percent indicated they did not utilize provider-owned equipment on-site (indicating a much higher reliance in this model than anticipated). So, what is driving this number and which industries are holding out in the adoption of on-premises, provider-owned models?

Four sectors, Industrials & Manufacturing, Retail & Consumer Products, Healthcare & Pharma, and High-tech account for the majority of enterprises not utilizing provider-owned on-premises data serving and computing solutions. From a geographical perspective, North America (21 percent) and EMEA (15 percent) have stayed away from the provider-owned on-premises model.

WHERE ARE WE HEADING?

To understand the long-term dynamics of usage models, we asked our panel *Please estimate your expected usage shifts over the coming 24 to 36 months:*

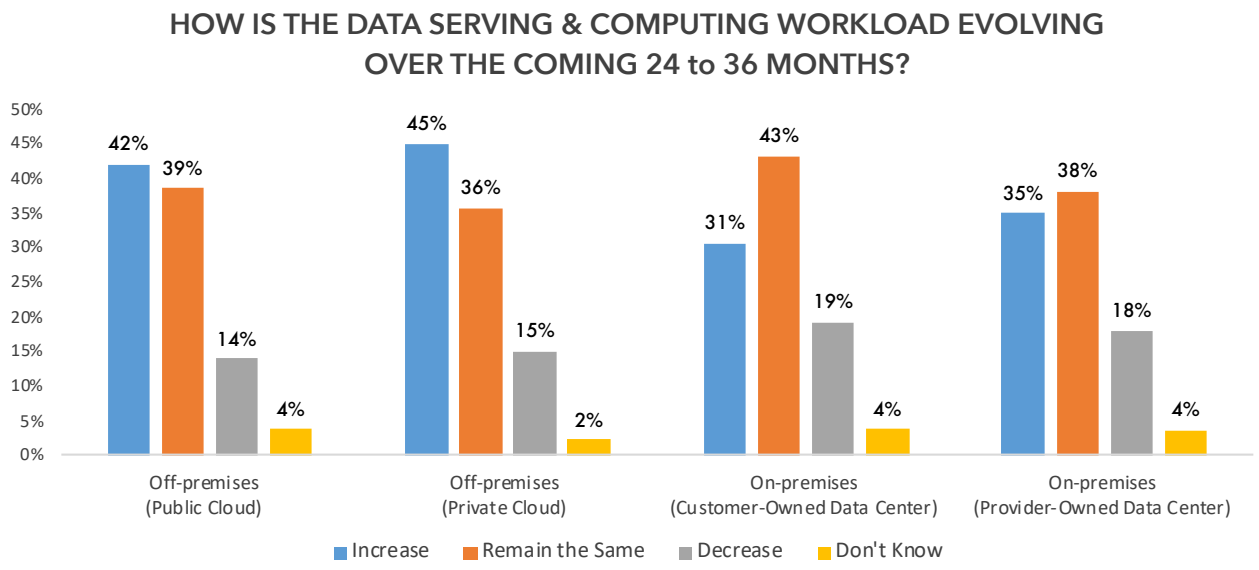
26%

Percent of respondents in the **Industrials & Manufacturing** sector indicating no provider-owned on-premises models.

Other sectors with a notable percentage not utilizing provider-owned on-premises models:

Retail & Consumer Products (24%), notable for the large percentage of enterprises that actually have data storage and computing resources on-premises (this industry is typically not particularly asset-heavy and is ideally suited for cloud-based approaches.

Healthcare & Pharma (24%), notable for traditionally preferring on-premises consumption models due to data security, privacy, and regulatory concerns.



While growth of public and private cloud solutions surpasses that of on-premises solutions, the mere fact that on-premises solutions are expected to increase by a third of our survey panel is significant. Notably, it would appear that this growth, particularly involving provider-owned elements, appears partially at the expense of customer-owned on-premises solutions.

Breaking this down, the largest shifts towards the public cloud are seen in Industrials & Manufacturing (61 percent) and Retail & Consumer Products (55 percent) sectors, and geographically within AsiaPAC and India (62 and 60 percent, respectively). Note: these same two geographies also lead in expected growth of private cloud.

We're highlighting these observations as the current and anticipated shifts in consumption models serves as the foundation to understand (and provide context to) how barriers, evaluation criteria, and operational factors are shaping the overall market (something to be discussed in the following sections.

THE CHINA FACTOR

Our survey data on existing and projected consumption models revealed some interesting data on Greater China. This region, as we've seen in other research projects, behaves somewhat

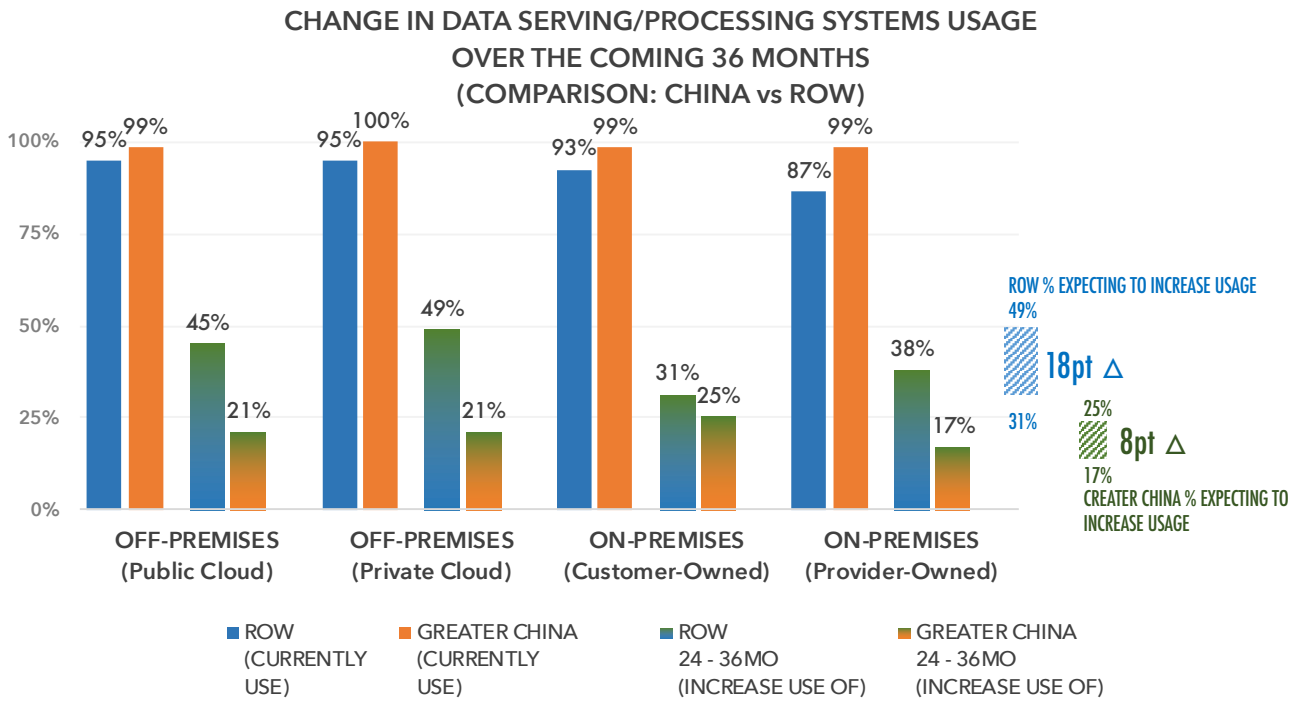
OBSERVATION

Off-premises solutions show a slightly greater indication of expected growth (vs on-premises solutions) over the coming few years with private cloud expected to increase the most, by 45 percent of enterprises.

NOTE: Over a third of all respondents expect the use of on-premises, provider-owned data centers to increase over the coming 24 to 36 months, *potentially at the expense of customer-owned, on-premises solutions.*

independently from other regions. For example, only 1 percent of enterprises in Greater China do not utilize all four consumption models (other regions range from 5 to 13 percent in this category).

This region also shows the least propensity to change or deviate from current consumption models.



While North America, LATAM, EMEA, India, and AsiaPAC (ROW) combined are anticipating frequency of usage of particular models to increase between 31 and 49 percent (an 18pt delta), enterprises in Greater China anticipate a much more even change of between 17 and 25 percent (a more modest 8pt delta).

