The next generation of cloud computing

How CIOs can help their organizations prepare for the business of tomorrow

pwc

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The heart of the matter

Once every five years or so a profound change flows across the IT ecosystem.

In the early 1990s, the Internet transformed the way businesses communicate. By the mid-90s, e-commerce virtualized purchasing for customers and business partners. A decade later, offshoring took hold – and took a lot of in-house business functions to China, India, and other low-cost centers around the world.

Today, cloud computing is sweeping over the information technology landscape, bringing broad changes in the way IT services are designed, delivered, consumed, and managed.

Demand for cloud computing – and its predecessors, virtualization and off-premise services – has been fueled by the lingering effects of the global recession, which forced many organizations to trim their cost structure (capital and operating) while still meeting customer demands. While this "do more with less" mandate is still in effect at most companies, many CEOs are now asking their organizations to prepare the business for growth.

Cloud computing is a strategic initiative for organizations that aims to strike the right balance between lowering costs and enabling growth.

Cloud computing provides a proven means to efficiently deliver lower IT capital costs and increased operating efficiencies. Yet concerns about information security, service availability, performance, and the complexity of integration have dissuaded many CIOs.

But that's all changing.

Case in point: Use of cloud-based e-mail service. While CIOs initially distrusted cloud-based enterprise messaging, today a wide range of businesses, nonprofit organizations, and local governments have adopted it to cut costs. Security issues? Cloud-based e-mail is now considered safe enough for cabinet-level US federal government agencies.

The General Services Administration (GSA), for instance, recently selected Gmail for its 15,000 employees in a bid to trim 50% of its annual e-mail costs over the next five years. [1] Similarly, the Department of Agriculture opted to use Microsoft's Business Productivity Online Suite (BPOS) Federal cloud suite for its 120,000 users.[2]

Government adoption of cloud-based e-mail and collaboration tools has concluded the first phase of cloud computing. The next stage of cloud deployments has now begun as organizations discover that the technology can help create innovative opportunities for partnerships and revenue growth.
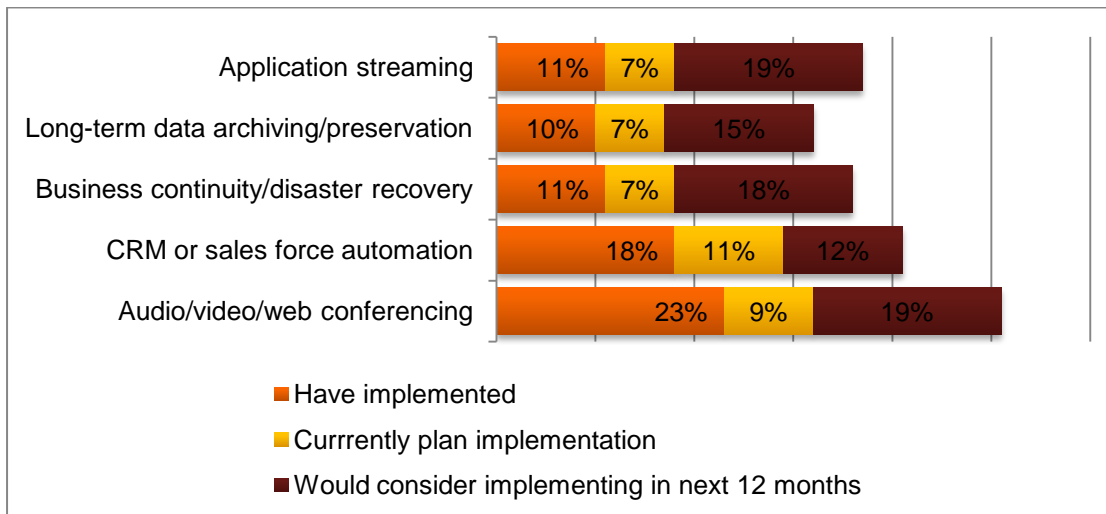
When coupled with a CIO's IT strategy around data center transformation, service virtualization, and unified fabrics, cloud computing offers synergies that can bring a new order of competitive advantage. Forward-thinking CIOs must be prepared to lead their organization into the cloud. Doing so can create an accelerated trajectory to success — for the CIO and the entire organization.

