Deloitte.

# Cloud computing
# Forecasting change

**Market overview and perspective**
**Consulting**

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# Preface

In today's globalized and volatile times, more than ever, it is necessary for businesses around the world to secure their competitive advantage. Companies must leverage their core competencies and be agile enough to evolve with the environment, especially in IT.

At Deloitte, we pride ourselves in helping our clients and partners to be one step ahead. Today we bring you our perspective on an important and disruptive development in the IT market that will impact you and those around you – be it slightly or radically – in the coming months and years: Cloud computing.

Cloud computing is a collection of Internet-based or private-network services providing users with scalable, abstracted IT capabilities, including software, development platforms and virtualized servers & storage. Although not new as a concept, Cloud computing is new in its generalized application to all IT services and is the next step in the relentless journey of corporate IT. Given its profound impact, Cloud computing cannot be ignored.

The goal of this brochure is to enable "hype-free" discussion on Cloud computing and align actors around a common understanding. We hope that, like us, you will be convinced of the compelling power of Cloud computing, not just because of its advantages, but also by understanding the risks it entails, and what can be done to address these.

Happy reading!


Patrick Callewaert
Customer Practice lead EMEA

Paul A. Robinson
Global Technology lead

Peter Blatman
Global Cloud lead

# Defining the Cloud

**Cloud computing will be the next technological disruption to transform enterprise IT delivery and services.**
To those who have embraced Cloud computing, it is powerful and is already embedded within their professional and personal lives. To others, it is immature, hyped, and distant, yet intrinsically compelling. Such conflicting descriptions are to be expected in any nascent industry, all the more so in one that is still searching for a clear definition to encapsulate a profound but subtle technological evolution.

To provide you with a hype-free understanding of Cloud computing, necessary for its successful assessment, we will start with a definition, continue with an overview of its evolution and disruptive qualities, and end with a word on the hype.

> The projected shift to Cloud computing … will result in dramatic growth in IT products in some areas and in significant reductions in other areas
>
> Jim Tully, Vice President and Distinguished Analyst, Gartner

The Cloud is a collection of internet-based or private-network services providing users with scalable, abstracted IT capabilities, including software, development platforms and virtualized servers & storage

### Our definition of the Cloud

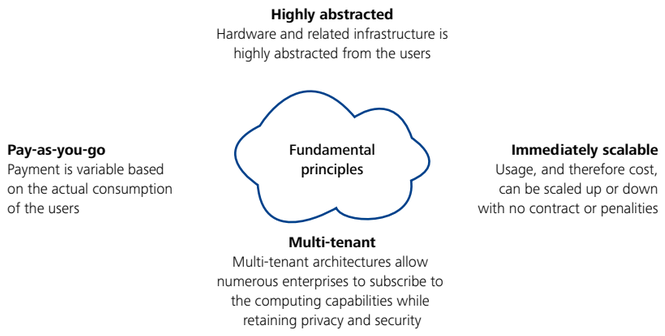
Even the most cursory examination of the Cloud market reveals a wide range of varying definitions, with recent studies finding more than twenty two.

The lack of a consistently accepted definition does not preclude the Cloud's benefits – the value of the Internet was realized long before it had a definition – but we believe it is important that a Cloud definition emerges to:

- Enable Discussion: Given the immaturity of the Cloud market, a definition provides a basis for analysis
- Control the Hype: By providing clarity on the fundamental characteristics of a Cloud, we can better identify true 'Clouds' and those Cloud-like entities that are 'along for the ride'
- Align the Actors: Sets the framework for alignment among vendors, buyers, integrators, and regulators

We have recognized a certain level of consensus emerging around the characteristics of Cloud computing, or the capabilities that must be adhered to an offering to be considered a Cloud offering.

**Figure 1 - Cloud computing characteristics**




These characteristics are the basis of our definition of Cloud computing: The Cloud is a collection of Internet-based services providing users with scalable, abstracted IT capabilities, including Software, Development Platforms and Hardware. Nonetheless, today, not all of these characteristics are truly present on the market.

### The Cloud as a building

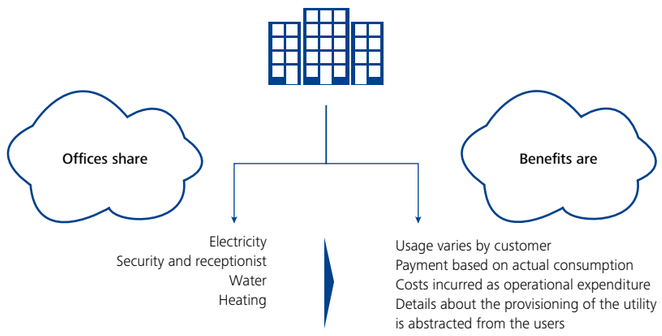
To more easily comprehend the Cloud's characteristics and benefits, a simple yet powerful analogy can be used – compare it to the typical office building, supporting the cohabitation of multiple companies simultaneously.

While each company is specialized in its own industry, market or product, and some companies benefit, due to size or requirements, from designing, building, managing, and renovating their own private office building, it is in the best interest of the vast majority of companies to share the office services they all use, notably certain fundamental utilities.

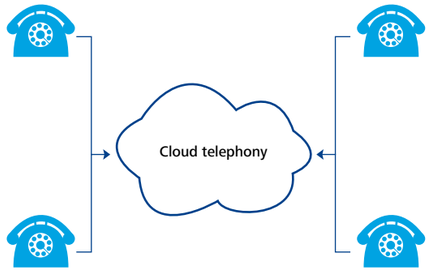
The same benefits also apply to Cloud computing with computing moving away from traditional characteristics of being customized, burdensome and private, to being shared, payed for based on consumption, and abstracted from the user.

The end state is for the installation and maintenance of software, development platforms and hardware to be as flexible, immediate, and cost effective as the electricity coming out of every wall.

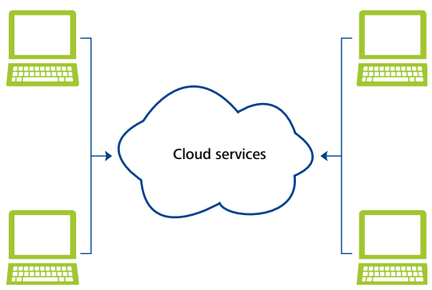
**Figure 2 - Cloud computing compared to shared office space**



**1960s: at&t Cloud telephony**




**1990s: at&t Cloud computing systems**




## Where has the Cloud come from?

The Cloud is not as new as it seems. The Cloud symbol that permeates virtually all Cloud computing literature is more than 50 years old, as indeed are the concepts that were recognized as early as the 1950s in the work done by AT&T in the area of telephony networking.

At that time, AT&T had already begun to develop an architecture and system where data would be located centrally and accessed by businesses through redesigned telephones and an updated telephone network. While the service did not materialize, the concepts and advantages were understood and relentlessly pursued through to this day.

The pursuit of centralized, abstracted IT services progressed over the decades with the advent and adoption of technologies such as Internet Service Providers (ISP – where servers were located at the Internet access point), and Application Service/ Infrastructure Providers (ASP – where infrastructure was rented to a customer at an offsite location, but used most of the time by the one, paying customer). Other IT services historically offered include Time Sharing Systems, Co-Location, Hosting, and Outsourcing.

As with any evolution, the step from ASP to Cloud computing is subtle yet disruptively important. While ASPs managed the offsite infrastructure for a customer, they were bound to the concept that the infrastructure capacity was predetermined and inflexible; ASP customers were required to declare the quantity of compute and storage capacity needed up front. If the customer's computing needs grew or contracted, the hardware had to be scaled up or down with an associated delay and up-front investment.

One of the main principles of Cloud computing, from Software-as-a-Service to Storage on demand, is that the computing capacity varies immediately and transparently with the customer's needs, and clients no longer must plan, configure, and deploy fixed quantities of computing equipment, with associated costs, lead-times, and financial risks.

Indeed, from this evolution we find ourselves at the cusp of a significant transformation in Information Technology. Companies that are knowledgeable and prudently adopt Cloud computing will recognize significant benefits, while those that do not will be left 'a step behind' and see their competitors pull ahead as a result of lower operational costs and increased flexibility and deployment capabilities.

## Where is the Cloud today?

Cloud computing encompasses an increasingly broad array of uses deeply embedded in both our personal and professional lives, with the distinction not always very clear:

**Personal** applications of Cloud computing provide the most universally accessible understanding of the Cloud. With the common acceptance of applications like Gmail, Hotmail, Facebook, MySpace we are already familiar with the advantages. Indeed, Gmail, to take but one example, offers virtually limitless space to its users, to whom the details of the underlying software and hardware are completely and purposefully obscured.

**Consumer** Cloud applications were born out of the dot-com bubble at the turn of the century and have matured into fully accepted services connecting consumers to buyers. These former start-ups, such as Google, eBay and Amazon, have become leaders in the Cloud computing industry and are poised to expand into and dominate the Business Cloud application market.

**Business** Cloud applications were carried to the CXO's attention with the advent, growth and acceptance of companies such as salesforce.com and NetSuite. Business Clouds, which deliver business value with a reduced IT footprint, are poised to change the way enterprises deploy and manage their IT assets and business processes.

| | |
|---|---|
| Gmail | • Virtualy limitless space available<br>• Software and hardware is managed entirely in the Cloud<br>• Feature and performance upgrades are automatic and apply to everyone |
| Ebay | • Consumer service provided in the Cloud<br>• Sales transaction business process is consumed by users<br>• Cost to consumer is based on usage |
| Salesforce.com | • Salesforce.com is accepted as viable enterprise solution by businesses of all sizes<br>• Exemplifies all characteristics of Cloud computing: Scalable, Pay-as-you-go, Abstracted, Multi-tenant |

## Disrupting the game

The trend of moving to the Cloud is a logical evolutionary step made possible through the mass adoption and capabilities of the internet and virtualization. Its impact on enterprise Information Technology over the upcoming decade will be enormous given its advantages. We believe it will prove to be disruptive, changing the game for all actors: software vendors, system integrators, customers, governments and regulators.

Cloud computing is a disruptive innovation, that has taken root initially in simple applications at the bottom of the market and is relentlessly moving 'up market', and will eventually displace established competitors. Today it is only subtly disruptive, but it will impact all IT players over time, both through "low-end disruption", and "new market disruption":

- Low end disruption: the performance of on premise applications now often overshoots the needs of customers leaving room for Cloud providers to enter markets by providing sufficient functionality
- New market disruption: Cloud solutions fit new or emerging needs, creating market segments that were previously not being served by on premise incumbents

**Figure 3 - Disruptive impact of Cloud computing characteristics**


| | Disruptive impact |
|---|---|
| **Highly absracted** | No need for the CIO to manage physical hardware or storage components for Business Applications in the Cloud |
| **Pay-as-you-go** | Payment is based on monthly usage, meaning CAPEX expenses become OPEX<br>Potential cost reductions since unused capacity can be quickly offloaded |
| **Multi-tenant** | Since all Cloud customers share the Vendor's architecture and software, there is no longer a need to worry about expensive software upgrades for SaaS applications |
| **Immediately scalable** | Capacity can be immediately scaled to the right number of users, from 1 tot 1000s<br>The cloud can be up or downsized in minutes, often via the internet |

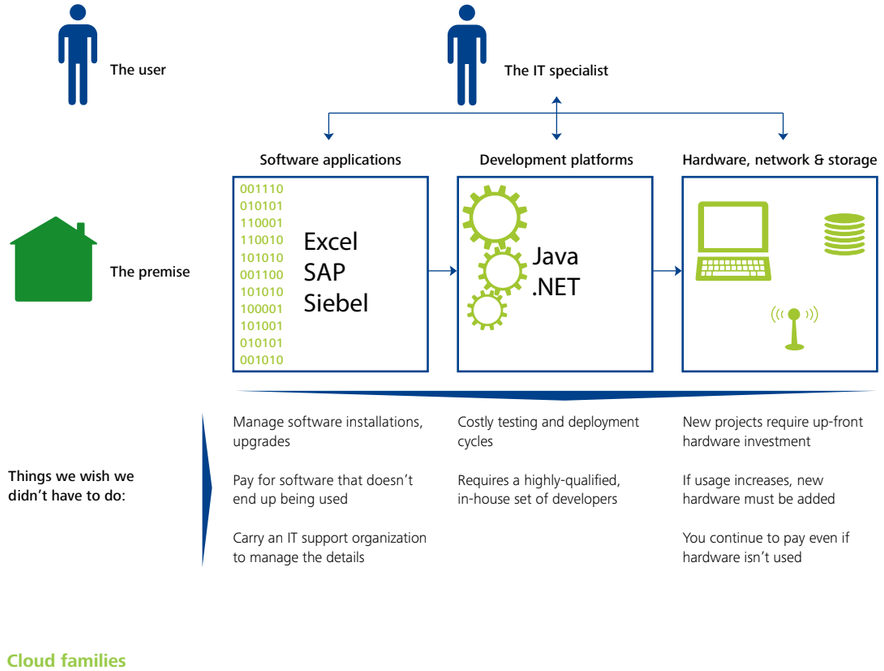
To better understand the disruptive impact of the Cloud, we must look at the immediate impacts of the Cloud's four main characteristics.

Alternatively, we can examine the issues that we take as 'necessary evils' surrounding today's enterprise IT landscape. We are all familiar with the IT stack of large enterprises, which typically contains business-facing Software applications (e.g. Oracle, SAP, Microsoft), development platforms used by developers to build custom applications (e.g. Microsoft .Net, Java, C/C++, COBOL) and the underlying Infrastructure (storage, servers, network) upon which the Software and Platforms run.

With most of these IT capabilities being conceived, set up and managed on the company's own premises, we have accepted the inherent effort and challenge required to 'keep it all running'.

In other words, we have learnt to live with the fact that our enabling IT requires our having to put up with a host of cumbersome necessities. The power of Cloud computing becomes clear when we imagine not having to invest the time and resources to accomplish many of the tasks we now take for granted, as illustrated in the figure below.

**Figure 4 - Downsides of on premise computing**




## Cloud families

One area of confusion that surrounds Cloud computing results from its breadth of application. As is often seen in the business world, the IT architect will understand Cloud differently from the Business manager, focusing on the cost saving potential rather than the advantages of streamlined processes.