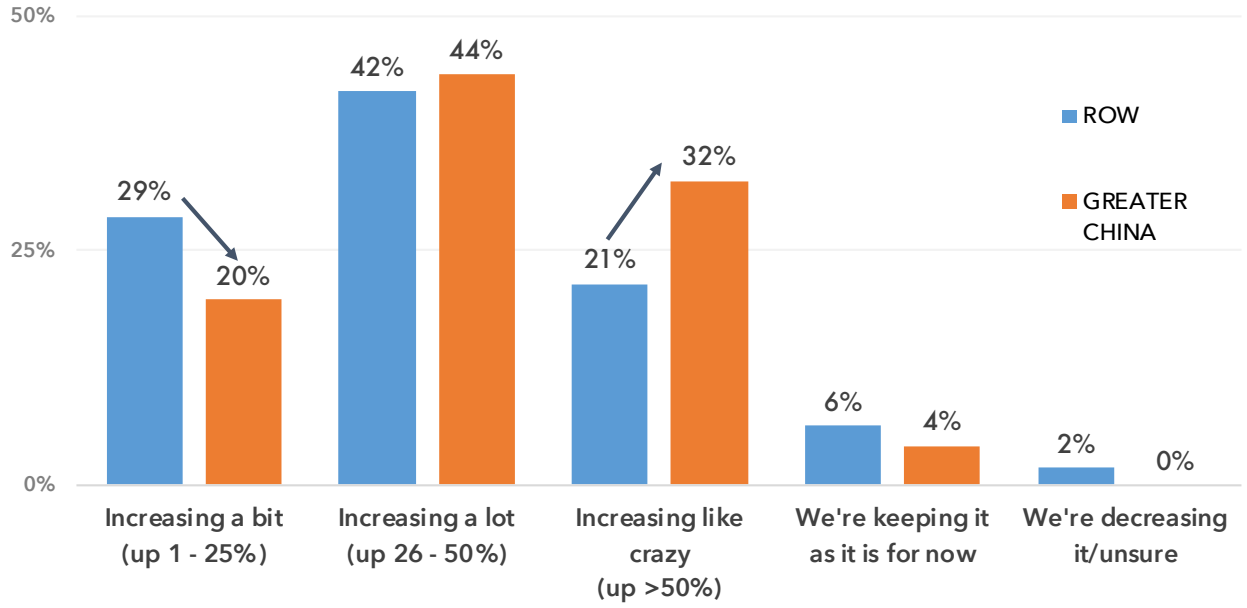
To really understand the magnitude of the different expectations between Greater China and the rest of the world, the following chart specifically highlights expected changes in capacity of existing data serving and processing systems.

OBSERVATION

China exceeds the rest of the world combined (ROW) in terms of consistently using all consumption models (only 1 respondent out of 71 does not currently use all four on/off-premises models).

We believe the relatively-low "increase use of" numbers (an 8pt delta) indicate a focus on maintaining the status quo, and not a limit on growth.

CHANGE IN DATA SERVING/PROCESSING SYSTEMS CAPACITY OVER THE COMING 12 – 24 MONTHS (COMPARISON: CHINA vs ROW)



Close to a third (29 percent) of ROW enterprises expect a low increase in capacity requirements, between 1 and 25 percent) over the coming 24 months. In contrast, only 20 percent of enterprises in Greater China anticipate such a low rate of growth. When we look at expectations for significant growth in excess of 50 percent over the coming 24 months, only 21 percent of ROW enterprises vs 32 percent of Greater China enterprises are that optimistic.

BOTTOM LINE

We see a slight shift from customer-owned to provider-owned on-premises solutions, with 38 percent of enterprises looking to *expand provider-owned (managed) on-premises solutions* over the coming three years. Interestingly, AsiaPAC and India have the highest percent of respondents (over 50 percent) that anticipate increasing both public and private cloud for data serving and computing over the coming 24 to 36 months, a sign that these systems must be designed to scale from the beginning. From an evolutionary perspective, Greater China appears to be the most stable in terms of maintaining current implementation models moving forward.

OBSERVATION

When we ask "how much" will your usage increase (a measure of needed capacity):

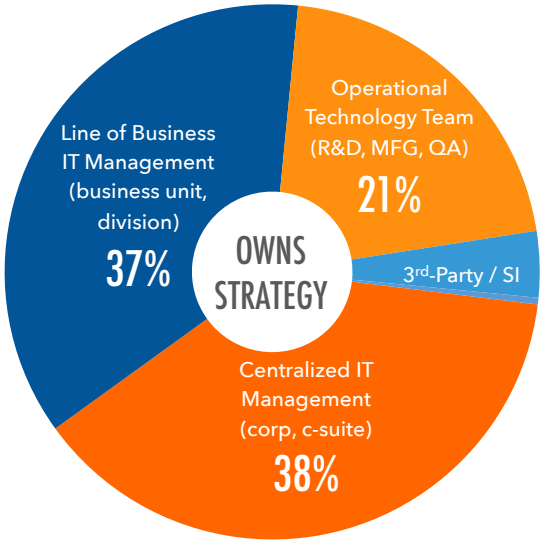
32% vs 21%

The percent of enterprises in Greater China vs ROW that expect usage levels (total serving & processing capacity) to *increase by more than 50 percent* over the coming 12 to 24 months.

ISSUE TWO OWNERSHIP & MANAGEMENT

Centralized IT leads data serving & computing strategy about a third of the time but manages data serving & computing systems over two-thirds of the time. While we believe IT must play a larger role in defining overall strategy, we also believe (coupled with the significance of security), that systems that are fundamentally less complex to manage and secure will be critical over the coming years.

The successful needs assessment, selection, implementation, and operation of any technology begins with a solid strategy. And operational systems are only as valuable as the level of coordination between the strategy team that designs the system and the management team that keeps the system up and running. Unfortunately, that coordination can be difficult, particularly when different teams are running strategy (which is typically an operational or line-of-business team) and operations (which, in the case of data serving, is almost exclusively centralized IT).



STRATEGIC OWNERSHIP

We asked our panel to identify who is responsible for developing the strategy behind deployments, specifically *Who primarily owns your organization's Data Serving and Processing/Computing strategy?*

Close to two-thirds of the time, data serving and computing strategy is led by an operations-focused team, including BU IT teams (37 percent), operational technology teams (21 percent), and operationally-sponsored 3rd-party integrators (4 percent). Only 38 percent of the time does a centralized IT team own strategy.

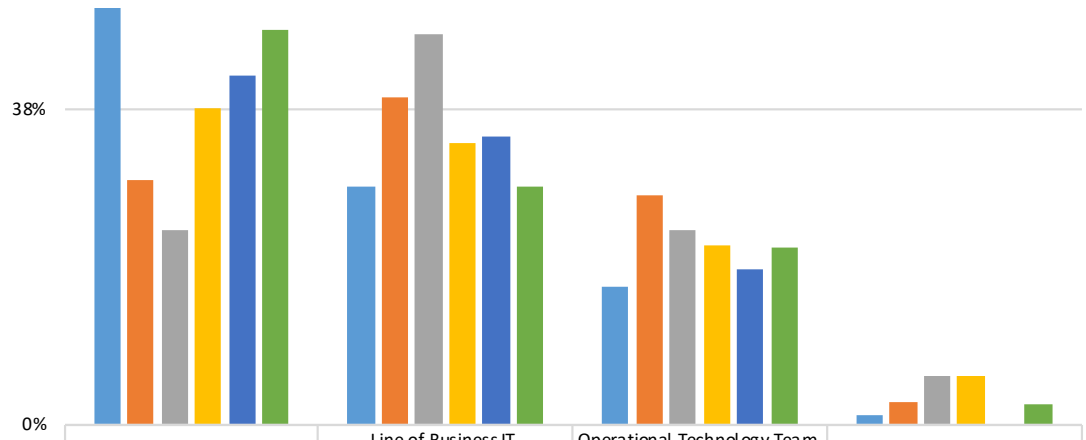
OBSERVATION

As often happens in both business and life, the plan and the execution can take on a life of their own. In this case, it's the difference between who owns the strategy and who owns the day-to-day operational management.

38% VS 73%

The percent of time centralized IT teams are leading strategy and planning vs the percent of times they are asked to oversee and manage systems planned by others.

