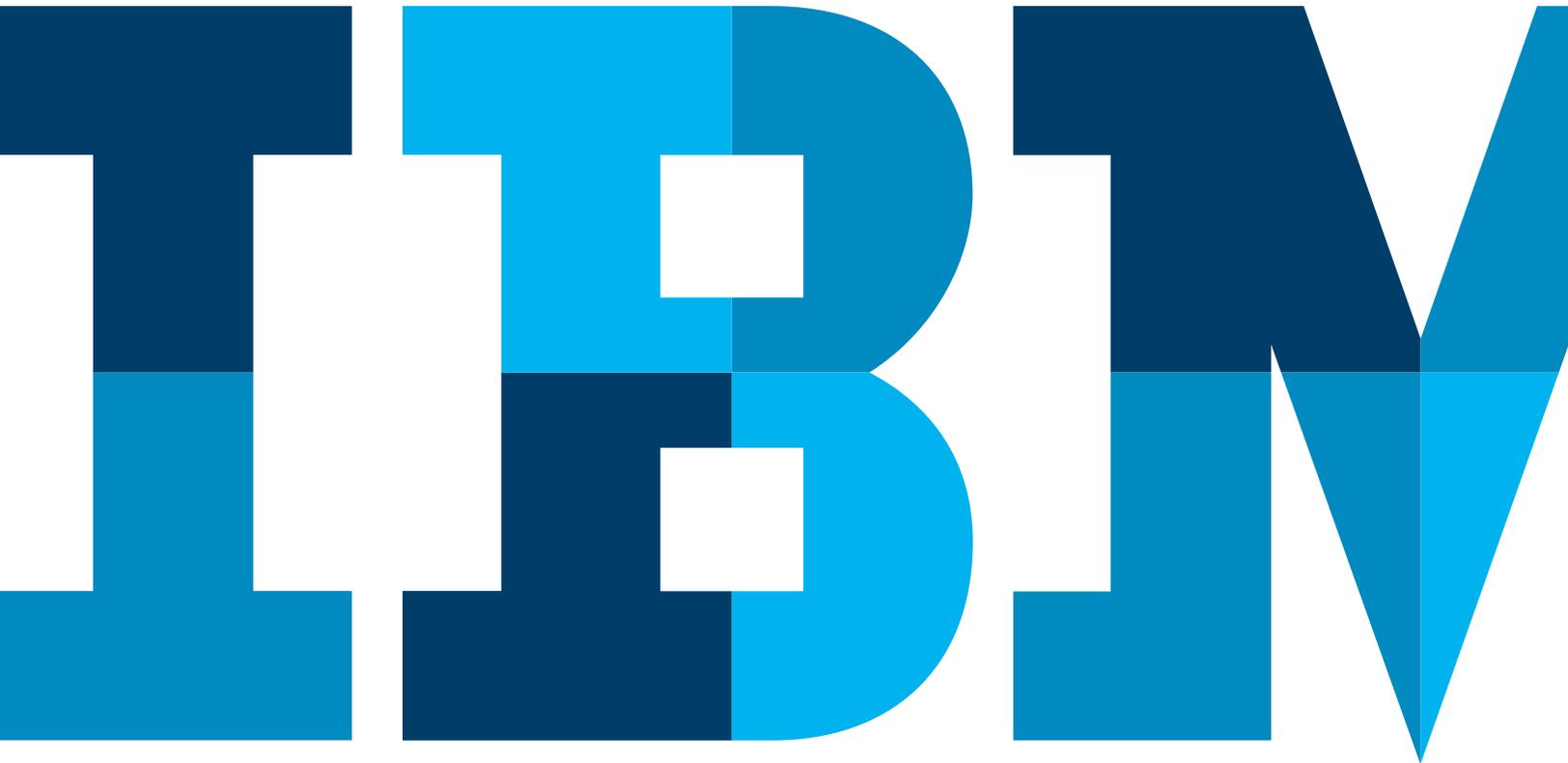


Avoiding the hidden stumbling blocks of cloud solutions

Reap the benefits of cloud through proactive governance, organizational and service planning



A holistic approach to realizing the benefits of cloud

Migration to cloud represents a significant undertaking for any organization, but the benefits of cloud can be well worth the effort. The journey covers organizational, cultural, process, technology and workflow changes. **In IBM's experience with clients, most stalled or problematic cloud projects result from a lack of up-front planning in IT governance, organization and services—what we call the hidden impacts, which can be stumbling blocks to adopting a cloud solution.** This paper guides you through understanding and addressing these challenges before they impact your cloud journey—and your business.

