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A balancing act
What cloud computing
means for business, and
how to capitalize on it

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# Cloud computing as a business issue

Most business leaders who are familiar with information technology (IT) already understand the basic concepts of cloud computing and recognize that it can offer increased business flexibility. They just aren't sure how to harness its potential, and don't fully understand exactly how cloud computing will affect their companies.

Like any emerging competitive technology, the facts about cloud computing are often obscured by technical jargon and confusing messages. But despite the hype, the potential business benefits as well as the strategic and business impact of cloud computing are significant.

To avoid the technical confusion that surrounds cloud computing, this report will answer the following questions in business terms:

• How is cloud computing changing the way IT services are purchased?

• How can cloud computing disrupt entire industries and enable new business models?

• What legal and governance hurdles must be addressed for cloud computing to achieve its full potential?

• What are some examples of where cloud computing makes sense today – and some where it doesn't?

With these questions in mind, business leaders must address many complex issues and understand the key to unlocking the new opportunities presented by cloud computing.

# Cloud computing: The big picture

Cloud computing represents a major shift in how businesses can process information and manage IT. With traditional IT, businesses make massive investments in dedicated resources and infrastructure, including hardware, software, data centers, networks, IT staff, and security.

In many cases, these IT resources are directly controlled by the company and located on its premises. With cloud computing services, on the other hand, there is an alternative to traditional on-site IT resources and infrastructure. IT functions can be delivered from a service provider, using highly flexible, scalable, and efficient computing resources, to a wide base of users to create significant economies of scale both in production and cost savings.

Cloud computing services arose from the convergence of Internet technologies, software virtualization, and IT standardization. Network-based applications and data services are sold as a "cloud" of IT services, with five key attributes:

- **On-demand self-service.** Users can subscribe directly to gain online access to cloud services.

- **Ubiquitous network access.** Users can access cloud services anywhere and anytime over the Internet.

- **Resource pooling.** The infrastructure used to provide cloud services is pooled as a shared resource.

- **Rapid elasticity.** Services can be scaled up or down in response to the user's changing capacity needs.

- **Pay per use.** Users pay only for what they use, which is tracked through metering systems.

Cloud computing services are offered most commonly in the following ways:

- **Software-as-a-service:** On-demand use of software over the Internet. This type of service has been on the market for several years, and has the greatest uptake so far. Businesses are moving steadily toward it, shifting from licensing software to subscribing to services, typically on a per-user, per-month basis.

- **Platform-as-a-service:** Tools and environments to build and operate cloud applications and services. This is newer in the marketplace, but adoption is expected to increase significantly over the next few years as the time required to scope, develop, test, and deploy applications is reduced. The value of converging applications on a single platform should further drive adoption.

- **Infrastructure-as-a-service:** Storage and computing resources as a service. The main advantages are lower costs, increased flexibility, and the ability to rapidly start up and shut down services. This type of service also helps to moderate capital expenditures by reducing the need for on-site data center infrastructure and computing systems.

From a user perspective, it doesn't much matter which type of cloud service delivers these functions. But from a business perspective, the way that cloud computing resources are structured and organized can make a big difference. There are several distinct models for business use of cloud computing, including:

- **Public cloud.** With this model, cloud computing services are provided by vendors and are accessible over the Internet or a private network. This model uses one or more data centers that are shared among multiple customers, with varying degrees of data privacy and control.

- **Private cloud.** Private cloud computing architectures are modeled after public clouds, but they're built, managed, and used internally by an organization. This model uses a shared services model with variable usage of a common pool of virtualized computing resources. Data is controlled within the organization.

- **Hybrid cloud.** This is a mix of public cloud services, private cloud computing architectures, and classic IT infrastructure, forming a hybrid model to meet specific needs.

- **Community cloud.** Community clouds are used across organizations that have similar objectives, enabling shared infrastructure and services. Community clouds are usually set up using public cloud services to enable collaboration among companies.

Each cloud computing model has a different level of awareness and business acceptance. At the moment, software-as-a-service is the most popular service model. However, platform-as-a-service and infrastructure-as-a-service are making significant inroads as business usage becomes more sophisticated. Private clouds are popular largely because they give businesses the most direct control and the greatest confidence in data security and information assurance. As organizations become more comfortable with cloud computing, they will increasingly seek to capitalize on the different advantages of each architectural model.

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# Why cloud computing?

Cloud computing receives significant attention for its disruptive potential. At its core, cloud computing is a fundamentally more efficient way to deliver and consume IT services.

