## The CEO's Guide to Cloud Computing

**Michael Snowden PhD** 

**OneNet** 

www.ComputingintheCloud.com

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Cloud computing is, arguably, the most radical transformation to take place in IT for the past 30 years.

What is cloud computing, exactly, and why should you care? Can cloud computing really lower your IT costs, increase your IT security and provide you with a brighter future?

If cloud computing can provide all of these benefits, what should your CIO be doing about it and how can you capture that value?



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#### PART ONE:

## Introduction

CEO's have faced a bewildering array of information technology (IT) change over the past 30 years, with integration issues, technical complexity, uncertain, and often surprisingly high IT operating costs, large capital expenditure outlays, followed by rapid technical obsolescence, frequent IT staff challenges and missed delivery deadlines.

Any casual observer of the IT industry knows that Moore's "Law" has generated rapidly falling computer processor costs over time, as processing power has almost doubled every eighteen months or so. This means, of course, that a microprocessor effectively halves in cost every eighteen months for a given amount of processing power.

The relative cost and performance of data storage and the transmission of data over telecommunications lines have performed even better than computer processing power over the past 30 years. The amount of data that may be stored for a given sum of dollars doubles every twelve months or so.

The quantity of data that may be sent down the same size of bandwidth "pipe" doubles roughly every nine months. The speed of light does not change, but the devices on each end of the "wire" allow the light waves to carry more data.

As a result, several IT industry pundits have recently described the cost of computing as being driven to zero.

If that is so, asks the typical CEO, why have my IT costs not declined accordingly? It often seems that IT complexity and costs continue to soar, while IT flexibility and agility continue to decline.

While it may be interesting for a CEO to have a moderate understanding of what the new computing paradigm of cloud computing is, who the main players are, and the growth and likely size of the cloud computing market, the key question the CEO should ask is: why should I care?

The reasons that a CEO should care is that cloud computing may:

- Lower costs
- Reduce risk
- Increase profits



Cloud computing is a disruptive business model innovation which is affecting all IT industry sector players, as well as IT professionals.

In essence, cloud computing represents a shift in the ownership and responsibility for delivering IT performance from inside the firm to an idea of consuming computing as a service from an external service provider.

The idea of consuming IT "as a service", represents a disruptive business model innovation.



The dawn of a new IT age

#### **PART TWO:**

# Cloud computing is a disruptive business model innovation

## Why is Cloud Computing a Disruptive Business Model Innovation?

Cloud computing represents a disruptive idea, or business model innovation, and a disruptive technology to virtually all of the players in the IT market space.

## • A Disruptive Business Model Innovation Often First Appears as a Wolf in Sheep's Clothing

What is a disruptive business model innovation? A disruptive business model or technology innovation that upsets established markets often first appears as a wolf in sheep's clothing.

In 1995 Joseph Bower and Clayton Christiansen, both now professors at the Harvard Business School, invented a new term, namely, a "disruptive" innovation or technology.

A disruptive innovation may be a technology, such as a microprocessor or prescription drug, or it may be an idea, political movement or business model.

#### • Initially, a Disruptive Innovation is Usually Incomplete

Initially, a disruptive technology or business model innovation is incomplete but it addresses the requirements of an under-served segment of the total market better than the existing incumbent technology or business model.

It is often derided by the then industry leaders as inadequate when compared with the established products or services.

#### Successful Disruptive Innovation Soon Replaces Market Incumbents

Very soon, however, rapid incremental improvements to the fledgling new market paradigm results in technology and business model refinement that, if it has "legs", quickly usurps the establishment, and become the new mainstream.



#### • Market Incumbents Often Don't Adapt to New Paradigm

Study after study has demonstrated that even when competent incumbent firms have full visibility of emerging disruptive technologies or business models, they often fail to adjust and are wiped out as a result. The reasons for this lack of responsiveness are well canvassed in Christiansen's highly regarded books "The Innovator's Dilemma" and "The Innovator's Solution".

#### Disruptive Innovations Are Like the Proverbial Boiling Frog

The risk for current IT firms providing existing technology and operating unchanged business models is reflected by the story of the boiling frog. The idea of a boiling frog is based on the premise that if a frog is placed in boiling water it will jump out. A frog placed in cold water that is slowly heated will not perceive the danger and will be cooked to death.

Although the premise of the story is, apparently, not true it is often used as a useful metaphor for the inability of firms and people to react to important changes that occur gradually. They may not know when to switch from the old to the new before it is too late.

### • IT Industry Players Label Many Existing Products With "Cloud" Name

The disruptive technology, or disruptive business model innovation, threat of cloud computing can be viewed from a number of aspects. The response and reaction from most IT industry vendor participants, seen in terms of announcing new cloud services and technologies, as well as plastering the word "cloud" on many of their existing products, is testimony to the disruptive impact cloud computing is making on them.

The impact of this disruptive technology and disruptive business model on traditional IT departments and their staff, as well as on traditional IT outsourcing firms, is considered further in this document.



A disruptive innovation often first appears as a sheep in wolf's clothing

## What Are Other Examples of Disruptive Business Model Innovations?

We provide below three examples of how traditional or conventional business practices are being turned upside down with new ways of providing traditional fixed asset investment as a service.

#### 1) "Military Intelligence-as-a-Service"

In Afghanistan at present, not all members of the NATO partnership have their own unmanned aerial vehicles, or spy drones, to seek military intelligence. Prior to sending out a patrol, it would be very helpful to know who is on the other side of the hill, where they are and how many there might be.

It happens that not all NATO members share their military intelligence for tactical reasons. What should a NATO member without a spy drone do? The obvious answer is to buy one, as other NATO members do.

However, there are options. At least 20 companies currently rent spy drones as a service. For example, a division of Boeing, Insitu, rents a spy drone for US\$2,000 per hour.



Military Intelligence-as-a-Service



This means the NATO member's decision-making entity is faced with the classic, enduring business dilemma of "make or buy" or "rent or own". Let us consider what the decision criteria might be. Even though this is not a typical business product or service, the same principles apply. What are the issues and considerations in this decision analysis?

#### Capital Expenditure

Obviously capital expenditure approval will be necessary. Is it available? How long will it take to obtain under the normal budgeting cycle? Is time-to-market critical?

With an "as-a-service" business model, the capital expenditure is avoided completely.

#### Skills Required

Are high-level or low-level skills required to operate spy drones? For the operation of more sophisticated spy drones, a high level of skill is required. How will those skills be secured and how will such scarce skills be retained?

A key benefit of the "as-a-service" model is that skills required to operate complex systems are not required at all. The service provider packages the skills with the service provided.

#### Scalability

Is the use of spy drones easily scalable? There are many types of spy drones with differing capabilities. What size, quantity and function should be bought? What happens if there is not enough resource or the wrong type of resource?

The "as-a-service" business model means that the service provider manages the problems of scalability, delivering just the right amount of resource, as required, when it is required.

"Much of computing will no longer be done on personal computers in homes and offices, but in the "cloud": huge data centres housing vast storage systems and hundreds of thousands of servers".

Briefing-Cloud Computing

The Economist, October 17, 2009

#### Obsolescence

Would you expect spy drones to have a high level of technical obsolescence? The technology of robotics, surveillance video and communications is rapidly evolving, so the risk of technical obsolescence is very high.

By contrast, the service provider absorbs all of the risks of technical and functional obsolescence.

#### Predictable Costs

How predictable is the cost of operating spy drones? If the total cost of acquisition, operation and support were divided by the number of surveillance missions, the cost per mission could be calculated.

However, the cost per mission would be highly uncertain, as the cost per mission is very sensitive to the number of missions flown. As most of the operational costs are fixed in nature, and do not vary greatly with the number of missions flown, the average cost per mission will range from very high to very low, depending on the number of missions. Accordingly, there is very poor predictability of the cost per mission.

As only the amount of service consumed is paid for under an "as-a-service" business model, the precise cost per mission is known in advance.

#### • Focus On Core Competency

What does the NATO member country's military unit actually need? Do they want to own and operate spy drones or do they just want the military intelligence?

This is a classic question. Placing the "make or buy" decision criteria in a military framework helps to clarify the essence of what is important. The similarity or parallel between the military and business context makes it clear that "owning" a resource poses many challenges that are avoided if the actual outcome required, military intelligence in this case, is secured "as-a-service".

Let us consider two further examples of business model innovation.

"Cloud computing will be no less influential than e-commerce"
Gartner Research Group, 2008



#### 2) "Tyres-as-a-Service"

Bridgestone, among others, provides tyres-as-a-service to heavy haulage trucking firms in Europe and North America. This means that Bridgestone owns the tyres, services and changes them and manages the operations relating to them.

For example, a truck hauling goods from a dry, high temperature region to a sub-zero temperature region would normally need to carry snow tyres. Bridgestone takes responsibility for maintaining the stock of snow tyres, where required, and changing them en route.

Instead of trucking firms owning the tyres and managing their use in a conventional way, the trucking firm only pays for the actual usage, as determined by a mileage or kilometre rate.

What benefits accrue from the "tyres-as-a-service" business model?

#### • Capital Expenditure

No initial or replacement capital expenditure is necessary.

#### Complexity

At first glance the management of truck tyres may not sound complex. However, the resources and complexity in optimizing the use of 16 and 20 tyres per truck for hundreds and perhaps thousands of trucks is clearly non-trivial. Accordingly, this complexity and technical resource is eliminated.



Tyres-as-a-Service

#### • Pay Only For Actual Usage

As the trucking firm only pays for the actual kilometre usage, there are no costs incurred with respect to tyres for any time the truck is idle.

#### • Predictable Costs

The gross margins earned in the trucking business are typically low. Because the precise cost per kilometre of running the tyre cost component is known with precision, the trucking firm is better able to price its services with more accuracy. The precise predictability of costs with a "tyres-as-a-service" business model means that margins are more likely to be preserved.

#### • Focus On Core Competency

Is the ownership and self-management of tyres on a truck an essential core competency in delivering goods from A to B? The answer is obviously "no". Accordingly, the trucking company is better able to focus on its core competencies and the areas where it can create value for its customers.



Thrust-as-a-Service



#### 3) "Thrust-as-a-Service"

Manufacturers of commercial aircraft jet engines are now offering a "thrust-as-a-service" option to airline operators, rather than engines as a product. Because the jet engine manufacturers are able to track the usage and performance of their engines from electronic sensors, they can offer their customers an alternative way to pay for what would otherwise be conventional capital expenditure, and only pay for actual usage.

Payment by per 1,000 kg of thrust per hour, or similar, substitutes for fixed lease payments or depreciation charges plus the operating and servicing costs.

Most aircraft are leased, but this is simply an alternative financing method for what is capital expenditure.

What benefits accrue from the "thrust-as-a-service" business model?

#### • Capital Expenditure

No initial or replacement capital expenditure is necessary.

#### Complexity

The coordination challenges and technical resource required for the maintenance of jet aircraft engines is high. This is significantly reduced.

#### • Pay Only For Actual Usage

The airline operator only pays for the actual usage of the jet engines, rather than the fixed costs of ownership, whether leased or not. If the aircraft are idle on the runway, no charge is incurred.

#### • Predictable Costs

The gross margins earned in the airline industry are traditionally low. Because the precise cost of operating an aircraft's jet engines is known with certainty, the airline may develop a more accurate fare pricing model. The precise predictability of costs with a "thrust-as-a-service" business model means that margins are more likely to be preserved.

#### • Focus On Core Competency

Is owning, whether leased or not, and self-managing jet engines on an aircraft an essential core competency in flying people and goods from A to B? The answer is obviously "no". Accordingly, the airline is better able to focus on its core competencies and the areas where it can create value for its customers.

#### What is Changing in These New Business Models?

Conventional ways of doing business are being turned upside down and are being replaced with new innovative business models.

 Heavy-weight capital expenditure and fixed costs are being transformed into lighter-weight variable costs. Rather than making what we now understand to be a capital expenditure decision for an investment in fixed assets, the transformation of a fixed asset or product into a service means that only operating expenses are paid, depending on the actual consumption of the service.

## The new business rationale of paying for value is creating a range of innovative business models.

- The ownership of assets and the liability for their performance is being shifted to a third party.
- Disruptive innovations are taking place as companies adopt new ways of doing business.
- New business models which allow for payment only for usage, or, ideally, only for value, have a high attractive value for organisations.
- The new business rationale of paying for value is creating a range of innovative business models.



## Why Cloud Computing is a "Computing-as-a-Service" Business Model

Cloud computing is a similar business model innovation to the innovative ideas of "tyres-as-a-service" and "thrust-as-a-service" for the following reasons:

- Computing is consumed as a service.
- A third party provides the hardware, software and technical resources, in different combinations to an organisation's users.
- Computing services are purchased as and when needed.
- Only the services required are paid for.
- Organisations no longer need to own and manage computing resources.

Each factor reviewed in the three examples of "as-a-service" business models is considered below in the context of the cloud computing business model.

#### • Capital Expenditure

A third party provides all of the investment in fixed assets required to solve the IT business problem. The user of cloud computing does not need to invest in fixed assets.

#### • Skills Required

The cloud computing provider provides all of the skills required to operate the systems and technology assets required to deliver the computing function. As a result, the user organisation does not need to build and maintain those skills.

#### Complexity

As the cloud computing provider manages all of the complexity behind its own "firewall", or secure boundary wall, the user organisation is shielded from complexity.

Accordingly, cloud computing removes complexity and provides simplicity.

#### Scalability

Another key benefit or difference in cloud computing is that the user organisation does not need to consider whether they have too much, too little, or the wrong type of technology resource.

"Not only is cloud computing faster and more flexible, it is cheaper. The emergence of cloud computing models radically alters cost-benefit decisions"

Financial Times, March 6, 2009

The cloud computing provider matches the user organisation's requirements, both increasing and decreasing, exactly with the demand.

#### Obsolescence

Computer technology is subject to notoriously fast obsolescence. If the user organisation invests directly in computer technology, it will be subject to high obsolescence.

As the cloud computing provider owns the technology, the user organisation avoids technology obsolescence completely.

#### • Predictable Costs

Organisations that own their computer technology do not have predictable costs.

In contrast, cloud computing providers deliver services which allow complete predictability of costs.

#### • Focus On Core Competency

The ownership and delivery of computing resources rarely, if ever, provides any competitive advantage to an organisation. We consider this point in some depth later.

Accordingly, organisations employing cloud computing are able to focus on the core competencies that provide their competitive advantage and create value for their clients and customers.



There are as many variations of cloud computing as there are ice cream flavours



## Cloud Computing is a Business Model Innovation Rather Than a Technology Innovation

It is important to recognise that cloud computing is a disruptive business model innovation rather than a technology innovation. Just as tyres and jet aircraft engines have not changed materially in their inherent technology, when provided "as-a-service", cloud computing does not reflect any significant change in technology capability.

In comparison with the history of information technology, represented by the evolution of the mainframe, the mini-computer, the personal computer and the Internet, cloud computing is not a technology revolution.

While there are cloud computing technology innovations taking place, and these innovations will help to drive the success of the cloud computing paradigm, cloud computing, in its essence, is a disruptive business model innovation.

Cloud computing is a disruptive business model innovation rather than a technology innovation.