Most medium-to-large companies have been running their businesses on multiple platforms, including cloud, for years. And 70 percent of companies believe they will have some form of on-premises IT forever.¹ Chances are you'll always be in a hybrid IT environment, commonly defined as a combination of public cloud(s), private cloud(s) and onsite IT.² That's a smart approach. An IBM study found 90 percent of companies with hybrid IT say it brings better return on investment than either all-cloud or all-in-house.³ This makes sense, because you deploy your workloads in the environment that best suits them.

Governance: The process by which organizations are directed, controlled and held to account

At its most basic level, IT governance is a decision-making process designed to effectively and efficiently use information technology. Successful IT governance helps an institution achieve its business goals by applying IT resources in a value-creating, yet agile manner. As an example, this includes principles and policies (which drive standards) outlining how IT will support business strategies while reducing cost and managing risk.

IT governance specifies how decisions are made, who makes the decisions, who is held accountable, and how the results of decisions are measured and monitored. Specifying decision rights and decision-making mechanics helps foster the desired behavior in the use of IT.

A common misconception within many organizations is mistaking governance for management. The key difference:

- Governance provides operational direction to the organization.
 - Management executes their responsibilities according to this guidance, while also providing required feedback on issues and performance to senior management.
-

Cloud can be transformative and rewarding—but you may experience unexpected outcomes

The world is moving fast, and your customers expect your organization to provide them with results faster and to improve value. An IT environment that incorporates a cloud platform helps complete deployments and show results quickly and inexpensively. It's tempting to take an informal or “business as usual” approach to cloud—one that does not include updating existing governance practices. But while that may save you time in the short run, it will become time consuming and less effective in the longer term.

“Digital transformation involves organizational (i.e., people) and/or business process/model change, or both, and thus is risky ... Therefore, it requires project leadership that can define a clear and compelling need for the transformation. Without this type of leadership, digital transformation projects experience false starts or early terminations.”⁴

—IDC

Hybrid IT: What industry specialists are saying

- By 2020, nearly half the world’s server market will move to cloud service providers (CSPs).⁵
 - “By 2020, 15% of enterprises that rely on machine learning (ML)–based decision automation will have established governance processes to assess predictions, prescriptions, and decisions against regulators, internal policy, and ethical considerations using internal and external human and machine auditors.”⁶
 - “Worldwide, 40% of enterprises will have failed to put adequate governance procedures and tools in place to meet the European Union’s (EU) General Data Protection Regulation (GDPR) by its May 2018 effective date, thus leaving them open to fines of up to 4% of revenue per breach of regulations.”⁷
 - Integration across functions, delivery methods and stakeholders will determine cloud success in 2018.⁸
 - The increasingly hybrid nature of solutions will enlarge decision-making teams. These new stakeholders will include IT practitioners across legacy, network and security disciplines, as well as business stakeholders that cross functions.⁹
 - Improvements in simple development tools will dramatically expand the number of nontechnological developers over the next 36 months. By 2021, these nontraditional developers will build 20 percent of business applications and 30 percent of new application features.¹⁰
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When enterprises establish a governance model, they employ one or more frameworks—a cohesive set of ideas, principles, methods and people that focus on connectivity and relationships. Major disruptions in computing technologies, like cloud, can quickly render existing frameworks obsolete. Add to this that some companies forgo governance and simply focus only on technology, often leading to IT service delivery that is no longer able to support significant business growth. Frameworks are needed to increase IT capability, although their maturity can vary according to an organization’s size and stakeholder commitments.

Regardless, new ways of doing business expose gaps and weaknesses. When your cloud strategy, objectives, policies and supporting standards are not linked together or incorporated into your overall enterprise governance model, an organization’s management or personnel can experience confusion and unexpected outcomes. This can manifest itself in many ways, including:

1. Taking an ad hoc approach to governance and organizational issues

With pressures to frequently launch new applications or install new environments, cutting corners now only to pay later is all too common. A lack of governance can negatively impact the design guidance and standardization needed for an integrated environment. It also inhibits the flow of performance data, which in turn makes it harder to respond to adverse conditions and take corrective action. From an organizational perspective, being reactive instead of proactive results in skill set shortfalls.