It's a good fit with how many businesses operate today, and an even better fit with how they will operate in the future. The key benefits include:

- **Cost efficiency.** Underlying IT resources are pooled and shared to achieve tremendous cost savings. Businesses pay only for what they actually use, so they don't need to maintain a reserve of largely unused resources in order to handle peaks in demands.

- **Less upfront investment.** Businesses can quickly gain access to the IT services they need, without the time and expense of establishing their own IT capabilities and infrastructure. Capital expenditures are replaced by operating expenses.

- **Business focus.** Companies can focus on their core business, instead of dedicating resources to IT services. IT resources can be shifted to activities that create more value for the business, such as innovation or decision support.

These benefits can dramatically reduce the cost and complexities associated with IT. In many cases, cloud-based services can operate at less than half the cost of similar traditional infrastructures, which is enough of a savings to disrupt procurement models and enable new markets to develop. The real power of cloud computing, however, is that it can enable companies to be more agile and flexible, and to do things that simply weren't possible before.

For example, cloud computing allows companies to launch new business ideas in weeks – not months – with limited IT investment and physical resources. In many cases, it takes only a few people and a couple of weeks to get a new business up and running. Imagine the potential innovations a company could produce, and the market share it could capture, by entering the marketplace with that kind of speed. With barriers to entry significantly reduced, how will established companies respond?

Cloud computing can also enable new business models that are less reliant on upfront capital and more reliant on knowledge and intellectual property. For example, cloud computing may allow small and medium-sized businesses in industries such as media, technology, manufacturing, and retail to challenge much larger companies and compete on a global scale. Cloud computing may also free up large amounts of investment capital to more efficient and creative uses.

Through business innovations like these, cloud computing has the potential to disrupt current practices in a wide range of industries, from technology and healthcare to energy, consumer products, and financial services.

**Sidebar: How cloud computing is disrupting the IT industry**

It's the secret most established IT companies don't want to talk about. The rise of cloud computing to meet growing demand has the potential to drive a major restructuring of the IT industry. With increasing scale and critical mass, innovative new services will likely position cloud computing to replace large swathes of existing systems.

Whether this occurs through internal private clouds or external public clouds, it represents a huge architectural shift. And it's gaining momentum. A 2009 report by Gartner estimated the U.S. market revenue for cloud computing in 2008 at US$3.5 billion, and forecasted compound growth of 40 percent between 2008 and 2013, reaching an estimated US$18.6 billion in 2013[1].

**The future of the IT industry**

The market for traditional IT services is growing very slowly, and demand for traditional hardware is shrinking. Cloud computing is where significant new growth is occurring in the IT marketplace, and vendors are pushing new innovation efforts..

The shift to cloud computing is also dramatically changing the way IT is consumed, and consequently will change the way IT is packaged and sold. For vendors, cloud computing is the new basis of competition, and this puts tremendous pressure on incumbents and traditional suppliers. Within a few years, the IT industry structure may be significantly transformed, both in terms of industry leaders and concentration of sectors. With new buyers emerging and long-standing demand sources stagnating, many traditional suppliers are in danger of displacement.

IT industry incumbents that can't establish a position in the cloud computing market risk being pushed into shrinking "pre-cloud" sectors. They may soon be obsolete as companies shift from purchasing computer equipment to using cloud service providers. There are other implications as well. Because cloud computing is fundamentally more efficient than traditional IT, and shows tremendous economies of scale, it represents a net compression of the amount of hardware required to deliver a given level of service. As companies move toward subscription services, demand for IT products will decline, which will put deflationary price pressure on vendors.

Since cloud computing is still emerging, its ultimate impact on the range and quantity of demand for new computing services remains to be seen. New efficiencies may put a lid on demand by sharply reducing the need for IT infrastructure, or they might create new opportunities for computing services, expanding overall markets and increasing demand for computing power. The future is unknown, but whatever the scenario, there is little doubt that the landscape will be significantly changed.

**Incumbents respond**

The attractive benefits of cloud computing put existing sales channels at risk, and pressure is growing on incumbents and current IT industry leaders. The reality is that many of the IT products currently in use by companies and service providers are not appropriate for a cloud delivery model, and will need to be enhanced to avoid displacement.

Product suppliers are designing new hardware and software that are cloud-enabled or cloud-specific. Functions previously assigned to a single specialized device – whether a network switch or a server that focuses on processing and interfaces with storage – are now being commoditized, and product positioning and competitive distinctions are blurring. This will upset established product design, marketing, and selling strategies for industry incumbents.