Nonetheless, over the past months, Cloud computing taxonomy has begun to shape into a generally accepted classification, being distinguished as three families of services:

- **Software-as-a-Service (SaaS)**
  - A web-based service that supports a specific Business Process or set of processes, where the user is typically within the Business organization
  - SaaS services are either purely business-related (e.g. sales reporting, marketing campaigns, HR talent management) but also encompass the applications that are used by business-oriented technologists (e.g. Business power-users who configure in salesforce.com, technology administrators who configure Integration and messaging applications between systems)
- **Platform-as-a-Service (PaaS)**
  - A web-based service that provides all the facilities required to support the complete life cycle of building and delivering Web applications and services, where the user is typically within the software development organization. In essence, "you program on the Internet"
- **Infrastructure-as-a-Service (IaaS)**
  - The delivery of computer infrastructure as a web-based service. Rather than purchasing servers, storage, O/S software, data center space, or network equipment, clients instead subscribe to those resources as a variable-cost service

Imagine being able to remember a time when enterprise software and hardware upgrades were needed

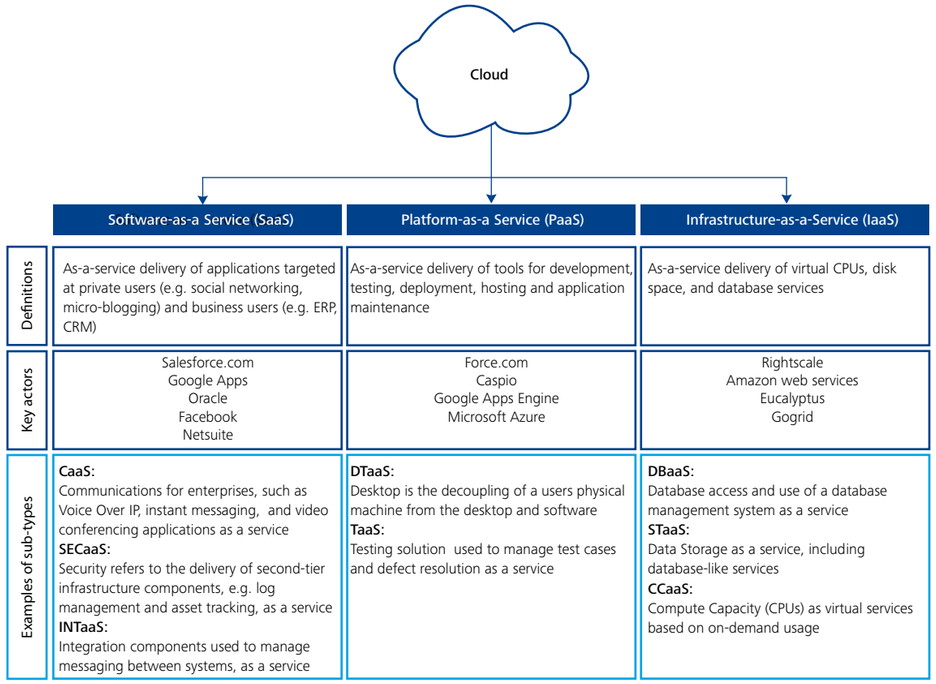
Paul A. Robinson, Global Technology Lead, Deloitte

# Confusion abounds when Cloud computing is discussed, and the situation is getting worse, not better

Daryl C. Plummer, Analyst, Gartner

The following figure depicts these three Cloud families, with leading players and emerging sub-families.

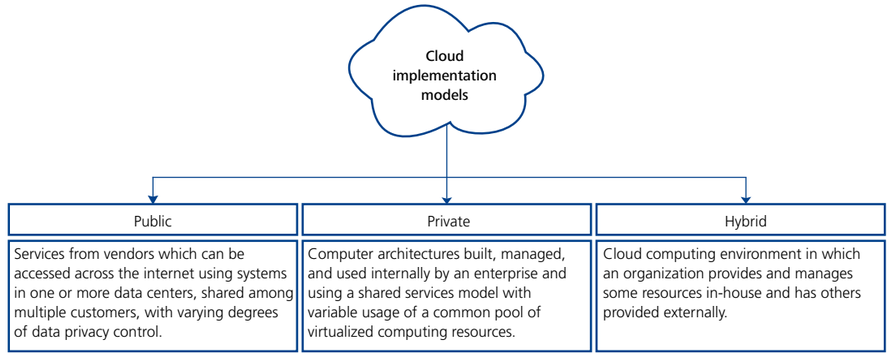
**Figure 5 - Cloud families (SaaS, PaaS, IaaS)**




Other groupings of Cloud offerings can be made such as the distinction between public (or vendor), private, and hybrid Clouds.

Essentially, these differentiate the degree to which Cloud computing is externalized from the organization. While the optimal cloud computing architecture will depend on the specific business needs of the client and the capabilities of the client's technology, today, only the largest organizations can hope to leverage true benefits using private Clouds exclusively.

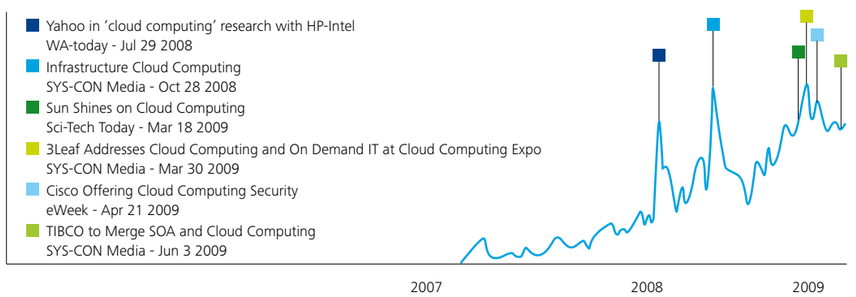
**Figure 6: Cloud implementation models**




## A word on the hype

As with transformational technology on the brink of adoption, there has been 'hype' around Cloud computing with exaggerated claims emanating from industry analysts and vendors, all the more so given the lack of an unambiguous definition – this is shown by a simple check of the number of google searches on the term since its emergence in 2007.

**Figure 8 - Search index on "Cloud computing", Source: Google**



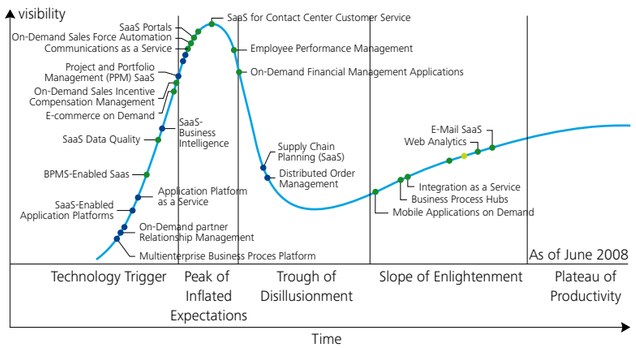
# Drivers and inhibitors

**Key points**

- Cloud computing is disruptive due to its four key characteristics:
  - Highly abstracted
  - Variable expense
  - Multi-tenant
  - Immediately scalable
- Cloud computing can be broken down into SaaS, PaaS and IaaS
- While hyped and not fully mature, Cloud computing is already yielding real benefits for its adopters
- To maintain a competitive edge, organizations should investigate the added value Cloud computing can bring to them today

Given the pervasive hype, Cloud computing's applicability, advantages, and challenges must be assessed for each enterprise individually based on an objective framework, taking into account the drivers and inhibitors. Indeed, as with any technological evolution, the technology introduces improvements but will not solve all existing problems, especially those related to executive sponsorship, organizational change management and effective communication between the Business and Technology groups. Nonetheless, it will help to move organizations forward, and the remaining chapters of this document seek to provide a tempered and objective evaluation of the current Cloud market trends and the actors involved, with the intent to cut through the hype and bring our Cloud computing expectations closer to reality. Furthermore, the 'hype' of on demand products within the SaaS Cloud family can vary greatly.
Of the three families of Cloud computing, broadly speaking, SaaS is by far the most mature and has the highest level of adoption by enterprises of various sizes. There is less 'hype' surrounding SaaS for the simple reasons that SaaS-based solutions have been on the market longer and the basic concepts, advantages, and challenges of SaaS have already been accepted and understood by most internet users. As such, the perceived value of SaaS is relatively well aligned to its actual value, meaning, there is less 'hype'.

**Figure 7: Hype Cycle for Software as a Service, Source: Gartner, June 2008**




Both PaaS and IaaS are predicted to experience larger growth over the next five years than SaaS although they start from a smaller base. Today, the expectations associated to PaaS and IaaS are more 'hyped' than SaaS simply because enterprises have only started to experience these technologies and perception has not yet aligned with the truth – this will take some time. A look at the Gartner Hype curve confirms that the different sub-families within Cloud computing are at vastly different maturity stages.

In conclusion, Cloud computing is approaching the top of the hype curve and has not yet reached maturity, but already yields real benefits for its adopters. To maintain a competitive edge, organizations should investigate the added value Cloud computing can bring to them today.

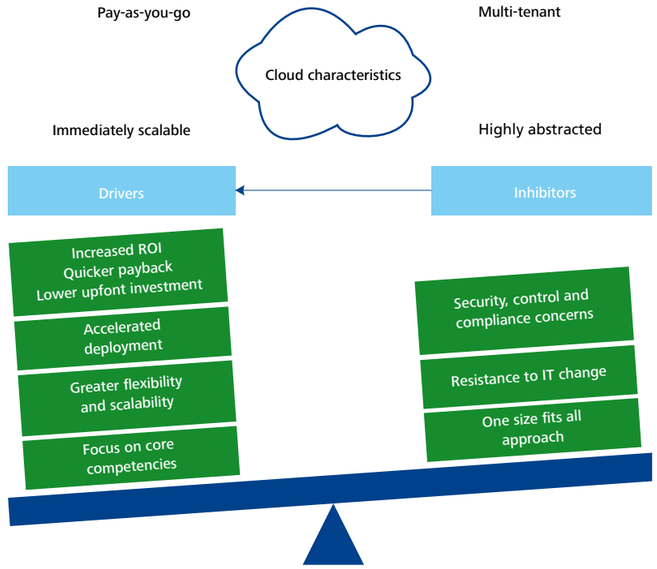
**Cloud computing has clear advantages – capitalizing on these and overcoming remaining inhibitors will allow its mainstream adoption.**
Cloud computing exhibits obvious advantages linked to its characteristics:

- The pay-as-you-go model and multi-tenancy lead to increased ROI with quicker payback and lower upfront investment
- High abstraction and immediate scalability lead to accelerated deployment, greater flexibility, and greater focus on core competencies

In the following sections we will detail these drivers and show how, beyond these advantages, Cloud computing service providers will need to address a number of remaining inhibitors to achieve mainstream adoption in the coming years.

The key factors for overcoming the present inibitors will be to gain users' trust on security and compliance, and promote a new way of thinking, a mindshift in the IT industry despite the resistance to change. Moreover, and perhaps just as important to Cloud computing's advancement, the industry will need to align perceptions of the Cloud drivers and inhibitorsmore realistically.

**Figure 9 - Cloud computing drivers and inhibitors**




> Clearly, businesses are examining how, when and what to migrate to the Cloud and seeking best practices in running hybrid environments that will save IT dollars and resources — without compromising security, regulatory requirements, rich functionality and other critical enterprise considerations"
>
> Chris Capossela, Senior Vice President, Microsoft's Information Worker Product Management Group

We expect the cloud adoption trend to be amplified by the current financial crisis

Frank Gens, Senior Vice President and Chief Analyst, IDC

## Favorable drivers are lifting the Cloud

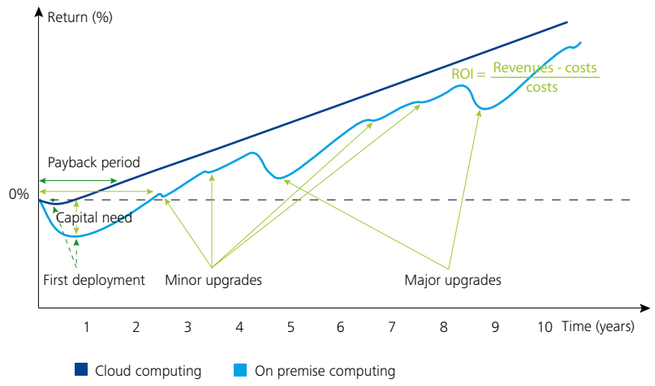
**Increased ROI, lower upfront investment and quicker payback**

A first key driver of Cloud computing is its pay as you go pricing model, in which IT is provided as a service that is charged based on its consumption via either a subscription model or utilization-based alternative, similar to utilities or telecom. The pay-as-you-go model:

- Reduces upfront IT CAPEX investments for users – be they in hardware or software – by shifting these costs to vendors who can spread them across their client base. Indeed, instead of paying for hardware and licenses upfront, and having to wait for the customization of an on premise solution, Cloud consumers pay a periodic subscription or utilization fee with minimal upfront costs covering a shortened deployment effort.
- Accelerates payback and improves Return on Investment (ROI): Given the reduced upfront investment and quicker deployment time for Cloud deployments, benefits are realized sooner allowing for a decrease in payback time. Positive ROI is also more quickly attained.
- Entails efficiency gains linked to the scalability (or elasticity) of Cloud deployments.
- Reduces the risks linked to IT deployments, by transferring them (in part) to Cloud providers.
- Streamlines the IT procurement process: Minimal capital outlays mean Cloud projects can avoid the administrative burdens of the multiple levels of approval that traditionally come with major IT investments. That, however, does not mean that Cloud investments do not need approvals.
- Abstracts IT maintenance, upgrade, and support costs from Cloud consumers, transferring these to Cloud providers to a large extent (e.g. with Cloud computing, upgrades are automatically provided to consumers and charged in the periodic fee).

These attributes are illustrated in an indicative graphical comparison of equivalent Cloud and on premise deployments.

**Figure 10 - Deloitte Cloud economics overview**




Given the current financial and economic crisis, the pay-as-you-go driver resonates all the more strongly, with an increased focus on cost reduction in IT. In fact, it is already causing analysts to revise growth expectations for the Cloud upwards. Notwithstanding, similar pricing models could to a certain extent be applied to on premise software, despite its lesser fit.

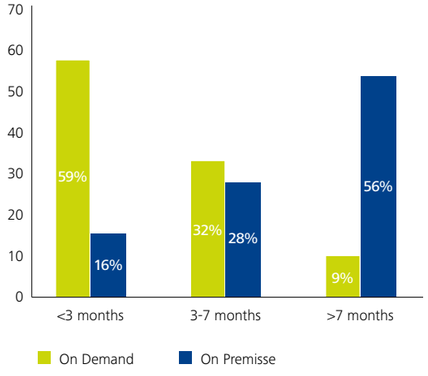
Nonetheless, for Cloud consumers to reap maximum benefits from the pay-as-you-go model, they will need to:

- Ensure that the price providers charge for their Cloud services is justified given the expected benefits. Indeed, the cost advantages Cloud providers have due to economies of scale should be carried over to consumers
- Exploit Cloud computing scalability by actively managing their usage of Cloud services
- Analyze the tax implications of Cloud computing, especially in international environments

**Accelerated deployment**

Cloud computing eliminates the lag that often exists between business and IT, thus ensuring organizational agility. As business cycles accelerate in a web-enabled world, many businesses require almost immediate deployment or adaptation of their supporting IT environment which can only be achieved at scale by leveraging out of the box solutions benefiting from optimized procurement, set-up, and migration time, as well as relatively high standardization. For example, one Deloitte client implemented the first release of an on demand sales force automation tool within two weeks. More generally, CSO Insights notes that deployment times in the CRM space – one of the most mature in Cloud computing – are significantly below those of equivalent on premise solutions, with many projects achieving deployment times of less than three months.