HOW DOES STRATEGY AND PLANNING DIFFER BY INDUSTRY?



	Centralized IT Management (corp, c-suite)	Line of Business IT Management (business unit, division)	Operational Technology Team (R&D, Manufacturing, Quality Assurance, etc.)	3rd Party / Service Provider or Systems Integrator
Banking & Financial Services	54%	29%	17%	1%
Energy & Utilities	29%	39%	28%	3%
Healthcare / Pharma	24%	47%	24%	6%
High-Tech	38%	34%	22%	6%
Industrials & Manufacturing	42%	35%	19%	0%
Retail & Consumer Products	48%	29%	21%	2%

There are, however, some major differences between different sectors. When we break out the data by industry we see that centralized IT teams actually drive data and computing strategies 54 percent of the time in banking and financial organizations and close to half the time in retail and industrial manufacturing organizations.

It's quite a different story, however, in healthcare and pharmaceutical organizations where IT drives strategy less than a quarter of the time. This lack of IT involvement can become a significant issue when we look at how data serving and computing systems are managed after the implementation has taken place.

MANAGEMENT OWNERSHIP

When we asked our panel to identify who was responsible for the ongoing operations of data serving and computing systems (regardless of who was responsible for the strategy), a very different picture emerges.

OBSERVATION

Industries where centralized (or corporate) IT leads in strategy *above* the 38 percent average:

Banking & Finance (54%)

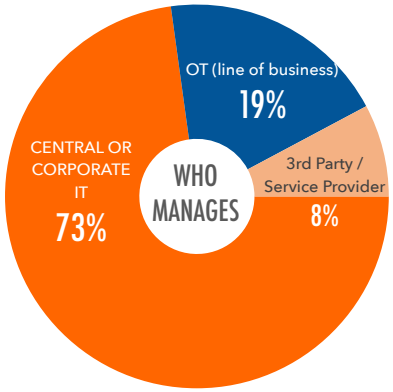
Retail & Consumer Products (48%)

Industrials & Mfg (42%)

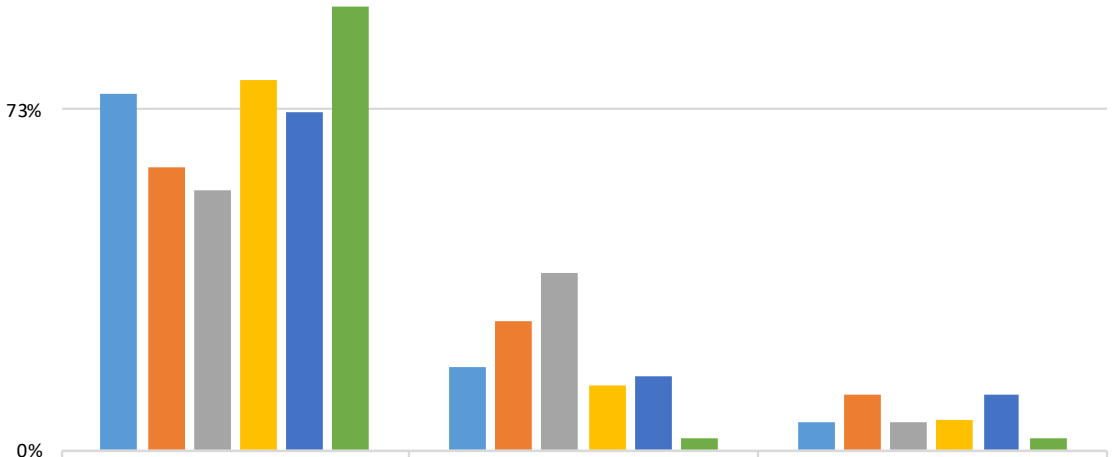
Of these, only the Industrials & Mfg sector is a bit of a surprise, as its heavy reliance on operational technologies might be perceived to require more of an operational perspective (unlike the banking and retail industries which typically rely heavily on centralized IT resources).

Specifically, we asked Who primarily manages your organization's Data Serving and Processing/Computing system?

While centralized IT organizations are only driving strategy 38 percent of the time, they end up owning the ongoing management 73 percent of the time. NOTE: This is a universal theme that we see across many technology areas, particularly where there is a strong operational or industrial component to the sector.



WHERE ARE THE DEVIATIONS TO MANAGEMENT?



	IT	OT (line of business)	3rd Party / Service Provider
Banking & Financial Services	76%	18%	6%
Energy & Utilities	61%	28%	12%
Healthcare / Pharma	56%	38%	6%
High-Tech	79%	14%	7%
Industrials & Manufacturing	73%	16%	12%
Retail & Consumer Products	95%	2%	2%

But just as there are outliers in the ownership of strategy, so too are there outliers in the management of these systems (although even in an industry such as healthcare, where centralized IT owns strategy only 24 percent of the time, centralized IT ends up responsible for ongoing

management 56 percent of the time. Notably, centralized IT is tapped for operational management 95 percent of the time for retail and consumer products companies.

BOTTOM LINE

While there are some deviations, based on the strength of operational teams in individual sectors, the theme of "Operations Procures while IT Manages" is one that we see across many different technology areas. It is also one that needs addressing as the imbalance can place significant strains on both operations and IT (budgets, talent, staffing availability, etc.).

ISSUE THREE STRATEGY DRIVERS

There is near universal agreement that data serving and computing is important to Digital Transformation initiatives, as well as on the importance of security as a critical feature of data serving and computing implementations.

One of the greatest challenges facing businesses today is of keeping pace with both the rate of emerging technology (leveraging technology as a competitive asset) and the rate of market and consumer evolution (anticipating and adapting to changing requirements and demands). For legacy organizations with deep prior investments in digital infrastructure, Digital Transformation (the process of strategically planning and implementing technology infrastructure to enable agility and adaptability of business processes) is one of the most critical initiatives they will face over the coming years.

Digital Transformation is an evolutionary process designed to provide business agility and the ability for an organization to adapt quickly to change. Our assumption going into this research effort (based on prior research) was that data serving and computing systems would, at a minimum, be impacted by a series of key factors, including existing Digital Transformation initiatives. But could the reverse be true as well?

We asked our survey panel How important do you believe the role of Data Serving and Processing/Computing is to Digital Transformation within your organization? 44 percent of our panel felt it played a very important role, while 51 percent felt data serving and computing systems were extremely important to achieving Digital Transformation success.

Data storage, server, and computing resources – when properly designed, implemented, and managed – may well be the foundation upon which other technologies and initiatives are viewed as successful or not.

But what about the factors that are driving data serving and computing strategies today? Are there certain considerations that are more or less important to organizations as they plan their data future? To address this issue, we compiled a list of factors (based on conversations with our clients

OBSERVATION

We consider agility and adaptability in data serving and computing resources to be essential to any digital business.