#### What Exactly Does "Cloud Computing" Mean?

The term "cloud computing" broke cover into the public consciousness in early 2008, following media coverage of Microsoft's US\$46.1 billion takeover bid for Yahoo!, which was subsequently aborted. Popular media drew the public's attention to the emerging trend of computing being shifted from traditional on-premise IT resources to external data centres "in the clouds".

#### • No Single Definition

The first critical point to appreciate is that "cloud computing" means different things to different people. There is no clear definition, and few IT experts can agree on what it is. There is not one "cloud", but several. There are as many variations of cloud computing as there are ice cream flavours.

#### • Three Simple Definitions of Cloud Computing

In early 2008, BusinessWeek magazine provided a simple definition of cloud computing, as follows:

"While different people use it to mean different things, the broadest definition refers to any situation in which computing is done in a remote location (out in the clouds), rather than on your desktop or portable device".

That is, there is a separation, or abstraction, between the organisation providing the software and computer processing, and the organisation the user belongs to.

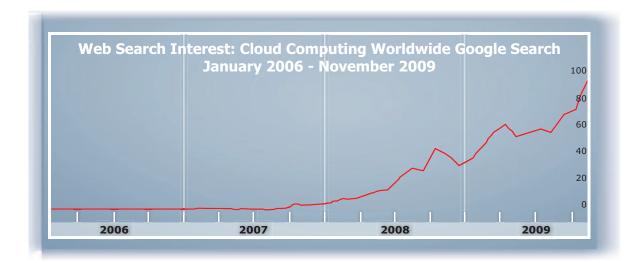
A second simple definition of cloud computing was provided in the October 17, 2009, edition of The Economist, as follows:

"The idea is that computing will increasingly be delivered as a service, over the Internet, from vast warehouses of shared machines".

A third simple definition of cloud computing was provided in the November 16, 2009, edition of Forbes magazine, as follows:

"....biggest contest in technology, called cloud computing, wherein data storage and computation takes place many miles from customer's desks".

"The idea is to cut the cost of labour, the hardware and the energy that go into data processing, and to make files accessible to workers who move around a lot"





#### Cloud Computing is a New Term

The term cloud computing, which encompass many different aspects of computing, is relatively new. The graphic entitled "Web Search Interest: Cloud Computing" represents the activity level of searches on Google for the term "cloud computing". It is evident that the term "cloud computing" was not searched to any extent until late 2007, with a strong upsurge starting in 2008.

#### • Internal, External and Hybrid Clouds

This clear-cut delineation is soon muddled with the concept of "internal clouds", whereby many of the essential technology elements of cloud computing are provided by the organisation's own internal IT group (but without producing almost any of the business benefits of cloud computing) and "hybrid clouds", which are a combination of both internal and external "clouds".

The rationale for IT vendors and internal IT staff embracing the erroneous idea of "internal clouds" is dealt with in a later section.

Confused? That is understandable. It does require a more in-depth understanding of the subtle differences within the concept of cloud computing, and what they mean, before deciding on what to do next.



The way things once were

#### **How Large is the Cloud Computing Market?**

A number of credible organisations have predicted very large market size forecasts for cloud computing in the near future. To place the following large numbers into perspective, IBM's revenue from software and hardware is about US\$50 billion of its US\$100 billion dollar plus total revenue, and Microsoft's revenue is about US\$60 billion.

- IDC, one of three leading IT market analyst firms predicts that the total cloud computing market will be US\$42 billion by 2012.
- IBM, in June, 2009, predicted that the total cloud computing market will grow to US\$66 billion by 2012.
- Gartner Group, another leading IT market analyst firm, predicts that the cloud computing market will grow from US\$46.4 billion in 2008 to reach \$150.1 billion in 2013.

They cannot all be right, surely? Or can they? Just as it is difficult to define the cloud computing market, so it is difficult to know exactly what is included in these future cloud computing market size forecasts.

Unlike precise definitions of goods, which allow accurate calculations of production, such as tonnes of steel produced or millions of transistors on a microprocessor, cloud computing eludes accurate market size measurement at present.

Cloud computing is a very scary disruptive business model innovation for most existing IT vendors.



## Is Cloud Computing Additive or Cannibalistic in the Total IT Market?

A much more interesting question, though, is whether the various cloud computing market size growth forecasts mean that:

Most of the cloud computing revenue will be incremental to the existing IT market

OR

Existing IT vendor revenue streams will be cannibalised and replaced with cloud computing revenues

If cloud computing revenue cannibalises existing IT market revenue, will it mean a dollar-for-dollar substitution? Or will the substitution be something more like a \$1-for-\$2 substitution, or even a \$1-for-\$3 substitution?

We think it will largely be a substitution effect. That is, existing IT industry revenues will be cannibalised by cloud computing revenue. The degree or ratio of substitution is, of course, unknown at this point in time.

In any event, existing IT vendor revenues will be rapidly eroded as the substitution effect takes place over the next five to ten years. This means that cloud computing is a very scary disruptive business model innovation for most existing IT vendors.

The behaviour of incumbent IT vendor firms and the firm's own IT team is changing as a result. We will consider those changes and their implications later in this document.

#### **PART TWO:**

## Why the CEO should care about Cloud Computing

To explain why the CEO should care about cloud computing we must firstly consider how IT works in the enterprise and whether the use of IT can create any competitive advantage for the business.

#### **How Do Firms Compete?**

Each firm competes with alternative product, service, business partners and solution providers to create value for its target market customers or clients. The mode of competition is normally on the basis of the execution of a unique business model, whether founded on speed to market, quality, cost, all three, or any other combination.

Apart from organisations creating new technology such as Intel in microprocessors or pharmaceuticals creating proprietary prescription drugs, most firms innovate in terms of the development and refinement of their unique business model.

#### What is the Role of IT?

The role of IT in the enterprise is to support the unique business processes which are tailored to the business model that enables the firm's employees and supply-chain partners to create value for its customers or clients.

The firm's processes are supported by "line-of-business" software applications which may include specialty vertical market applications unique to the firm's industry and generic ERP, or enterprise resource planning, software.

In addition, CRM, or customer relationship management software, reporting systems and other software "glue" that helps to integrate each disparate software system allows effective data exchange between those systems, both inside and outside the firm's "firewall", or IT security perimeter, provides a complete solution for the enterprise.

Each generic vertical market, ERP and CRM software application is likely to be heavily modified, customised and integrated in some form to enable the firm's business processes to support the firm's unique business model.

Other generic software such as e-mail and office productivity software, may also be tightly integrated, but is often regarded as functional, but not strategic, in terms of competitive advantage.



#### **How Does the Firm Differentiate Itself with IT?**

The CEO should care about cloud computing because it relates directly to how an organisation is able to differentiate itself and compete in its own market space with its IT resources.

It is important to recognise that competitive advantage from IT comes from the effective use of application software, and the customisation of that software to support the firm's own unique business processes, which are a reflection of the business model the firm competes on.

#### • Separating "What" Software is Used from "How" it is Delivered to Users

In this context, an organisation's IT may be segmented into the "what" software is used, which includes the line-of-business and other software applications as described above, and the "how" it is delivered, which is the method of delivering those software applications to the firm's "users".

A user may be considered to be anyone who uses the firm's software applications in the life cycle delivery of the firm's market solution. Users would include the firm's own employees, its supply-chain partner employees, external service providers, business partners and the firm's customers or clients.

## It is the "What" Software that is Used which Provides Competitive Advantage, Not the "How" the Software is Delivered to Users

The fundamental point to understanding the contribution that IT may make to the firm's competitive strength, is that it is the "what" software, which is used that provides competitive value, not the "how" it is delivered to users.

Of course, unless the underlying "how" of delivery, comprising the server computers, data storage, communications systems, security and ancillary support services operate efficiently, then the best software will struggle.

## Underlying Computing Infrastructure Does Not, and Cannot, Create Any Competitive Advantage for the Firm

The key point is that this underlying computing infrastructure does not, and cannot, create any competitive advantage for the firm. Neither can generic and widely adopted application software, such as e-mail and office productivity software, provide competitive advantage to the firm.

Computing infrastructure does not, and cannot, create any competitive advantage for the firm.

In other words, the secure and stable delivery of a firm's software applications to its users is a necessary condition, but not sufficient on its own, to create competitive advantage from a firm's IT resources.

## • Early Adoption of New Technology May Provide a Temporary Competitive Advantage

In earlier stages of the IT evolutionary cycle, when some firms lagged their competitors in their adoption of what is now virtually fully-diffused IT technology, such as personal computing, e-mail, office productivity software, mobile and remote access, and "vertical market" software applications, it was possible to stay slightly ahead of the competition. Today, most of those gaps have closed.

As new technology emerges there is a continual stream of opportunities to adopt earlier than a firm's competitors. The timing of being too soon on the "cutting" edge, or even "bleeding" edge, is an on-going challenge and trade-off against being too late and playing a catch-up game.

## • Industry-specific Standard Software Offers Limited Opportunity for Competitive Advantage

With the proliferation of vertical market software, which addresses the needs of an industry's specific market requirements, most firms in any market segment now have access to virtually all of the industry's specific software functionality.

During earlier stages of the IT evolutionary cycle, many of these specific software functions were addressed by custom-written software, which brought its own challenges of cost, lack of flexibility, support and agility.

Over time, software vendors emerged with most of the specialty vertical market industry features and best practice processes required already embedded in standard packages.



This brought many attendant benefits including lower cost, better support, a clear upgrade or development path, independence from a "legacy" custom-written software trap, enhanced integration capabilities and a vigorous competitive landscape which drove innovation in the software, to the benefit of all industry participants.

However, this increasingly meant that every industry player had access to the same packaged software, as well as the IT technology means to deliver it to their users.

### • If Every Industry Player Has Access to the Same Software Applications, How Can Competitive Advantage be Built from IT?

The answer to the question of how firms using the same or similar industry-standard software applications can build competitive advantage from IT lies in:

- the relative rate of new technology adoption, with respect to one's industry peers
- the customisation of those standard industry software application packages
- most importantly, how well those software modifications support the firm's unique business processes, which in turn are a function of the firm's competitive business model
- the speed at which the applications can be modified to support changes in the firm's business model

That is, a firm builds competitive advantage primarily by engaging in business processes which are different to its competitors. The IT function supports and enables many of those processes. The more unique the business process, with respect to the firm's industry competitors, the more likely it is that there will be unique custom-written software developed to support them.

It follows that competitive advantage potentially generated from IT resources relates to how well the firm's line-of-business-applications, or its industry-specific software applications, support the firm's own unique business processes and its users. It does not relate to how those applications are delivered to the firm's users.

That is, how the applications are delivered to the firm's users is not an integral part of the IT competitive advantage equation, provided they are delivered to them securely and reliably for a competitive cost.

#### • What is Different with "Software-as-a-Service" Applications?

When we examine the role of "software-as-a-service" below, which is one of the three main tenets of cloud computing, the same rules apply.

It is the functionality of the software, in terms of how well the software addresses the firm's business process requirements, and its ease of customisation and data integration, that is critical to the firm's competitive position, not its delivery process or mechanism.

#### The Functional Software Must be Selected First, and the Delivery Mechanism is Secondary

In other words, the functional software must be selected first, and the delivery mechanism is secondary. Whether software is delivered from an "on-premise" resource or over the Internet "as-a-service", the first and most important decision is which software application has the best match of functionality to the firm's requirements.

If the best software for the firm happens to be provided "as-a-service", in the nomenclature of cloud computing, or purchased in the form of perpetual licenses in the traditional way, it should not matter.

However, integration challenges, security and reliability concerns will obviously have a bearing on the decision.

### • Why the "What" of Software Applications Should be Separated from the "How" they are Delivered to Users

The crucial point is that the function of delivering the firm's software applications to its users (the "how") should be disaggregated from the software applications (the "what") within the total IT role. If it is not possible to gain competitive advantage from the delivery of software applications, as opposed to the software itself, then why do it, if there is a lower cost and better alternative?

This is where cloud computing enters the CEO's consciousness.



## Cloud Computing Can Cut Costs, Reduce Risks and Increase Profits

The CEO should care about cloud computing because it makes it possible to:

- lower the IT costs required to deliver the firm's software applications to its users
- actually increase the security and reliability of doing so
- create a brighter IT future in terms of flexibility and agility
- gain from the commercial benefits of market competitiveness among alternative external cloud computing providers
- fix for, say, three years the cost of delivering the firm's software applications to its users, so that only what is actually used, is paid for, whether user numbers go up or down
- ignore the need to provide for growth or contractions in the business, but still pay only for the IT resources actually used, at a fixed price per user
- arrange a performance contract to suit the business' specific needs with independent auditors checking the security of its cloud provider's systems
- avoid costly capital expenditure for new computer server and communications hardware equipment upgrades
- make the rapid obsolescence losses on this equipment and the very expensive, and rising, salaries of the skilled staff required to manage this equipment someone else's problem
- extend the lives of the same PCs currently owned by the firm, regardless of the demands of the software applications used

In many respects, cloud computing may be regarded as the CEO's Holy Grail of computing infrastructure.

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#### PART THREE:

# History, nature and implications of Cloud Computing

## Is Cloud Computing the Current Revolution in Information Technology?

The last great revolution in enterprise computing started in August 1981, with the introduction of IBM's personal computer in the USA market. While PCs were around for several years prior to this, IBM legitimised the idea of one computer/one user in corporate computing.

The very rapid diffusion of this then radical idea revolutionised computing and spawned a wave of almost unbelievable technological innovation, including the explosion of the Internet, falling real prices, dramatically rising capacities and massive market growth since that time.

The question now is whether "cloud computing" presents a similar inflection point and a fundamental tectonic shift in the enterprise IT landscape, whether it heralds a new nirvana in enterprise computing, or whether it is just computer industry snake-oil hype. A healthy skepticism is a useful ally when considering this question.

#### Where Did Cloud Computing Come From?

Many IT industry commentators claim that there is nothing new about cloud computing. However, in determining what is new in cloud computing it should be remembered that every advance has many ancestors. A brief history of the various stages of cloud computing follows below:

#### Time-sharing

One could argue that cloud computing began with the concept of "time-sharing" in the 1960's. Time-sharing meant that multi-million dollar computer processors could be shared remotely among many users at the same time, rather than by a single user.

One could also argue that Ross Perot, the storied founder of EDS in 1962, and a later US presidential candidate, invented commercial cloud computing.

In February, 1963, Ross Perot rented computing resources and "time" from businesses already using IBM mainframes during the night-shift while it was idle, and used it to process a sales-route accounting system for his first big client, the snack food company Frito-Lay.



#### Outsourcing

The surge in the practice of outsourcing of IT resources, beginning in the 1970's and growing rapidly in the 1980's and 1990's, has several common features with cloud computing. That is, a third party manages the firm's software and delivers it back to the firm's users. The disenchantment with long-term IT outsourcing contracts and the fixed cost elements slowed this trend by the early 2000s.

The concept of using someone else's computing resource to process data, managed by a professional independent organisation, without having to own the computing resource, while only having to pay for the computing resource actually used, lies at the heart of the "cloud computing" idea.

In determining what is new in cloud computing it should be remembered that every advance has many ancestors.

One key differentiator, therefore, between traditional outsourcing and cloud computing, from an IT infrastructure point of view, is the idea that a firm will only pay for what it actually uses, rather than a fixed cost outsourcing fee.