**Figure 11 - CRM System Implementation Time Comparison, Source: CSO Insights**




Beyond the decreased deployment time – going from months to weeks, organizations will be able to focus on the real business issues with IT organizations acting as change agents rather than plumbers maintaining the internal IT structure, resulting in a more focused form of IT.

**Extreme scalability**

Given the observed minimal average IT resource utilization rates in most organizations (some analysts estimate these to be as low as 10% of capacity), scalability is another major advantage of Cloud computing.

Organizations can nearly instantaneously scale up or down their IT infrastructure (processing power, storage, networking or number of users) in line with consumption needs, avoiding costly upgrades, wait times and capacity constraints. They no longer need to choose between too much or too little.

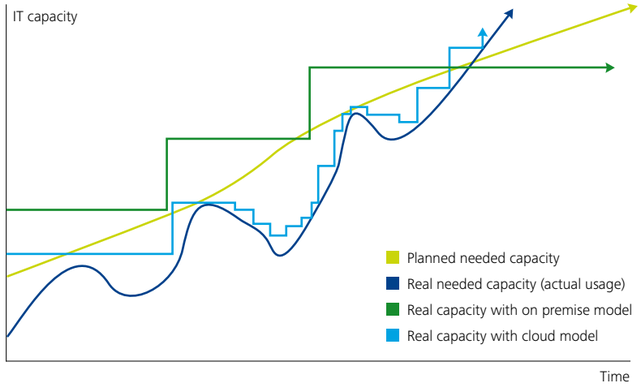
The adoption and leverage of Cloud computing's capabilities will eventually leave IT waiting on the business to react

Patrick Callewaert, Customer Practice Lead EMEA, Deloitte

> Vendors should architect for the wild success of their solutions from the beginning
>
> Dr. Werner Vogels, Vice President and CTO, Amazon.com

Moreover, organizations can choose their degree of reliance on the Cloud's scalability either focusing on ensuring average needs are covered internally, and using Cloud services on demand for peaks, or leveraging the full benefits of Cloud both upwards and downwards.

**Figure 12: Example of Cloud computing scalability as opposed to on premise**




A good example of leverage on Cloud computing's scalability is the Indy 500 website (www.Indy500.com), which stores more than 100,000 images using Amazon S3. Amazon EC2 is used to host and stream live motor sport races to over 3.1 million visitors with massive peaks in usage during races that could not be accomodated economically using internal infrastructure.

Nevertheless, companies should be aware that scalability is not unlimited. For example, Amazon relies on future capacity reservation to better forecast demand and provision their infrastructure accordingly.

### Focus on core competencies

Leveraging Cloud providers for IT services allows organizations to outsource non-key areas and focus on their core competencies to maximize competitive advantage.

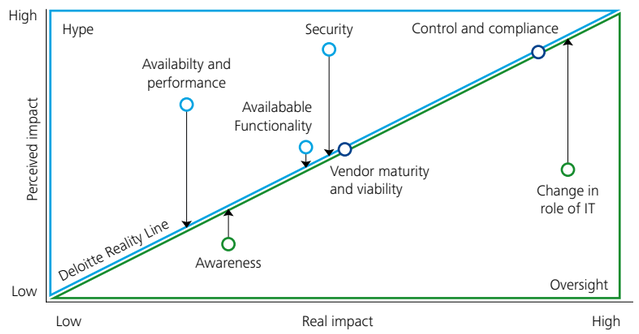
An example of this is GeoEye, a provider of commercial satellite imagery to the US Department of Defense and intelligence community. By leveraging Cloud computing to perform sharpening, compression, and geo-correction of its high-resolution satellite images, and eliminating the need for multi-processor supercomputers traditionally needed to perform such applications, GeoEye focuses on its core competency of operating the world's highest-resolution commercial Earth-imaging satellite.



### Cloud computing inhibitors

A number of inhibitors are consistently cited in the discussion of Cloud computing adoption. However, their perceived impact often differs from the actual impact.

**Figure 13 - Deloitte perspective on perceived and real impact of Cloud inhibitors**




The diagram shows that inhibiting concerns, such as security, availability and performance, and control and compliance are perceived as more important than they should be, while Cloud awareness, and resistance to change in IT are typically underestimated.

### Data security

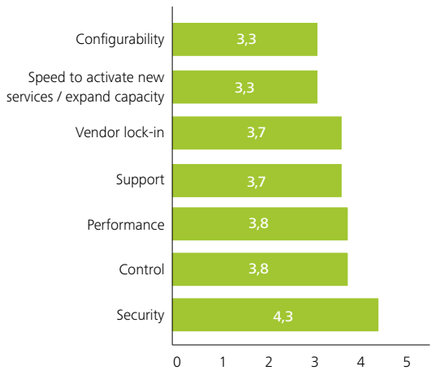
A major concern with using Cloud capabilities is that vendor-provided services are not as secure as their on premise counterparts. Indeed, security came out as the IT management concern in a recent Information Week survey on top Cloud computing concerns. Given the location of data outside corporate firewalls, its multi-tenant architecture, and the abstraction inherent to Cloud services there is certainly some legitimatacy to these fears. However, the perceptions do not fully match the underlying reality, and this difference will evaporate over time, as was the documented case with online payments.

There exists a general overconfidence in internal data security levels, especially in large and growing organizations, that combine internally and externally managed data centers. In fact, most organizations consider security as a necessary evil.

On the other hand, major Cloud vendors such as Amazon and IBM have understood the importance of security and made it one of their core competencies, providing proprietary technological solutions for security management, and going as far as challenging organizations on their ability to manage security themselves.

> Essentially … users of IT-related services will be able to focus on what the service provides them rather than how the services are implemented or hosted
>
> Daryl Plummer, Managing Vice President and Gartner Fellow, Gartner

**Figure 14: Information week analytics Cloud computing survey, 2009. Respondants were asked: How concerned are you with following issues as they relate to cloud computing? (range from 1 to 5)**




> 60% of corporate data is unprotected, and 1 out of 10 laptops are stolen within 12 months
>
> Adrian Joseph, Managing Director, Google Enterprise EMEA

On top of this, Cloud solutions do not remove responsibility for data security from users as they can add their own layer by using encryption or "depersonalizing" data.

Moreover, there are a growing number of mitigation strategies to address security issues:

- **Contractual protection**: Organizations should look to contractual protection to ensure vendors adhere to acceptable practices, as well as to manage planned and unplanned terminations.
- **Security audits**: it is increasingly possible to perform security audits of Cloud providers to ensure the providers' security politicies align with those of the organizations. These audits can involve on-site visits and remote testing, and may leverage independent third parties.
- **Certification by trusted third parties**: providers are increasingly complying with IT security norms such as US SAS70 Type 2 or ISO/IEC 27001:2005 security management certification, as well as SOX guidelines.
- **Leverage standards**: the Cloud industry is pushing for standards, with initiatives such as the CSA (Cloud Security Alliance). However, consensus remains to be built among the major providers.

**Figure 15 - view of mitigation strategies to data security**

| Inhibitor | Mitigations | Latest developments |
|---|---|---|
| Data Security | Contractual protection | Already included in many contracts |
| | Security audits | Increasingly done as part of Cloud deployments (with vendors adhering to norms like US SAS70 Type 2) |
| | Security certification by trusted third parties | Increasingly expected of Cloud vendors (many of whom are ISO/IEC 27001:2005 certified) |
| | Compliance with standards | Industry pushing for standards, e.g. CSA initiative (Cloud Security Alliance), although consensus still to be achieved |



**Availability and performance – can you rely on the Cloud?**
Cloud outages are more public than those of on premise solutions with recent downtimes having made headlines. Vendors are still reluctant to comply with strict availability assurances or contractual SLAs. Nevertheless, Cloud services are rapidly becoming more reliable since the providers' credibility relies on this. Google and others are reaching uptimes in the range of 99,9% nearing all but the most demanding enterprise's expectations. In fact, many IT systems do not need 99.99% availability or nightly backups, which come at a significant cost.

**Figure 16 - Uptime SLA's of selected Cloud vendor offerings**

| Service | Family | Availability SLA |
|---|---|---|
| Google Apps | SaaS | 99.9% uptime SLA |
| Amazon S3 | IaaS | 99.9% uptime SLA |

Stability and performance tend to prove better in the Cloud given the scalability and abstraction of Cloud services, as well as the increasing use of web and service oriented architectures. For this reason, compute intensive initiatives, such as major research projects, are increasingly looking to leverage the Cloud's power. Nonetheless, a basic constraint to Cloudservices remains network latency.

It is up to users to push for contractual terms to be included in SLAs and SLO's (Service Level Objectives) where relevant, and to balance these with the benefits of disaster recovery that come with the Cloud. CIO's such as Permasteelisa's CIO Marcello Cordioli cite DR as a key driver for moving to the Cloud.

**Control and compliance – can you trust the Cloud?**
With Cloud computing's IT abstraction, control is relinquished to providers (more so with SaaS than with PaaS or IaaS), leading to fears over:

- Data ownership: e.g. does the data an organization creates, uses, and stores within a Cloud belong to that organization?
- Data access: can an organization's data be viewed, accessed, or used for unknown purposes without its prior knowledge or consent?
- Compliance with data-related norms and regulations: does the organization comply with regulations in a sufficiently controlled manner?

To counter data ownership and access concerns, organizations must ensure they have control of their data in the Cloud, and have the ability to manage trust, authentication, and authorization to this data. Most vendor solutions already allow for this.

Strict data privacy protection regulations, such as the European Union's Directive on Data Privacy, coupled with increased ability for authorities to access data (e.g. the USA Patriot Act) are factors in deploying to Cloud computing, especially for the movement of data and abstraction of the IT infrastructure.

> Would you keep your money at home?"
>
> Patrick Callewaert, Customer Practice Lead EMEA, Deloitte

> Responsibility is not like IT services – it cannot simply be outsourced
>
> Erik Luysterborg, ERS (Enterprise Risk Services) Partner, Deloitte

Over time, people will start to view an external service provider as more compliant than internal

Greg Papadopoulos, CTO, Sun Microsystems

Cloud providers' responses to such regulations are:

- **Localized solutions**: Providers, such as Akamai, Amazon and Google, now offer localized solutions that ease concerns around data residing outside of regulatory boundaries
- **Certifications**: Cloud providers are increasingly certified as complying with relevant industry-specific norms and regulations, such as SAS 70, SOX, HIPAA and PCI DSS

Authorities are also beginning to react with governmental institutions actively looking into compliance issues. Examples are the European Commission undertaking research and setting up dedicated agencies such as ENISA (European Network and Information Security Agency), as well as the US FTC (Federal Trade Center). Advances have been made: the US-EU Safe Harbor act provides protection for EU and international organizations for which data must be specifically managed in multiple jurisdictions.

It is not just the authorities that impose compliance constraints. Industry regulations such as HIPAA (US medical industry), BASEL II, PCI-DSS in the payment card industry, and non-regulatory compliance and risk management constraints further complicate the adoption of Cloud computing. Indeed, organizations impacted by these regulations are often confronted with constraints going beyond those defined at the national level.

As with security-related issues, there is overconfidence in existing internal IT solutions. According to one recent survey, 71 percent of organizations said they did not have an accurate inventory of where personal data for employees and customers is stored.

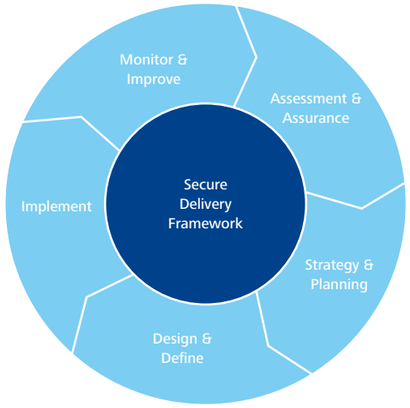
More generally, much work remains to be done in terms of data governance, but this extends beyond Cloud computing. Attention must be focused on adequately protecting data throughout its life cycle in the organization and the Cloud, no matter what the technology.

**Figure 17 – Data types and uses most impacted by Cloud computing**

| **Types of information** that must be closely managed when using vendor Cloud service providors include: | **Enterprises will need** effective methods for Cloud computing: |
|---|---|
| • Personal information<br>• Patent or trade secret<br>• Customer information<br>• Corporate information<br>• Medical information<br>• Financial information<br>• Other sensitive information | • **Discover** data, to apply the appropriate security controls<br>• **Classify** data, understand its importance and sensitivity<br>• **Control** data, restrict access to data, prevent misuse of it, and secure it at rest and in transit<br>• **Audit** data and its usage, enforce the security controls |

A Cloud data governance approach can be put in place to control risks at different stages of deployment.

**Figure 18 - Deloitte Cloud computing services Security and Privacy framework**




**Provider maturity and viability**

New Cloud solutions are emerging rapidly, but many still lack the richness, depth, breadth, and integration capabilities of their "on premise" equivalents. This is unsurprising as even the more established players like salesforce.com or Netsuite are only about 10 years old. With many emerging players, market fragmentation and provider viability is a concern for potential buyers, especially with consolidation expected in the coming years.

Nonetheless, potential buyers can mitigate these maturity risks. First, organizations should be aware that Cloud functionality is quickly catching up with that of similar on premise offerings. Next, with the presence of major industry players such as Google, HP, IBM, and Amazon, the entry of traditional "mega-vendors" such as SAP, Oracle and Microsoft into the Cloud, and the significant growth of pure players like salesforce.com and Netsuite, buyers can turn to recognized names in cases of doubt. Criteria such as the number of years of operations, major client references and financials can be used to gain confidence even in less-known providers.

**Changing IT organizations**

The impact of Cloud computing on IT organizations is today probably the least understood inhibitor to its development.

Major IT investments have been made over the last several decades in setting up IT organizations and putting in place hardware and software. Given the scale and complexity of these investments, and the often unstructured way in which IT organizations have grown (especially with mergers and acquisitions), the prevalent mindset amongst CIOs and CTOs is still one of implementing technologies and making sure they work, rather than being an agent of change by aggregating services leveraging technology and information.

Cloud computing will change the nature of IT management, shifting the focus from internal operational maintenance towards IT visioning, service provisioning, and relationship management – both with the business and with outside parties. It will therefore need to be accompanied by a mind shift within IT organizations to be successful, with businesses needing to reconcile fast moving needs and a large number of more abstracted vendor solutions. In other words, as the rate of change increases, internal control of changes will decrease. This will lead to additional strain on the overall integration and coherence of solutions requiring an adaptable internal IT architecture capable of maintaining overall consistency.