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[1] General Services Administration, GSA Becomes First Federal Agency to Move Email to the Cloud Agencywide, December 2010
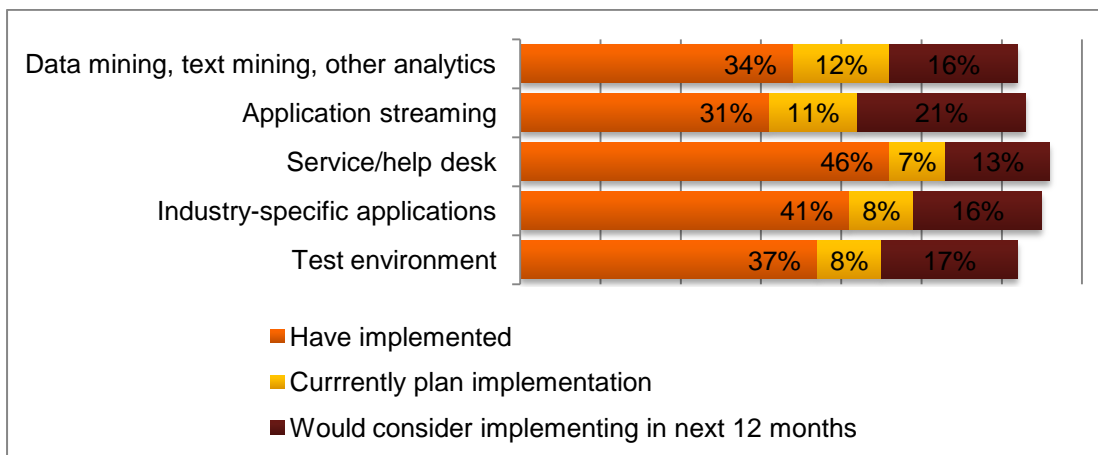[2] USDA, USDA Moves to the Microsoft Cloud, December 2010

Public cloud workloads

Workload	Have implemented	Currently plan implementation	Would consider implementing in next 12 months
Application streaming	11%	7%	19%
Long-term data archiving/preservation	10%	7%	15%
Business continuity/disaster recovery	11%	7%	18%
CRM or sales force automation	18%	11%	12%
Audio/video/web conferencing	23%	9%	19%

■ Have implemented
■ Currrently plan implementation
■ Would consider implementing in next 12 months

Source: IBM, Dispelling the vapor around cloud computing, January 2010

Private cloud workloads

Workload	Have implemented	Currently plan implementation	Would consider implementing in next 12 months
Data mining, text mining, other analytics	34%	12%	16%
Application streaming	31%	11%	21%
Service/help desk	46%	7%	13%
Industry-specific applications	41%	8%	16%
Test environment	37%	8%	17%

■ Have implemented
■ Currrently plan implementation
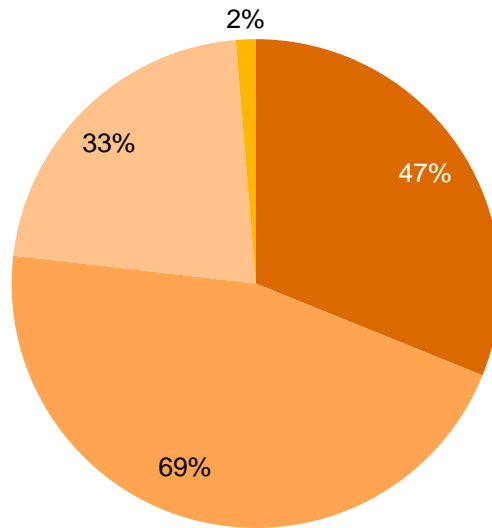■ Would consider implementing in next 12 months

Source: IBM, Dispelling the vapor around cloud computing, January 2010

SaaS leads cloud deployment

41% of respondents to PwC's 2012 Global Information Security Survey say they have deployed some form of cloud service. Most(69%) use SaaS.

■Infrastructure as a Service ■Software as a Service ■Platform as a Service ■Do not know

Source: PwC 2012 Global Information Security Survey, September 2011

An in-depth discussion

Cloud computing is the fastest-growing trend in enterprise technology today – and for the foreseeable future. Forrester Research predicts the global cloud computing market will mushroom from $40.7 billion this year to $241 billion by 2020. [3]

Indeed, cloud has already taken flight in many IT organizations. In PwC's 2012 Global Information Security Survey of more than 9,600 security and IT leaders, 41% of respondents said their organization has implemented some form of cloud computing.[4] Most of these implementations – more than 75% – are Software as a Service (SaaS) implementations such as Salesforce.com for customer relationship management (CRM).

These numbers indicate that CIOs now consider cloud computing mature enough for their enterprise. Despite that vote of confidence, a precise definition of cloud computing remains elusive.