2. Adopting cloud without sufficient program management, sponsor engagement or adequate skill sets

Too often, organizations don’t understand what it means to fully prepare for a cloud environment. They exhibit poor program management and fail to keep sponsors engaged throughout the program. Also, IT may be slow to adopt flexible, agile techniques. New roles in third-party management, cloud service integration and other areas such as data architecture are inadequately staffed. As a result, organizations often expect their employees to understand cloud, even when they lack the requisite skills and learning experiences.

3. Failing to embrace the benefits of automation

Organizations are sometimes slow to embrace automated tools that facilitate decision making and governance policies, yet automation is a huge step toward defining, maintaining and managing governance standards and processes. For example, automation can help incorporate cloud policies and standards into the existing enterprise architecture, as well as define how nonstandard requirements and changes plan to be handled up-front.

The rapid pace of change in the cloud far exceeds manual capacity to manage capabilities.¹¹ Automation helps increase speed and efficiency, reduce errors and provide multiple views to cover various stakeholder interests that are essential for governance oversight and risk management. By using data analytics in conjunction with automation, organizations can more easily “course correct” as needed. Automation also drives logs and recordkeeping that create much needed audit trails for regulatory compliance.

4. Not measuring the right things

Measurements provide a mechanism for linking strategic objectives for cloud service to delivery results. This helps organizations achieve their business goals and properly diagnose exception conditions to support the high availability requirements needed from cloud services.

Without building in key performance measurements related to the new cloud services, organizations won’t have an effective vehicle to determine where failures occur in the service workflow. This can result in both a higher total cost of ownership (TCO) for the cloud service, along with increased client frustration in the overall solution.

5. Adopting technical solutions with disparate interfaces and disjointed processes

Organizations often focus on implementing point solutions, which leads to disparate interfaces, among systems, business units and third parties. Such disparate interfaces make it increasingly difficult for applications to exchange information. This results in cumbersome workarounds that erode the flexibility required for cloud solutions to be effective. Ironically, the benefits of standardization ultimately help organizations

achieve customized outcomes. Think about it: many applications are now composite, meaning their design integrates pre-existing modular services. Standard technologies and processes embedded into an IT environment establish a solid foundation for the creation and aggregation of those new services.

6. Using an assortment of service providers for uncoordinated purposes

While multiple service providers are at times common, juggling them without sufficient planning can cause you to lose control of the overall picture. Without oversight and due justification, you end up with more administrative effort and more points of failure introduced into your end-to-end services. As well, both your organization and your CSPs can experience confusion; duplication; and gaps concerning roles, responsibilities and accountabilities.

What happens when an inadequate focus on governance, organization and services leads to struggles with cloud?

When organizations encounter even one or two of the challenges above, they end up with a difficult-to-support, stagnant IT environment. For one **IT services** organization, onboarding was delayed a full year due to the CSP's inadequate focus on governance and organization. As well, this company focused on custom solutions rather than on deriving business value from "as a service" solutions. Despite some levels of automation, the company still faced significant manual integration work.

To improve efficiency, a **government** organization wanted a hybrid cloud that allowed for division-specific solutions while also providing a consolidated platform for cross-organization services. Unfortunately, this company did not fully define and agree to roles—including those of CSPs—before implementation, resulting in confusion over accountability. Their training plan did not adequately address workflow and cultural change, and the entire endeavor lacked strong executive sponsorship. The organization almost cancelled the initiative, even after significant investment. However, because the business case is so compelling, the company is defining new requirements and an updated approach for a second attempt.

The additional challenges of multicloud implementations

According to IDC, over 90 percent of enterprises will use multiple cloud services and platforms by 2020.¹² Various unrelated CSPs could be involved in delivering IT services to your organization, with service transactions flowing through numerous CSPs before reaching you and your clients. This adds complexity to governance controls like negotiating and managing service level commitments. Additionally, policies for the orchestration of operational activities, such as problem escalation and communication, will need to be reconsidered and updated. IDC reports that building and maintaining a clear vision of integration across your cloud platforms will be critical.¹³ In such environments, governance is even more important.

While these unexpected outcomes we've just described may be clearly evident, the underlying causes are often less obvious and can be summarized as three major stumbling blocks.

The three hidden stumbling blocks: Managing cloud's impact with a sharper focus on governance, organization and services

To overcome cloud's inherent challenges and fully realize the benefits of cloud, organizations must take a holistic approach to cloud adoption. This approach encompasses **managing cloud's impact on a company's existing governance, organization and services**. In this section, we'll explore the hidden stumbling blocks in each of these three areas. (See Figure 1.)



Figure 1: Key areas to consider prior to your cloud transition are governance, organization and services.