The mind shift has three main implications:

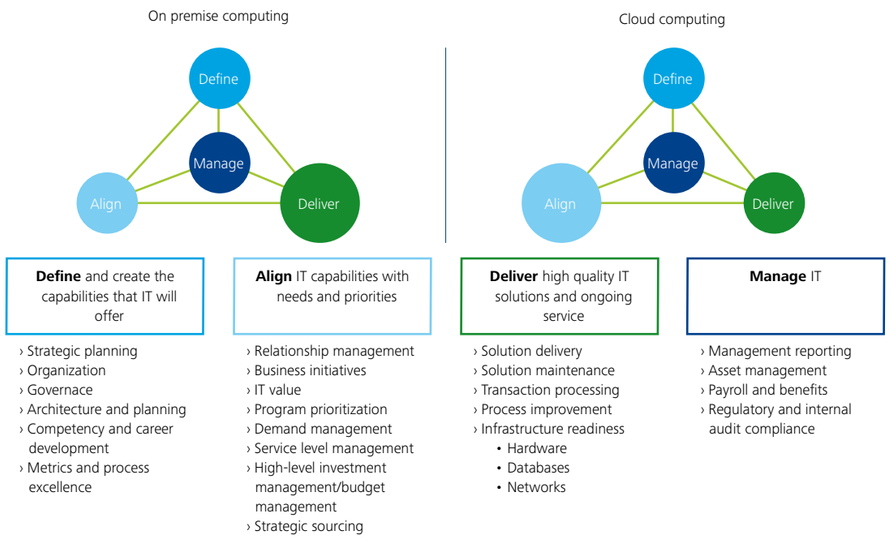
- Focusing on new skillsets
- Reducing the size of IT organizations with an increasing dependency on the maturity and adaptability of IT governance
- Developing service management capabilities in areas such as demand management, request management, and service continuity

In every challenge lies opportunity. Despite expected initial resistance due to the perceived loss of "power" for IT management, and the increased ability for lines of business to "manage" IT themselves, Cloud computing is an opportunity for leaders to shape more agile and focused IT organizations, able to cope with the increasing pace of IT evolution.

Cloud computing allows us to envisage a time when IT organizations will be visionaries rather than followers

Paul A. Robinson, Global Technology Lead, Deloitte

**Figure 19 - Deloitte view of Cloud impact the IT organization**




Stepping up to the challenge will not be easy, but the rewards will be there to reap for IT organizations able to:

- Fulfill the role of true industry-driven technology and information advisors supporting – and even driving - innovation within the business
- Focus on the more strategic IT decisions and outsource the delivery and maintenance of point solutions outside their core competencies
- Design and maintain truly flexible architectures

For Cloud providers, the key challenges will therefore be to:

- Ensure that the necessary paradigm change occurs sufficiently quickly by supporting IT organizations
- Avoid bypassing IT organizations entirely as this will lead to an unstructured approach. Where on premise solutions were bought by the IT organization, Cloud, and especially SaaS services can more easily be bought by the business, and it is the temptation to do so that both consumers and providers should resist

| Key points |
|---|
| Cloud computing has clear advantages: increased ROI, accelerated deployment, greater focus on core competencies, and greater flexibility and scalability |
| Cloud computing must overcome security and compliance concerns, and resistance to change in IT organizations |
| Industry is actively working to ensure inhibitors are mitigated |
| Organizations shoud assess usage of Cloud computing services based on factual evaluation of the drivers and inhibitors |



# Assessing the market

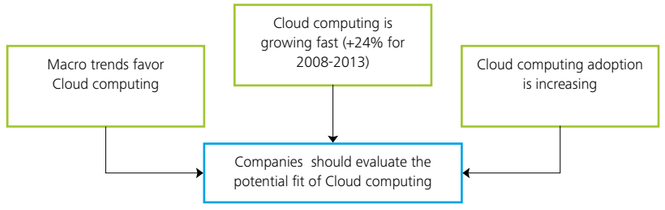
**The Cloud computing market is growing rapidly. With many organizations starting to benefit from the Cloud, companies of all sizes should evaluate the potential fit.**

Cloud computing is gaining importance for the following reasons:

- Economic, social, technological and environmental trends are favorable to a further extension and broader adoption of Cloud computing. Policy makers are actively addressing the impact of Cloud computing on security, privacy, location and ownership of data.
- The Cloud computing industry is growing sharply with a projected CAGR of 24% for the 2008-2013 period. While new innovative and successful vendors are emerging, traditional vendors such as SAP and Oracle are also investing massively in developing and acquiring on demand solutions. In the SaaS segment, the strongest markets in terms of size and growth are Content, Communication and Collaboration (CCC), Customer Relationship Management (CRM), Integration-as-a-Service, Enterprise Resource Planning (ERP), and Supply Chain Management (SCM).
- The use of SaaS, PaaS and IaaS has been evolving during the past years and has become increasingly popular. We expect the adoption rate to increase as its computing viability and benefits are legitimized. Cloud computing has become one of the hot topics on CXOs' agendas.

In the coming sections we will successively address these three key points in detail.

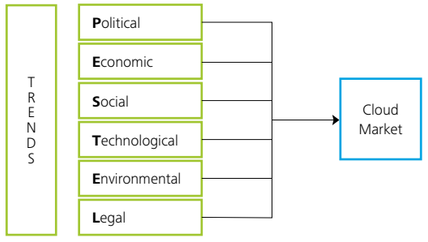
**Figure 20: Justification factors for Cloud computing interest**



## Macro indicators are favorable

In general, the current macro environment offers a fertile ground for the increasingly rapid adoption of Cloud computing. Indeed, despite some uncertainties regarding future regulations and policies, we observe various positive signals from the economical, social, technological and environmental trends.
This section applies the PESTEL framework to systematically analyze the Political, Economical, Technological, Social, Environmental and Legal factors influencing the Cloud computing market in the coming years.

**Figure 21: PESTEL framework analysis of the Cloud market**




### Political

When the internet emerged as a new powerful information and communication tool in the early 1990s', it took many years for policy makers to set up common norms and procedures regarding the internet's usage.

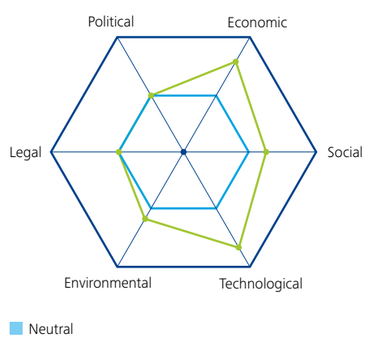
As Cloud computing gains acceptance, policy makers are more proactive in addressing technological changes. However, regulations remain immature for Cloud computing: vendors have to deal with many different governmental policies in order to deliver their services to a global market.

Despite efforts to harmonize the legal environment (such as the US-EU Safe Harbor Act), regulations are still incomplete. Policy makers are moving foward and are busy addressing issues such as security, privacy, location and ownership of data. Some vendors, such as Amazon Web Services, have addressed this issue by deploying local infrastructure in its main markets (United States and the European Union), letting the client choose to select his operating zone.

### Economic

In this time of economic downturn, when investment and funding are becoming scarce, companies are facing increasing cost pressures and IT is no exception. In this context, Cloud computing offers a less capital-intensive alternative to traditional on premise implementations and this will be considered as a key decision driver for IT projects in the coming years. In addition, Cloud computing benefits from rapid time-to-market and flexibility, which is a key source of competitive advantage.

**Figure 22: Expected impact of macro trends on Cloud computing adoption growth**




Due to pervasive cost pressures, we expect a sharp decrease in IT investments in 2009 (-3,7%) compared to high performance in 2007 (+10,5%) and in 2008 (+6%). Off course, opinions on when the financial crisis will end diverge but we can expect IT spending to come back to a positive (but limited) growth during the years 2010 and 2011. As a result, Deloitte believes the IT demand is progressively shifting from an on premise to on demand model primarily due to its limited need for upfront capital expenditures and flexible nature. We expect the on demand model to mature as vendors develop further and complement their solutions to meet expectations of enterprise IT buyers.



**Figure 23: Worldwide: End-User IT and Telecom spending (billion USD) (Source: Gartner Dataquest)**

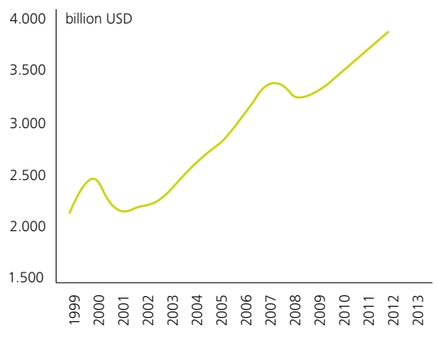
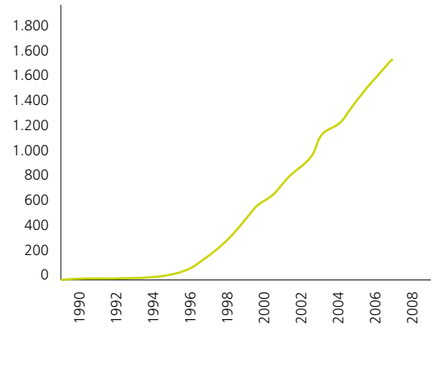



**Figure 24: Worldwide internet users (millions)**




### Social

Without any doubt, one of the most disruptive social phenomena of the past decades is the increasing use of the internet for personal and professional activities. As Cloud computing is an internet-based technology, it will benefit from the increasing adoption of the internet, and social networks.

More specifically, the number of internet users has increased exponentially since its emergence in the early 1990's and reached approximately 1,53 billion users worldwide in 2008. Generation Y, which grew up as "technology native" is actively engaged in various activities on the internet (social networking, entertainment, video, internet banking) and there is no doubt that future generations will be further connected to the internet in their personal and professional lives. We expect companies to further leverage the internet to improve their internal processes and to connect with their customers and prospects.

Further, social media have known an unprecedented growth in the last several years, in popularity but also in intensity (it is now the 4th most popular activity on the internet). The latest trends show that, where it was mainly adopted by the younger generations in its earliest manifestation, older generations are quickly catching up to bring this phenomenon to a cross-generation trend. Indeed, leading companies are leveraging social networks for their business to harvest the opportunities presented by the trend that change not only the way people behave on the internet but also the way they communicate in their daily life.

### Technological

During the past decades, IT infrastructure and service sharing have become a key source of growth. Technologies such as virtualization, service-oriented architecture, and Cloud computing, have been a sequence of disruptive innovations in the IT landscape. The trend enables more efficient use of resources and makes IT available to the world at reduced costs and massive scale.

Virtualization technology is considered the precursor to Cloud computing. Virtualization involves dividing computer resources into multiple environments and refers to various types, such as platform, desktop, resource, and application virtualization.

Following the same trend, in the past twenty years we have observed an increasing standardization and industrialization of IT. As IT services are delivered via the internet, they become repeatable and usable by a wide range of customers. The IT transformation roadmap illustrates this trend: the initial initiatives to reduce IT costs involved the simplification and consolidation of infrastructure. Then, virtualization technologies emerged where companies brought together IT resources in order to benefit from higher infrastructre utilization. Today, we enter into the Cloud world where IT resources are flexible and highly scalable.

**Environmental**

Electricity use for servers doubled over the period 2000 to 2005 (Lawrence Berkeley National Laboratory) and the IT industry is estimated to produce 2% of global CO2 emissions – which is the same as the Airline Industry (Gartner, 2008). In parallel, 2 million tonnes of electronic waste are produced in the EU every year (25-33% of which is due to IT equipment).

Based on these facts and growing regulatory pressure, IT suppliers and their corporate customers are changing the way computing assets are designed, manufactured, operated, and disposed of to gain efficiency and cost savings while reducing environmentally harmful impacts.

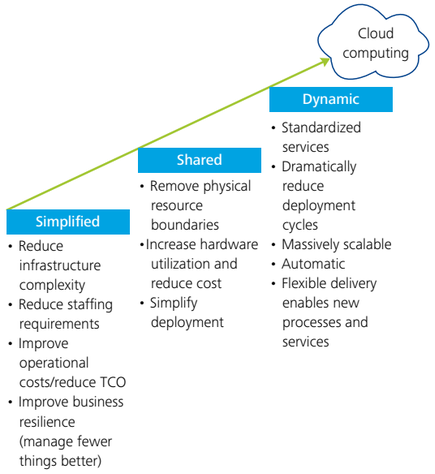
Cloud computing is a recognized way to reduce the environmental drawbacks of IT using IT infrastructure more efficiently to reach higher infrastructure utilization. It implies that Cloud data centers are becoming greener due to the high standardization of their services. On the user side, it also reinforces the remote computing trends, which means in its simplest form that desktops will eventually become useless as PCs will access data and softwares exclusively online.

**Legal**

Despite ongoing efforts, a common and harmonized legal framework is not yet in place. Vendors still need to face local regulations that often restrict the free flow of information between countries. However, these regulations are necessary to protect the interest of Cloud services consumers. For example, the Canadian government prohibits public sector IT projects from using US-based hosting.

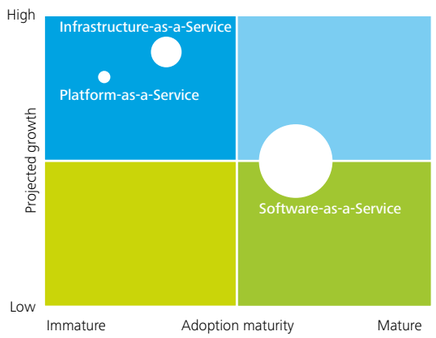
The key areas where the legislation remains insufficient are related to security (sensitive data), ownership and location of data, confidentiality, and intellectual property. The future state of the legislation is still uncertain and it represents a considerable limitation as the Cloud continues to permeate borders.

**Figure 25: IBM IT transformation roadmap**




> The IT industry is estimated to produce 2% of global CO2 emissions – which is the same as the Airline Industry
>
> Ben Pring, Analyst, Gartner

**Figure 26: Cloud computing maturity model (2009). The size of the ball represents the relative current market value (in 2009)**



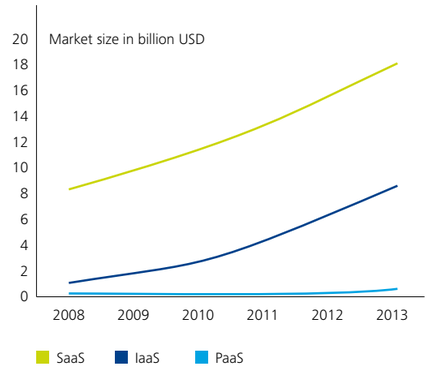

**The on demand industry is growing fast**

The second important factor to consider is that the Cloud industry is growing quickly and vendors are investing significant amounts of money to develop solutions-as-a-service, suggesting they believe in the success of this technology as an alternative to traditional IT solutions.

Many experts state that the Cloud market will drastically expand in the coming years. For the 2008-2013 period, Gartner predicts an impressive growth of the Cloud computing market from 9,1 to 26,6 billion USD, which represents a CAGR of 24% (these numbers exclude revenues derived from Cloud-based advertising).