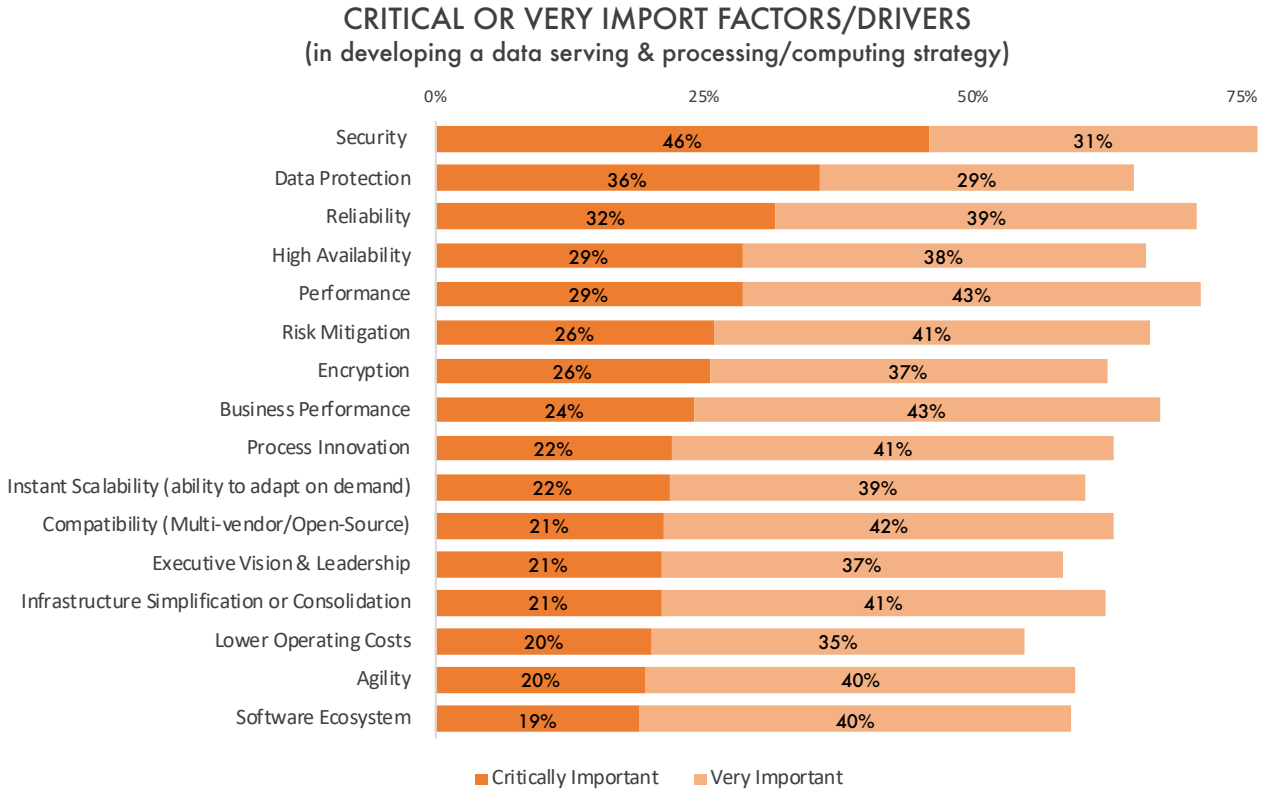
95%

The percent of enterprises that feel data serving and computing systems are either very or extremely important to existing Digital Transformation efforts within their organization.

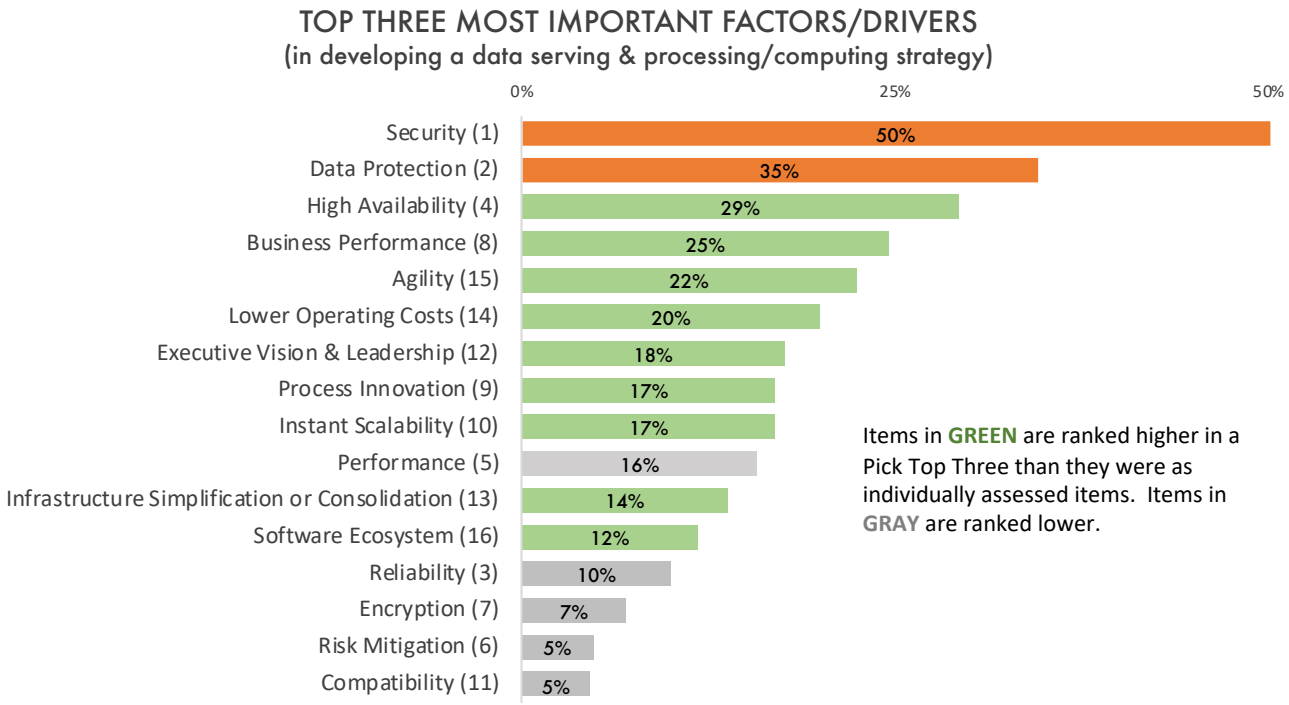
Rather than just a component or outcome of Digital Transformation, server and computing systems may actually enable the success of such efforts.

and industry-wide conversations) that are often referenced as considerations in developing strategic plans involving data collection, storage, access, and computing. We segmented these considerations into four key groups, focused on security, business goals, performance capabilities, and interoperability. We asked our survey panel how important each factor was as an individual item, and them compiled an aggregate list of all ratings.

Perhaps the most important theme to come out these questions was that of the importance of security at the core of any digital or data-focused strategy. Security and data protection were rated the highest as factors in developing a data serving and computing strategy, with Risk Mitigation and Encryption being placed no lower than seventh out of sixteen ranked factors.



It's notable that issues such as Business Performance and Process Innovation – two items closely linked with Digital Transformation initiatives – are middle of the pack. That changed, however, when we asked our panel to select their Top Three most important factors from within the entire group. Note: To avoid bias, the group was not presented as a ranked list of any type.



When asked to pick their top three, 50 percent of our panel selected Security as they most important factor, with 35 percent citing Data Protection as number two. However, Business Performance rose from a ranking of 8th to 4th in importance. Agility, from 15th to 5th. In fact, security aside, the lowest-ranked individual factors became some of the highest-ranked overall factors.

The most well-debated and carefully implemented strategy is doomed to fail if it is not secure, fails to drive business value, or ignores the vision of executive leadership.

What's behind this shift in the importance of strategy drivers? We believe part of this is the result of over-marketing throughout the industry that pushes the same long list of buzzwords in front of potential customers every day. This approach, focused on feature and not necessarily value, may be de-valuing the importance of factors that, while considered less critical by the market, are essential to the actual development of a well-planned strategic roadmap. Factors that help lower costs, enable agility, allow for business process innovation, and take the CEO's vision into consideration – these matter considerably and are often non-negotiable.

BOTTOM LINE

The value of data serving & computing strategy to advance Digital Transformation is most important to industries experiencing the most tech-fueled upheaval: Retail & Consumer Products, Banking & Finance, and High-tech. The value of Security (including cyber security) and Data Protection are considered critical to data serving and computing strategies, cited as the top factors overall (by 50 and 35 percent), outranking business, performance, and interoperability drivers.

In the end, it's not about which item is perceived to be more important than another, it's about those items that the other items cannot succeed without.

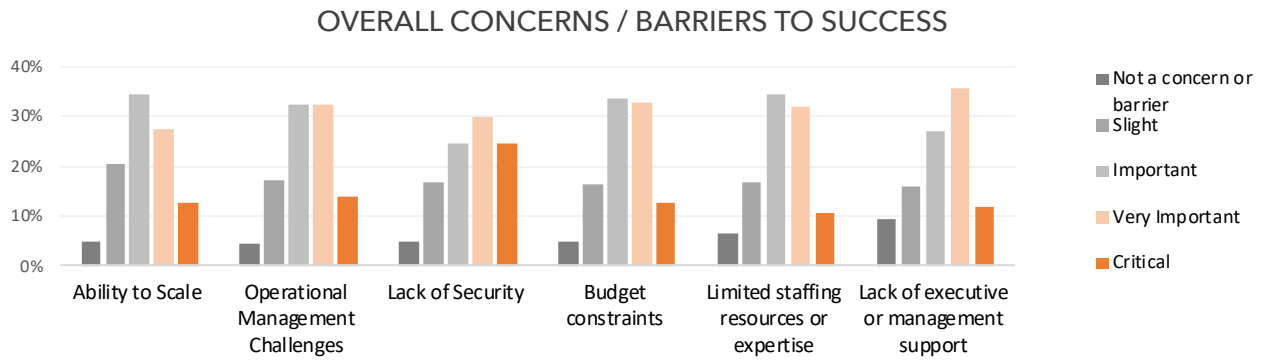
However, sub-components, like Encryption and Risk Mitigation – while ranked high individually – are considered less critical than most other factors or drivers. High Availability, Business Performance, Agility, and Lower Operating Costs - while ranked low individually - are considered top factors by only a quarter of all respondents.