1 Gartner: Forecast: Sizing the Cloud; Understanding the Opportunities in Cloud Services (March 18, 2009)

Also, companies are changing the way they consume services. They're no longer as concerned with the features of specific product components as they are with the service itself. They're changing focus from a product-acquisition or licensing model to a service-subscription model.

For these reasons, industry analysts looking at the overall IT landscape anticipate deflationary pressures on traditional IT product suppliers. They expect a shift in market power from enterprise buyers with decreasing leverage to increasingly concentrated cloud service provider buyers that will have substantial leverage over sellers.

### Adapting to the cloud

Cloud computing consumption models will change who vendors sell to and how they satisfy customer demand. For example, in the semiconductor business, the race to create the fastest processor might be rendered moot by cloud computing. Instead, the winning strategy could be creating chips that save power and enable the integrated architecture features required for cloud services, at a low cost.

The vendors that have adjusted their portfolios to the unique requirements of cloud computing can deliver the kinds of products that cloud service providers need, and they will shape their go-to-market strategies around the assumptions of the future marketplace.

Some industry leaders see the move to cloud computing as "one of the biggest opportunities in computing history." They view the transition to cloud computing as a boon to potential new sales. However, their future customer isn't necessarily the traditional end-user organization, but rather the cloud computing service provider with enormous data centers filled with homogenous technology architectures.

Of course, the downside for IT suppliers is that over time there may be less demand for the IT industry's established products. This could drive prices down in a shrinking market.

Cloud computing creates a new and level playing field that enhances market competition. For example, chip companies can sell directly to cloud service providers, cutting out the "middleman" (i.e., the server companies). This offers chip companies an opportunity to make specialized cloud chips and to move the point of differentiation to the cloud, instead of company servers.

### Strategies for IT vendors

Vendors anticipating a long-term shift to cloud computing service models should adopt strategies that:

• Recognize and anticipate significant changes in the market for end-user computing, with cloud service providers moving into position as the dominant buyers in the marketplace for computing infrastructure.

• Work with cloud computing service providers to tap their growing markets and customize products to accommodate the demands of cloud computing.

• Shape consumer and end-user products based on the needs of the cloud, rather than for intensive "end-node" computing.

Cloud computing will disrupt older product and service models. Vendors with the foresight to identify and act on the changes as their industry adopts cloud computing will be better positioned to profitably meet customer needs in the future.

# Barriers to cloud computing – and how to address them

Cloud computing has the potential to transform current operating practices by making businesses more agile and enabling them to do things that simply weren't possible before. But those changes won't happen overnight, and there are many obstacles to overcome.

Most obstacles do not apply to every situation, and in many cases, reasonable workarounds are available. That said, understanding the obstacles will help companies make the right trade-offs and enable them to design an approach to works.

**Transparency.** One of the big advantages of public (or vendor-provided) cloud computing services is that businesses don't have to worry about the complex details of how these services are delivered. This is also a potential disadvantage. Because a company may not have visibility into cloud services, it's hard to know if everything is operating as it should. Vendor audits, service level agreements, and robust contracts can help. Another option is for a company to operate its own private cloud, although this means losing some of the benefits of public cloud computing.

**Control.** With public cloud computing, an outside party controls the IT resources used to provide the service. Under normal circumstances, that's a benefit, because it allows a company to focus on its core business. But if a critical system goes down, the company has limited control over the situation. This is one reason many companies have elected to implement a private cloud model.

**Security and privacy.** There are growing concerns about privacy, identity theft, and cyber security. How can a company protect its data when it doesn't have direct physical control over it? Companies that work with IT outsourcing and third-party business partners already face this problem, but the move to cloud computing adds additional layers of complexity and detachment. Vendor audits are crucial to establish required controls.

**Compliance.** In some situations, government regulations present additional compliance requirements when using public cloud computing. For example, using a cloud service to manage sales transactions will require that the vendor provide sufficient audits of its IT environment, with the logging and reporting that laws require. The regulatory requirements for cloud computing aren't always clear, and applicable laws aren't always enforced. It isn't always clear what laws apply when services take place simultaneously in several jurisdictions. Until regulatory practices catch up with cloud computing usage, this is likely to remain an open issue.

**Geographic restrictions.** Public cloud computing can be provided across different geographies. Organizations should be aware of situations where physical location matters. For example, European privacy laws require personal information about EU citizens to be stored in the EU. To meet this requirement, organizations might need to adopt a cloud model where they can explicitly determine where resources are located, within general guidelines.