The different segments of the Cloud computing market (SaaS, PaaS and IaaS) show different maturities and adoption levels. While SaaS definitely represents the largest portion of the Cloud computing market (89%), PaaS and IaaS have higher growth potential (~50%). This is justified by the later emergence of IaaS and PaaS compared to that of SaaS.

**Figure 27: Current and projected size of SaaS, IaaS and PaaS markets**

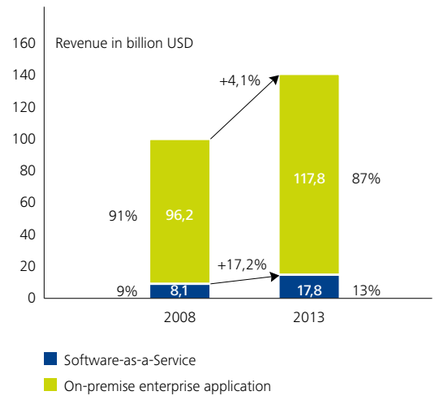



**Software-as-a-Service**

The SaaS market accounts today for 8,1 billion USD worldwide, which represents 7,7% of total enterprise application revenues and is the largest component of the Cloud computing market (89%). Such penetration has been achieved due to extremely high growth in the past years and we expect this trend to continue.

Based on analyst predictions and market trends, the SaaS market is set to reach a value of 17,8 billion USD in 2013, which represents a CAGR of 17,2%. At this point, the SaaS share in the enterprise applications market will be higher (~13,2%) as the on premise applications will experience much lower growth (~4,1%).

**Figure 28: current market size and projected market size of enterprise application market**




We see numerous early movers emerging with innovative on demand solutions. Leading vendors have experienced extremely high growth such as salesforce.com in CRM (+43%), workday in ERP (+63%), and Net Suite in SCM and ERP (+40%). At the same time, the larger vendors, such as SAP, Oracle, and Microsoft, are investing massively in on demand solutions (through in-house developments and acquisitions) and are slowly shifting their revenue models toward a greater proportion of on demand capabilities. However, traditional vendors still need to resolve the dilemma of the shift towards Cloud computing because their mainstream revenues traditionaly come from on premise licences. This will remain true in the next years.

During the coming years, small and large vendors will continue to invest in SaaS and will introduce an increasing number of application functionalities, disproving the idea that SaaS can only be used for heavily standardized business processes.

**Software-as-a-service segments**
The various segments within the SaaS market will grow at different rates. The fastest growing among these are Customer Relationship Management (CRM), Supply Chain Managment (SCM), Integration-as-a-Service (Int.aaS), and Content, Communication and Collaboration (CCC) software.

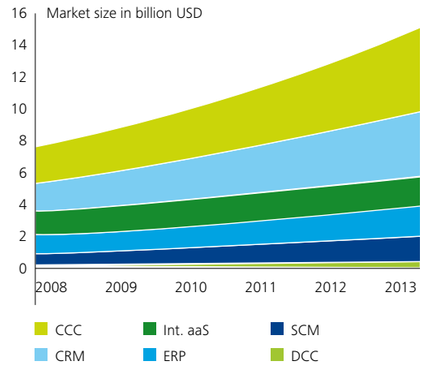
**Figure 29: Main SaaS segment trends (source: Garner 2009 and Deloitte analysis). SaaS revenues include licenses, subscriptions, and software maintenance and technical support services**

| Main software segments | SaaS revenue in billions of dollars (USD) | | CAGR | Share of SaaS of the total enterprise application market* | |
|---|---|---|---|---|---|
| | 2008 | 2013 | | 2008 | 2013 |
| **CCC** | 2,16 | 5,07 | 18,7% | 20% | 26% |
| **CRM** | 1,84 | 4,02 | 17,0% | 20% | 30% |
| **Int .aaS** | 1,47 | 1,86 | 4,8% | 10% | 9%** |
| **ERP** | 1,26 | 1,96 | 9,3% | 5% | 6% |
| **SCM** | 0,75 | 1,65 | 17,1% | 11% | 16% |
| **DCC** | 0,07 | 0,37 | 39,1% | 2% | 9% |



**Content, Communication and Collaboration (CCC)** market in SaaS accounted for 2,16 billion USD in 2008 and is expected to grow at 18,7% during the coming five years, reaching 5,07 billion USD in 2013 (26% share of the total CCC market). The strongest segments in CCC are web-conferencing and e-learning and, to a lesser extent, e-mail and team collaboration. However, SaaS in the Enterprise Content Management (ECM) and Instant Messaging sub-segments remains barely adopted (~ 3% of total market revenue).

**Figure 30: Expected market size for the main SaaS segments (source: Gartner 2009). Revenues include new licenses, subscriptions, and software maintenance and technical support services**




**Customer Relationship Management (CRM)** market in SaaS accounted for 1,84 billion USD in 2008 and is expected to grow by 17% during the coming five years, reaching 4,02 billion USD in 2013. This high growth will occur in all sub-areas (sales, marketing and servicing) and will contribute 30% to the total CRM market in 2013. Sales will remain the largest contributor (70%) of the SaaS revenue within CRM while marketing and servicing segments have weaker penetrations but are expected to experience higher growth. About half of the SaaS revenue within CRM is contributed by salesforce.com, which maintains its leadership in the CRM SaaS market. The heavy investment in developing and acquiring on demand solutions by the largest CRM vendors, such as Oracle and SAP, further legitimizes general SaaS adoption and future growth potential.

**Integration-as-a-Service (Int.aaS)** market in SaaS represented 1,47 billion USD in 2008 and is expected to grow by 4,8% during the coming five years, reaching 1,86 billion USD in 2013. This relatively slow growth is due to the already high maturity of the integration and middleware market in general.

**Enterprise Resource Planning (ERP)** market in SaaS represented 1,26 billion USD in 2008 and is expected to grow by 9,3% during the coming five years, reaching 1,96 billion USD in 2013. ERP on demand still represents a small portion of the total ERP market (5%) but it will increase to 6% in 2013 because of the slightly higher growth of on demand versus on premise solutions. The Human Capital Management (HCM) segment (such as e-recruitment, performance and talent management, and expense management) is promising mainly due to out-of-the-box functionalities that can be applied across industries. However, SaaS has a weaker presence in the field of Enterprise Asset Management (EAM), Manufacturing/ Operations, and Financial Management Systems (FMS) as a result of their higher process and integration complexity.

**Supply Chain Management (SCM)** market in SaaS represented 0,75 billion USD in 2008 and is expected to grow by 17,1% during the coming 5 years, reaching 1,65 billion USD in 2013. SCM on demand represents 11% of the total SCM market and will reach 16% of the market in 2013 because of the higher growth of on demand (17,1%) versus on premise (6,9%) SCM solutions. The higher adoption areas of SaaS SCM will be Procurement and Logistics with Supply Chain Planning experiencing lower growth due to the higher business process complexity.

**Digital Content Creation (DCC)** market in SaaS represented 0,07 billion USD in 2008 and is expected to grow by 39,1% in the coming 5 years, reaching 0,37 billion USD in 2013. Although the fastest growing SaaS segment, it remains nascent. The fields of digital imaging and digital video are expected to experience higher growth when compared to the DCC market in general.

# One in four enterprises reports budget for cloud infrastructure-as-a-service.

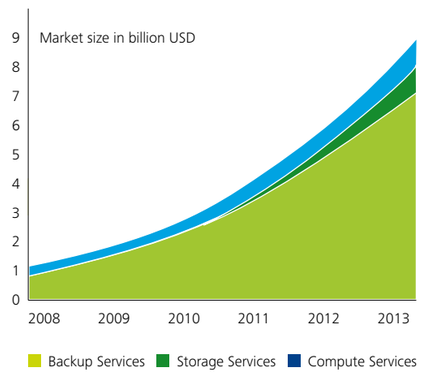
Frank E. Gillett, Analyst, Forrester

**Infrastructure-as-a-Service**
IaaS revenue was 969 million USD in 2008 and is expected to increase to more than 8 billion USD in 2013, which represents a CAGR of 53,6% (Source: Gartner, 2009) and a share of 31% of the total Cloud market. Despite slow growth to date, IaaS has solid potential.

Amazon, the leader in the IaaS field today, provides Elastic Compute Cloud (Amazon EC2) and simple storage (Amazon S3) web services. EC2 webservice provide resizable compute capacity in the Cloud and S3 provides Storage-as-a-Service and is designed to make web-scale computing easier for developers.

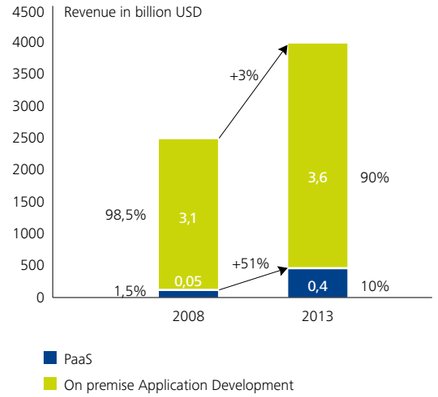
Traditional hosting providers, such as IBM and HP, are moving toward shifting their hosting solutions to the Cloud. IBM recently launched its Smart Business Private Cloud that will help IT to become one central resource for the company, rather than being dispersed across a variety of departments. This private Cloud offering can be managed either by IBM or by the client directly.

**Figure 31: Expected revenue for the main IaaS categories (source: Gartner 2009)**
**Revenue takes into account the new licenses, subscriptions, and software maintenance and technical support services**




**Platform-as-a-Service**
PaaS are web-based services that provide all the facilities required to support the complete life cycle of building and delivering web applications and services, where the user is typically within the software development organization. PaaS technology has emerged because Java and Microsoft.NET platforms are not designed for SaaS-style application development and deployment.

**Figure 32: Current and expected worldwide application development software market size**




PaaS remains an early-stage market with revenue of around 50 million USD, which represents approximately 1,5% of the total application development market. Despite massive investments by vendors such as Microsoft, Google and salesforce.com in PaaS technologies, the PaaS market remains immature and vendors have proprietary and differing programming standards. Other inhibitors of PaaS adoption are the lack of best practices and information integrity risks; however, both inhibitors should be mitigated within the coming years as maturity increases.

As a result of its high technological interest and because SaaS is growing sharply, the PaaS market is expected to experience high growth in the coming five years (~ 50%) and to reach 400 million USD in 2013 (10% of the total application development market). This growth will come primarily from Independent Software Vendors leveraging PaaS offerings to reduce their costs.

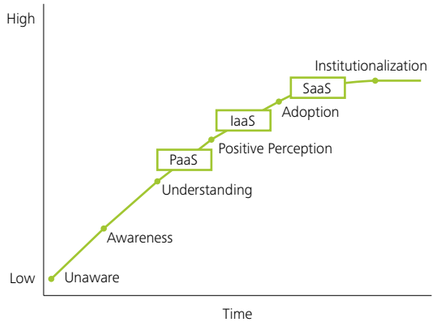


## On demand models are increasingly adopted in companies

Cloud computing doesn't show the same adoption level across its different segments (SaaS, IaaS and PaaS). In general, SaaS is more widely adopted due to its earlier market entrance, followed by IaaS and then by PaaS, which is a nascent technology and market.

Enterprises evaluating and migrating to Cloud computing services will follow a typical adoption path. We will assess the adoption level of SaaS, IaaS and PaaS in order to see how and why they differ.

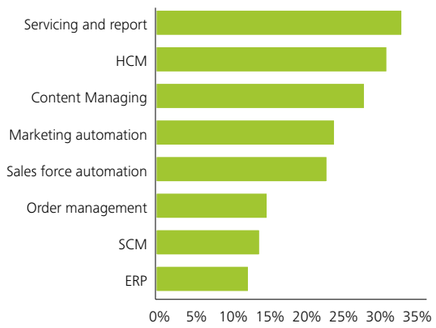
**Figure 33: Enterprise adoption of Cloud computing over time**




**Software-as-a-Service**
SaaS has become increasingly popular over the past years. Today, more than 40% of companies report using SaaS within their organization in one form or another, while only 15% were using SaaS in 2006 (Source: Gartner, 2008)

A recent Gartner survey estimates that 66% of the companies currently using SaaS plan to increase their investments in the technology, 26% are planning to maintain the same level of investment, and only 8% are planning to decrease investment. Among the same users, one-third of respondents are planning to transition from on premise to on demand applications. The drivers mentioned by these companies include improved Total Cost of Ownership (TCO) compared to on premise solutions, faster deployment time, and limited up-front capital expenses.

**Figure 34: SaaS sub segment adoption**
**Source: Forrester survey, 2009**




Until now, SaaS was mainly adopted by smaller companies, while larger companies have been more reluctant due to security and integration concerns. Today, the SaaS model has proved to be viable and we expect larger and more risk-averse enterprises (such as Financial Institutions) to start adopting SaaS.

Among the different sub-segments of the SaaS solutions, user adoption is highest for customer service and support, followed by Human Capital Management, Content Management, Marketing automation and Sales force automation, with SCM lagging slightly.

**Infrastructure-as-a-Service**
According to a Forrester survey (2009), only 3% of companies worldwide will have adopted IaaS. However, an additional 4% have already planned an implementation in the 12 months to come and 17% would be interested but do not have the necessary budget, partly due to the global economic downturn. Despite the low adoption rates, there is strong interest for IaaS throughout the market.

Large firms report higher levels of awareness, interest, and adoption of external IaaS than small firms, while retail/wholesale companies lead the market in budgeting for IaaS with little difference by region.

| Key points |
| --- |
| • Economic, technological and social factors favor Cloud computing growth |
| • Industry trends show significant 5-year, worldwide growth |
| • Over the next 5 years, SaaS will remain the most mature and largest market, followed by IaaS and PaaS |
| • Customer surveys indicate a high level of interest in Cloud computing by IT stakeholders |
| • With many organizations starting to benefit from the Cloud, companies of all sizes should evaluate its potential fit |

**Platform-as-a-Service**

Despite its high technological interest, PaaS adoption is slow to take off because of the following reasons:

- The PaaS solutions are relatively new and still lack reliable credentials
- There are no PaaS standards as programming languages differ from one vendor to the other, implying a lock-in aspect for clients
- There are a number of challenges underlying a transition from traditional on premise platforms to platforms-as-a-service, such as the integration with on premise environments and the need to learn new programming models residing in the Cloud

However, in the coming years most of these inhibitors will be mitigated and the need to build new or composite SaaS applications, as well as the growing confidence in the PaaS model, will prompt more organizations to build their applications in PaaS environments.

In addition to the growth through innovating Independent Software Vendors, organizations will be encouraged to experiment with PaaS development by virtue of the familiarity they have with their SaaS solutions. For instance, a company using salesforce.com will be more likely to experiment with Force.com development since the step from SaaS to PaaS is facilitated.

**Cloud computing is on the rise**

In conclusion, the rising rationalization and standardization of IT, the ever-increasing adoption of internet and social media, the economic downturn, and the work of policy makers to harmonize the legislation around Cloud computing are a number of favorable trends supporting Cloud computing.