The confusion is due, in part, to a compounding number of cloud service types and deployment models, which has generated a torrent of new terminologies and acronyms. At the same time, technology vendors are further muddying matters by adding the word "cloud" to marginally related services to take advantage of the high hype of the cloud.

To clarify, we will use the definition published by the National Institute of Standards and Technology (NIST). The institute defines cloud computing as a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction.[5] A cloud service provider can be an internal IT organization that delivers services to business units (and sometimes consumers in the business ecosystem), a technology vendor that provides services to customers and consumers, or a hybrid of the two.

Cloud computing is commonly delineated by deployment model or service model. Today three deployment models are dominant:

- **Public:** A public cloud infrastructure is available to individual consumers or businesses.

- **Private:** A private cloud is operated solely for an organization and can be managed by the organization or a third-party company, on site or off site.

- **Hybrid:** A hybrid cloud comprises a mix of public and private cloud infrastructures that are discrete entities but are integrated to allow interoperability of data and applications.

	Public	Private	Hybrid
What	Development/test, backup/disaster recovery, bursting marketing collaboration, storage	Applications virtual desktops, analytics, disaster recovery	Business applications, messaging, collaborations
Why	Lower cost agility pay for service	Risk management compliance, customization	Lower costs less complexity fast provisioning
Barriers	Customization vendor lock-in	Disruption of operating IT model, legacy investment, transition costs	Integration, operating model

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[3] Forrester Research, Sizing the Cloud, April 2011
[4] PwC, 2012 Global State of Information Security Survey, September 2011
[5] http://csrc.nist.gov/groups/SNS/cloud-computing/cloud-def-v15.doc

Cloud computing solutions, however, are typically marketed and described based the type of services they deliver. Three most common offerings are:

- **Software as a service (SaaS):** The consumer employs a web browser to accesses a provider's applications running on a cloud infrastructure. (Examples: NetSuite, Salesforce.com, SuccessFactors)

- **Platform as a service (PaaS):** The consumer deploys applications on a cloud provider's infrastructure but has no control over the underlying network or servers. (Examples: Google AppEngine, Microsoft Windows Azure, DotCloud)

- **Infrastructure as a service (IaaS):** The consumer provisions computing resources on the provider's infrastructure and can control operating systems, data storage, and applications – but not the underlying infrastructure. (Example: Amazon EC2, Joyent, Rackspace.)

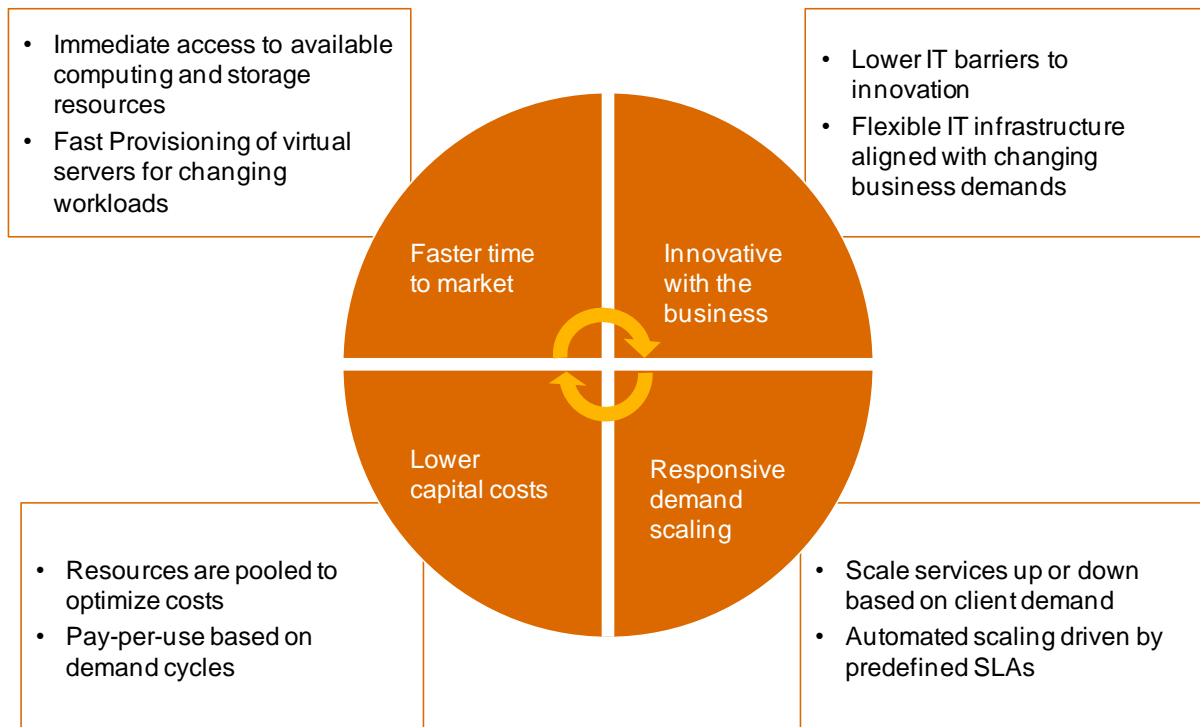| SaaS	Easy first step to adopt alternative desktop office application
	Requires only a credit card to deploy
	Security and data exchange issues must be resolved
PaaS	Aimed at small and new companies, but applies to all
	Large companies will benefit as services scale up and the model is driven into internal software development tools and processes
IaaS	Galvanizing approach to utility computing to drive high ROA
	Overflow to external provider to avoid cap-ex to accommodate peaks
	Longer term play due to immature tools and resistance to change