Hidden stumbling block #1: Maintaining control through re-inventing governance practices

You can drive to a new destination without a GPS, but you may well get lost or delayed along the way. Cloud implementations are similar. Yes, you can begin without a thoughtful governance strategy in place but expect troublesome, time-consuming detours. Here are some critical governance factors to consider, whether you're working with private clouds, public clouds or a hybrid combination of both.

Start by understanding and clearly communicating the desired impact of each cloud objective by using policy statements. Then, update the organization's guiding principles so that operational decision making is consistent with the desired results. When these policy statements get translated into standards, the organization can have a good mechanism to understand decisional bounds in support of cloud objectives. "Use your cloud strategy to develop policies on public, private and hybrid cloud services that can then be automated and abstracted away from the consumer of cloud services."¹⁴

Frameworks will also need to be updated to accommodate the new rigors and requirements of cloud. Specifically, the revised governance framework should consider the new risks and legal realities of the cloud environment. For example, businesses and their IT providers often struggle with how to meet regulatory requirements within a cloud solution. These restrictions can affect data residency—a challenge when data is shared across multiple cloud environments. Regulatory concerns also include protocols such as the General Data Protection Regulation (GDPR), Sarbanes Oxley Act (SOX), and BASEL III. We can use GPDR as an example to show the impact on cloud deployment. GPDR (which comes into effect on May 25, 2018) is designed to protect the data of all individuals in the European Union (EU). Exporting personal data outside of the EU also falls within the GPDR's jurisdiction, creating global ramifications.¹⁵ To manage compliance with this requirement, organizations need to work closely with their CSPs to understand where and how their data is stored.

By turning to external CSPs, businesses can accelerate improved compliance management for specific workloads. This also frees up the IT department to concentrate on other tasks. However, a CSP does not assume ultimate accountability for conforming to updated governance requirements such as compliance—that still resides with the "owner" organization.

In addition, using CSPs raises the importance of updating your architectures to support integration of standard services from multiple third parties to verify consistent control, direction and accountability in a multicloud environment. Without such updates, the business runs the risk of sub-optimized sourcing with an uncoordinated, complex IT environment sourced from a range of suppliers with multiple contractual commitments and support provisions. IT services—constructed from standardized infrastructure, integrated platforms, management processes, roles and tool applications—help cloud to better deliver on its promise of value.

With so many governance implications to consider, using a **Cloud Decision Framework** can automatically determine which cloud services best fit your needs, taking into consideration requirements from both business and IT. This avoids starting fresh with an evaluation process for each new project. The result: systematic, objective cloud-related decisions that improve service delivery. Learn more by reading "[Designing your Cloud Decision Framework: A consistent, structured approach to selecting cloud services](#)".¹⁶ Also, see "[Integration: The foundation of a successful hybrid IT strategy](#)".¹⁷

Hidden stumbling block #2: Evolving your organization, roles and skill sets to keep pace with cloud

Organization and cultural change are often the most challenging aspects of any transformation, including that of cloud. Strong leadership—leading by example—is required to establish the new working patterns. According to Forrester, a successful initiative needs to “identify the leaders who will drive change, embrace the prescribed processes, and be willing to consider changing the physical environment.”¹⁸

Traditionally, IT focused on in-house components like infrastructure and platforms. With cloud, your organization will develop new roles and retire some traditional ones, with IT roles and skills evolving with your cloud strategy and vision. “Build and run” are where the biggest changes will occur, as organizations shift to consuming standard services. For example, you’ll need advanced virtualization and cloud skills to properly configure the new cloud environment. As discussed earlier, IT staff must also focus on compliance, the governance of IT, and sourcing and managing CSPs. (See Figure 2.)