SaaS is the largest contributor to the Cloud computing market with a contribution of 89% of total Cloud computing revenue. The SaaS market is primarily driven by the CCC and CRM segments that together account for 50% of SaaS revenues and will continue growing by more than 15% per year. Most adopters of SaaS are companies with relatively straightforward requirements without need for deep customization. For this reason manufacturing, operational and financial solutions requiring specific functionalities and integration are slower to move to an on demand paradigm. However, we expect both Cloud service providers and Independent Software Vendors to differentiate by offering an increasing number of solutions developed exclusively using PaaS.

IaaS and PaaS are both at an early stage of their growth. However, customers are gaining confidence in these new technologies and adoption is consequently growing, primarily driven by the flexibility and cost effectiveness of IaaS and PaaS solutions. At the same time, leading vendors such as Amazon and Force.com are being legitimized. Therefore, despite their smaller size, the IaaS and PaaS markets are expected to increase along with SaaS with yearly growth rates of over 50% until 2013.

With the emergence of new Cloud offerings, an increasingly broad range of organizations are benefiting from the Cloud. Companies of all sizes need to evaluate how and where the Cloud will create value for them. In doing so, they should first assess Cloud drivers, inhibitors, and key Cloud service providers.



# Players in the Game

**As Cloud computing grows, an increasing number of new players are influencing the game.**

Cloud computing is a burgeoning trend with new players surfacing monthly, often playing a vital role in the evolution and growth of the market.

We distinguish four categories of Cloud actors: Consumers – enterprises and individuals; Regulators – governmental institutions and industry regulators; Integrators – companies facilitating Cloud implementations; and Providers – companies operating Cloud computing systems to deliver services. We will focus our analysis on the providers since:

- They are at the base of the value chain
- All other actors lag the providers in terms of maturity, and their actions will be determined by those of the providers

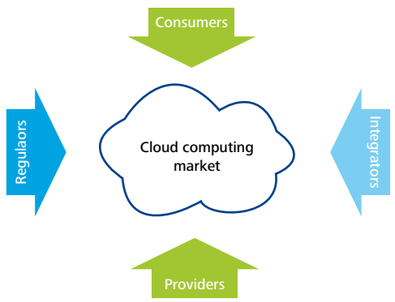
The regulators should act with the idea of empowering users and citizens in order not to hamper the benefits of Cloud computing

M. Nelson, former Technology Advisor to President Bill Clinton.

### Categories of players in the Cloud computing market

Our analysis identifies four categories of players that already have, or are expected to have, an important role in the Cloud computing market.

**Figure 36 - Cloud computing market actors**




#### Consumers

Both enterprises and individuals can be considered Cloud computing consumers. Where the mass market will focus on free Cloud computing services, enterprises will prefer to pay for a service that is more professional and offers the necessary service and guarantees. Today, retail customers extensively use Cloud computing, especially in the form of Software-as-a-Service (Gmail, YouTube), while enterprises are lagging behind, due to a lower maturity of entreprise Cloud services.

The power that consumers have on the market is important as these consumers will set the standards in the industry and partly drive the aggregation of players through more demanding requirements. However, this consumer influence typically characterizes a market with more maturity, a maturity level that Cloud computing has not yet attained.

#### Regulators

While the "Cloud industry" does not yet have dedicated regulators, per se, it is confronted with a number of local internet regulations, which have been inherited from existing internet legislation.

Cloud computing-specific data security, location, ownership, and intellectual property and privacy issues remain unclear and must be addressed in the coming years. Mike Nelson, former technology advisor to President Bill Clinton, said policy makers will face huge challenges as Cloud computing becomes increasingly popular. According to him, the major policy issues to be worked out are: Who owns the data that consumers store on the network? Should law enforcement agencies have easier access to personal information in the Cloud than data on a personal computer?

Generally, experts agree that the influence of regulators will be a crucial factor in the coming years. When asked for his advice to regulators, Nelson said that "they should act with the idea of empowering people and citizens in order not to hamper the benefits of Cloud computing".

#### Integrators

As with the on premise software and hardware industries, many providers in the Cloud computing market collaborate with integrators to bring their services to customers. Providers have partnerships with integrators to help clients to internalize the new services and products.

At this point, the main integrators in the traditional software and hardware market are also present on the Cloud computing market and actively leverage their important customer base. Their role in the development of the market is to make it easier for customers to adopt the new technologies. However, the Integrators will have to change their business model to accommodate the simplicity and user-centric approach of the Cloud computing model.

Since barriers to entry in the Cloud integration market are significantly lower than in traditional integration, we expect the appearance of a large number of smaller, less-experienced entrants that have not had the time to acquire deep business expertise. The resulting fragmented integration market will present consumers with a significant challenge in identifying suitable implementation partners.

#### Providers

A Cloud computing service provider owns and operates Cloud computing systems to deliver services (Software, Platform or Infrastructure) to consumers. Currently, we see a mix of large and small players in the market and there is still space for outsiders. Regarding the small players in the market, Collin Smeeth, CEO of Progress software, says that "Large players have figured out a way to offer computing power at a low cost because of volume, so the opportunity for the small vendor is to provide value-added services to the Cloud offerings; the nice thing about Cloud computing is that there is more of an opportunity to collaborate and partner".

Today, while customers are starting to adopt the technology, regulators are not directly active and the main integrators involved are the same as the traditional software and hardware markets. While their current influence is relatively restricted, as the market grows, it will be crucial to follow the development of these actors in the game. Because the main innovations and evolutions of the market are currently driven by the providers, we will focus on these players and will present what we believe is a subset of the most representative players in the Cloud computing market.

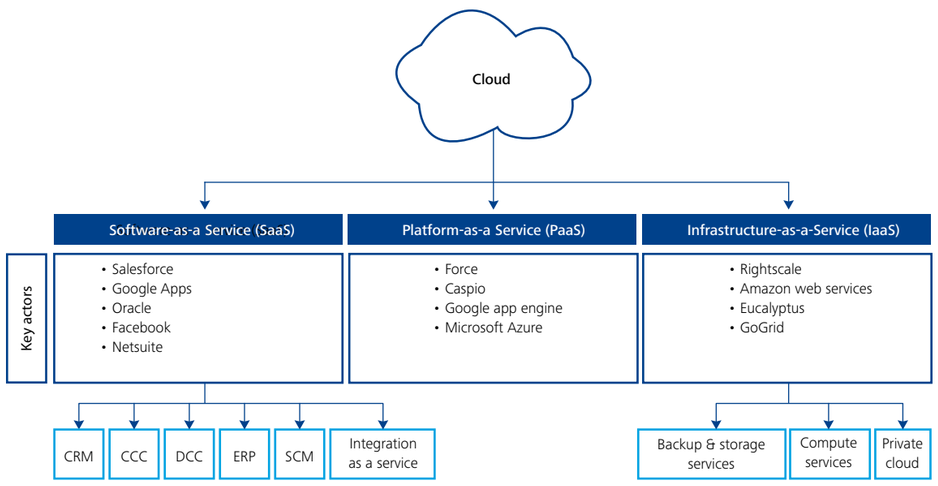
Large players have figured out a way to offer computing power at a low cost because of volume, so the opportunity for the small vendor is to provide value-added services to the Cloud offerings; The nice thing about Cloud computing is that there is more of an opportunity to collaborate and partner

C. Smeeth, CEO, Progress Software

## Which providers should you keep an eye on?

Cloud providers can be classified into 3 different families: SaaS - PaaS - IaaS, with each family divided into sub-segments.

**Figure 37 - Cloud computing families and sub-segments/offerings**




When analyzing Cloud computing solutions, companies should assess the Cloud provider's capabilities at the sub-segment level (i.e. CRM, SCM, ERP) due to large differences in the sub-segments maturity. Consequently, their viability should be a central question when considering these vendors. Where the known, main players of the computer industry (Google, SAP, Oracle,...) do not represent a true viability risk at first sight, it does not necessarily mean that smaller players will not survive the growth to eventually become market leaders.

A large number of providers have been identified during this study. For each sub-segment, we have selected a set of representative players based on their offer, individual maturity, and the role they play within their sub-segment. Regarding the maturity of the players, it is important to note that starting a Cloud services business requires significant investment and, as this market is evolving fast, so is the technology and experience of the players. Not all companies investing in Cloud businesses have known success and even important players have sometimes decided to take a step back or even shut down their investments in specific areas because they realized they were already too late in the game (e.g., Yahoo recently shut down Jumpcut, its video sharing platform). Therefore, we consider that partnerships and alliances between players are key to sustained growth, offering complete and flexible solutions, and eventually being able to remain on the market.

The current landscape is a mix of new and recent niche players competing with more established software and hardware vendors. We compare these providers based on the following criteria:

- Domain of activity
- Date of first Cloud release
- Year-on-year growth (2007 to 2008)
- Key differentiators
- A sample of key clients
- A sample of key partnerships



**Software-as-a-Service**

The SaaS market landscape is divided into different sub-segments:

| Representative providers of the main SaaS categories | | |
|---|---|---|
| CRM | Customer Relationship Management (CRM): | Oracle - Salesforce.com - RightNow |
| ERP | Enterprise Resource Planning (ERP): | SAP - Netsuite - Workday |
| SCM | Supply Chain Management (SCM): | Descartes - Ketera - Ariba |
| CCC | Content, Communication and Collaboration (CCC) markets: | SumTotal - Cisco webex - IBM Lotus |
| DCC | Digital Content Creation (DCC): | YouTube - Adobe |
| Int. aas | Integration as a service: | CastIron - Boomi - Pervasive |

**CRM**

The 'On Demand' CRM market is one of the most mature sub-segments in the SaaS market. The first players arrived on the market in early 2000 and since then the market has grown towards maturity. According to analysts, the CRM on demand market will generate more than 2 billion USD in 2009 and will represent more than 20% of the entire CRM market.

While the market is characterized by a multitude of niche players focusing on sub-segments of CRM (Marketing, BI, Sales, Servicing), it is largely dominated by salesforce.com, which combines the complete CRM suite functionalities in one offering.

| Provider | Domain of activity | Date of first cloud release | 2008 revenue USD* | YoY Growth | Key differentiators | Sample of key clients | Sample of key partners |
|---|---|---|---|---|---|---|---|
| • Salesforce.com | • Marketing<br>• Sales<br>• Customer service | 1999 | $1,077 M | 43,8% | Market leader in sales functionality and moving aggressively into new areas. salesforce.com is a pioneer in all areas of CRM on demand and was the first on the market. They are currently contributing substantially to the growth of this market by constantly developing applications that leverage web 2.0 technologies (e.g. The Service Cloud integrates the CRM tool with various Social Networks and Communities) | • Allianz<br>• Dell<br>• Kone | • Amazon Web Services<br>• CastIron<br>• Google |
| • Oracle | • Marketing<br>• Sales<br>• Customer service | 2006 | $694 M | 24% | Oracle is the market leader of on premise CRM with Siebel product. They successfully followed salesforce.com in the quest for the on demand market. Oracle on Demand CRM will shortly release Oracle Social CRM suite, a set of tools leveraging the power of social software and taking advantage of the data available on the internet (Facebook, LinkedIn, Google Maps...) | • 3M<br>• Bayer | • CastIron<br>• Facebook<br>• Hoovers |
| • Right Now | • Marketing<br>• Sales<br>• Customer service | 1997 | $140,4M (Total) | 25,3% | The RightNow CRM software systems are an important player of the SaaS market, especially in the US. RightNow is able to "go live" in an average of 45 days, more quickly than traditional on premise CRM vendors.<br>RightNow CRM product offerings are widely recognized for the high quality of their customer service solution. In 2006, they acquired SalesNet to accelerate the delivery of a competitive Sales solution | • TomTom<br>• British Airways<br>• Drugstore | • Boomi<br>• Demand-ware<br>• Cisco<br>• Demand ware |

* The RightNow turnover only represents the on demand activities



**ERP**

ERP defines a broad area of sub-categories from human resources to financial management. Today, most of the SaaS ERP customers are midsized companies. Indeed, large corporations are confronted with limitations due to the complexity of their needs preventing them from entirely embracing Cloud ERP possibilities. However, during the last two years, the market has seen the entry of several new players which will encourage the existing providers to bring their systems to the next level of functionality and open the doors of SaaS ERP solutions to larger companies.

| Provider | Domain of activity | Date of first cloud release | 2008 revenue USD* | YoY Growth | Key differentiators | Sample of key clients | Sample of key partners |
|---|---|---|---|---|---|---|---|
| • SAP | • Manufacturing<br>• Financials<br>• Human Resources | 2007 | $16,300M (Total) | Double digit growth in mid-market | SAP Business ByDesign is a SaaS solution that helps companies with their end-to-end needs. The solution is mostly dedicated to the midmarket.<br>The software can be easily customized as required | • Carlsberg<br>• Air France<br>• Cisco<br>• Bayer HealthCare | • Akamai<br>• Pervasive |
| • Netsuite | • Manufacturing<br>• Financials<br>• Human Resources | 1998 | $153M | 40,5% | Their strategy is to provide an integrated suite of applications delivered on demand to small and mid-size businesses<br>An early mover focused on ERP for mid-market companies, they have not yet penetrating large enterprises. | • Virgin<br>• Money<br>• Computer Warehouse | • Rootstock<br>• Ebay<br>• HP |
| • Workday | • Manufacturing<br>• Financials<br>• Human Resources | 2005 | $9M | 63,2% | Their strengths are the usability and embedded analytics of the solution. They offer maturing talent management and payroll capabilities.<br>Workday is a key vendor to watch as SaaS penetrates ERP. | • Sony Pictures<br>• Flextronix<br>• ATMI | • ADP<br>• Microsoft |

* The turnover only represents the On Demand activities

**SCM**

Supply Chain Management applications are those that allow companies to improve externally-oriented processes, to manage selected portions of their supply chains, and to better control their supplier base. As the availability of on demand SCM applications is accelerating, SCM specialist providers are offering new functionalities using their on demand platforms and are pioneering new ways to deliver value to their networked users.

| Provider | Domain of activity | Date of first cloud release | 2008 revenue USD* | YoY Growth | Key differentiators | Sample of key clients | Sample of key partners |
|---|---|---|---|---|---|---|---|
| • Descartes | • Transportation management | 2006 | $59 M (Total) | 13% | This Software-as-a-Service solution provides real-time access to delivery information and a scalable solution that enables the company to plan, optimize, dispatch routes, track and monitor delivery fleets in real time. The hosted solution eliminates the need to install software at every site or continually update maps as the retailer expands to new markets. | • Coca Cola<br>• Crate & Barrel<br>• British American Mauritius | • Navteq<br>• ALK<br>• Microsoft |
| • Ariba | • Sourcing/ procurement | 1999 | $32,6 M | 73% | Ariba is the only provider that combines leading spend management and contract management solutions with global consulting and category expertise. In 2007, Ariba acquired Procuri, a privately held provider of SaaS sourcing and contract management solutions in order to broaden their Cloud offering. | • BMW<br>• American Express | • Sun microsystems<br>• Tibco |
| • Ketera | • Sourcing/ procurement | 1999 | $7M | N.A. | The Ketera "on demand advantage" is the delivery model that combines hosted procurement applications with the "heavy lifting" services required for success, including supplier enablement, hardware infrastructure, project resources, system administration and solution upgrades.<br>Ketera has been named to Deloitte's prestigious Technology Fast 50 Program for Silicon Valley – a ranking of the fastest growing technology, media, telecommunications, and life sciences companies. | • Delta<br>• GAP<br>• United | • The Claro Group<br>• HCL |