The idea that software could be consumed as a service, rather than a firm having to own and depreciate its cost over time, and support it, is a parallel development.

#### On-demand Computing

By 2000, IBM and other IT firms began marketing the concept of "on-demand" computing. This idea was akin to the concept of "utility" computing, alongside a similar idea of "grid" computing, which used multiple, and often widely disbursed computers, to focus on large scale computation tasks such as genome and pharmaceutical research.

The common element in each of the "on-demand" concepts is similar. Computing resources, provided by an external third party, could be marshalled to bear on solving a temporary, or recurring, information processing task. Once the requirement was met, the computing resources would no longer be required, or paid for. Only the actual usage would be billed.

This provides an enormous benefit to the user organisation, as computing costs can be matched more precisely with demand, and peaks in demand could be more easily catered for without the need to maintain surplus or redundant internal IT resources, which were otherwise always required for uncertain "peak loads".

The term "on-demand" has now entered the widespread lexicon, attached to almost anything that may be consumed at will, at the consumer's choice of timing and desired consumption level, while paying only for what is actually consumed.

The concepts of "utility" and "on-demand" are associated with the way utility supplies such as electricity and water are typically consumed and paid for. Apart from, perhaps, a minimum or fixed line or access fee, most consumers of utility-type services only pay for what they actually consume.

#### Origin of the IT Meaning of "Cloud"

The idea of consuming computing resources as and when required, and only paying for actual usage, morphed into the concept of "cloud computing" in 2007. The term "cloud computing" has, it may reasonably be argued, a much sexier ring to it than "utility computing".

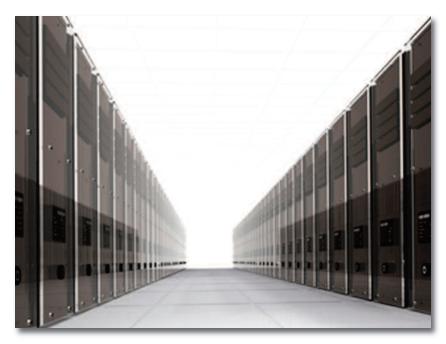
The word "cloud", in the cloud computing context, has its origins within the IT industry in the use of a cloud-type drawing in network diagrams, to show a generic communications linkage of multiple sites, such as branch or country locations, without needing to specify the exact communications technology being used.

Later, the cloud image became understood in the IT industry to be a metaphor for the Internet.

#### • Is cloud computing just old wine in a new bottle?

By now you may be thinking that if the cloud computing concept was established several IT generations ago, and known by different names, is this simply the same old wine in a new or different bottle? The answer to this question is, unfortunately for the desire for simplicity, both "yes" and "no", as we shall examine shortly.





A modern data centre

#### What Are the Three Main Elements of Cloud Computing?

Three parallel trends in cloud computing have developed over the past ten years or so. Each trend relates to the core benefits of economies of scale, automation, low distribution costs through the Internet, pay-only-for-actual-use and predictable IT costs.

An historical context may help to explain the evolution of cloud computing and its likely future trajectory.

#### 1) Software-as-a-Service

Initially, the idea of consuming software applications as a service began to find favour among smaller firms, in particular. This idea, now labeled "software-as-a service", or by its acronym "SaaS", is considered to be one of the three fundamental planks in the concept of cloud computing today. Some understanding of the evolution of "software-as-a service" may be helpful.

#### • Application Service Provider

"Software-as-a-service" is an outgrowth of its close relation, the application service provider, or ASP, business model which began in the late 1990's. It may reasonably be argued that the ASP model re-cycled an established IT practice from as far back as the 1970's. The ASP model was touted at the time as the next great IT revolution, and venture capital swamped the early players.

The ASP promise did not live up to the hype and expectations of the time for several reasons, as considered below.

- The availability, speed and quality of broadband communications were not up to what was demanded of it for the task.
- The scalability challenge of provisioning and delivering computing and software resources was not easily met by the then existing technology.
- An important reason for the failure of the ASP business model at the time was the idea that an ASP provider would deliver a portfolio of standard complementary software applications to an organisation to address most, if not all, of that firm's application requirements.
- That is, a typical ASP provider offered a portfolio of generic software applications, usually with one ERP, CRM and accounting package. The ASP firm usually supported its client's end-users in the day-to-day functional operation and customisation of the portfolio applications the ASP provider supplied.
- Therein lays the inherent fatal flaw in the ASP's business model. No two businesses
  are the same, and while the whole portfolio of applications may suit a few firms,
  most businesses want to be able to select a "mix-and-match" of available software
  applications. If one "size" of software could fit every firm's requirements, there
  would only be one size on the market.
- Why otherwise, would there be so many different variations of CRM, ERP, accounting, as well as specific line-of-business applications, available from commercially viable software suppliers? The ASP provider is only able to support a narrow range of applications. Each business will want to select the optimum selection from a wide range of suppliers, not just the unique combination offered by any particular ASP provider.
- Another important source of failure of ASP's was simply the time it takes for any new idea to be diffused into any community from an early adopter stage to an early majority stage. Venture capital simply ran out before the idea could become viable.



• The final nail in the ASP business model coffin was the dotcom crash of 2000, and the ensuing demise of most Internet-related visionary business models. In other words, the ASP business model baby was thrown out with the dotcom crash bathwater.

Just as this sweeping rise and fall of the ASP model was taking place, an emerging idea, which is a close cousin to the ASP, began to germinate in the late 1990's.

#### • How Does "Software-as-a-Service" Differ From the ASP Model?

The key difference between the ASP model and the "software-as-a-service" model is that rather than offer a whole suite of software applications over the Internet to cover most of an organisation's needs, software vendors would offer a single application to address a specific requirement.

This meant that the client organisation could pick and choose among alternative suppliers, and then build their own optimal portfolio of software applications to suit their specific needs.

Some of the applications could be obtained from new external "software-as-a-service" providers, and some could be obtained from traditional on-premise perpetual software licenses.

The traditional IT software business model generally means that software applications are purchased under what is euphemistically described as a "perpetual license". This usually means that the purchaser is able to use the software applications in perpetuity, but does not own the software code.

Provided annual maintenance or upgrade fees are paid, usually for between 15% and 25% of the purchase price, the business is able to maintain current versions of the software.

"The capital crunch of 2009 will put a spotlight on the advantages of cloud computing; no capital expenditure, predictable operating expenses and fast results"

Fortune, December 15, 2008

The "software-as-a-service" concept reflects at least four important factors, as follows:

### i) Business Model Innovation

Firstly, SaaS is primarily a business model innovation. Instead of receiving a large "up-front" purchase price plus the ensuing maintenance and upgrade fees, the SaaS provider receives a stream of per user rentals from the firm.

This provides a financial challenge to most SaaS providers, as it takes some time for the cumulative volume of subscription rental revenue to build to the total revenue level that the traditional sale of perpetual licenses would otherwise reach in the short term.

### ii) "Multi-tenancy"

The second difference relates to the notion of "multi-tenancy" in the SaaS provider's software technology. In essence, multi-tenancy means that only one "instance", or installation of the software, is required for many different customers.

Each customer's data is securely separated from other customers' data. This means the cost of maintaining the software is lower and upgrades can be conducted more easily than with multiple instances of the software, as was the case with the ASP business model.

### iii) Internet Browser

A third difference is that the user need only have an Internet browser, such as Microsoft Internet Explorer, to access and use the software. This means that it is not necessary to install any software on the user's PC to operate the software.

This is not an exclusive preserve of the SaaS model, as it is currently promoted. It has been possible to do this for many years with Citrix software, as we explain further in this document.

### iv) Self-service

The fourth factor is self-service. The idea of self-service began with the innovation of supermarkets, followed by ATM machines, and has become widespread in recent years. The self-selection of airline tickets and seating through the Internet has become a widely adopted example of self-service in recent years.

Self-service shifts the costs and time to deliver services from the provider to the consumer. The consumer often embraces the self-service model because it allows the consumption of the service to take place at a time, geographic location and pace which suits the consumer while simultaneously avoiding the queues and delays involved in waiting for a supplier's service representative to perform the task in a traditional manner.



### • What Are the Benefits of SaaS?

The key benefits of software-as-a-service are that firms only pay for what they use, there is no under or over-provisioning of software licenses, a third party provides all of the IT infrastructure to deliver the software and, manages upgrades to the software while the firm's users are able to access the applications from wherever access to the Internet is possible.

### i) "Pay-only-for-what-you-use"

The SaaS business model is based on consuming the service "on-demand". This usually means the service can be switched on and off at will by the consumer, without contractual barriers to exit.

In reality, lower prices offered for longer term commitments, as well as the relative importance of the software to the consumer, often leads to a more "sticky" relationship.

In line with the "on-demand" benefit, SaaS, together with most other cloud computing business model variants, delivers a "pay-only-for-what-you-use" feature and benefit.

### ii) Avoid Under and Over-provisioning of IT Software Licenses

This is a highly attractive benefit to anyone who has experienced the cost of over-provisioning an IT resource. The ability to match supply and demand and pay only for the supply actually needed is an inherent attractive factor in cloud computing.

The number of "shelf-ware investments" is testimony to this principle. Firms may purchase more software licenses than is necessary at the time to allow for uncertain growth in user numbers, simply fail to fully implement the new software, or the firm attempts to capitalise on volume discount pricing and ends up with unused software licenses "on the shelf". The SaaS business model helps to overcome the over-provisioning problem.

### iii) Third-party Provides IT Infrastructure and Software Upgrades

A key benefit of SaaS business model is that the software vendor manages the performance of the software application, develops and implements software upgrades and provides the IT infrastructure to run the application and store the end user client's data.

### iv) Users Access SaaS Software from Almost Anywhere, at Any Time

Another benefit of SaaS software is that it may be accessed by a client's users from almost anywhere a user has access to the Internet.

This advantage is not an exclusive SaaS benefit, as traditional software applications may also be accessed from almost anywhere a user has access to the Internet, using technologies such as Citrix.

### • What Are the Disadvantages of SaaS?

The two principal disadvantages of SaaS are that users usually cannot control the timing of software upgrades and that some integration and performance issues may arise.

### i) Users Usually Cannot Control SaaS Upgrades

One drawback of the multi-tenant SaaS delivery model is that often firms are unable to select when upgrades happen and that sometimes software upgrades may expose security risks.

# ii) Multiple SaaS Sources May Create Integration and Performance Issues

As firms use SaaS applications from disparate providers, issues of integration and performance may emerge.

Since each SaaS vendor maintains its client's data in physically separate data centres, often distributed around the globe, the requirement for different software applications to have the right piece of data available at the precise moment to optimise processing performance, may mean some deterioration could occur.

In addition, if multiple SaaS providers are used for different parts of the business, the traditional issues of software integration will remain. This problem may be compounded by the disparate software development platforms used and the variable capability of the software integration "hooks", or application program interfaces (APIs), provided by the SaaS vendor.

### Does "Multi-tenancy" Matter?

Many SaaS vendors argue their case from a technology standpoint in terms of, for example, whether their software application is multi-tenanted or uses a Web browser efficiently. From the client firm's point of view, however, the fundamental point is that it is the business model that counts.

That is, the relevant business questions are:

- i. Does the client business only pay for what it actually uses?
- ii. Does someone else manage and deliver the software applications?
- iii. Is the company's data safe and secure?
- iv. Can the company ignore the problems of IT scalability?
- v. Can the firm's users access the applications from virtually anywhere, at any time, with a Web browser?



The technology the SaaS provider is using is not relevant to the client firm in most practical situations. The cost and complexity or simplicity for the SaaS provider will help determine their costs and pricing offers, but it does not matter too much to the client firm or its users.

### Many People Use Cloud Computing Without Knowing It

Many people now use cloud computing every day without knowing it is called that. Anyone engaging in social networking (or some would call social "not-working", when engaged during business hours) using sites such as LinkedIn, Bebo, Twitter and FaceBook, or watching videos on YouTube, or storing photos on Flickr, understands intuitively that the software required to run these sites and the location of their data is somewhere other than on their PC or laptop, and resides somewhere else, now called a "cloud".

Although it may not be common knowledge within most firms, many employees now use software delivered as a service without the firm's IT team necessarily knowing about it. It may be as simple to subscribe to the service as the swiping of a credit card. The integration and security of company data is often an afterthought.

### • Who Are the Current Leaders in the SaaS Market?

The commonly discussed leaders in the SaaS market are Salesforce.com, offering CRM and Google, offering Google Apps, a competitor to Microsoft Office, and Gmail, a competitor to Microsoft's Exchange/Outlook e-mail. Many IT industry commentators discuss how Microsoft has arrived late to the cloud computing party.

Microsoft recently launched a cloud computing service comprising Exchange e-mail, and SharePoint collaboration software.

### • Microsoft is an Unheralded Pioneer in Cloud Computing

Microsoft has been a long-standing member of the SaaS community through its business partners. For a number of years, Microsoft business partners have offered Office and Exchange e-mail over the Internet and via dedicated communications links.

While Microsoft Office has been delivered via Citrix, a software delivery technology described further below, hosted Exchange/Outlook e-mail has been multi-tenantable and accessed through the Internet since its inception.

This business model is almost identical to the SaaS model in practical terms. The Microsoft business partner "rents" the software application to the firm's users on a month-to-month basis, and the firm only needs to rent as many individual licenses as it requires.

The business partner pays Microsoft only for the actual usage, in accordance with Microsoft's Service Provider License Agreement (SPLA). At no additional cost, the current version is offered. This arrangement originated in the late 1990's with the emergence of the ASP business model described above.

# • Microsoft Business Partner Leadership in Cloud Computing is Under the Radar

The long-standing cloud computing access to Microsoft's key productivity software applications has largely operated under the radar and is relatively unknown in the wider community, as well as among many IT professionals. As a result, Microsoft has suffered in its image as a technology laggard with respect to cloud computing.

New versions of Microsoft's highly successful collaboration software SharePoint and its CRM applications, together with Exchange/Outlook e-mail, have been available as a monthly pay-per-user, hosted cloud computing service from Microsoft SPLA business partners for several years.

# Selection of Application Software – SaaS or On-Premise Delivery? Does It Matter?

As we noted earlier, it is the functionality of the software portfolio chosen, together with software customisation and the integration of data exchange, as a match to the firm's desired business processes, as dictated by its competitive business model, that is most important, not how the software applications are delivered to the firm's users

or the software vendor's pricing model.

"The rise of the cloud is more than just another platform shift that gets geeks excited. It will undoubtedly transform the information technology (IT) industry"

The Economist, October 23, 2008

That critical software application selection should be made independently of the on-premise versus SaaS delivery model decision, except with respect to the underlying issues of security, reliability and data integration.

The selection of new software applications for key functions is never taken lightly. Few CEOs will not have experienced the pain, cost and disruption of new software adoption.

The switching costs and challenges of user education, customisation, integration, and the time required for the adoption of new processes among users, resulting from changes in the organisation's software portfolio cannot be under-estimated.



### How Do You Find Your Line-of-Business Software Functionality in the Cloud?

Should the firm wait until most, or all, of the functionality required in line-of-business applications are available as a SaaS offering? If all existing software applications are considered to be "legacy", when does it make sense to change them, when faced with the new paradigm of cloud computing? If the history of the evolution of new software models is any guide, this could be a long wait in today's business environment of highly pressured time constraints.