ISSUE FOUR BARRIERS

Security, operational management challenges, and budget challenges are the top three barriers to successful implementation of data serving and computing initiatives.

Some of the most effective plans and strategies are those designed to take into account, or overcome, an array of challenges and barriers that would otherwise initiative defeat. We asked our survey panel to identify their perceived key barriers with the hope of comparing these against the key factors driving strategy and helping identify gaps between the two.

Our list of barriers consisted of six different items, each representing more of a category of smaller barriers than individual barriers themselves. Specifically, we asked: *As you implement Data Serving and Processing/Computing solutions, how much of a concern or barrier are the following?*

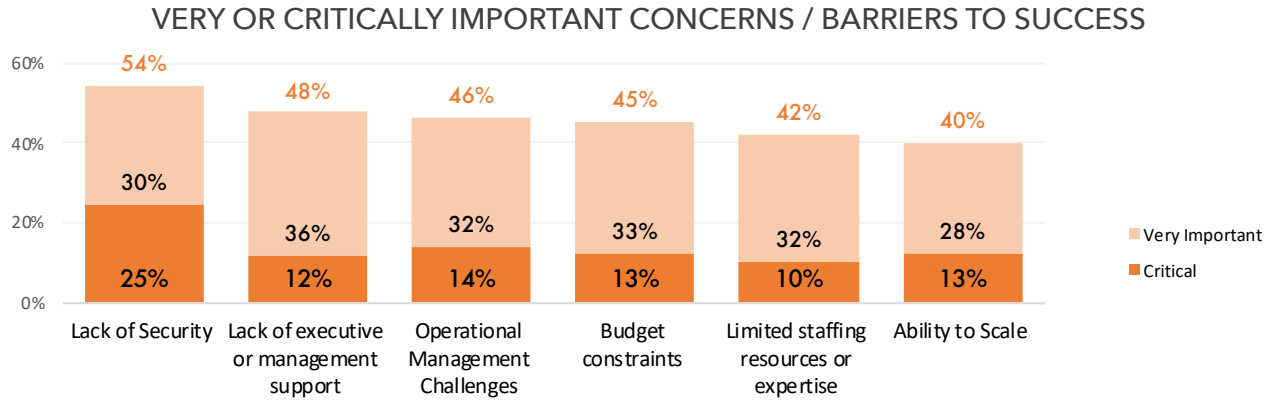


Our panel was asked to rate each potential concern or barrier on a scale of "Not a concern" on the low end all the way to "Critical" concern on the high end. Comparing just the Very Important and Critical concerns paints a fairly clear picture: security is both a key factor in driving data serving and computing strategies and the top barrier said strategies are designed to overcome.

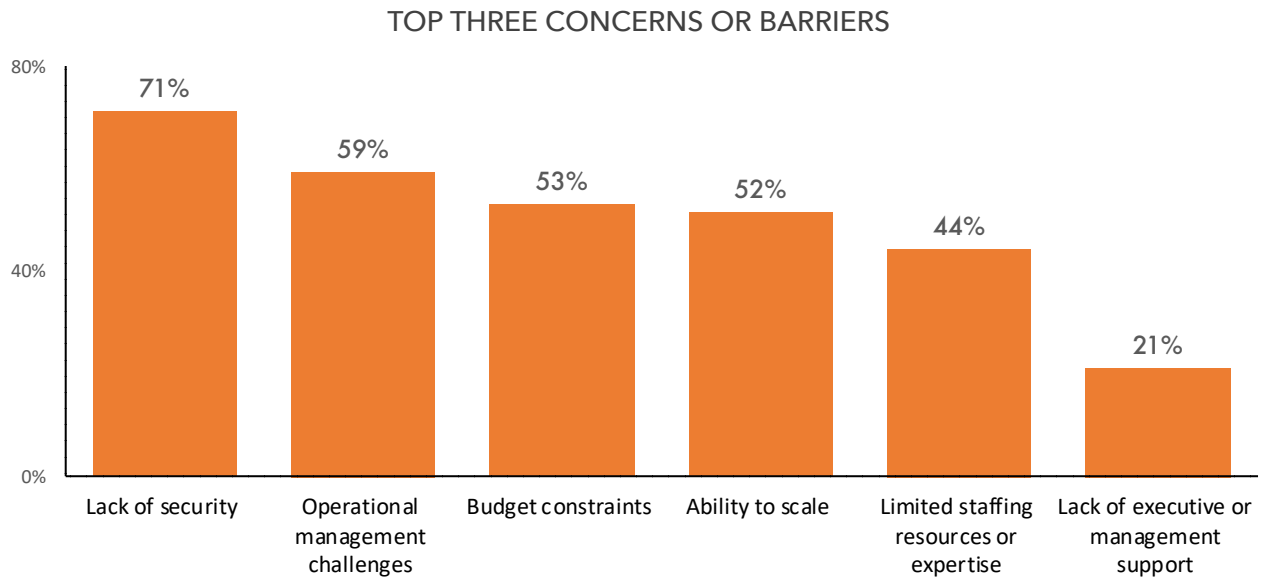
OBSERVATION

Consistent with Security being cited as the top factor in developing a data serving & computing strategy, it is also cited as the top most critical barrier to successful implementations and ongoing operations.

Operational Management Challenges are also cited as a significant barrier, in line with the data that shows Lack of Executive or Management Support as the third overall very or critically important barrier.



Given our experience advising on digital and data-focused initiatives and gathering feedback from management teams of what was actually successful as planned, the data results from this question were generally in line with expectations. But would the rankings change if our panelists were asked to pick just three "must overcome" barriers?



Security as a barrier is clearly an issue, cited as the top concern by 71 percent of our survey panel. But the surprising shift in our data involved the areas of management support and scalability. Let's break those down a bit.

Lack of executive or management support is often cited as a key barrier to success, and rightly so. It can destroy even the best of plans when it is not provided. But the drop from #2 to #6 on the list – particularly when replaced by operational management challenges at #2 – is certainly intriguing.

Similarly, the ability to scale (previously the lowest ranked concern) not only shifts up to #4 but it shifts up in magnitude of importance, essentially interchangeable with concern over budget constraints and not far behind operational management challenges.

To understand these barriers, and their relative ranking, let's group them into two categories: Total Fail, and Can Be Corrected. The Total Fail category is for items that are either present or not, and if not, are not easily corrected. This includes security (which is very difficult to add or engineer after the fact, and carries a steep penalty for failure), budget (often planned out years in advance and subject to cuts even when approved), scalability (often a combination of technical and contractual limitation that are difficult to overcome after the fact), and perhaps even operational management issues (a dysfunctional process, team or culture can infect an organization and be extremely difficult to correct).

As for the Can Be Corrected list, let's drop staffing resources & executive support into one large bucket. In contrast to operational management challenges which can be systemic in nature, talent resources can be acquired or developed much more rapidly. Similarly, a lack of management support can often be corrected by a good visit to the CFO or CMO – here's how this is going to improve operational efficiency or how it's going to drive demand and revenue.

Looking at the list of Top Three Concerns or Barriers, we believe that the ultimate ranking reflects the realities of how likely a barrier may be to overcome once a program has begun.

BOTTOM LINE

Security continues to be a major factor in technology implementations, cited as both a driver of strategy and a key barrier to overcome. The good news is that security appears to be a factor that is "baked in" to the strategy, although it is a limiting implementation factor well.

While support from the executive team is considered critical on its own, it does not appear to be a barrier so significant that it cannot be turned around or overcome, potentially indicating operational or implementation teams have the authority to implement what they need to meet overall business objectives.