* The turnover only represents the On Demand activities

**CCC**

The Content, Communication and Collaboration market varies in the maturity of its sub-segments. Adoption rates range from a high use of SaaS (where 60% of all e-learning solutions are SaaS-based, 70% for Web conferencing and 47% for team collaboration software) to medium (10% of email and only 15% of instant messaging markets) and low adoption (only 2% of Enterprise Content Management and 4% of search and information access run on SaaS). During the last few years, a consolidation of the different players on the market has occurred (WebEx acquired Intranets, and was then in turn acquired by Cisco), which is leading to more comprehensive CCC suites for companies.

| Provider | Domain of activity | Date of first cloud release | 2008 revenue USD* | YoY Growth | Key differentiators | Sample of key clients | Sample of key partners |
|---|---|---|---|---|---|---|---|
| • Cisco Webex | • Web-Conf-erence<br>• Team collaboration | 1995 (acquired by Cisco in 2007) | $550M | >20% | WebEx is recognized as the world leader in web conferencing (Gartner, Frost &Sullivan), providing services to more than 35000 companies for more than 13 years. | • DSM<br>• BDO<br>• Toshiba | • SumTotal |
| • SumTotal | • E-learning | 2004 | $126,9M | 5% | SumTotal is recognized as a market leader in learning management by Gartner. They plan to double their revenue in 2010 via the development of their best of breed on demand learning solution. While 80% of their revenues come from the US, they expect an important growth on the EMEA market in the next three years. | • AA<br>• Microsoft<br>• Fujitsu | • Adobe<br>• Cisco Webex |
| • IBM Lotus | • Email<br>• Team collaboration | 2009 | N.A. | 63,2% | Lotuslive is a suite of hosted collaboration and communication services designed to be easy to use and adopt. The suite is designed to allow for simple integration with third-party applications. | N.A. | • Facebook<br>• LinkedIn<br>• Skype<br>• Salesforce.com |

* The turnover only represents the On Demand activities

**DCC**

SaaS currently represents a small part of the Digital Content Creation market. This market relies, more than others, on customer decisions; consequently, as the consumer's appetite for digital video (Youtube, MySpace…) shows tremendous growth and online image editing software versions (e.g. adobe Photoshop online, Picasa…) are appearing, many evolutions are ahead for digital imaging and video. However, SaaS will still represent a minor penetration rate in this market due mainly to the limited internet bandwidth capacity that prevents the sharing of high-volume information, such as images and videos. SaaS in the DCC market is not yet mature enough for enterprise purposes and will experience an uncertain growth dependent upon the evolution of internet bandwidth capacity.

The actors presented below are the key players of the DCC on demand consumer market. Although these players are important and experienced internet players, the recent closure by Yahoo of its video sharing and editing site 'Jumpcut' (closed down on 15th of June 2009) reinforces the attention to pay to viability when considering Cloud computing providers.

| Provider | Domain of activity | Date of first cloud release | 2008 revenue USD* | YoY Growth | Key differentiators | Sample of key clients | Sample of key partners |
|---|---|---|---|---|---|---|---|
| • YouTube | • Digital video (Youtube) | 2005 | >$320M | >70% | Youtube is currently the world leader in video broadcasting online. It has experienced a steep growth and has more than 100 million viewers. In 2007, Youtube launched Youtube remixer, an online video editing tool that is now used by a community of more than 250 million users. | • CNN<br>• Fox 4 News | • Google<br>• Universal |
| • Adobe | • Digital imaging (Photoshop Express) | Photo-shop Express 2008 | N/A (no commercial activity yet) | N/A (no commer-cial activity yet) | Adobe is by far the leader in digital imaging software (more than 55% of overall market share). The company launched Photoshop Express as their first online image editing software. Currently, it is still free and in Beta version but the imaging giant has plans to make it a platform integrated with their other desktop products like 'Lightroom' and 'Elements' | N.A. | • SumTotal |

* The turnover only represents the On Demand activities



**Integration-as-a-service**

According to Gartner, in 2008 companies spent more than $1.5 billion on enterprise integration projects. While the total integration market is vast, the size readily available to Integration as a Service is small due to the maturity of on premise applications and prohibitive switching costs.

The growth rate for integration as a Service is expectedly low but represents significant potential due to its overall market size.

| Provider | Date of first cloud release | 2008 revenue USD* | YoY Growth | Key differentiators | Sample of key clients | Sample of key partners |
|---|---|---|---|---|---|---|
| • Pervasive | 2009 | $42,47M | 14% | Pervasive recently launched an on demand offer and has a solid experience in providing on premise integration services to grow quickly in the market. | • Astadia<br>• Centive | • Oracle<br>• Salesforce.com<br>• SAP |
| • CastIron | 2001 | $35M | 118% | Cast Iron is one of the most innovative Service/business Models to target companies of all size.<br>Cast Iron's strengths include its flexible SaaS integration deployment model and its domain experience with enterprise integration.<br>They offer companies with a comprehensive integration solution based on configuration, not on coding, to integrate in just days. | • SalesForce.com<br>• Paypal<br>• Fiat Group<br>• Hilton | • Google<br>• Oracle<br>• SalesForce.com |
| • Boomi | 2007 | $3,8M | >30% | Boomi is the first provider of Int.aaS to specifically target SaaS providers. They target small and mid-sized companies with their visual integration process editor solution. Easy and affordable solutions are their competitive advantage. | • Puma<br>• Raley's<br>• D&H | • ExactTarget<br>• Netsuite<br>• Right Now<br>• Force.com |

* The turnover only represents the On Demand activities

**Platform-as-a-Service**

Although having generated considerable interest, Platform as a Service is still an early-stage market. These software development platform providers have broadened their scope to enable multi-tenant development and, leveraging their presence in the SaaS market, are bringing these platforms to the market as PaaS solutions. While many are still in 'Beta' versions, Force.com is already leveraging its SaaS experience with salesforce.com to position itself.

| Provider | Date of first cloud release | 2008 revenue USD* | YoY Growth | Key differentiators | Sample of key clients | Sample of key partners |
|---|---|---|---|---|---|---|
| • Force.com | 1999 | $290 M | 34% | Force.com has the largest implementation possibilities and a growing number of partners are using the platform as an enabling technology for their businesses across multiple industries and geographic regions.<br>Force.com is recognized for its ease of use and rapid learning curve. | • Bluewolf<br>• Häagen-Dazs | • Google App Engine<br>• Amazon Web Services |
| • Google App Engine | 2008 | N.A. Beta version | N.A. Beta version | Google Apps engine has been released in Beta version. It virtualizes applications across multiple servers and data centers.<br>Google App Engine is maturing and began allowing people using the Cloud computing foundation to pay for a heavier use. | N.A. Beta version | • Salesforce.com<br>• Force.com |
| • Azure | 2008 | N.A. Beta version | N.A. Beta version | Azure is only available in beta version until the second half of 2009. The Azure Services Platform provides developers with the flexibility and ability to create applications while taking advantage of their existing skills, tools, and technologies. | N.A. Beta version | N.A. |

* The turnover only represents the On Demand activities
** Turnover includes 'other' division of Amazon (Webservices, EC2, S3)

**Infrastructure-as-a-Service**

The interest in Cloud computing in the infrastructure market has grown substantially, and so have the investments. Several infrastructure services have been relabeled and this causes confusion between the various offerings. From outsourcing, the market has already moved to Infrastructure Utility (pay as you go but with limited sizeability and scalability) and, as Cloud computing grows, Infrastructure Utility is becoming Infrastructure-as-a-Service with virtualy unlimited scalability and sizeability. Today, public Cloud infrastructure is not yet able to provide a complete offering to companies and therefore the market is growing slowly and is characterized by early hybrid Cloud models. As this phenomenon evolves, it will in turn drive adoption and enable a faster growth towards maturity.

The market is composed of focused players in the areas of data storage, compute services, and private Cloud solutions.

**Backup & Storage Services**

In the online backup and storage services market, price competition is high forcing providers to keep costs low to maintain profitability. Consequently, the providers are looking to measure their benefits from economies of scale.

As the market is nascent and actors vary substantially in size, the detailed revenue breakdown of their Cloud offering is not always available.

| Provider | Date of first cloud release | YoY Growth | Key differentiators | Sample of key clients | Sample of key partners |
|---|---|---|---|---|---|
| • Amazon Web Services (S3) | 2006 | >40% | Amazon S3 stands for Simple Storage services. It provides Storage as a Service and is designed to make web-scale computing easier for developers. Amazon S3 provides a web services interface that enables customers to retrieve their data from anywhere at any time. Every customer has access to the same highly scalable, reliable, fast, inexpensive data storage infrastructure that Amazon uses to run its own global network of web sites. | • Xignite<br>• Elephantdrive<br>• Mediasilo | • Salesforce.com<br>• Oracle<br>• Facebook<br>• Appirio |
| • Right Scale | 2006 | >40% | Rightscale aims at providing data centres on demand. Rightscale is automating the grunt work required to use the Cloud most effectively. They provide solutions that enable design, deployment, management and automation of applications on Cloud computing services. The company offers a fully-automated management platform that delivers the scalable, cost-effective, and on demand power of Cloud computing. | • WaveMaker<br>• Mindtouch | • GigaSpaces<br>• Amazon Web Sevices<br>• GoGrid |

Utility computing is a method by which an end user consumes the resource of a computer based on utilization rather than hardware ownership

**Compute services**

The key added value offered by compute providers is elastic computing power, which can transparently cater to the organization's fluctuating needs. Currently, on demand compute services is at its early stage but is, according to analysts, the most promising sub-segment of the IaaS market. The providers presented below vary in size and all are relatively recent on the market.

| Provider | Date of first cloud release | YoY Growth | Key differentiators | Sample of key clients | Sample of key partners |
|---|---|---|---|---|---|
| • Amazon web services (EC2) | 2006 | >40% | Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the Cloud. It provides complete control of the computing resources. EC2 allows for easy scaling of capacity with minimal friction. Amazon EC2 reduces to minutes the time required to obtain and boot new server instances. | • Washinton-post.com<br>• Harvard Medical School | • RedHat<br>• Salesforce.com<br>• Sun Micro-systems |
| • GoGrid | 2008 | N.A. | GoGrid is the Cloud hosting division of ServePath Dedicated Hosting, a company with extensive expertise and experience in web hosting infrastructure.<br>GoGrid enables system administrators, developers, IT professionals and SaaS vendors to instantly create, deploy, and control servers. Bringing up servers and server networks takes minutes via GoGrid's unique web control panel or GoGrid's award winning API. | • Shepard<br>• Unlimited Conferen-cing | • RightScale<br>• GigaSpaces<br>• Tapin Systems |
| • Skytap | 2006 | N.A. | Skytap is the leading provider of Cloud-based virtual labs that deliver 100% self-service provisioning of complex IT environments without any architectural changes.<br>One of the interesting ways Skytap can be used by development teams is to create templates that reproduce bugs or build breaks.<br>Users are able to customize features of the platform, such as access and assets, through a provided management tool. | • WildBlue<br>• Vdi works | • Savvis<br>• Microsoft<br>• VMware |
| • Akamai | 2004 | 12% | Akamai offer an open, reliable, and stable platform for deploying web-based applications.<br>By providing customers with additional computing power as they need it, Akamai reinforced its position as a technology innovator and now delivers 15 to 20% of the web traffic.<br>In 2009, Akamai was named in the prestigious Forbes 25 fastest growing technology companies in the USA. | • Audi<br>• FedEx<br>• CNN | • Oracle<br>• Citrix<br>• at&t<br>• SAP |



**Private Cloud computing**

A private Cloud environment is a solution that enables companies to centralize their IT resources instead of working with separate environments. The advantages for companies include the ability to access a pool of resources that offers the flexibility and scalability to handle fluctuating demands, and cost savings through on demand provisioning of virtualized resources.

In May 2009, IBM was the first provider to announce a commercial private Cloud solution focused on a testing environment, which will soon be publicly available.

| Provider | Date of first cloud release | YoY Growth | Key differentiators | Sample of key clients | Sample of key partners |
|---|---|---|---|---|---|
| • IBM | 2009 | N.A. | IBM is the first major vendor to produce a private Cloud solution for its customers.<br>IBM's offering provides customers with access to Cloud computing by transforming their test environments into a Cloud. If this offering succeeds, IBM might introduce other private Cloud offerings. As the main advantage of their offering is scalability, the IBM private Cloud makes the most business sense for large companies. | • Elizabeth Arden<br>• USGA | • Workday<br>• Salesforce.com<br>• Amazon Web Services |

| Key points |
| --- |
| • Four trends will characterize the coming years of Cloud computing: |
| • Emergence of a Cloud computing value chain: collaboration between SaaS, PaaS and IaaS players |
| • Aggregation of the players to benefit from economies of scale and broaden the offer |
| • An alignment to set a standard of PaaS programming language |
| • Companies should perform exhaustive vendor assessments paying specific attention to the viability and strategic partnerships of the Cloud service providers |

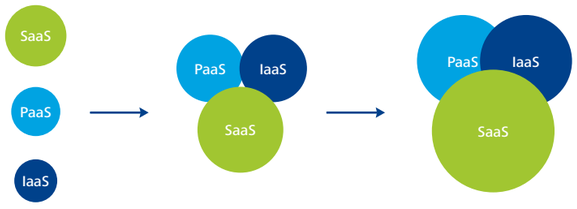
### Looking forward to the emergence of a Cloud Value Chain

Over the last few years SaaS has driven the growth of Cloud computing. This trend will continue in the foreseeable future. Part of this growth results from the rise in the number of Independent Software Providers (ISVs) on the market developing SaaS solutions. These ISVs in turn drive the growth of the Platform as a Service market as they will increasingly leverage the existing development platforms in the Cloud. As most platforms use their own programming language, there will be an effort to standardize platform programming languages across the industry.

The Infrastructure-as-a-Service market is still shifting from the outsourcing model to IaaS through Infrastructure Utility. As the market evolves, it will grow together with the emergence of a Cloud value chain: SaaS providers will use the services of PaaS providers and both will collaborate with IaaS providers instead of investing in their own infrastructure capacity. This collaboration among the players will create a 'Cloud Value Chain' that will bring Cloud computing to the next level and foster a solid basis for maturity.