The answer to this critical question is that there is a "mix-and-match" solution available right now. We will discuss this best of both worlds option further below.

### 2) Infrastructure-as-a-Service

The second stream of cloud computing is described as infrastructure-as-a-service, or IaaS. Infrastructure usually means the provision of server computing capacity, data storage and some ancillary service, provided by a third party on a pay-as-you-go basis "on-demand", often by just using a credit card.

### • "Rent-a-Server" Service Has Been Around For a Long Time

While dedicated servers have been available for rental from traditional IT hosting providers for many years, the notion of being able to gain self-service access to pre-configured server capacity and associated data storage, with a credit card transaction, is relatively new.

### • Utility or On-Demand Computing Were Early Terms for IaaS

Prior to the cloud computing term becoming popular in 2007 to 2008, this type of infrastructure rental was called utility computing or on-demand computing.

A good metaphor for utility or on-demand computing is to compare the difference in modes of supply of potable water to a household. If a property is located in a rural area and uses rainwater-fed storage tanks for the supply of potable water, the users will worry about at least two important potential problems.

The first potential problem is microbes in the water, which may be considered to be a proxy for IT security. The second potential problem is drought or simply running out of water. This could be considered a proxy for IT scalability.

If the household users were offered an alternative, whereby they could turn a tap and receive drinking-quality water, in unlimited supply, and only pay for what is actually used, what would they do?

This example may be considered a match to the business model difference between on-premise IT infrastructure and utility or on-demand computing

### Amazon.com is the Pioneer in Modern "Infrastructure-as-a-Service"

The origin of the current incarnation of infrastructure-as-a-service is usually attributed to Jeff Bezos, founder and CEO of Amazon.com. While most people would view Amazon as primarily an e-commerce vendor of many products, the infrastructure required to operate the Amazon e-commerce Web site is enormous.

More to the point, sufficient IT infrastructure is required to manage the peak load of demand, which means that over 75% of transactions occur between Thanksgiving Day on November 25 and Christmas Day. This means that there is excess IT capacity in the other months. Mr Bezos considered that if Amazon made some of that capacity available to rent on demand, a return could be earned from that spare resource.

Accordingly, Amazon was the first major enterprise to offer IT infrastructure, comprising base operating system, server and data storage capacity, as a service. Obviously, Amazon is not a traditional player in the IT market.

Today, Amazon is considered to be the market leader in "bare metal" computing resource, as a service. The term "bare metal" means the user of the service is responsible for adding the layers of software required to provide a total computing solution.

### • What is Server Virtualisation?

An important enabling technology of infrastructure-as-a-service is server virtualisation. This technology has its origins in IBM mainframes of the 1960s and 1970s, and has been reinvented to apply to Intel servers.

In essence, virtualisation allows multiple "virtual" servers to co-exist on the same physical server. Traditionally, a new server would be provisioned for each new software application the firm introduced. This led to a proliferation of physical servers, consuming more energy and management time than necessary.

### • Server Virtualisation Is Not Cloud Computing

Server virtualisation is an enabling cloud computing technology. It is not cloud computing per se. A firm introducing server virtualisation on its on-premise servers will gain enormously from reduced server investment, energy use and management time, but server virtualisation does not equal cloud computing.



# Server virtualisation is an enabling cloud computing technology. It is not cloud computing per se.

### • Computing on a Credit Card

There are now many IT industry players offering computing and data storage resources, available on-demand as a service, with charges based on actual consumption, and usually arranged by online self-service with a credit card. The range and diversity in quality, reliability, support, security and pricing models demands a careful investigation of the market offerings. However, this type of cloud computing has fulfilled much of the early IT industry promise of "utility" computing.

### • What are the Major IT Players Doing?

The major IT players have gone much further. For some years Google has been building massive data centres in a global network. Following a little later, Microsoft has also been building massive data centres to deliver its own cloud services. For example, Microsoft recently commissioned a 70,000 square metre data centre in Chicago and a 30,000 square meter data centre in Dublin, Ireland. Literally billions of dollars have been invested.

Traditionally, IBM has built and maintained data centres for its own purposes, currently with approximately one million square metres of data centre space. In addition, IBM has built at least 13 new data centres dedicated to cloud computing in the past two years. HP is likely to leverage the enormous global spread of EDS's data centres, following its acquisition of EDS in 2008.

Even Apple announced recently that it was building a billion dollar data centre in South Carolina. This massive march of new data centre investment cannot be ignored.

All of the above examples of data centre building activity relate to the respective vendor's own requirements. In contrast, Amazon.com and many other IT vendors now provide infrastructure as a service to any third party user.

# • Who Are the Early Adopters of Infrastructure-as-a-Service?

The most common early adopters of this type of cloud computing service are:

- Startup Web software development firms
   who are able to quickly scale their
   computing resources, as and when needed,
   with just a credit card. Previously, Web
   software startups required massive and
   uncertain IT infrastructure investment.
- The second type of early adopter of IaaS is an enterprise IT department dipping a toe into the cloud computing waters and employing generic computing capacity for readily deployable computing resource, often to test new software applications, without an on-going financial commitment.



The battle of the Clouds

 The current global recession is also driving early adoption, as firms are naturally reluctant to add new IT fixed costs and capital expenditure and the lower cloud computing operating costs are appealing.

### 3) Platform-as-a-Service

The third stream of cloud computing is described as "platform-as-a-service", or PaaS. This is based on how software is written to be delivered over the Internet. PaaS is a new trend within cloud computing, and it is usually described as a "platform". A platform reflects the foundation upon which software is written.

The challenge of PaaS selection relates more to software developers who must make decisions on which platform "horse" to back in the cloud computing race.

There are at least three major IT players attempting to encourage software developers to follow their path.

 Google offers software writers a development platform as well as computing capacity and an open source Web browser, which is optimised for this type of software development.



- Salesforce.com, an early and leading player in the SaaS market for CRM, is attempting to create a development platform for ancillary solutions.
- Finally, Microsoft, a late entrant into cloud computing, is providing its new Azure software development environment for its legions of software development partners.

The evolution of new applications based on the new cloud computing development platforms will take some time. The co-existence of new cloud computing "native" software applications, or those "born on the Web", together with traditional "client-server" applications currently used by most businesses, will pose an integration challenge and a mixed delivery model for some years to come.

### Other Cloud Computing Business Models and Acronyms

Other business models and associated acronyms in the cloud computing space describe sub-segments of the above three main streams. Examples include:

- "storage-as-a-service", for on-demand data storage, from many providers including Iron Mountain
- "computing-as-a-service", as recently announced by Verizon
- "applications-as-a-service", as recently announced by Unisys

Other cloud computing terms being bandied about at present include "desktop-as-a-service", "security-as-a-service" and "anything-as-a-service".

The new paradigm of cloud computing is faithful to, and maintains, the computer industry's traditional history of acronym inflation.

### What Does Cloud Computing Mean for Your CFO?

In many organisations the CFO, or Chief Financial Officer, often has overall responsibility for IT. The CFO will have the same concerns about security that the CIO will have, although on a less technical level.

Provided the CFO can be convinced that any security issues may be satisfied, the CFO is likely to warmly embrace the value proposition of cloud computing.

The CFO may initially see more value and benefit to be gained from cloud computing than the CIO, for the following reasons:

- ability to fix the cost of delivering the firm's software applications to its users
- only pay for actual usage
- pass the problems and costs of scalability, both up and down, to an external provider
- avoid capital expenditure
- reduce IT complexity
- access to enterprise-class computing, one user at a time
- gain from the cloud computing provider's economies of scale of IT capital investment and IT skills

The above benefits are very readily appreciated by a CFO.

The business and financial parameters offered by the new cloud computing paradigm means that a whole new methodology to evaluate the return on investment (ROI) and total cost of ownership (TCO) of IT resources will be necessary.

The reduction in IT complexity and access to enterprise-class computing, one user at a time, allows the firm's CFO scope to focus on the value-creation elements of the firm's software applications and processes, which provide its competitive advantage.



### What Does Cloud Computing Mean for Your CIO?

The answer to this question depends upon what you want your CIO, or Chief Information Officer, to do within the firm. A CIO who is determined to add value to the firm's market success will focus on how the IT function can create value for the firm's:

- own users
- industry supply-chain partners
- service providers
- business partners
- customers and clients

# • If Owning and Running IT Infrastructure Cannot Create Value, Then Why Do It?

If the ownership, maintenance and running of a firm's IT infrastructure cannot build any competitive advantage for the firm, the CIO will understand that viable alternatives should be evaluated.

It is often revealed by industry surveys that up to 70% of a typical firm's IT staff and budget are engaged in maintaining existing systems, rather than building new capabilities. This is the IT challenge to which cloud computing offers the most promising solution.

Employing staff to run and maintain a firm's IT infrastructure may actually reduce, rather than add value to the firm's competitive position, if a lower cost and, potentially, a more secure and flexible alternative is available.

After all, providing the IT infrastructure used to deliver the firm's software applications to its

The CFO may initially see more value and benefit to be gained from cloud computing than the CIO.

users is secure, reliable and cost-effective, no matter whether it is provided by internal or external resources, that IT infrastructure cannot add any more value to the business than paying any other administrative expense, such as office rental.

### Cloud Computing Means the CIO Can Remove the Shackles of Maintaining IT Infrastructure

In the cloud computing environment, the CIO has an opportunity to remove the shackles of maintaining IT infrastructure. As a result, the CIO is better able to focus on ensuring the disparate software applications the firm uses to develop its competitive advantage are well integrated for its users.

"Instead of buying computers and software, many companies want cloud computing services in which they pay monthly fees to companies that run the software for them"

BusinessWeek, May 11, 2009

Most importantly, the CIO and his or her staff will be able to focus on adding value to the firm through the relevancy of the software applications the firm uses, their integration with each other and the agile support of the business processes the business depends upon to build its competitive advantage.

### Automation is Likely to Eliminate Many IT Infrastructure Jobs in the Near Term

Τt is, realistically, largely inevitable that in the near term the current role that infrastructure support engineers provide in enterprises of all sizes will be eliminated by automation. Cloud computing providers, with their economies of scale and market-driven competitive motivation, will lead the field. Accordingly, cloud computing will help to dramatically transform the traditional IT department.



### • Cloud Computing is a Disruptive Innovation for the Firm's Own IT Staff

It is clearly evident that cloud computing is a disruptive technology for the firm's own IT staff, as well as industry technology providers. There will be an inevitable resistance to anything that may threaten job status and employment prospects. A CIO will recognise this situation and carefully examine any objections to the adoption of new ideas, even if it may mean a reduction in the number of his or her IT team employees.

### • The CIO May be Viewed as the "Chief Integration Officer"

As most firms will almost certainly want and need to continue to employ existing legacy software, while also engaging new software applications delivered by third party providers through the "cloud", the CIO's integration challenge will become more complex. Previously, all or most of the organisation's software applications would run on servers within the firm's own firewall, and disparate applications and the exchange of relevant data between them was less complex.

Accordingly, the CEO may also view the CIO's role as the "Chief Integration Officer", responsible for ensuring the disparate software applications, irrespective of the cloud source from which they may be delivered, are secure, reliable, cost-effective, and exchange data as they should.

In this role, the CIO would devote more time and resource to managing the integration of external cloud computing providers, including the likely multiplicity of software-as-a-service providers, as well as their business relationships.

### Legacy "Line-of-Business" Applications Will Provide an On-going Challenge

It is also likely that the firm's "legacy" line-of-business applications, which support the firm's unique competitive advantage business processes, will not be readily available from emerging SaaS providers for quite some time, and there will continue to be a challenge of integrating and delivering the multiplicity of data sources to the firm's users.

Indeed, it is unlikely that it will be possible to find software functionality from SaaS providers that match the firm's specific business processes at all, particularly if there is already heavy customisation of standard on-premise industry-specific software packages. Even if there were a close match, the firm would be driven to seek further customisation to distance itself from its competitors.

# • Internal and External Application Support Staff Will Still Be Needed for Some Time

The IT staff a firm employs either directly, or indirectly through its software application vendors, for the development and customisation of its "legacy" competitive advantage software applications, will likely continue for quite some time.

This is a critically different situation with respect to the IT staff a firm employs to deliver its software applications to its users, and we will consider the implications of this shortly.

### • Performance Evaluation of CIO's Will Change with Cloud Computing

In the near future, the measurement of CIO performance will likely shift from a traditional IT "production" environment, to one measured on the effectiveness of cloud computing business partner relationships and the contribution those relationships have towards adding value to the firm's competitiveness.

The future CIO's evaluation and remuneration will, most likely, be less focused on the staff numbers reporting to the CIO position and the annual IT capital expenditure budget and more on the ephemeral, and less quantitative, criteria of value creation.

# What Are Some of the Barriers to the Adoption of Cloud Computing?

Surveys of CIO intentions to adopt cloud computing, primarily in the USA, frequently reflect concerns about security as being the number one impediment to the adoption of cloud computing.

This concern covers several security aspects, some of which relate to on-premise IT as well as cloud computing. Some of those security elements are reflected in the following panels.

For cloud computing providers to succeed in the market place, these concerns must be addressed. Some are technical issues that apply whether the firm's software applications are delivered from an on-premise solution or a cloud computing solution. These matters should be dealt with by a careful due diligence check on the cloud computing provider's processes, reference checks and testing.



### SECURITY ISSUES FOR BOTH ON-PREMISE AND CLOUD PROVIDERS:

- 1. Security of and access to company data
- 2. Privacy of data
- 3. System uptime
- 4. Latency, or responsiveness of keystrokes to screen refresh, performance
- 5. Data restoration and disaster recovery capabilities
- 6. Frequency of necessary operating system "patch" updates to ensure on-going security vulnerabilities are reduced
- 7. Security of communications through the Internet and, encryption of company data

### SECURITY ISSUES FOR EXTERNAL CLOUD PROVIDERS:

- Degree of control in terms of independent audit access, legal agreement with performance criteria (Service Level Agreements or SLAs), practical enforceability of contractual terms and transparency into the provider's systems
- 2. "Lock-in" to the provider's unique offering
- 3. Standardisation and ease of mobility to allow a move of the software and data back to an on-premise arrangement
- Ownership of company data

The balance of the concerns may be addressed by the construction of a suitable engagement contract, clearly delineating the firm's ownership of its data, the process to move the firm's application software and data back to an on-premise arrangement, if required, access for a regular independent security audit and a regular review meeting arrangement with the cloud computing provider's senior executives.

# How Does Traditional IT Outsourcing Compare to Cloud Computing?

While there may be several common cloud computing elements in the outsourcing business model, the cloud computing model breaks the traditional IT outsourcing fixed cost pricing model so that firms only pay for what they actually use.

# Cloud computing represents a disruptive business model innovation to the traditional IT outsourcing business.

The user benefits of self-service, easy scalability and a predictable per user pricing model are fundamental differences. The cloud computing business model focuses on the benefits derived from economies of scale, whereas most traditional IT outsourcers have "islands" of technology dedicated to each client firm.