ISSUE FIVE EVALUATION FACTORS

There is strong consensus in the value of CSPs, data awareness, and hybrid on/off-premises solutions (with three-quarters of enterprises believing Hybrid on/off-premises solutions offer the greatest operational flexibility), but there are gaps that need to be bridged during the evaluation, selection and negotiation phase of data serving and computing implementations.

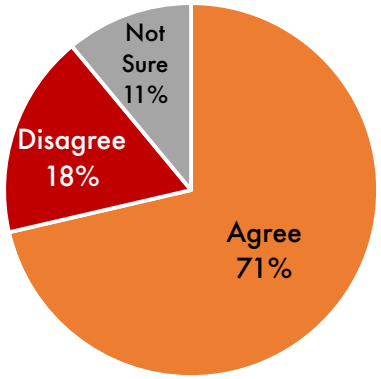
With a clearer understanding of the key drivers of data serving and computing strategies, as well as direct insight into how barriers or impediments to successful implementations are viewed from within the enterprise, we can now begin to address how and why enterprises evaluate and select one technology or provider over another.

When we take a step back and look at this market from a slightly holistic perspective, the same segmentation found in existing consumption or usage models (on-premises vs in the cloud, owned vs shared or managed) should be apparent within evaluation criteria as well. If this was in fact the case, we should be able to test or gauge the opinions of our global panel in a few areas, such as:

- How hyper-cloud providers (e.g. AWS, Google, Microsoft…) are perceived against smaller, more specialized cloud service providers (CSPs);
- Determine if the growing market sentiment data security is tied to data location applies to this market; and
- Understand if hybrid on/off-premises implementations (currently in use by the overwhelming majority of our survey panelists) is one of convenience or of value.

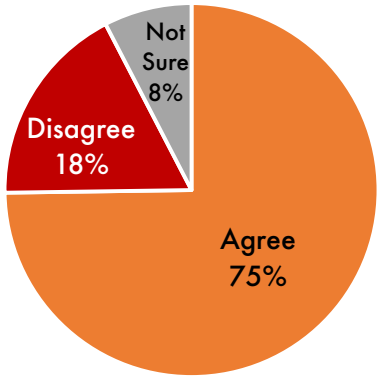
Specifically, we asked our panel: Do you agree or disagree with the following?

CSPs offer more flexibility and customized service offerings compared to hyper-cloud providers



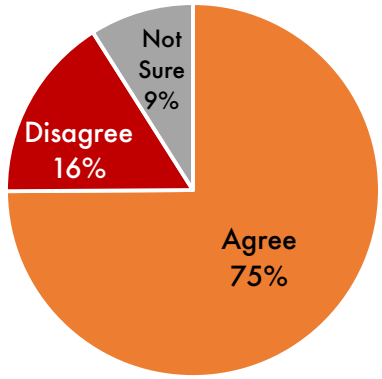
DISAGREE / NOT SURE	
Healthcare & Pharma	44%
Energy & Utilities	37%
Industrials & Mfg	33%
Retail & Consumer	24%
Banking & Financial	24%
High-Tech	22%

Cloud is great, but knowing where your data is located is key to security & regulatory compliance



DISAGREE / NOT SURE	
Healthcare & Pharma	32%
Energy & Utilities	29%
Banking & Financial	28%
Retail & Consumer	26%
Industrials & Mfg	22%
High-Tech	18%

Hybrid on/off-premises solutions offer the greatest operational flexibility



DISAGREE / NOT SURE	
Energy & Utilities	33%
High-Tech	27%
Banking & Financial	20%
Retail & Consumer	19%
Industrials & Mfg	17%
Healthcare & Pharma	15%

Given the solid agreement amongst our panel, we opted to take a look at those panelists that were either unsure of themselves or disagreed directly with the statement. Surprisingly, respondents in the healthcare & pharmaceuticals and energy & utilities sectors were among those who disagreed significantly from the other sectors (banking & financial panelists also fell into this category to a degree.

We couldn't find any common factor amongst those sectors directly, so we looked for other ways that those panelists differed in their opinions. Using the question of CSPs vs hyper-cloud providers as a test case (comparing the Disagree & Agree segments revealed that those in the disagree camp are:

- Slightly more likely (65 vs 51 percent) to be from an enterprise of less than 5,000 global users;

OBSERVATION

We find a high-level of agreement amongst our global survey panel on the value of flexible and customizable service offerings; the connection between knowing where data is located and the ability to properly secure data and maintain regulatory compliance; and the operational flexibility of hybrid on/off-premises solutions.

Enterprises that are: smaller and located within EMEA or Greater China; unsure of the connection between data serving and computing and achieving agility and adaptability; rely on 3rd-parties for ongoing system management; facing flat budgets and/or cost constraints; and focused on moving to the cloud…

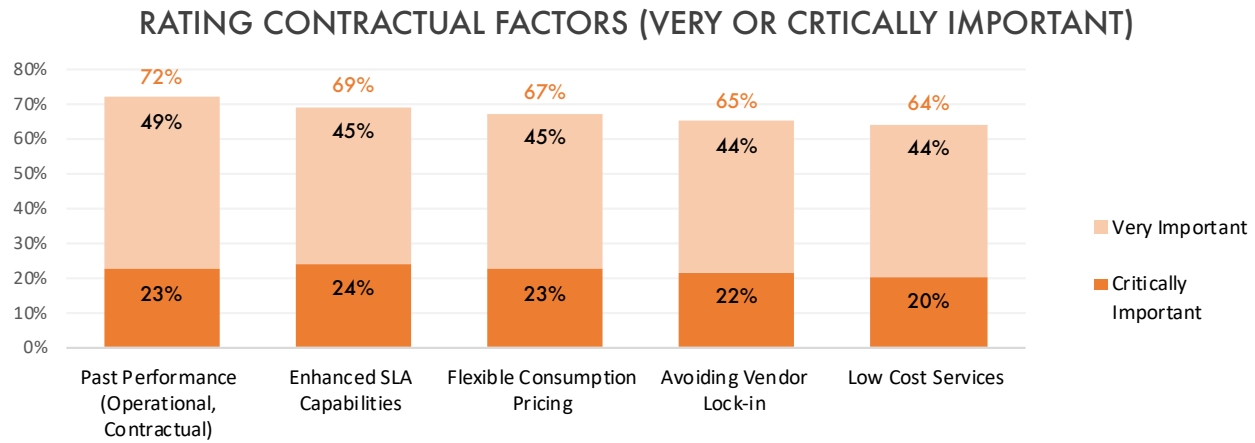
…may be less aware of the value CSPs, data proximity, and flexible hybrid solutions may offer.

- Less likely (36 vs 58 percent) to believe that data serving and computing is extremely important to Digital Transformation initiatives;
- Statistically more likely to be located in Greater China or EMEA (51 percent) vs other regions (33 percent);
- Twice as likely (41 vs 22 percent) to have an operational team or 3rd-party integrator responsible for managing data serving and computing systems;
- Significantly more likely (73 vs 49 percent) to expect budgets to be flat or only increase slightly;
- More likely (25 vs 15 percent) to expect declines in on-premises solutions;
- Twice as likely to rate Data Privacy, Security Auditability, and Past Security Performance as not very or only slightly important when evaluating technology or solutions providers; and
- More likely (27 vs 18 percent) to cite lowering operating costs as a top five driver of data serving and computing strategy.