While delivery and deployment models vary, cloud computing offers four benefits that are universal: on-demand elastic scaling, rapid service activation, abstraction of technology resources and management, and a pay-as-you-go pricing model.

Beyond these advantages, organizations have moved to the cloud to scoop up a number of economic, management, and operational advantages.

For many CIOs, the cloud's ability to lower capital and operating expenditures is the primary attraction. Once in place, many are discovering that cloud computing can generate further cost benefits by building revenue through partnerships and new lines of business that are developed by IT.

Because cloud computing employs a centralized, shared pool of computing resources, CIOs can leverage rapid deployment of services with minimal management. Its scalable architecture can boost an organization's ability to move at the pace of business and increase productivity and efficiencies.

Cloud computing benefits

- Immediate access to available computing and storage resources
- Fast Provisioning of virtual servers for changing workloads

- Lower IT barriers to innovation
- Flexible IT infrastructure aligned with changing business demands

Faster time to market

Innovative with the business

Lower capital costs

Responsive demand scaling

- Resources are pooled to optimize costs
- Pay-per-use based on demand cycles

- Scale services up or down based on client demand
- Automated scaling driven by predefined SLAs

Challenges to cloud computing

Although the benefits of cloud computing are many, it would be imprudent to disregard the potential drawbacks.

The elephant in the server room is, of course, security. Protecting sensitive, business-critical data is paramount to CIOs, and they worry that cloud service providers will not be able to deliver adequate user access controls, encryption, secure multi-tenant access, and protection from virus and hacker attacks. CIOs also are understandably reluctant to hand over the keys to protection and backup for data to a cloud service provider.

Yet as organizations adopt cloud computing, many are finding that security delivered by service providers meets or beats their needs. In fact, PwC's 2012 Global Information Security Survey found that 54% of companies that have implemented cloud computing say the technology has actually *improved* the organization's security posture.

CIOs are troubled by potential damage to reputation and revenue as a result of service downtime. High-profile incidents affecting leading cloud providers in recent months have done little to allay fears. While uptime and resilience may never be 100% guaranteed, CIOs can help ensure uptime by pursuing high availability options and ensuring traditional disaster recovery plans are in place to mitigate potential downtime whether it is in the cloud or the enterprise.

Similarly, system latency can erode application performance and response times, potentially delivering another black eye to a company's reputation. While this may be a concern of many, it affects very few. That's because problems associated with latency apply only to very demanding apps with high transaction rates. In reality, these types of mission-critical applications are not typically sent to the cloud.

Some organizations with dramatically fluctuating computational needs worry that a cloud provider's capacity and scalability may prove inadequate. That's becoming less an issue as cloud providers move

to address this concern by integrating "cloud burst" technologies and capacity on demand along with sophisticated capacity and demand-management tools.

All things considered, we believe that many of the potential weaknesses associated with cloud computing have been resolved as the technology has matured. Nonetheless, rigorous due diligence and a robust governance strategy remain critical for CIOs planning a cloud computing implementation.

Despite maturity, some confusion lingers

With the right governance model, CIOs today can help ensure that cloud providers deliver secure, highly available, and scalable services. Yet CIOs face a fresh round of confusion and challenges that are outside of the power of even the most efficient governance.

Take, for instance, the lack of open standards in cloud computing. While cloud computing is rapidly maturing, CIOs are hamstrung by the lack of standardized processes for development, deployment, and migration of data. As a result, CIOs cannot accurately predict how – or if – a mélange of cloud providers and services will work with each other as well as with existing on-site applications. And without standards for moving data, it is difficult to move an application or data from one cloud supplier to another. Vendor lock-in becomes a real concern.