As there are many different variations of traditional IT outsourcing, it is not possible to be definitive for each comparison, but it is unlikely the traditional IT outsourcer would offer the crucial business benefits of flexible pricing, self-service and easy scalability that accrue from cloud computing.

	Traditional IT Outsourcing	Cloud Computing Provider
Pay only for use – variable cost per user	No	Yes
Benefit from economies of scale	Unlikely	Yes
Self-service capability	Unlikely	Yes
Easy scalability	Unlikely	Yes



Cloud computing represents a disruptive business model innovation to the traditional IT outsourcing business. The main antidote for a disruptive technology is to create a new stand-alone entity, free to operate independently of its parent. If that does not happen, the challenge of trying hard to put the new idea or technology into the same old business model will remain.

The move from a fixed service charge to a variable per user pricing model may pose a significant challenge to some traditional outsourcing providers.

Client firms will greatly benefit from the competition generated by dedicated cloud computing providers with their economies of scale in shared resources. As noted above, traditional outsourcing providers typically have isolated pockets of IT technology dedicated to individual client organisations.

As a result, a cloud computing services provider may potentially offer lower prices and more flexibility. In addition, a cloud computing service provider may offer stronger security than a traditional outsourcing provider because the entire portfolio of client "outsourced" environments is treated as one, thus reducing the complexity of overall security and the possibility of errors and omissions.

### **Firms Using Outsourced Data Centres**

If an organisation's own IT staff manages all of its own servers in an outsourced data centre facility, the comparison is more correctly made between an internal cloud and an external cloud. Benefits from a more secure physical environment are certainly achieved, but not the main benefits to be gained from cloud computing.

Relocating a firm's IT infrastructure to an outsourced data centre may address the challenge of uncertain investment in on-premise data centre resource as well as provide stronger environmental protection. In addition, the firm will likely only pay for actual resources consumed.

However, unless a third party owns and manages the infrastructure and charges on a pay-only-for-usage basis, the firm will still be faced with most of the disadvantages of an on-premise solution, namely, the need for scarce IT skills to be retained, ongoing technical complexity and continued fixed costs.

### **PART FOUR:**

# Internal clouds miss the point and most of the business benefits of Cloud Computing

### **Internal Cloud versus Public Cloud**

It may appear that many of the concerns one may have of security within public clouds could be avoided if the firm built its own internal cloud, using the same technologies as a public cloud provider. We need to begin with some working definitions to help with this debate.

### • What is an Internal Cloud?

An internal cloud is generally understood to be a computing cloud which is created and managed by the firm's own IT staff, with assistance from external IT vendors.

The firm uses cloud-type technologies such as server virtualisation, but owns and keeps its IT infrastructure within its own data centre and within its own security firewall.

An internal cloud is also sometimes described as a private cloud, although this is ambiguous as private clouds may be securely established within public clouds, as we consider further below.

### • There is No Such Thing as an Internal Cloud

The term "internal cloud" is a misnomer. The term "cloud" is simply the wrong word to describe an on-premise computer system. The use of the word cloud simply confuses the idea of cloud computing. If the computing services are not being provided by a third party over the Internet, then it is not cloud computing. IT vendors, and many internal IT staff are strongly motivated to promote the term "internal cloud", but it is largely meaningless, as we shall examine shortly.

### • What is a Public Cloud?

By contrast, a public cloud is provided by an external service provider, outside the firm's own firewall. Obviously, the quality and competency of external cloud computing providers varies.



A public cloud is also referred to as an external cloud. Accordingly, the second column of the table entitled "How Cloud Computing Models Compare" is described as a "public external cloud".

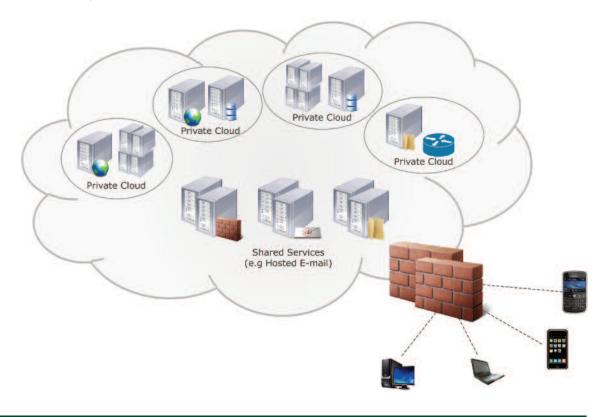
### • What is a Private External Cloud?

The concept of a private external cloud is that a public cloud computing service provider is able to securely segment different client firms from each other. This structure allows either a hybrid cloud, defined as a combination of an internal and external cloud, or a private cloud computing space logically and securely dedicated to a single firm.

Amazon introduced its private cloud offering in September 2009, and this allows either a hybrid cloud or a dedicated private cloud.

The term "cloud" is simply the wrong word to describe an on-premise computer system.

### **Private Clouds in a Public Cloud**



The graphic entitled "Private Clouds in a Public Cloud" illustrates how some cloud computing providers create separate logical and physical private clouds within a public cloud context. Shared services such as e-mail are used by many different organisations with the respective firm's data being kept isolated from the other users, as we explained in the section describing the term multi-tenancy.

The private clouds are often established with a separate firewall between each private cloud. This provides the best of all worlds whereby firms can take advantage of the scalability benefits derived from shared resources, while also gaining secure private clouds for sensitive application delivery.

### • What is a Managed Private External Cloud?

Adding the word "managed" transforms the entire public cloud computing model structure. The expression "managed" means that an external cloud computing provider adds value to the firm by taking active responsibility for the performance and delivery of the services.

These services may be the delivery of the firm's applications to its users or similar. This is in contrast to most external cloud computing services which are provided to knowledgeable IT professionals who use low-cost cloud computing for their own requirements.

In addition, the managed external cloud is private, as defined above, to be logically and securely separated for the dedicated purposes of one firm.

The features of a managed private external cloud are compared to the features of an internal cloud and a public external cloud in the following table, as well as further examined in a later section. The managed private external cloud is also considered in this context to provide enterprise-class quality computing, which is also defined in a later section.

### What is a "Hybrid" Cloud?

The idea of a "hybrid" cloud is premised on the combination of an "internal" cloud, as described above, and the use of an "external" cloud to cope with surges in the demand for computing resource.

Apart from all of the inherent drawbacks of an internal cloud described below, the technology required to smoothly transition capability between the two is still immature at present. Apart from some simple examples, the complexity required to achieve this at present will likely out-weigh any perceived benefits.



### **How Do the Different Cloud Computing Models Compare?**

Would a firm gain the same advantages of cloud computing if it used an internal cloud instead of an external cloud? Let us consider some of the differences.

A number of key attributes are considered in the previous table under the three cloud computing models described above.

How Cloud Computing Models Compare	Internal Private Cloud	Public External Cloud	Secure External Managed Enterprise-class Cloud
Server Virtualisation	Yes	Yes	Yes
Economies of scale	No	Yes	Yes
IT Complexity	High	Low	Low
Fixed Cost of IT	High	Low	Low
Pay only for use	No	Yes	Yes
Capital Expenditure	Yes	No	No
Commercial Drivers			
To Perform	Low	High	High
Captive User Market	Yes	No	No
Self-service	Unlikely	Yes	Yes
Transparency	Uncertain	Opaque	Clear
IT Skills Required	High	Low	Low
Under/Over Provisioning Risk	High	Low	Low
Engagement Contract	Uncertain	Weak	Strong
Customised SLAs	Yes	No	Yes
Lock-in/move back	NA	Uncertain	No
Security	Uncertain	Uncertain	Strong
Meet the Service Provider	NA	Unlikely	Yes
Clear and Certain Costs	No	Yes	Yes

### **Should a Firm Build an Internal Computing Cloud?**

While many of the technologies a cloud computing provider would use to build an external cloud are available to build an on-premise, or internal cloud, the idea and perceived benefits of an internal cloud are largely spurious, for the following reasons.

The idea and perceived benefits of an internal cloud are largely spurious.

### No Commercial Drivers to Lower Internal Cloud Computing Costs

The critical difference between internal and external computing clouds is that there are no commercial drivers present in an internal cloud that work to squeeze out any excess costs in the same way that an external cloud computing provider would otherwise be forced to do under intense market competition.

### • Avoiding External Cloud Computing Provider's Profit Margins is Unlikely

It could be argued that an internal cloud would avoid the profit margin that an external provider would seek. While that may be the case, there is no competitive pressure to ensure that an internal cloud would be provided at a lower cost, even after allowing for a profit margin.

### • An Internal Computing Cloud Has a Captive Market of Users

An internal cloud has a captive market of the firm's users. There is no external market discipline force bearing on the drive for efficiency, pricing and performance.

The prospect of losing a client focuses an external provider's mind on improving its performance. An internal cloud has none of that discipline and cannot artificially create it.



### • An Internal Cloud is Still a Fixed Cost

Critically, an internal cloud is a fixed cost inside the business, no matter how imaginative the IT charge-back process may be. Even if business units were charged for their IT consumption on a pay-per-use model in line with external cloud computing providers, the total fixed costs within the total firm will not vary.

While there may be some behavioural benefits to be gained from a more consumption-based charging system, they are unlikely to match the incremental costs of an internal cloud.

### • Problems of Under and Over-provisioning of IT Resource Will Remain

The problems of over and under-provisioning of IT resource will not go away with a wave of the internal cloud wand.

### • Complexity of Internal IT Will Remain

Complexity in IT will also remain. Indeed, the costs and complexity of building an internal cloud and the scarce IT skills required to build it will likely offset any perceived or real benefits.

### • Capital Expenditure on IT Continues

The firm's capital expenditure requirements will remain, as nothing has really changed.

### • IT Skills Still Required

As the firm building and maintaining an internal cloud will continue to require highly skilled IT staff, no benefit will accrue in this regard from an internal cloud.

It could be argued that the skills to build an internal cloud will create demand for new and more scarce IT skills, thus compounding the scarcity and cost issues of internal IT skills.

# An Internal Cloud Misses the Point and Most of the Business Benefits of Cloud Computing

An "internal cloud" may offer an inherent appeal in terms of security because it is inside the firm's firewall and managed by the firm's own IT team. However, an "internal cloud" largely misses the point, as well as most of the business benefits to be derived from using an external cloud.

The key benefits to be derived from using an external cloud computing provider are that IT infrastructure costs are converted from fixed expenses to a variable, pay-only-for-what-you-use financial model, and the firm gains from the competitive tensions generated by competing cloud providers, resulting in better service offerings.

All of the issues related to matching IT infrastructure resource, whether scaling demand up or down, still remain. IT infrastructure costs will still remain fixed, no matter how much divisional charge-back machination takes place.

The term "internal cloud" is specious. While the idea of an internal cloud is superficially plausible, and inherently attractive to incumbent IT vendors, systems integrators and some internal IT staff, the term is totally misleading and used incorrectly.

While the deliberations about internal versus external clouds may seem like a religious debate, the key component in the definition of cloud computing is that the enterprise does not have to own and run its IT infrastructure.

If your IT team is building IT infrastructure inside your own firewall, or external security perimeter, and running it themselves, it is not cloud computing.

As we note above, there is no such thing as an internal cloud. Why has this term been so strongly promoted by IT vendors? Let us consider some of the reasons.

An "internal cloud" largely misses the point, as well as most of the business benefits to be derived from using an external cloud.



# Why Does an Internal Cloud Have a Strong Appeal to Some CIOs?

The idea of building an internal computing cloud within the firm's own firewall has many attractions to some CIOs. The reasons for this, though, may not always be based on business logic, as we shall examine below.

### • "An Internal Cloud Overcomes the Security Issue"

As noted above, frequent surveys of CIO's attitudes to cloud computing consistently place security issues as the most important barrier to the adoption of cloud computing.

It is ironic that the evidence shows that most security breaches occur from inside, rather than from outside the firm.

In this context though, security is correctly positioned as the main objection to using external cloud computing providers.

However, we will consider further below why the security objection to using an external cloud computing provider may mask a different motivation.

### • "The 'Cloud' Is Hot, and I Want One"

As with many new and exciting changes, it is human nature to want to seek them out. The rapid growth in the acceptance of the idea of cloud computing and the "buzz" within the IT industry naturally stimulates the appetite of IT professionals to participate.

Peer pressure, status-seeking behaviour and the thirst for new and challenging endeavours may lead to a less than rational demand for an internal computing cloud.

In addition, the building of an internal cloud would provide an opportunity for the firm's IT professionals to update their technical skills in the face of a new transformation in the IT industry, thus preserving their own marketability.

### • "Don't Worry, We Are Doing It Ourselves"

When the CEO or CFO asks the CIO about the benefits of cloud computing and what he or she is doing about it, the chances are the response would be: "Don't worry, we are doing it ourselves".

This response implies that the benefits of cloud computing can be secured with an internal cloud. The sections considered above have clearly proven the point that an internal cloud provides almost none of the business benefits that a secure external private cloud delivers.

### • "We Are Virtualising, It's Cloud Computing"

Virtualisation of servers is a good idea. It reduces the number of physical servers required, lowers energy costs and usually lowers management time. The ROI from virtualisation is well established. Server virtualisation is a building block or enabling technology of cloud computing.

However, server virtualisation is not cloud computing. The positioning of server virtualisation as cloud computing is a self-defence reaction by IT vendors and some professionals who are threatened by what we describe as external cloud computing.

### "Our Trusted IT Vendors Advised Us to Build An Internal Cloud"

As we considered earlier in regard to the disruptive nature of the emergence of the cloud computing business model innovation, almost all sectors of the IT industry face a scary challenge.

If computing moves to a smaller number of service providers, rather than to the end-user organisations where it is at present, IT vendors will face a smaller number of potential customers and lower revenue. Market power will shift to cloud computing providers over time, thus lowering prices and potential market size for IT vendors.

Resellers, systems integrators and IT consultants are in a similar position. As the traditional on-premise business model makes way for the external cloud computing model, business opportunities will diminish accordingly.

Some CIOs, together with some of his or her staff with a heavy investment in on-premise infrastructure technical skills, may also be threatened by the new paradigm of cloud computing.

Often, CIO's are guided by their leading IT vendors and their value-added resellers in determining their IT strategy.

The three parties all share the same challenge. As computing moves to the cloud, on-premise computing will diminish, along with market opportunities and jobs.



It is natural, therefore, to view the response to cloud computing from the traditional IT vendors as a marketing strategy, rather than a technology strategy.

By adding the word "cloud" to traditional on-premise products and promoting the concept of an "internal cloud" IT vendors hope that their obfuscation and confusion-generating marketing hype will distract from the real underlying market trend.

While it may be difficult to find a single definition of cloud computing, virtually no credible commentator describes an internal cloud as cloud computing.

The three parties of IT vendor, added-value resellers and some CIOs have a vested interest in disguising conventional virtualisation as an internal cloud, in an attempt to maintain the status quo.

### **Objections to External Clouds Are Often Hidden Objections**

A hidden objection is something almost everyone uses every day in conversations with almost everyone. A "hidden objection" is a concept well understood by salespersons managing a sales cycle.

A sales prospect may offer a reason why he or she may or may not want to buy a product or service. The nominal reason may be very plausible, but it "hides" the true objection or reason the sales prospect may have.