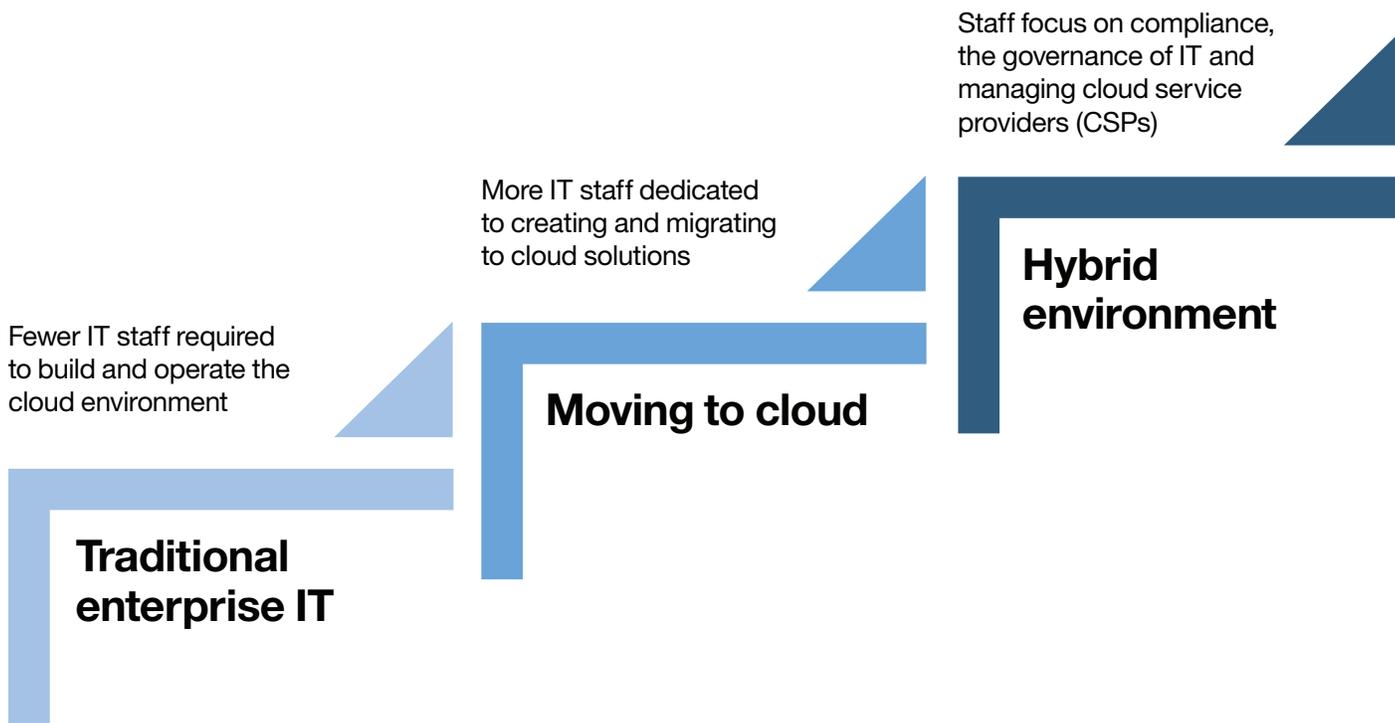


Figure 2: As your IT environment evolves, so will your staffing and skill sets.

In the cloud, automated scripts all but eliminate traditional component-level skills involving infrastructure and platforms. As discussed earlier, automation handles workflows much faster than traditional methods and systems. It also facilitates user self-service, reducing the need for tech support. However, this decrease should be offset by emerging focus areas, including cloud migrations and governance, compliance and service provider oversight.

IT may need additional roles that support a business service-based view of IT capabilities, such as business liaison, sourcing manager and transition manager. As well, technical staff will require deep “cloud” skills (for example, specialty architects for sourcing, integration, and data, and perhaps skills in agile and lean development). Your company will need additional security expertise as data travels through multiple environments.

Additionally, cloud environments require significantly increased collaboration between IT and the business. A cloud deployment is an opportunity for IT to strengthen its relationship with the business side by establishing and achieving common service goals. Often IT departments understand the technical aspects

of cloud but are uncertain how to transform that into true business value. According to the Everest Group, “Business value creation requires the monolithic IT services stack to eventually collapse and be realigned to ‘outcome-oriented’ agility stacks/pods.”¹⁹

TBR anticipates the emergence of more integrated, application-focused lines of business (LOBs) cloud use cases that will drive integration across functions, delivery methods and stakeholders. This means much larger and more diverse sets of decision makers need to facilitate cloud business value versus just technical or financial benefit.²⁰ Inevitably, the CIO’s role changes from leading “IT only” to leading and collaborating with the LOB, as well as CSPs, to drive business performance.

Resources with broad skill sets will be in demand. By 2021, Gartner anticipates that 40 percent of IT staff will be “versatilists,” holding multiple roles, most of which will be business related rather than technology related.²¹

Hidden stumbling block #3: Taking a services view that encompasses both IT and business perspectives

A cloud implementation also requires an end-to-end services mindset. To achieve this service perspective, IT must identify and promote how the provided services deliver value through enabling business needs.