While some CIOs worry about vendor lock-in, others find it difficult to select a vendor in the first place. Cloud computing is a comparatively new segment, after all, and a dearth of dominant vendors makes it challenging for the CIO to confidently identify a provider. For now, cloud vendors that best suit an organization may not be the go-to brands that IT leaders can confidently fall back on. The CIO must be willing to trust vendors with proven performance (after the proper due diligence, of course), even if they're not traditional enterprise IT suppliers.

We have seen that cloud computing – SaaS offerings in particular – enable line of business leaders to easily implement external services without the approval or participation of enterprise IT. This end run around the CIO can result in serious security risks and a fractious, fractured IT architecture. It can also end in failure when lines of business find they lack the expertise to migrate production pilots to mainstream deployments.

These uncertainties have given rise to a new breed of solutions provider, the cloud services broker. Services brokers help organizations identify the right cloud services and providers, then help ensure agreed-upon service delivery is provided and, ultimately, service value is achieved. Given the complexity of cloud implementations, it's not surprising that brokers are gaining favor among CIOs. According to Gartner, by 2015 brokers will handle at least 20% of all cloud services, up from less than 5% today.[6]

The power of partnering

As companies adopt the cloud model, they are starting to share IT resources with internal business units and outside partners to create powerful new growth opportunities. In some cases, they are becoming both consumers *and* providers of cloud services – and they are transforming IT from cost center to revenue generator in the process.

Some organizations have leveraged the cloud model to create new lines of business by partnering with external providers. Take, for instance, Automatic Data Processing (ADP). The global supplier of payroll processing and business services recently partnered with a cloud-based talent-management firm to satisfy customer demand for sophisticated offerings. The partnership enabled ADP to rapidly bring a new, differentiating, and in-demand service to market in a very brief time – without significant capital expenditures.

Other companies are using the cloud model to create new lines of business by partnering with external providers, as cloud-based Tickets.com did when it opened its APIs to other cloud companies that offer

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[6] http://www.gartner.com/technology/research/cloud-computing/index.jsp

complementary services that enhance Tickets.com's product line. For instance, one partner stores monetary value on tickets to enable holders to purchase merchandise at an event.

Cloud computing is also used to speed innovation and delivery of new services. A leading pharmaceutical company, for instance, moved its R&D application to a cloud service to reduce costs but also to enhance collaboration, data sharing, and software development. The move enabled the pharmaceutical firm to dramatically reduce the amount of time required to deliver new business services.

How the CIO can lead innovation

In the past, CIOs focused on efficiently providing IT services to the business. Now information executives are expected to take full partnership in business strategy and growth.

To ensure a seat at the table, adoption of new technologies that drive innovation and differentiate the business are now critical. Cloud fits the bill. Yet while technology is an enabler of cloud computing, the CIO must be able to forecast and clearly articulate how cloud technology will impact business, rather than how the technology itself is evolving.

The CIO also must lead IT into a new era in which the role of the IT department will shift from an emphasis on technical skills to abilities in managing relationships with service providers and internal business units.

As use of cloud computing increases, it will almost certainly lessen the need for internal IT employees with deep knowledge of technology. Simply put, the CIO must be prepared to proactively address resourcing issues – and to reduce or reallocate staff as necessary. The CIO should communicate a commitment to re-training of IT staff for new skills like managing relationships in a cloud service-focused environment. The message? We are providing a path to new skills, not eliminating jobs.

What this means for your business

When discussing moving to the cloud, the question has become "how and how fast" rather than "why." In the new era of cloud computing, the CIO will take the role and responsibilities of a cloud broker, controlling the sourcing, implementation, and management of multiple cloud services.

The CIO must assess the organization's needs to identify business opportunities that will drive revenue and competitive advantage, then develop an integrated strategy that may include public, private, and hybrid cloud services. At all times, the CIO must anticipate potential information security issues.

It is, to be sure, a challenging role. That's where PwC can help.

We have deep knowledge of all aspects business and technology areas necessary to help CIOs prepare for cloud computing, including IT strategy and infrastructure, enterprise architecture, applications, security, and shared services. We can help you design a strategy and implementation roadmap for cloud computing, develop a business case, connect the dots between a variety of services and providers, and design and implement effective change management. After the implementation, we can help you monitor and measure the cloud deployment to drive future performance.

A carefully considered implementation of cloud services is the first step toward preparing for the business of tomorrow. Let us help you make the move with confidence.

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