An example may go something like the following:

A person walks into a car showroom to closely examine a shiny red sports car. The salesperson quickly engages and it is clear the viewer has an in-depth knowledge of the car and appears to be a serious buyer.

After a promising conversation, the potential buyer asks whether it is available in white. After being told the car is not available in white, the prospective buyer loses interest and states that he will have to "leave it".

The salesperson is given the impression that the reason the prospective buyer did not proceed is that the car was not available in white.

However, the true reason or reasons, or the "hidden objections" could be that he could not afford it, his children would never fit in the tiny back seats or that his wife would never let him buy it.

Hidden objections take place, often subconsciously, with respect to attitudes towards external clouds.

The same process of hidden objections takes place, often subconsciously, with respect to attitudes towards external clouds.

Hidden objections take place, often subconsciously, with respect to attitudes towards external clouds.

The objections may, on the surface, relate to security concerns or IT vendor advice, while the true or hidden objections may relate to peer pressure, IT vendor encouragement, fear of diminished job status and many other reasons.

Accordingly, the CEO will benefit from an understanding of cloud computing to provide a knowledgeable decision-making framework, as well as understanding the underlying motivations of the various parties.



### **PART FIVE:**

# How can we use Cloud Computing today?

What if all of a firm's current software applications could be delivered from the "cloud" today? What if all of the firm's legacy software applications, their specific customisation functions, as well as all of the current integration solutions, could be delivered securely and reliably from the cloud, right now?

If all of the benefits of cloud computing IT infrastructure could be realised today, what would you ask your CIO to do?

### What is One IT Industry Leader Doing?

Firstly, let us look at what one of the IT industry's dominant leaders is doing to enable this capability. On June 16, 2009, IBM announced a number of new cloud computing initiatives. Among them, was an announcement that IBM would soon be offering a virtualised desktop, using software technology from Citrix and "thin clients". What does that mean?

Under this scenario, IBM runs the firm's software applications from its own data centres, and delivers the software applications to the firm's users, employing Citrix and other technology as the software delivery mechanism.

### • What is Citrix Software?

Citrix is a mature product suite, with over 20 years of development and refinement. The software is used to deliver software applications developed with Microsoft or Unix/Linux operating systems to PCs and thin clients.

Citrix software, together with the operating system software from Microsoft or Unix/Linux, processes and stores the firm's data in centrally located servers located in IBM's data centres, rather than on local PCs or on-premise servers.

If all of the benefits of cloud computing IT infrastructure could be realised today, what would you ask your CIO to do?

### • What is a "Thin Client"?

With thin clients, or the use of existing PCs acting as thin clients, only mouse clicks and keystrokes are transmitted to the servers, wherever they may be, and only screen refreshes are sent back to the user. All data transmitted between the centrally located servers and the firm's users, is encrypted, or scrambled to military-strength, for security purposes.

In addition, the authentication of any user, or the authorised permission for any user to access the firm's data and software applications, remains under control of what is known as Microsoft's Active Directory or the equivalent Unix/Linux process, just as it currently does for almost all on-premise IT systems.

### Cloud Computing May Offer the "Best of Both Worlds"

The recently announced IBM solution approach to cloud computing would appear to offer the best of both worlds.

On one hand, the firm may continue to use exactly the same software applications it does at present, including the most "crusty" of legacy applications, while also being able to gain from the benefits of cloud computing.

Of all the myriad cloud computing market options that exist at present, IBM's solution of a managed user desktop, providing access to all of the firm's software applications, delivered securely from an IBM data centre offers, arguably, the best of all worlds in the current evolutionary stage of cloud computing.

Indeed, it may well transpire that IBM will legitimise this method of delivering a firm's software applications to a corporate firm's users in the new 21st century paradigm of cloud computing, just as it legitimised the use of personal computers in 1981.



# What is a Secure External Managed Cloud, Delivering Enterprise-class Computing?

In order to evaluate the benefits and costs of cloud computing, it is necessary for us to set a benchmark understanding of cloud computing as a comparison.

This category of cloud computing model adds three critical components to the "public" cloud, as follows:

### i) The Cloud is Secure

The cloud is secure, as defined by specific technical, legal, governance and performance service level agreement (SLA) criteria. This level of security is clearly defined by an enforceable engagement contract, which is often customised to the client's own requirements.

Transparency into the cloud computing provider's systems is clear and accessible. Data custody, ownership and privacy are well defined. The ability and process to move the firm's software applications and data from the cloud computing provider back to an on-premise arrangement, is also clearly defined.

The prospective client is able to meet the people behind the cloud computing provider, in both technical and business leadership roles.

The essence of this model is that all of the security concerns a business may reasonably have, can be addressed with a higher level of visibility and customisation of the engagement contract, thereby dramatically reducing the risk of using an external service provider.

### ii) The Cloud is "Managed"

The second critical word is "managed". This means that the firm's external cloud is managed to the standards set out in the engagement contract, with commercial penalties for non-performance.

This cloud computing segment, defined as a "secure, external managed cloud" offers the best of both worlds to a business. Most of the benefits of cloud computing can be realised, while the business is able to tai the business relationship with its cloud computing provider, according to its specific governance requirements, and the delivery of its software applications and data to its users are fully managed according to that engagement contract.

### iii) The Computing Cloud is Enterprise-class Quality

The third fundamental difference is that the quality of computing delivered is equal to what one may expect from a large, well-run, large-scale enterprise. This concept is defined in a separate section of this document.

When cloud computing services are provided to an enterprise-class level, in a secure, managed, external cloud, the value proposition becomes compelling.

# What are the Key Business Benefits to be Gained from Cloud Computing?

To answer this question, it is first necessary to define the "flavour" of cloud computing we are describing, so that the essential business benefits to be gained from cloud computing are correctly matched to the actual cloud computing service being offered.

The major business benefits of cloud computing are lowering a firm's IT costs, providing stronger IT security and enabling a brighter IT future.

Following from the section describing how cloud computing can be used today, we define a secure, external, cloud managed service. delivering enterprise-class computing, as the benchmark against which the chief business benefits to be gained from cloud computing may be compared to traditional on-premise IT infrastructure as a software delivery model.

The major business benefits of cloud computing in this context may be summarised as lowering a firm's IT costs, providing stronger IT security and enabling a brighter IT future. Each principal benefit is examined in more detail below.

The major business benefits of cloud computing are lowering a firm's IT costs, providing stronger IT security and enabling a brighter IT future.



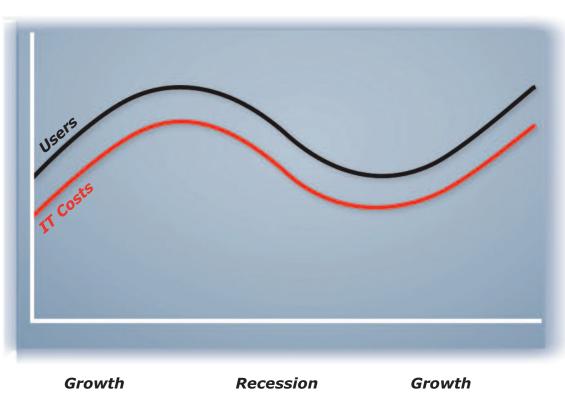
### 1. Lower IT Costs

Cloud computing provides lower IT costs for most firms because fixed costs are converted into variable costs, capital expenditure is avoided, energy costs are reduced, higher quality IT resource is made available at a lower cost than could be obtained for on-premise resources, and the uneven demand for highly skilled internal IT staff resource is avoided. We consider each factor below.

### a) Fixed On-premise IT Costs are Converted to Variable Costs

The essence of lowering a firm's IT costs from cloud computing lies in the business model offering that IT resources are consumed from a cloud computing provider and paid for on the basis of what is actually used. That is, a firm would have a pay-per-usage payment structure for some relevant usage metric such as data storage, computation time or software application usage, or pay-per-user on a "bundled" market offering, and so forth.

A CEO would readily appreciate the commercial benefits of this pricing model.



**Cloud IT Costs are Variable** 

### Most On-premise IT Cost is Fixed or Semi-fixed in the Short Term

Most on-premise IT cost is fixed in the short term. The cloud computing model converts these otherwise fixed IT costs into variable costs. This means that IT costs will vary exactly with the volume of usage and the supply of IT resource. IT costs are matched exactly with the firm's demand for IT resources. The costs vary, or are "variable", in direct proportion to the quantity consumed. No more and no less.

The benefit of cloud IT costs being a variable cost, which varies in direct proportion to the number of users, through growth and recessionary cycles, may be viewed graphically with the graph entitled "Cloud IT Costs are Variable".

Of course, all fixed costs in business become avoidable or discretionary at some time. For example, when a commercial rental lease for a property reaches the end of its fixed term, future rentals may be avoided if the lease is not renewed. While they are not the same as variable costs in nature, future fixed IT costs may be avoided.

For example, a suitable time for a business to take a serious look at cloud computing is when a major server refresh or otherwise major IT capital investment is contemplated. If the business invests in the new infrastructure and staff support, IT costs will remain fixed, usually during the life cycle of that investment.

Another view of this cost behaviour is to consider on-premise IT costs to be semi-fixed. That is, a combination of both fixed and variable costs. During an economic downturn, for example, a firm may shed some IT costs, depending on the source of cost. Reducing IT remuneration costs may work to some degree, but few firms could sell second-hand servers or software licenses for anything other than a pittance.

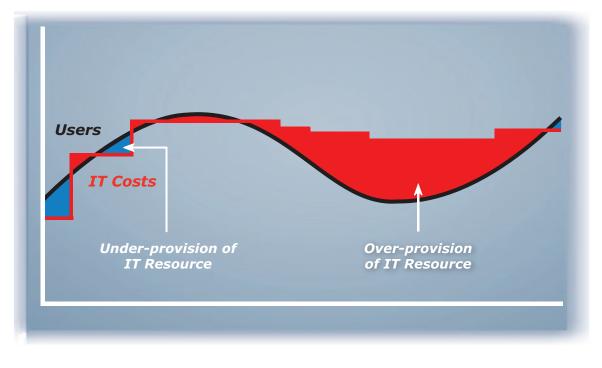
### • On-premise IT Swings Between Over and Under-provisioning of Resources

Another important problem with investments in on-premise IT is that it is inevitable that there will be swings between over-provisioning of resource and under-provisioning. Because internal IT investments are either indivisible in many cases, or because the upper limits of internal demand cannot be forecast with certainty, extra resource is often acquired "just in case".

The time lag experienced in adding new infrastructure because of annual budget cycles or just the order/delivery/implementation cycle time, adds further delays and under-provisioning gaps. Each time new IT resource is added, there is likely to be an over-provision gap, because the IT team often has little idea of what the future holds.



### **On-premise IT Costs are Semi-Fixed**



Growth Recession Growth

### **Economic Conditions**

In contrast, when a firm down-sizes as a result of a business recession or other reasons, the usual problem of under-provisioning reverses to become one of over-provisioning. It is very difficult to reduce on-premise fixed IT costs at the same rate as staff numbers are reduced.

The different cost behaviour models, comparing on-premise IT costs with cloud computing costs, under both growth and contraction business conditions, may be viewed graphically. The graph entitled "On-premise IT Costs are Semi-Fixed" illustrates how IT resources are often under-provisioned in times of economic growth (blue sections), while IT resources are often over-provisioned in recessionary times (red sections). Only rarely, with a growing and/or contracting firm will there be a perfect balance of IT resource.

#### b) IT Infrastructure Capital Expenditure is Avoided

Because the server, data storage and communications hardware and related operating system software resources are supplied by the cloud computing provider, the firm does not have to make risky, expensive and lumpy capital expenditure decisions for resources which have a lightening-fast rate of obsolescence.

As a result, capital expenditure, or "capex", is transformed into operating expenses, or "opex". The firm's capital resources are preserved in terms of funding requirements, and explicit financing costs are zero when cloud computing is employed.

#### c) Cloud Computing Provider Buys IT Infrastructure for Lower Prices

Since the cloud computing provider maintains and builds a large IT infrastructure investment to service its clients, it is likely to be able to purchase IT equipment and related software at lower prices than any individual client may. This means that, under conditions of strong competition among alternative cloud computing providers, clients benefit from lower IT costs as a result.

#### d) Energy Costs are Reduced

The idea of "green" computing, or the reduction of carbon emissions from the use of more energy-effective computing resources, has taken a back seat during the global recession. The IT industry generates around 2% of global carbon emissions, about the same as the airline industry, principally from the coal and oil burned to generate the electricity required to power and cool computer systems, screens and communications. The typical on-premise data centre, plus the firm's use of PCs to deliver software applications, uses a surprisingly large amount of electricity, and most firms do not know how much. Significant energy savings and ecology benefits may accrue from the use of cloud computing for at least four principal reasons.

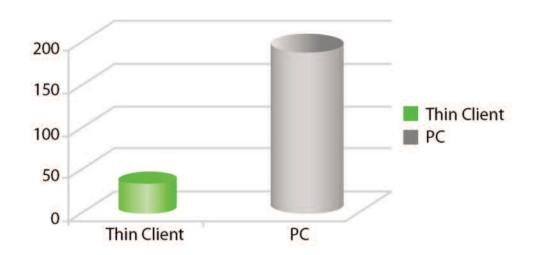
#### i) Few Firms Know the Cost of IT Energy Consumed

Firstly, the cloud computing provider knows what energy costs are required to deliver their service from their electricity bill. Few on-premise data centres have this information.

Electricity consumption is a major cost item in the cloud computing provider's cost structure and is, therefore, closely managed to maximum efficiency. The cost of electricity for most firms is a relatively small part of their overall cost structure so it does not get the same focus.



#### **Power Usage (Watts with Cooling)**



#### ii) PCs are Very Energy Inefficient

Secondly, the PCs the firm employs for its users are notoriously poor in terms of energy efficiency. Cloud computing, as we are defining it for the purposes of this document, in which the firm's same software applications are made available to the firm's users on "thin clients", results in a fraction of the power consumption that PCs require.

In addition, PCs and thin clients generate heat, equal to the input energy used to operate them. In an air-conditioned office, this heat must be cooled, and so the amount of input energy required to operate them, is effectively doubled by the energy required to cool them. This difference in energy consumption may be illustrated by the graphic entitled "Power Usage (Watts with Cooling)".

#### iii) Virtualisation is a Big Energy Saver

A third key area of energy saving is in the virtualisation of server computer resources. Virtualisation, as explained above, is an enabling technology for cloud computing. It is also an important transformational technology for on-premise server resources.

Traditionally, each new software application a firm introduced was usually supported by dedicated servers. This led to a proliferation of servers in the on-premise data centre. Surveys examining of the utilisation of servers typically ranges from 10% to 15% in on-premise situations.

While virtualisation technology is well accepted today, global implementations are barely above 15% of all servers overall.

The cloud computing provider, however, has compelling economic reasons to make server virtualisation a priority, thus yielding lower overall energy consumption costs.

#### iv) Existing Computer Equipment Gets an Extended Life

A fourth reason why cloud computing lowers overall energy costs, as well as the firm's capital expenditure, lies with the resultant extended life cycle of computer equipment. A thin client device, because it does not do the actual computation work, does not "run out of power", the way a traditional PC may.

That is, the processing of the firm's data is done on servers housed in the cloud computing provider's data centre. If additional computing power is required, or new operating systems or application software demand a higher level of technology performance, usually only the servers need replacing, rather than the user's own PC device.