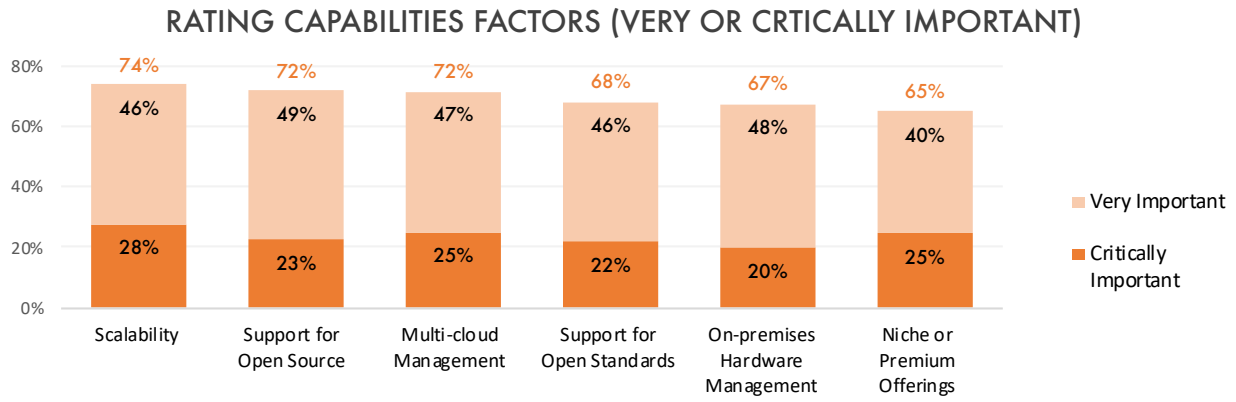
KEY EVALUATION FACTORS

Consistent with prior ranking elements within this survey, we grouped 15 commonly-cited evaluation factors into three distinct groups:

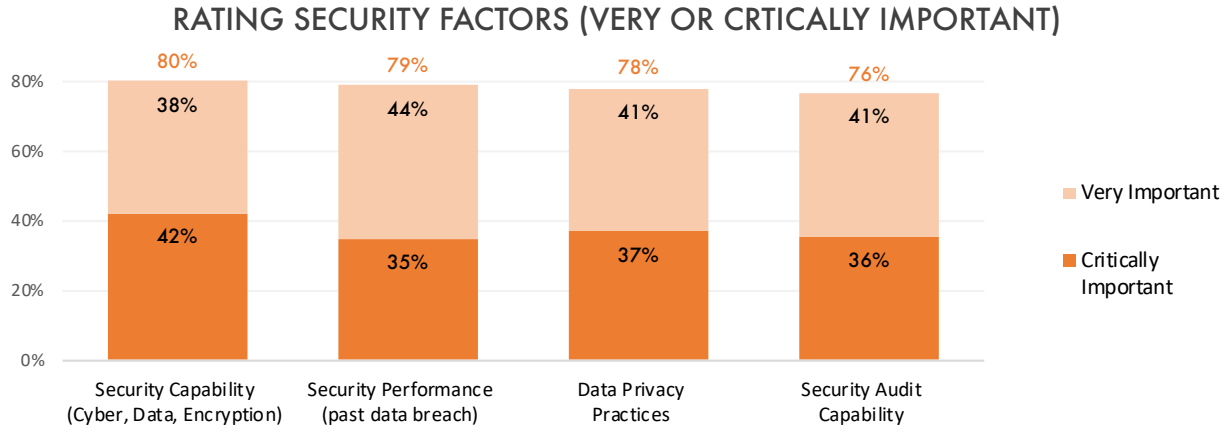
Contractual Factors. Involving issues related to contractual performance or terms, typically established up front that impact the duration of a services contract for both cloud and on-premises implementations.



Capabilities Factors. Relating to specific types of product or service features or offerings typically used to evaluate the overall value of solutions.



Security Factors. Criteria that directly reflect the ability of a solution or provider to ensure digital trust through features such as data protection, encryption, and security audit capabilities.



When evaluated on a group basis, security-related factors dominate the other two groups, with contractual factor in general being rated the least critical as a group. This makes sense as the value of security and performance features must be addressed prior to contractual terms being negotiated.

OBSERVATION

On individual merit as critical factors, **security dominates the top four evaluation criteria**:

1. **Security Capability**
2. **Data Privacy Practices**
3. **Security Audit**
4. **Past Security Breach**
5. Scalability
6. Multi-cloud Mgmt
7. Niche/Premium Offers
8. Enhanced SLAs
9. Past Contract Perf.
10. Flexible Consumption
11. Open Source Support
12. Open Standards
13. Avoiding Lock-in
14. Low-cost Services
15. On-premises Mgmt

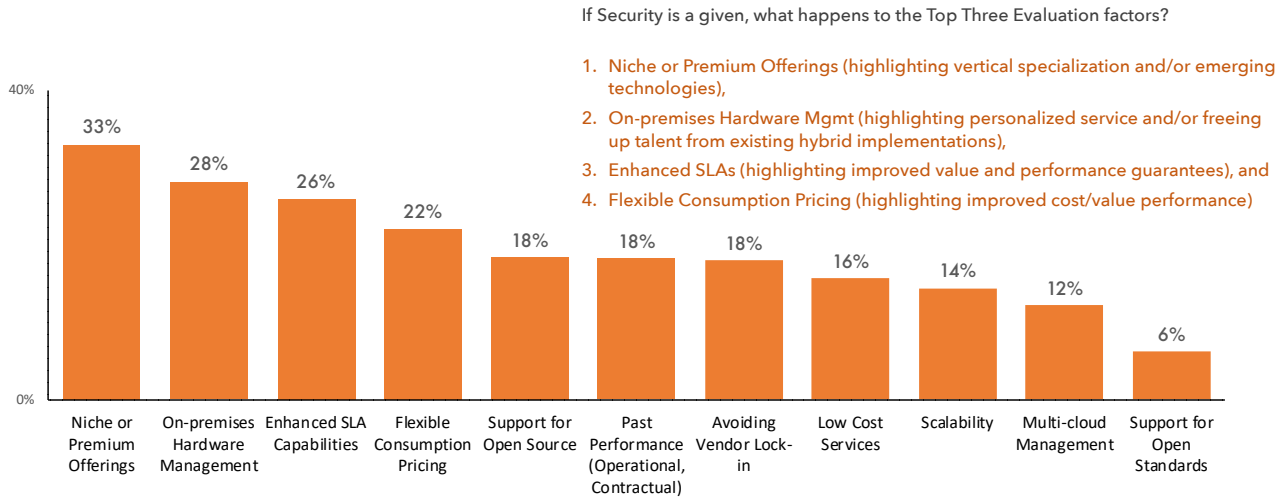
Note: While only 20 percent rate on-premises hardware management as a critical factor, we see hidden support for this criteria with 35 percent of respondents planning to ***increase*** their use of on-premises solutions managed on-site by a service provider.

TOP THREE EVALUATION CRITERIA

As we've seen throughout this research paper, security is consistently rated as the top driver of strategy, as the top concern or barrier, and as the most critical evaluation criteria. Given the reliance of digital technologies and the risk associated with the theft or corruption of data during its creation, collection, storage, and transmission, security is what we consider to be a must-have factor that will increasing determine if other evaluation criteria are considered.

With this in mind, we asked our survey panel: *What are the top three factors in evaluating Cloud Services and Cloud Services Providers?* To gain a deeper insight into what users consider the most important criteria in this "security must be a given" environment, we've ranked the remaining capabilities and contractual factors based on our panel's responses as follows:

KEY EVALUATION FACTORS: TOP THREE (OTHER THAN SECURITY)



BOTTOM LINE

Security-related features and/or capabilities dominate the list of overall evaluation factors, but we suspect that *security may be quickly shifting to a must-have requirement* as for service providers to get in the door. It also appears that personalized and/or customized services, particularly if they help introduce new or specialized technologies while freeing up talent and staffing and offering better control over the cost/value equation, are very important evaluation criteria.