As noted in stumbling block #2, if IT solutions are to solve LOB problems, this shift requires closer collaboration between IT and the business at all levels. This means that orchestrating services across your various IT resources, LOB stakeholders and external CSPs (that may be providing core services and processes) is critical for a successful transition to cloud.²² Such service orchestration is also critical to identifying and managing cloud services commitments and service level agreements (SLAs), as well for identifying benchmarks and targets for measurements.

You need to evaluate the impact of cloud on each service to develop a go-forward plan to address any gaps or issues. This requirement can be demonstrated by looking at some of the common IT services that may need to become part of your

cloud migration plans. In some cases, the requirements can be addressed with follow-on cloud projects, but it remains important to identify the required changes at the beginning of your cloud initiative. These common IT services include:

- **Resiliency and data recovery** considerations encompass elements of a client's business continuity plan such as:
 - Updated business impact assessments and associated recovery agreements
 - Changes to required facilities, technologies and connectivity
 - Disaster recovery (DR) planning and testing
 - Data backups and locations (both operational and DR)
- **Security** is a broad topic that includes both physical and data security. You should consider any unique requirements for both sensitive and regulated data that may become part of the cloud environment as well as updated policies for access control and auditing. Risk management practices like encryption, additional firewall requirements and restricted remote access may also require evaluation.
- **Federated identity and access management** is the means of linking a person's electronic identity and attributes, stored across multiple distinct identity management systems. It aims to make any changes as seamless as possible for the business community. Items like a single sign-on require the secure exchange of information among service suppliers, which may require new technologies and workflows.

- **Dev/test environment** requires consideration regarding how it will function in a hybrid cloud environment. If this environment is already cloud based, new interfaces and service agreements may need to be established. In either case, testing scripts will need to be updated and additional test scenarios may need to be created.
- **Service management disciplines** include items such as the support functions (including service desk), service level commitments and integrated change management. The introduction of cloud to the service delivery portfolio requires consideration of changes/extensions to existing service management practices. For example, the only way to manage the velocity of change in the cloud is to automate standard changes. As well, the cloud necessitates evolving from siloed skills (and processes) to a much more integrated view (think of the Site Reliability Engineering [SRE] concept).²³

Organizations that got it right

A large **healthcare** system initially saw their cloud journey as a technology “lift and shift.” But they soon understood the need to increase focus on their organizational change management elements, addressing skill gaps in automation, architecture and third-party cloud management. They hired enterprise cloud architects and retrained resources as transition managers. They also trained some staff on overall cloud capabilities by functional area, which helped optimize a flexible platform for doctors, nurses and administrative staff within the healthcare system.

A **finance** company designed and automated their approval process to allow developers to provision cloud within certain parameters, including monitoring for usage and reallocation. They also established approvals for infrastructure with chargebacks, pushing the responsibility for resource consumption back to the application teams and LOBs.

With a vision of being a cloud services broker, a large **telecommunications** organization is putting technical governance and automation in place to authorize and manage data types within their ecosystem of cloud services and systems of record. Monitoring will give them a mechanism for responding to auditors about controls.

For your consideration: 10 key actions from IBM

IBM has years of successful cloud adoption experience that typically involve a client properly planning for the process. The essential starting point is to use your cloud objectives to determine what IT should work on and how IT should prioritize what it does. This section summarizes these key actions in a “top 10 list.” Clients who proactively execute these actions

usually achieve faster cloud adoption than those reacting to unexpected outcomes as they occur. In the latter case, such outcomes can still be resolved, but it will require greater effort.

As an overarching mandate, you’ll want to understand the scope and potential of available cloud services to successfully identify the IT changes needed to achieve your cloud business objectives. These actions can be examined using this “top 10 list” in Figure 3 as a guide:

	Governance	Examples/considerations
1.	Update framework decision-making processes to rapidly control selection and management of cloud services.	<ul style="list-style-type: none"> Establish who can purchase what services. Decide how CSP services will be placed in a central service catalog and billed in a way that promotes easier access and usage. Design management at the XaaS level for cloud services and applications.
2.	Address how your organization embeds cloud decisions and controls in policy and applies them in practice.	<ul style="list-style-type: none"> Use governance to guide management in enforcing compliance. Governance defines required updates to support cloud, but management enforces compliance through reward and discipline. Support controls, but build in some leeway. If overly restrictive, controls can impede development and execution. Investigate updates to communication mechanisms to increase awareness and commitment to cloud policy.
3.	Update your existing architecture to incorporate cloud standardization, integration and capability requirements.	<ul style="list-style-type: none"> Help provide balance across stakeholder interests and cloud requirements by adopting an outcomes-based approach, positioning services and solutions relative to business priorities. Incorporate governance controls/mechanisms to support interoperability, reliability and availability of the cloud as a service. Promote consistency and repeatability in creating and delivering cloud solutions.
4.	Engage a strategic partner to help you establish and execute a regulatory compliance plan.	<ul style="list-style-type: none"> Start now to help avoid penalties for noncompliance. Identify mitigating actions to address risks through role definitions, accountabilities and information flow. Understand how the regulations apply to your business. Do you have unique requirements that may become part of the cloud environment? Develop a compliance plan focused on actions, owners and deadlines.