**Vendor viability.** Many public cloud vendors are known quantities with significant resources, such as Google, Amazon, IBM, Salesforce.com, and Microsoft. But most new vendors aren't as widely recognized or mature. Rigorous due diligence is essential when selecting key vendors and mission-critical services and systems. The relative immaturity of cloud computing makes due diligence even more important.

# The future of cloud computing – and developing a sensible path forward

As the market for cloud computing matures, the consumption models discussed above will likely become the standard for IT services. But until then, it's important to understand where cloud computing makes the most sense, and where it doesn't.

When evaluating options for moving forward with cloud computing, consider the following factors:

- **Levels of variability and flexibility requirements.** Cloud computing offers the greatest benefits where the computing load has significant peaks and valleys, and where flexibility and speed are important. When load variations occur over the course of a single day, or over a period of weeks or months, cloud computing models can offer capacity that rapidly scales up or down to meet changes in demand, with little risk of over committing resources.

- **Avoidance of capital expenditures.** Cloud computing services are particularly attractive to start-up companies and other businesses with capital constraints. Larger organizations with significant amounts of existing IT infrastructure can also reduce capital outlays using cloud computing models, leveraging their investments in legacy equipment.

- **Balance of risk and opportunity.** In some cases, the current risks of cloud computing can outweigh the benefits. For example, companies with an unusually strong need for data privacy and security might find that the workarounds necessary to meet their strict requirements aren't feasible or affordable. However, for other organizations the barriers may be minimal or easily managed, giving them a clear path to capitalize on the benefits of cloud computing. Organizations should carefully assess the risks and benefits for each potential IT service using cloud models.

Cloud computing consumption models can deliver significant benefits for almost any business. Many companies begin with IT cloud computing services where the barriers to adoption are minimal. For example, application development is an area where the compliance and privacy barriers aren't significant.

Application developers can accelerate time-to-market and raise productivity, and use cloud computing as a significant enabler.

There are other situations where the barriers are greater, making public cloud computing less attractive in the short term. For example, in public sector organizations, data security and privacy are major issues, and may not allow data out of government-owned and government-controlled data centers. Unless sensitive data can be protected, agencies will avoid external cloud services but may be able to capture many of the efficiency benefits of cloud computing by implementing private cloud models. The business benefits of cloud computing will likely lead some highly secure IT shops to move forward in selective ways, such as private cloud architectures, in order to pilot cloud computing services in a lower-risk environment.

> **Case study: Putting cloud computing to work at the U.S. Department of the Interior**
>
> The U.S. Department of the Interior is an early adopter of cloud computing in the federal government:
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> "Our center handles payroll, HR and financial systems and services, contracting services, and other computing tasks for dozens of federal agencies through two large data centers, one in Northern Virginia and another outside Denver. With the volume of data we manage continuing to explode, cloud computing can help us fulfill our mission – maybe even without having to build another data center.
>
> Security is an issue we have to manage, but the scalability, affordability, flexibility and maturity of the cloud computing model make it all but inevitable.
>
> We're introducing several cloud-style applications in the months ahead, including Web-based training, and staffing and recruitment software. In tests with HR and procurement software, the cloud-computing environment has already delivered efficiencies of 40 to 60 percent in productivity and power consumption.
>
> We see cloud computing as another way for government agencies to take advantage of the convergence of government business functions and the advent of the shared service center. Central to our mission is the idea of a converged Shared Service Provider that allows the government to streamline its business operations and leverage a common infrastructure. Cloud helps make that possible."[2]
>
> **Doug Bourgeois,** Director, National Business Center, Department of the Interior

2 Deloitte Development LLC, "Cloud Services: Technology Evolution or Business Revolution?" 2009

# Conclusion

Cloud computing is not a passing fad. It is already a compelling computing services option for many situations, and is rapidly gaining momentum in the market. As the market matures, companies will be challenged to adopt cloud computing services models in order to remain agile and competitive. Making this transition is a strategic business issue, and will require the engagement of top business leaders, working closely with the CIO.

Cloud computing will play a major part in the future of IT and will present significant opportunities for companies. Although it might not be ready for every situation – at least not yet – business leaders generally agree the value is real. They know they must think strategically about how cloud computing has a potential impact and start getting ready for the outcome.

The emergence of cloud computing presents organizations with a clear call to action. Buyers of IT services should be on the lookout for new consumption options and dropping prices, with some risks for vendor obsolescence and IT suppliers should prepare for market disruptions with increased competitive challenges. And more importantly, business leaders must plan for new market opportunities opened up by this accelerating cycle of innovation.

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