ISSUE SIX PLANNING & BUDGETS

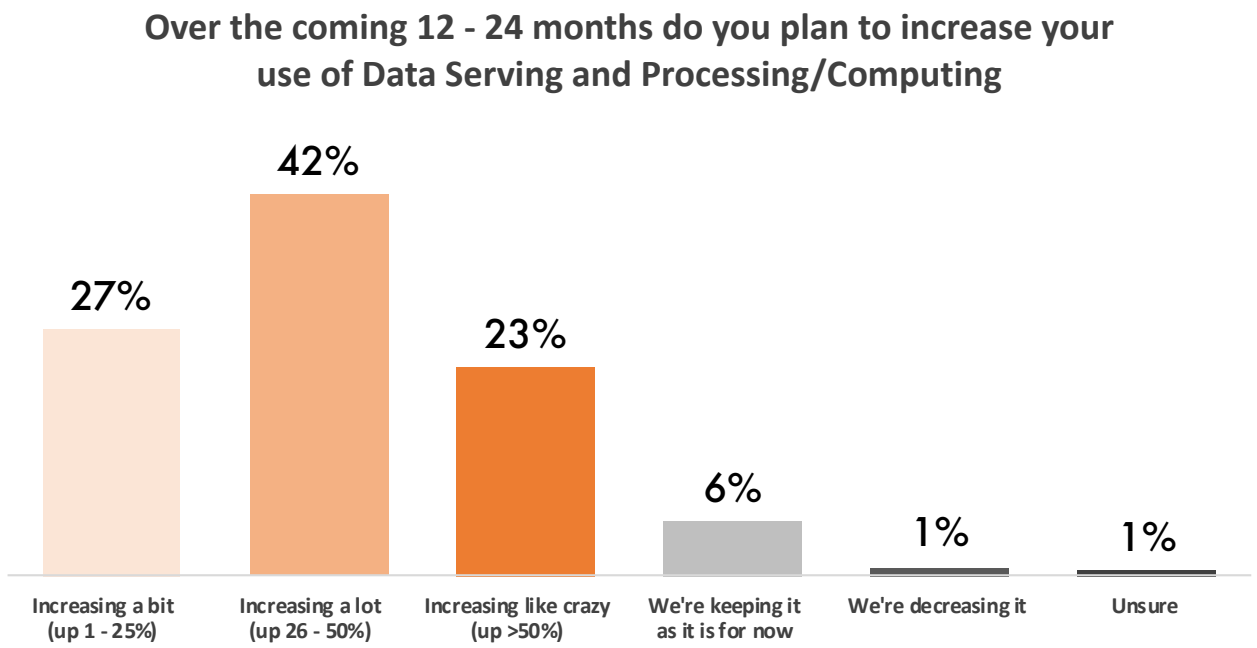
A majority of respondents anticipate increasing their use of data serving and computing services by over 25 percent over the coming 12 to 24 months, with a subset of 23 percent anticipating an increase in excess of 50 percent. We believe this will strain even the best budget plans and strategies.

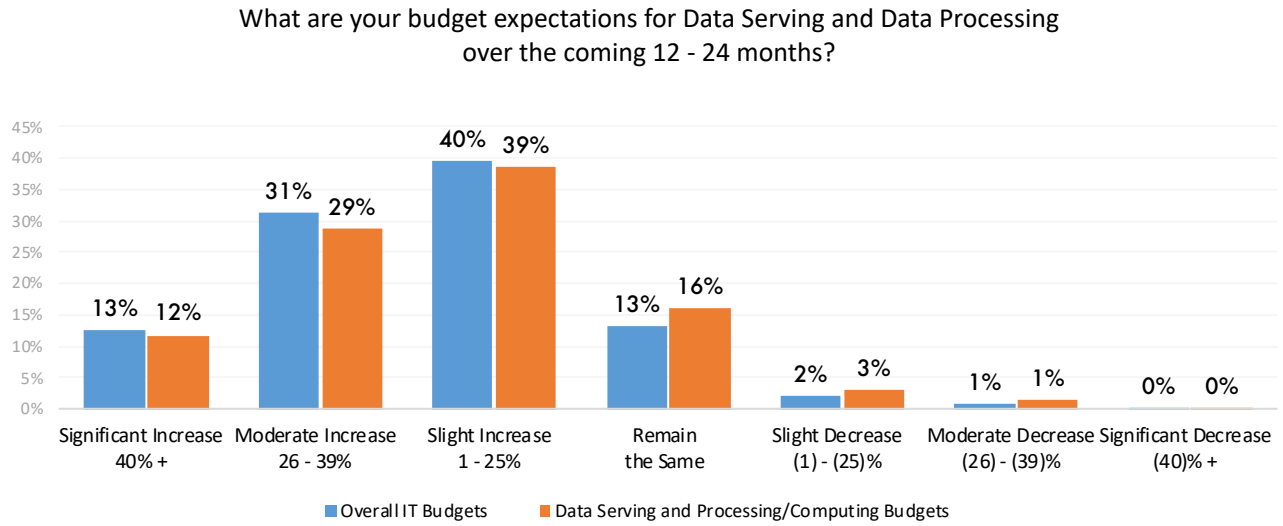
Technology and services are never free, and, particularly given the underlying foundational role that data serving and computing solution provide to all other digital and data-focused technologies and business processes, it is incumbent on every enterprise to properly plan for and align both services strategies and budgets. Data is an asset that can be created, valued, and adapted for business and financial gain. Operational data from the extreme edge to the closest supply-chain partner must have the necessary infrastructure to ensure the creation, collection, and sharing is completed in the most accurate secure manner possible.

But are implementation strategies and plans adequately accounted for in operational and IT budgets? Given the challenges and disconnects that exist between these two teams, where one primarily designs and derives value while the other must bear the burden of operational management, budgets alignment is not a simple or easy task. Even with a variety of on/off-premises and management options, anticipating the life-cycle cost of these systems can be a challenge. And while technology and the cloud are considered to be moving towards commodity status in some ways, the continual addition of complexity (in applications and usage), the ongoing generation of greater volumes of data, and the challenges of ensuring the security of data to allow for its full value to be realized will translate into higher-expenditures for many.

ADOPTION AND EXPANSION PLANS

To understand the challenges faced during the budgetary cycle we asked our survey panel to estimate their plans for data serving and processing needs over the coming 24 months. Specifically, we asked: *Over the coming 12 – 24 months do you plan to increase your use of Data Service and Processing/Computing?* This question speaks directly the volume of data being processed and the resulting capacity requirements.





OBSERVATION

Where are the deviations?

A significant 44 percent of Energy & Utilities firms expect capacity requirements to increase by 50 percent or more (likely driven by business requirements to digitally monitor and add intelligence to the grid and generation capabilities, as well as the drive to gain deeper insights (and create new services offerings) within the home.

While we anticipate that costs for same-services are likely to decrease over time, we do not anticipate those cost reductions will be adequate to offset increased spend requirements to match capacity or adequately fund data analytics or security needs.

BUDGET EXPECTATIONS

When we queried on the topic of budget expectations, we find close alignment between overall IT and data serving and computing budgets, but budget growth (or declines) slightly trail IT projections. Of concern is the disconnect between planned capacity needs (close to a quarter anticipating significant capacity requirements) and significant budget expansion (only 12 percent are anticipating budgets to match).

BOTTOM LINE

Budget resources for data serving and processing are expected to lag behind the growth of overall IT budgets. We are not convinced that cost of operations and/or services may be sufficient to offset the increase in expected usage and have not seen any indication that centralized IT organizations are prepared to handle increased management and oversight. This is an area not of concern but of caution.

CONCLUSION SUMMARY FINDINGS

The increasing need for data serving and computing solutions is matched by the growth of flexible, hybrid solutions that leverage combinations of on/off-premises implementations that can be tailored and customized to the needs of individual enterprises.

Based on our research, *we offer the following key findings:*

KEY FINDING 1

Security dominates strategy development, implementation barriers, and key evaluation criteria, becoming the top must-have feature for providers, leaving niche or custom offerings, on-premises hardware management, and enhanced SLAs & flexible consumption pricing as the top "next" evaluation criteria. *Providers that do not have a solid security offering will be challenged*.

KEY FINDING 2

The world of data serving and computing is solidly a hybrid (on-premises/off-premises) world, with a third of enterprises expecting to increase their use of on-premises solutions over the coming three years. Additionally, *three-quarters of enterprises believe hybrid solutions offer the greatest operational flexibility*.

KEY FINDING 3

Centralized IT leads data serving & computing strategy about a third of the time but manages over it over two-thirds of the time. While we believe IT must play a larger role in defining overall strategy, we also believe (coupled with the significance of security), that *systems that are fundamentally less complex to manage will be critical over the coming years*.

KEY FINDING 4

75 percent of enterprises agree "Cloud is great but knowing where your data is located is key to security & regulatory compliance" while 71 percent agree "*CSPs offer more flexibility and customized service offerings compared to hyper-cloud providers*."

KEY FINDING 5

Security, operational management challenges, and budget challenges are the top three barriers to successful implementation of data serving and computing initiatives; meanwhile, *security, performance, and business agility are the top three strategy drivers*.

KEY FINDING 6

Budgets for data serving & computing are *not keeping pace w/ IT budgets and may not be adequate*.

KEY FINDING 7

Data serving & computing are considered *extremely important to supporting Digital Transformation initiatives*.

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