Looking back at the speed of the evolution of Cloud computing, although the SaaS, PaaS and IaaS markets are dominated by several large players (salesforce.com, Netsuite, SAP, Google, Amazon, IBM, Sun), new entrants will continue to appear while the market remains volatile. As the evolution continues, there will be a consolidation among the different players as Cloud providers look to benefit from economies of scale and offer broader solutions.

**Figure 38: Evolution of Cloud computing families**




# Social networking and Cloud computing

Cloud computing has grown from the bottom up, spreading from consumer to enterprise markets. Social networking plays an important role in the increasing adoption of the Cloud.

In the last few years, we have seen an important rise in social Cloud computing, with social interactions appearing on the internet in many different forms, ranging from online communities to social networks. While opinions vary on the impact this phenomenon will have, one thing is certain: we should not underestimate its power and potential impact on business.

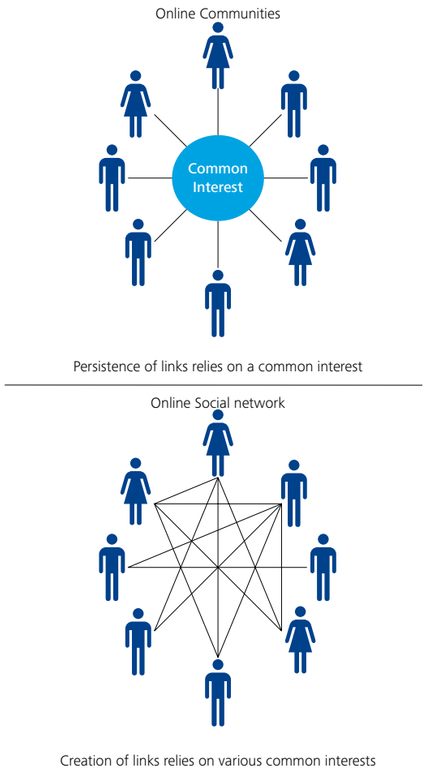
Online social networking is considered to be the rising IT retail market of 2008, demonstrating impressive growth statistics in adoption and usage. We believe it represents a major source of opportunities for businesses and will highlight how forward-thinking companies are already harvesting these networks.

> It is not about Millenials socializing on the Internet, or Facebook and MySpace; It is about game-changing organizational transformation
>
> Patrick Callewaert, Customer Practice Lead EMEA, Deloitte

The staggering increase in the amount of time people are spending on social networking sites has ramifications for how people behave, share and interact within their normal daily lives

AC Nielsen report, "Global Faces and Network Places", March 2009

**Figure 39 - Online Communities vs Online Social Network**




## Online Communities and Social Networking

To understand how to leverage social computing, it is important to first understand its two main families: online communities and social networks.

An online community is composed of groups of users with a common interest who voluntarily gather to share or exchange information through internet-based communication tools. The link between the members is dependent on their common interest; when the interest disappears, so does the community. An online community is typically a blog, a wiki, or an instant messaging system.

In the last 5 years, an increasing number of companies, understanding the power of user communities online, have created their own blogs, wiki's and discussion platforms. The objectives of these company initiatives vary substantially, yet most of the time the communities are driven by marketing purposes. Although companies have been more or less successful in attaining the anticipated returns, this phenomenon has influenced the rules of the marketing game.

An online social network is a network of people among which direct links are established based on an affinity toward common interests. The common interests play a role in linking people to each other individually; even if the interest disappears, the link persists. The members voluntarily share information on a broad set of subjects, including themselves, their hobbies, feelings, and even product preferences. Facebook, LinkedIn, Twitter are the most important examples of this new technological paradigm.

While companies clearly see the added value of creating or participating in Online Communities focusing on a specific subject (market research, Idea generation, brand building, product testing, customer loyalty), most companies do not yet know how to approach the online social networks phenomenon. In order to focus on the most uncharted and transformational applications of social networking, we must examine the examples.

## Online social networks: temporary buzz or sustainable phenomenon

Online social networks represent a relatively small number of users globally (e.g. 1.5 million Twitter users, 200 million Facebook users). However, if we consider the evolution that this new trend has known, the figures speak for themselves: Something big is happening!

- **Popularity**: 67% of the world's online population is a member of at least one online social network, with little deviation in this statistic from country to country.
- **Audience**: While the early adopters were clearly within the Y Generation (18-28 years), the older generation is massively joining the movement. For example, Facebook's fastest growing audience in 2008 was adults aged 35 to 50.
- **Growth**: In 2008, the increase in reach of online networks has grown twice as fast as any of the 4 other most popular online activities.
- **Intensity**: The time spent on online social networks has experienced a 700% growth in one year and accounts for close to 10% of all internet time, where 25% of the online population visits a social community at least once daily. Today, online social networks are the fourth most popular activity on the internet, ahead of personal email.

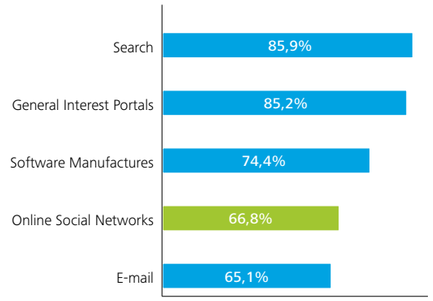
Where some might think that online social networking is "yet another bubble ready to burst", the indicators confirm that it is moving from niche adoption towards mainstream maturity, broadening its audience and confirming the importance it has inside people's lives. Companies should investigate what clearly is a global consumer phenomenon for both individuals and businesses.

Indeed, companies are already leveraging social networks. Social networking bleong to one of the two types: those created exclusively for employees as internal social networks, and those, such as Twitter, LinkedIn and Facebook, that are public, available to everyone.

## Business leverage of public social networks

Public social networks are generally used by companies in two ways, either for Customer Engagement or Customer Awareness.

**Figure 40 - Top 5 most popular internet activities (Nielsen Global Faces and Network places, March 2009).**




Customer Engagement involves a proactive effort on the part of the company to reach out to the customers where they are. This Customer Engagement results in the building of valuable social capital, which is created through the active participation of a company with its customers. The more a company listens and responds to people where they are, the more social capital, and consequently, brand allegiance, is reinforced.

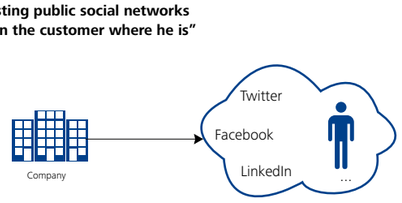
Indeed, there is a clear difference between a public social network, where companies actively seek the customer, and online social communities, where the customer is expected to initiate the relationship himself.

Alternatively, customer awareness results from the fact that people, being existing and potential customers, are voluntarily posting an overwhelming amount of information to online social networks. Whereas on blogs and wikis (examples of online communities) 10% of the users post 90% of the content, on social networks, users contribute through the fact that they simply belong. As social networks offer many opportunities for user participation and the expression of their behavioral tendencies and opinions, innovative companies have started to mine this valuable information often revealing important facts about their company, its products, and consumer base. Moreover, software vendors have released tools to help companies to analyze and synthesize the data available on these Social Networks.

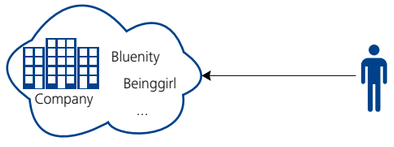
### Proactive Customer Service using Twitter

In late 2008, Bank of America (BoA) started using Twitter, the fastest growing micro-blogging community (3700% increase from 2007 to 2008). David Knapp, a service representative, answers the tweets from consumers and small businesses on product-related questions. In case the answer proves to be more complex, consumers can send their phone number through Twitter and be called back by an agent. BoA is not the only bank to serve its customers on Twitter but it does so better than others since BoA sees Twitter as a new customer interaction channel and spends the necessary time and effort to answer incoming customer requests.

**Existing public social networks "Join the customer where he is"**



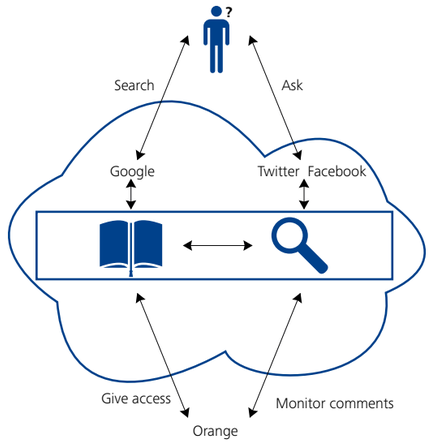

**Existing public social networks "Join the customer where he is"**




Orange, a telecommunications company, brings this concept one step further by integrating Twitter into their CRM tool. Twitter is automatically scanned for keywords linked to Orange services and products. The twitter messages are then sent to the CRM tool where an Orange agent provides answers back through Twitter on the customer's own page. By mining Twitter content, Orange can detect frequent problems and add the resolutions on their support website (FAQ pages) or push the answer back to the customer by making it available through google search.

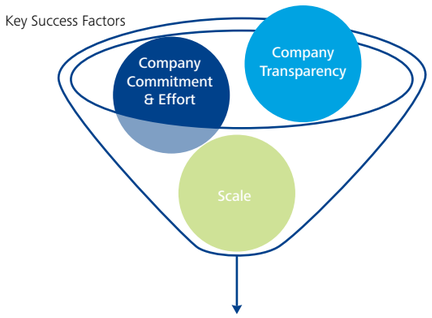
Of course, this will help neither Bank of America nor Orange to control what is said about them on the internet. But by being present in the social network, as they respond and contribute, they improve their image and gain valuable knowledge of their customers. Further, they also increase Brand awareness, influence their e-reputation, and "pull" precious information regarding the market and their customer base.

**Figure 41 - Salesforce.com integrates Twitter as a servicing channel for Orange**




> By 2012, 30% of organizations with more than 5,000 employees will have enterprise-wide employee social network deployments
>
> N. Drakos, Analyst, Gartner

**Business leverage of External and Public social networks**




### Business leverage of private social networks

Private social networks bring the fundamentals of Web 2.0 and online collaboration within the management and operations of the company (imagine an internal Facebook or Twitter application). Companies have begun implementing private social networks to provide specific essential services to their employees: knowledge sharing and productivity, platform for employees to build internal networks, and employee collaboration opportunities. The results of these initiatives include more effective professional development, talent retention, and increased employee efficiency.

However, playing in this game is not without effort and risk; there are rules to respect that require the involvement and commitment of the entire organization.

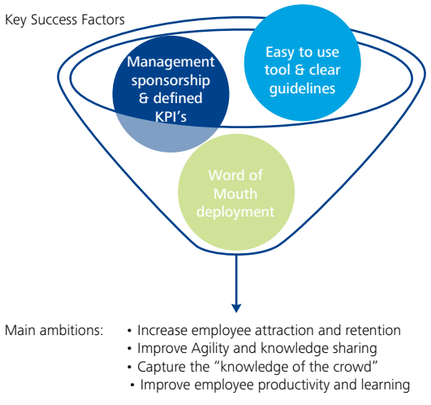
In addition to traditional implementations success factors of clear strategic direction and management commitment, the implementation of private social networks requires specific considerations for success. A company's ability to adopt private social networks requires it to relinquish some of the control they traditionally maintain. For instance, while a company may monitor all articles posted on its intranet, when implementing social networks, it must necessarily part with some control in order to provide the freedom necessary for social network adoption. Contrary to typical corporate software applications, social networking is typically a grass-roots movement. Companies must move away from traditional software deployment paradigms, where adoption is promoted from the management level down, to a word-of-mouth model, where user community opinion leaders promote the software adoption through peer evangelization. In this way, with simple or familiar private social networks, training and end-user buy-in investment is significantly reduced.

### Leveraging Internal Social Networks to increase workforce productivity and collaboration

In 2008, Deloitte US launched D-Street, an internal social network used to connect 45.000 US employees. Deloitte's objective through D-Street is to increase employee attraction and retention, improve agility and information sharing, capture the "wisdom of the crowd", and eventually make a large organization feel smaller to the employees.

The approach taken by Deloitte was to provide an easy-to-use tool, with Facebook-like functionalities, leveraging Web 2.0 to create an environment conducive to employee networking and information sharing. With 95% of Deloitte US using D-Street, it quickly became an essential workplace tool.

**Business leverage of Internal and Private social networks**




Similarly, T-Mobile USA (a large network operator) recently launched an internal social network for its B2B frontline sales team, which connects the 700 T-Mobile B2B sales representatives who are dispersed across the

**Key points**

- Social networks were proven through their mass adoption by internet users
- Organizations use internal social networks to:
  - Increase employee effectiveness
  - Foster innovation and collaboration
- Organizations use external social networks to:
- Enhance customer and partner relationships
  - Understand brand perception
  - Gain market insight
- Organizations should assess the value social networks will bring to them as the Cloud evolves

## Social Networks will contribute, along with mobile technologies and the 'Internet of things'- connecting computers and non-tech objects via networks- to the internet maturity

Viviane Reding, EU Commissioner, Information Society and Media

US. The objectives are to provide a forum where the Sales team members can reach out to one another as needed, to create an environment of peer-to peer learning, to reduce decision making time within the sales process, and improve the onboarding of new hires. An important innovation was that T-Mobile chose to deploy the tool through word of mouth among the sales users. They started a pilot version with 15 key sales people and, without setting any specific incentives, in less than 3 months, 300 of the 700 sales employees were using the social networking forum.

These examples show that internal social networks can be successful and improve both employee productivity and talent assimilation. Indeed, the internal social network provides the employees with a platform where the information available is not only "pushed from the top" but also "pushed from the bottom", where and they can then "pull" the most pertinent and essential information.

### The future of business leverage on social networks

Comparing the way we work today with how we worked ten years ago uncovers important differences. Ten years ago, technology was more advanced at work than at home. Today, this trend seems to have been reversed: while people are searching google, twittering, checking facebook, and calling with VOIP at home, they are sending emails, searching outdated databases, and calling using landlines at work. Communication technologies have become more accessible outside our business environment.

Companies will increasingly use public social networks to proactively enhance customer relationships, increase brand awareness, and capture market insights. Private social networks are already in place delivering increased employee productivity, higher collaboration, and talent retention.

To attain these benefits, the entire company must alter its traditional thinking in order to bring the potential of social networks from the personal domain to the business.

Social networks on the Cloud began and were proven through their mass adoption by internet users. They have since started to penetrate the business market bringing value through both internal and external applications. Organizations of all sizes should weigh the potential of bringing the collaborative and team-building aspects of Facebook- and Twitter-like applications to their internal staff. Innovative leaders have begun mining the unprecedented wealth of data and relationships available in the Cloud to understand their brand perception and connect with their customers in a way that has never been possible before - what about you?



# For further information

Should you wish to talk to us about Cloud computing, or have any feedback on this paper, please do not hesitate to reach out to our dedicated Cloud computing team.

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