 Organization/people recommendations	Examples/considerations
5. Define required cloud additions and updates for roles, teams and competencies.	<ul style="list-style-type: none"> • Identify cloud competency centers for sourcing, integrating and brokering across internal and external providers. Combine deep technical skills and business analysis skills to better meet business needs. • Validate that new cloud roles include the necessary accountabilities, responsibilities and handoffs for the cloud services. • Organize teams to help avoid tower or silo structures that inhibit innovation and responsiveness. Consider how to deliver cloud-based solutions to market quicker and with greater flexibility. • Encourage the use of agile techniques and DevOps concepts to speed development and improve quality of new cloud services.
6. Align skills and training with new cloud technologies in a way that reduces tension between the old and new.	<ul style="list-style-type: none"> • Determine if combining “old and new” technology skills will work or if you should select an alternative. • Plan evolution of cloud skill sets, (not just programming but managing new service flows, coordination across CSPs, etc.) and invest in training.
7. Establish relationships with the expanding number of cloud stakeholders within the organization.	<ul style="list-style-type: none"> • Align IT, LOB stakeholders, and third parties using guiding principles and updated role and relationship definitions. • Review current IT roles and activities to incorporate business value-add objectives.

	Service recommendations	Examples/considerations
8.	Engage early with CSPs to help influence workflows, meet integration needs and determine acceptable service levels. ²⁴	<ul style="list-style-type: none"> • Define the end-to-end interaction workflow among the business, internal IT and third parties in delivering cloud services. • Rethink data flows as information moves through IT services in a completely new way. Does information exchanged among service suppliers require a new workflow? A new approach such as the use of common repositories? A new technology?
9.	Identify and address gaps in cloud service capabilities and business commitments to improve support functions.	<ul style="list-style-type: none"> • Review cloud service level commitments and identify required updates to existing service commitments (or address communication of new commitments) • Identify changes, e.g. expanded responsibilities and capabilities, required in support functions (including service desk). • Determine how monitoring systems will be enhanced (e.g. updated alerts, self-healing technologies, etc) to monitor end-to-end services across environments and suppliers.
10.	Assess the effectiveness of your governance program by updating your metrics, including an update to your balanced scorecard.	Examine basic metrics including measuring value creation, performance and diagnostics by: <ul style="list-style-type: none"> • Considering stakeholder views that encompass end-to-end cloud services, along with the impact of cloud service delivery on meeting business objectives • Recognizing performance and diagnostic views to identify trends, poorly performing services and root causes A balanced scorecard for cloud might focus on <i>services, outcomes, health and agility</i> .

Table 1: Ten key cloud adoption actions from IBM

Moving forward: Creating a solid foundation to handle shifting requirements

In summary, a proactive approach can provide:

- An end-to-end managed and measured solution where issues are seen from an organizational perspective, identified early and prioritized in line with business requirements (taking on increased importance when delivering hybrid cloud services across multiple providers)
 - Identification of key cloud roles and responsibilities, including alignment to the existing organization structure or to CSPs
 - Updated architecture and policies that support the standardization, interoperability, reliability and compliance of the IT cloud environment
 - Policies and procedures that can be administered through automation
- Measurements targeted to provide advanced indication of cloud service attainment and delivery challenges
 - Strong sponsor and executive commitment and engagement
 - The avoidance of “shadow IT,” in which the business takes matters into their own hands and contracts with cloud suppliers directly to provide their IT capabilities

For a successful cloud implementation, don't procrastinate. Create a solid foundation by incorporating cloud governance, service planning and flexible organization requirements from both an IT and LOB perspective. Service planning includes integration across providers and service workflows. Cloud, by its very nature, is dynamic. You'll need a solid foundation to handle constantly evolving requirements.