This means that all of the end users' devices, whether they are PCs or thin clients, can have their lives extended to well past the conventional three to four year replacement cycle. Not only does this have a dramatic effect on reducing PC replacement costs, as noted above, but also the amount of e-waste, or the risky disposal of the heavy metals contained in computer equipment, is reduced.

Another very important cost saving gained from the use of cloud computing is that the extended cycle of PC replacement not only reduces the level and frequency of capital expenditure for PCs, but the often very significant cost of IT staff required for removing and adding new PCs, setting up users' new PCs and their access to the firm's software applications, particularly when multiple sites are involved, is avoided. Disruption to users is often also material when this happens.



## e) On-premise Staff Requirements for IT Infrastructure Management are Much Reduced

With respect to the on-premise IT staff required to deliver the company's software applications to its users, as opposed to those required to customise and support the applications themselves, the demand for highly skilled, often scarce and expensive personnel largely disappears with cloud computing.

The requirement to ramp up this resource during a major IT infrastructure upgrade, and then down-scale it, largely vanishes. The challenge of matching supply and demand for IT infrastructure resources is mirrored by a similar problem of matching the supply and demand for IT human resource. Rarely is there a happy balance.

It is expensive to both hire and terminate such workers. Contract IT staff members may bring their own challenges of cost and loyalty. During slack periods, permanent IT staff members are often under-employed, meaning their economic return is much reduced.

Staff leaving between upgrade cycles may cause disruptions by taking with them vital knowledge of how the firm's systems are set up. During slack times some staff may be tempted to promote new projects to suit their own need for skill updating, or even create mischief when idle.

#### f) Access to Skilled IT Human Resource Without Paying the Full Price

A competent cloud computing provider offering enterprise-class computing will usually employ highly skilled IT staff whom the typical firm may not be able to attract, afford, need permanently or provide a fully engaged employment challenge to keep them long term, if required to do so.

Even if that were not the case, it is unlikely that the typical firm would be constantly engaged in continuous innovation to improve the quality of application delivery, security, scalability, automation and cost reduction, as a cloud computing firm driven by endless and fierce market competition would.

Because of those on-going IT professional challenges, the cloud computing provider is able to offer a very attractive role to the best IT professionals available, who highly value the associated intellectual and technical challenge.

The key business benefit of the cloud computing model to a firm using cloud computing services is that each client of the cloud computing provider gains from a one-to-many spread of those costs.

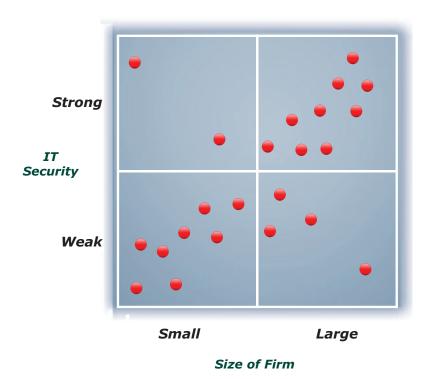
That is, when a highly competent team of IT professionals focuses on solving a technical problem once, the solution is then made available to all clients at no additional cost. Therefore, each client gains from both the access to that highly skilled team, as well as having their cost spread over all of the cloud computing provider's clients.

As the cost of that highly skilled team is shared across many clients, each client gets a bargain by not having to find, hire, build an in-depth skilled resource, test, wait for sufficient familiarity with the firm's on-premise systems, terminate if surplus to requirements after an upgrade project, risk having the wrong people, or pay anywhere near the actual cost of receiving the benefits generated.

#### 2) Stronger IT Security

Frequent surveys of IT executives canvassing questions about their attitude towards adopting cloud computing invariably conclude with security issues being the number one concern or obstacle. This is as it should be.

# Comparison of IT Security to Size of Firm



#### Is "Stronger IT Security" an Oxymoronic Statement?

At first glance, therefore, the idea that an external cloud computing provider may provide stronger IT security than the typical firm does at present may seem counter-intuitive, or even an oxymoronic statement.

However, unless the firm is a bank, defence contractor, or similar, the chances are that a high quality cloud computing provider, delivering enterprise-class computing to its clients, will provide stronger security than an on-premise solution.



#### • Larger Firms Usually Have Stronger IT Security Than Smaller Firms

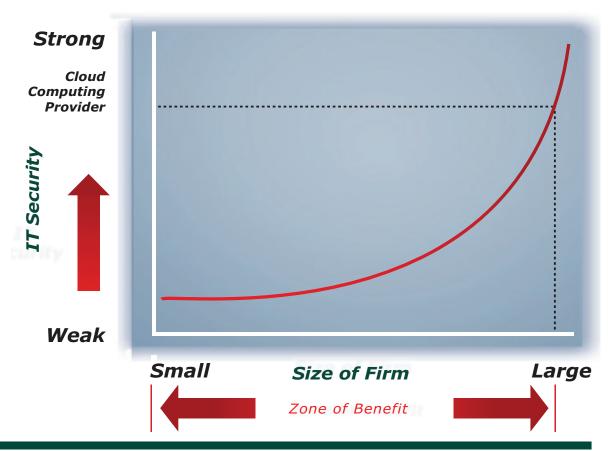
If a survey were done on a sample of firms ranging from small to large, measuring the level of IT security and resulting in a single number reflecting the strength of IT security in each firm, the results, when plotted, may look like the conceptual graphic entitled "Comparison of IT Security to Size of Firm"

There will be outliers in any sample. For example, the red dot in the top left hand corner may represent a defence contractor, while the red dot in the bottom right hand corner may simply represent a large organisation that has poor security as a result of neglect.

However, generally speaking, the larger the firm, the stronger the level of IT security. This makes sense for the simple reason that there are more stakeholders involved. Good corporate governance, statutory requirements and independent auditors demand strong IT security and there are more financial and IT human resources to fund and deploy the required security measures.

In essence, larger firms have more financial risk in absolute terms than smaller firms and they have the motivation and resources to reduce IT risk.

#### **Security Enterprise-class Computing**



#### How Can Cloud Computing Provide Enterprise-class IT Security, to Firms of Any Size, One User at a Time?

The conceptual sample data of IT security, plotted in respect of the size of the firm, may be presented as a single best-fit line in the graphic entitled "Security – Enterprise-class Computing".

This graph reflects the size of the firm from small to large on the horizontal axis and the strength of IT security from weak to strong on the vertical axis. The red curved line is the conceptual relationship between the size of the firm and the respective strength of its IT security.

Any firm smaller than the largest gains a significant benefit of increased IT security from a competent cloud computing provider.

The key point is that a cloud computing services provider usually operates at a level of scale that matches the size of larger enterprises. This position is reflected in the black dotted line. The cloud computing services provider will likely have very strong IT security for the reasons stated above, as well as for the very important reason that IT security is a core competency focus.

Any firm smaller than the largest gains a significant benefit of increased IT security from a competent cloud computing provider. This is reflected in the "zone of benefit", marked by the two red arrows.

Obviously, this is a conceptual chart and is not based on empirical data. However, a general conclusion may be drawn that most firms that are small to medium in size, will likely gain stronger IT security by using a competent cloud computing provider than they can with their own resources.

Generally speaking, the smaller the firm, the greater the benefit or improvement in IT security, unless the firm is a defence contractor or similar, with a contractual requirement for high security.



#### • Security is a Core Competency for a Cloud Computing Provider

The fundamental reason for firms within the zone of benefit significantly increasing their IT security is that the cloud computing provider views security as a focused core competency, not a part-time occupation. Risk reduction is a pivotal platform for a cloud computing provider's success. It is likely that more resource and attention will be paid to security than most firms would with an on-premise situation. The cloud computing provider's very commercial survival is absolutely predicated upon getting security right. It will win or lose or stand or fall in the marketplace on this vital factor alone.

#### • IT Security Will Remain a "Cat-and-Mouse" game

Even so, computer security is, and almost certainly always will be, a cat-and-mouse game with an exposure to unknown threats at any point in time. No matter how careful one may be, the identification of new threats as they emerge and the time lag that occurs before a solution is available to close them, will provide on-going security concerns irrespective of the model of computing employed.

#### • IT Security Risk Comes in Many Guises

Computer security can be viewed in several ways. External, as well as internal, threats to a firm's data, data theft, sabotage of systems, denial of service whereby the firm's systems are overloaded by an attack and many other nasty and fast-changing threats will continue unabated.

In addition, security may be viewed in terms of the reliability of the supply of system resources, usually measured in terms of system "up-time", or the percentage of time in, say, a month that the software applications are able to be processed by a firm's users.

#### Cloud Computing Providers Employ Security Specialists

Leading cloud computing providers, delivering enterprise-class computing to its clients, will employ specialist security staff to deploy and actively manage to the then current IT industry and vendor best practice, and best-in-class security systems. These will range from intrusion detection systems used to identify and block external alien threats, managed firewalls to hold intruders at bay, segregated client security walls within the cloud computing provider's shared infrastructure, and processes to help prevent security breaches from social engineering from the firm's own users, as well as from third parties.

#### • IT Security is a Part-time Activity for Many Organisations

In general, IT security tends to be a part-time activity for many organisations, depending on their size or market segment. Firms without dedicated security staff find it difficult to keep a focus on on-going security matters when so many other demanding tasks confront them.

When a major focus is made and security systems are upgraded, it often means a steady deterioration over time as the "eye is no longer on the ball", unless an emergency arrives.

Part of the difficulty in security management is that if nothing happens, it is difficult to measure performance. Even if many security holes exist, with doors left open, unless they are breached there is often no awareness of their existence.

In smaller firms, often with over-worked IT administrators, security matters can often be overlooked because of a lack of expert IT security skills or because there are more interesting projects on hand.

#### • Social Engineering is a Key IT Security Threat

Social engineering is one of the most common sources of security breach. This term refers to examples where a user or external third party convinces, say, a member of the support help desk to change a password or otherwise provide critical information to enable the system to be compromised.

A cloud computing provider, delivering enterprise-class computing to its clients, will incorporate best practice processes to minimise social engineering risks, as well as employ mature and proven security protocols which govern the current and constantly changing shared IT infrastructure.

#### • Protection of Client Data is of Paramount Importance

The protection of client data is probably the most important security challenge facing cloud computing providers, and the source of anxiety for the CEO, CFO and CIO. It is not just the threat of internal and external hacking forces, but the everyday custodial responsibility of that data.

If everything in a data centre were destroyed for some catastrophic reason, while the company client's data is held off-site, all of the Humpty Dumpty IT infrastructure pieces can be put back together again and the data restored, to live again.



#### • Clear Legal Definition of Data Ownership is an Imperative

If a company's data is being held by a third party cloud computing provider, it is critical that clear legal ownership responsibilities are established, as well as the processes to ensure a smooth uninterruptible transition from one cloud computing provider to another, or back to an on-premise environment, as required.

#### • Geographic Location of the Firm's Data may be Very Important

The geographic location of the firm's data held by the cloud computing service provider may be very important. The legal jurisdiction and access to the firm's data by third parties in non-resident countries is an important consideration in the construction of an engagement agreement.

#### • Enforceable Service Level Agreement is Essential

The principal way a CEO can ensure that the firm's cloud computing provider has stronger security, is to engage in a service delivery contract which details those functions. This would come in the form of Service Level Agreement (SLA) terms within the contract with commercial penalties for non-performance or non-compliance.

A critical factor here is transparency. A cloud computing provider should be willing to open the parts of their systems which provide the specific client's services for on-demand monitoring by the company's CIO or other IT staff to ensure compliance with performance expectations.

#### • Independent Security Audit is a Valuable Risk Reduction Policy

A cloud computing provider, delivering enterprise-class computing to its clients, should welcome and endorse any client instructing its auditors or other security specialist firm to test the provider's systems on a regular or random basis.

Independent investigation will not necessarily prevent a security breach, just as a financial auditor will not necessarily prevent fraud, but it will most likely go much, much further than the firm's own current practice.

The use of an independent auditor or specialist security firm, reporting to the company client's CEO or CIO also satisfies a good deal of the firm's IT governance requirements.

The cloud computing provider should welcome this external audit process, as it will enhance the acceptability of their service, as well as help test the resiliency of their systems, to the benefit of all parties.

#### 3) Brighter IT Future

How can cloud computing, as we have defined it, help to create a brighter IT future for the firm?

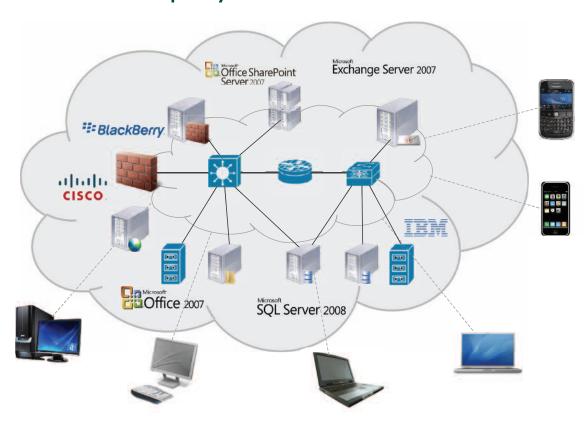
There are at least three reasons.

#### i) IT Complexity is Replaced with Simplicity

Firstly, the rise in complexity in IT systems has created a labyrinth of interconnected wiring which challenges the best intentions for manageability. All of these systems would be managed by the firm's own IT staff with an on-premise deployment of IT infrastructure.

In contrast, this complexity is removed from the firm and its users with cloud computing. The firm's users may access its software applications and data securely from thin client devices, PCs, laptops, Netbooks, iPhones or their BlackBerrys.

#### **On-Premise IT Complexity**





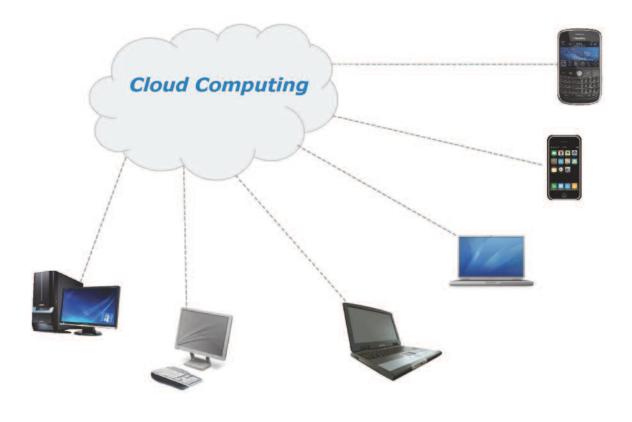
This is the essence of cloud computing. The complexity is hidden, and simplicity is delivered. This key benefit may be demonstrated graphically. The relatively simple on-premise network diagram for a small organisation, entitled "On-Premise IT Complexity" is, nevertheless, complex.

In stark contrast, the graphic entitled "IT Cloud Simplicity", illustrates how the IT complexity is absorbed by the cloud computing provider. The users are not affected in a material way, but the organisation removes complexity from itself.

This means users may access their "desktop" and perform their IT tasks securely from almost anywhere, at any time, whether mobile or in a fixed location, with almost any device connected to the Internet, or plugged into the cloud.