Enlist the right provider to prepare for hidden cloud impacts

You've read about the pitfalls, stumbling blocks, key actions and success stories. Now you want to take action so you can avoid cloud complexities and see benefits sooner. Do you need guidance in getting started?

When seeking a CSP regarding governance, you must ask yourself:

- Can the provider help you balance rapid decision-making with maintaining control of your environment?
- Does the provider manage cloud services? What are their key differentiators in this space?

- How does the provider maintain agility across roles, teams, competencies, and CSPs?
- Does the provider have in-depth technical expertise and tooling to automate governance, organization, and service plans into reality?
- Will the provider understand and align with your enterprise objectives and values which add another layer of nuance and complexity to the mix?

IBM advisory and professional services help you address your public, private and hybrid cloud needs, through your implementation phases. (See Figure 4.) We can identify and focus on the key areas designed to bring the most value to your initiative.

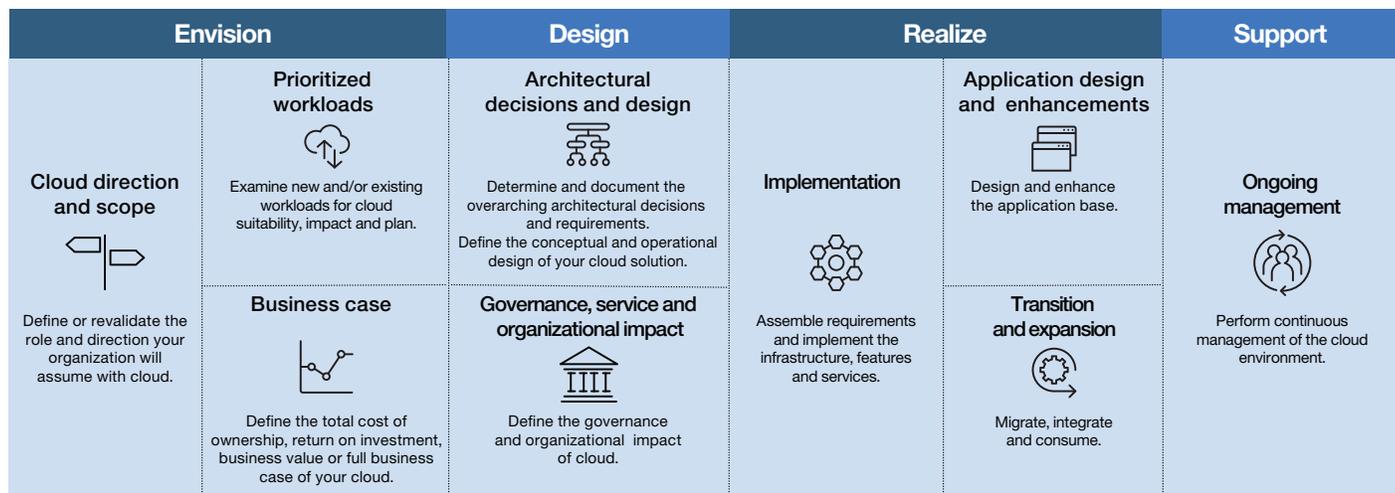


Figure 4: IBM advisory and professional services encompass various phases of your implementation.

Industry analysts often cite IBM's market leadership, depth and breadth in hybrid IT management. For example:

- Forrester ranked IBM as a leader in hybrid cloud management solutions and hybrid integration for enterprises.²⁵
- Frost & Sullivan named IBM the Cloud Company of the Year, highlighting IBM's extensive capabilities in supporting hybrid cloud environments.²⁶
- Technology Business Research, Inc. (TBR) ranked IBM #1 in hybrid cloud environments. In TBR's semiannual 1H16 Cloud Customer Research survey of more than 1,800 enterprise respondents, IBM was identified as the global leader in hybrid environment adoption thanks to its large enterprise customer base, brand reputation and expertise in hybrid integration and IT transformation.²⁷
- And finally, almost three-quarters (72 percent) of IT operations executives surveyed consider IBM an industry leader in hybrid IT management solutions, with specific emphasis on IT operations analytics, application server and application performance management.²⁸

With expertise in 17 industries and global capabilities that span more than 170 countries, IBM helps clients around the world benefit from new opportunities available on the cloud. IBM has received 5,200 cloud patents over the last five years, and more than 1,900 of these patents were awarded in 2017.

For more information

To learn more about cloud computing or IBM's managed services offerings, please contact your IBM representative, or visit the following website:

ibm.com/cloud

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