The business benefits of shifting from complexity to simplicity mean more than just reducing rapidly rising management costs.

#### **Cloud IT Simplicity**



#### ii) Ease of Adding and Removing Business Units

The second business benefit of cloud computing in terms of creating a brighter future is that it becomes very easy to split off IT systems when business units are divested, and to add new entities to the group when businesses are acquired.

When companies are sold, there is often a major IT disaggregation challenge. The new business owner would need to migrate the relevant systems to new infrastructure. Time delays before settlement would occur. Uncertain costs prevail.

With cloud computing, the cost model is totally predictable. Applications and data are easily moved to a new secure private managed cloud and time delays are miniscule.

When businesses are acquired, many of the same problems exist in reverse. How much should be paid for the acquisition target's IT infrastructure? How much will it cost to run their IT? How secure is their IT? How long will it take to integrate their IT infrastructure systems?

Cloud computing overcomes all of these questions of future cost predictability, flexibility and security in terms of the IT infrastructure. In addition, the migration of software applications and data is a core competency of a cloud computing provider delivering enterprise-class computing.

#### iii) Dramatic Improvement in Agility and Flexibility

The third, and most important business benefit of IT infrastructure simplicity gained from cloud computing, is the quantum leap in improved agility and flexibility. Why does this provide a decisive benefit?

Critically, IT simplicity, flexibility and agility means the firm can more easily innovate on the most important driver of competitive differentiation, namely, the firm's business model.

Business model innovation is the main source of competitive differentiation and is the primary driver for market success in most firms and industries. Business model innovation requires focused software applications to support the business processes which drive the new business model.

Without IT agility, the firm faces "technological drag", or the impediments and strictures that choke off innovation because the firm's underlying IT infrastructure is too ossified, complex, non-scalable, obsolete or otherwise presents a significant barrier to the firm's entry to a more competitive way of doing business.



Cloud computing, as defined above, can help enable the firm to deliver on that potential and provide a brighter future.

# What Do We Mean by the Term "Enterprise-class Computing"?

A cloud computing provider delivering enterprise-class computing to its clients means that one would find the same standards, processes, IT infrastructure, skill sets, providing manageability, security, service and support that one would find in a large, well-run enterprise IT department.

Fundamentally, one would find a strong physical environment, best practices in operations, best-in-class technologies, full-spectrum security, and two-of-everything system "redundancy" to avoid single points of failure.

However, these are largely bits and atoms in a cooled building without, arguably, the most essential element: competent and visionary IT leadership.

This definition of enterprise-class computing is largely the direct antithesis of a cloud computing provider who may offer a "bare metal" virtualised server, available on-demand with a credit card, with limited or no performance SLA's.

The definition of enterprise-class computing would include at least the factors presented in the table entitled "What is Enterprise-class Computing?

#### WHAT IS ENTERPRISE-CLASS COMPUTING?

- Competent and visionary IT leadership
- Strong IT governance protocols
- A culture of being conservative while innovative
- Competent, experienced and stable IT team
- IT team has deep domain knowledge
- IT team has redundant, replicated skills
- IT team has relevant industry qualifications
- Strong relationships with global IT providers
- Access to global IT providers for problem resolution
- Industry best-practice standards in everything
- Well documented network systems
- Well documented processes to match best practices
- Best-in-class hardware and software technologies
- Redundant everything, wherever possible
- Full spectrum security and intrusion detection
- Best practice data backup cycles and custody
- Data centre security and environmental protection
- Full-time system and security monitoring
- Incident response capability available 24/365
- Strong system uptime skills and restoration skills

# How Can Cloud Computing Deliver Enterprise-class Computing to a Business of Any Size, One User at a Time?

A cloud computing services provider, who has built an IT infrastructure and provides supporting services to the standard and quality one would expect to find in a large well-run corporate organisation, may be considered to deliver enterprise-class computing to its clients, one user at a time. How does this work?

#### • Small Firms Gain from Economies of Scale

Each client firm gains the benefit of economies of scale, and the professionalism of the technical team, as if it were a member of a very large organisation. One main benefit is that each user, irrespective of the individual client business he or she may belong to, uses the same standardised and uniform quality of enterprise-class computing.

This means that each individual user and client gains from the collective investment for all, while only paying a fraction of the cost that would be required in a stand-alone business.

#### **CASE STUDY ONE**

Global Systems Limited, not its real name for privacy purposes, is a manufacturer and distributor operating from multiple sites in two countries. The original core business was built quickly into an enterprise of over 1,000 users as a result of multiple acquisitions. Each new acquisition brought its own unique set of IT systems of variable quality until the total was a complex mish-mash web of disparate islands of technology.

The IT challenge was to unite all of the separate islands into one uniform structure. While an on-premise solution was an obvious choice, Global Systems chose cloud computing to solve the problem. Each separate business e-mail system was migrated to a single entity on a hosted Microsoft Exchange e-mail solution in the cloud.

The cost for the service was fixed on a per user basis for three years, resulting in a very competitive, low risk, and predictable cost for the service, compared with the on-premise e-mail alternative.

With self-service capability, office administrators with little IT training were able to add and delete users instantly at will, without having to call a help desk as would otherwise be necessary with an on-premise e-mail solution, as employees started and left each business unit.

Unfortunately, with the economic recession, many employees were let go. Immediately, Global Systems was able to reduce the e-mail costs for those users, as it only needed to pay for the actual users connected. With an on-premise e-mail solution, Global Systems would not have been able to reduce the hardware, software or most IT staff costs related to the delivery of e-mail at all. When the economy recovers, Global Systems will be able to add users at the same cost per user, thus providing financial certainty and without any scalability issues.



#### • System "Redundancy" at No Extra Cost

The cost and complexity involved in provisioning two of everything to reduce the risk of having a single point of failure in the total supply-chain of delivering applications to users, is prohibitively high for most organisations.

As a chain is only as strong as its weakest link, having two links, or duplicated systems, helps to reduce, but does not eliminate, the chance of a system outage. This is known as system "redundancy".

A business employing just one of everything will probably enjoy a reasonable level of system "up-time". However, with enterprise-class cloud computing, the client firm effectively gets two for one, at the same or lower price than for one alone, as a result of the cloud computing provider's economies of scale.

#### • Gains from "Economies of Skill"

It is not just the cost of the IT infrastructure. The specialised, expensive and scarce skills required to build, maintain and grow an enterprise-class computing infrastructure are almost invariably out of the commercial reach of most organisations with fewer than, say, thousands of users.

The economies of scale generated from building a large enterprise-class IT infrastructure allows the cloud computing provider to pass on cost savings, as well as having the revenue stream to employ, retain and motivate scarce IT talent.

#### • Relentless Market Pressure Brings Big Benefits

As the cloud computing provider faces strong and demanding competition from other cloud computing providers, the client firm gains from the efficiencies and automation introduced to maintain competitiveness, as well as price competition. These competitive forces are largely absent from any internal on-premise IT infrastructure.

#### • Benefits from One-to-Many Problem Resolution

The cloud computing provider's business model of solving a technical challenge once, while implementing it across the board so that all clients and users benefit from it, means that the one-to-many solution generates economic benefits without any incremental cost to the client organisation, compared to a traditional on-premise IT arrangement.

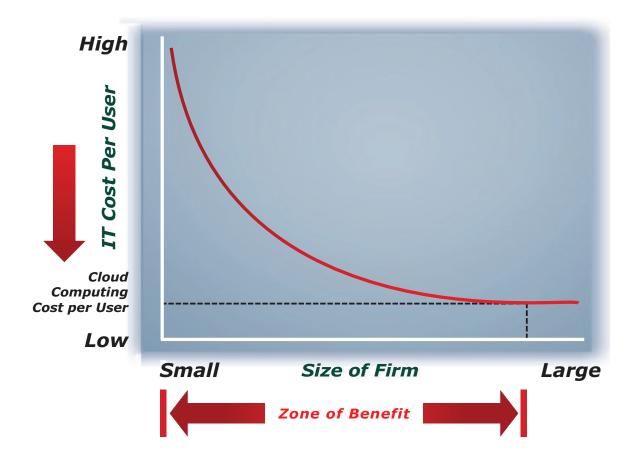
## • Enterprise-class Computing Can be Delivered, to Firms of Any Size, One User at a Time

The cloud computing provider, delivering the same uniform quality of enterprise-class computing to each client firm's users, does so according to the number of users each firm has.

This is a critical benefit. This means that enterprise-class computing may be delivered one user at a time, irrespective of how many users a firm may have. A startup business or a smaller business with tens of users is able to enjoy the same quality and price of computing that a business with hundreds or thousands of users may have.

This key benefit may be viewed in a graphical context. The graphic entitled "IT Cost Per User – Enterprise-class Computing", compares the per user cost of enterprise-class computing for firms ranging in size from small to large.

#### IT Cost Per User - Enterprise-class Computing





The cost of replicating an enterprise-class computing infrastructure and skill base for a single-user business is so high, the IT cost per user may be considered to be infinitely high. This is reflected in the very high per user cost of enterprise-class computing for the smallest firm on the graph.

However, as the number of users increases, with larger firms, the cost per user falls, as fixed IT costs are spread over more users. The cost per user will continue to fall until the cost curve flattens out as diminishing marginal savings are reached with large firms, where scale has a lesser effect, the larger the firm.

Irrespective of the size of one's business, high quality enterprise-class computing can be secured, one user at a time.

The cloud computing provider is thus able to deliver enterprise-class computing at a per user cost equal to, or lower than, most large organisations. All smaller firms below this size are able to secure high-quality enterprise-class computing at a fraction of the cost they would otherwise incur on their own.

All firms within the "zone of benefit" are able to secure enterprise-class computing at a lower cost than they would be able to achieve on their own. The cost may be driven down to the point where the dotted black line meets the vertical axis.

#### • Cloud Computing Democratises Enterprise-class Computing

This crucial benefit may be described as the democratisation of enterprise-class computing. Irrespective of the size of one's business, high quality enterprise-class computing can be secured, one user at a time, on a per user basis, according to just the number of users employed.

This is a similar concept to the democratisation of computing that occurred with the introduction of the PC. Prior to this, only large firms could afford to buy dedicated mini-computers or mainframe computers. The PC unleashed the creative talents of millions of users globally to drive the PC/Internet revolution.

#### • Not All Computing Clouds Are Created Equal

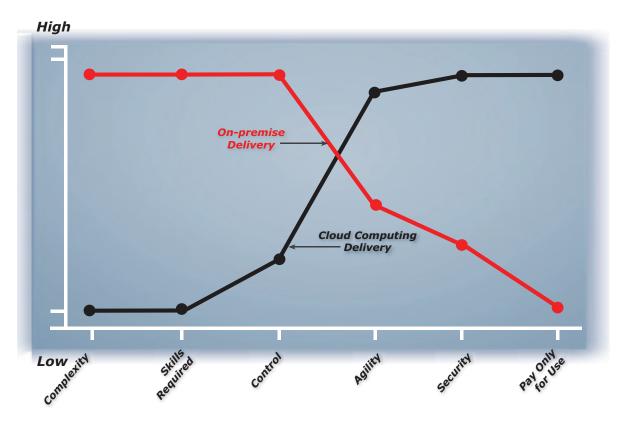
It is clear from the discussion above, that cloud computing is not a common commodity, to be bought on price alone. Careful due diligence is required to ensure enterprise-class computing is delivered as promised.

#### **Value Proposition of On-premise versus Cloud Computing**

We may now summarise the key differences in the value proposition of traditional on-premise software delivery models and cloud computing software delivery models.

The graphic entitled "Value Proposition of On-premise versus Cloud Computing" provides a summary of the key differences, as discussed further below. There are many other points of difference between the two software delivery models, but we consider these are the most important ones.

#### **Value Proposition of On-premise versus Cloud Computing**





#### Complexity

The key benefit of cloud computing is that IT complexity is replaced with simplicity. Any on-premise delivery model retains the existing complexity.

#### • Skills Required

Obviously, an on-premise delivery model requires skills to manage the IT infrastructure necessary to deliver the applications.

Conversely, a cloud software delivery model means that the firm does not need to maintain those skills at all.

#### Control

Control is an interesting concept. The on-premise model is represented as maintaining full control. In a firm's actual experience, full control may only exist in theory, as employment law constraints and other interpersonal considerations may mean control is less than absolute.

Cloud computing, by comparison, is not without control. While some SaaS vendor engagement agreements are not particularly generous, other cloud computing vendors do write enforceable agreements with penalties for non-performance.

However, the primary means of control is the commercial reality of choice. If there is non-performance, the firm may switch providers. There is nothing like the market discipline of potentially losing an account to improve a provider's performance. This option rarely exists in an on-premise situation.

#### Agility

The word agility is heavily overused in IT marketing. However, the section addressing the benefits of cloud computing with respect to a brighter future outlines some of those improvements in commercial agility.

The flexibility and agility from an on-premise solution is positioned as being lower than the cloud computing delivery model. However, the relative positions of each will be governed by the specific facts of each firm and its cloud computing provider.

#### Security

As explained in detail in an earlier section, in most cases, a competent cloud computing provider may deliver a much higher level of IT security than the firm can provide itself.

Of course, the actual position of the respective positions on the graph will depend on the particular facts of the situation.

#### • Pay Only for Use

This element is one of the foundations of the cloud computing software delivery model. Even with sophisticated internal charge-back systems, the firm cannot avoid the largely fixed costs of IT for the enterprise as a whole.

The substantial costs of over and under-provisioning of IT resources remain with the on-premise delivery model.

#### **How Can We Get Started In Cloud Computing?**

The entry point for cloud computing can range from a tentative experiment with a non-essential service to a full adoption of all IT services.

#### • Start With Non-critical Applications

If the prospect of transferring all of the firm's software applications and data to an external cloud computing provider seems daunting, a common method for a business to engage in cloud computing is to move less critical or non-strategic applications, such as e-mail or collaboration software, to the cloud.

This enables the firm to evaluate the provider itself, as well as the impact and benefits of cloud computing.

#### • Hardware "Refresh" Stage is Often the Trigger Point

The impetus to start in cloud computing often comes when a major server or software upgrade is planned. The server upgrade or software licence upgrade generates the demand for substantial capital expenditure. The costs and benefits of the traditional on-premise computing model may then be compared with the new cloud computing delivery model.



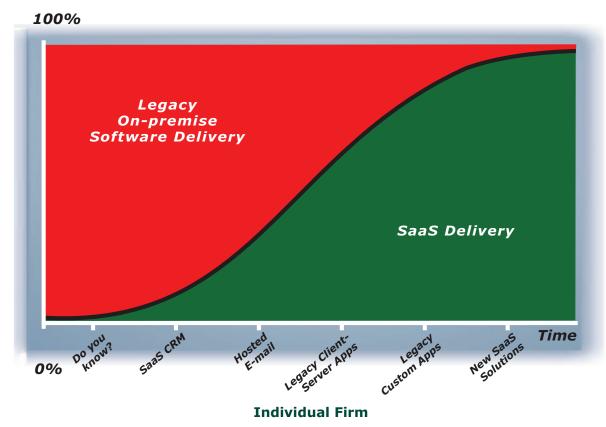
#### Adoption Stages of Cloud Computing

The graphic entitled "On-premise versus SaaS Delivery – Cumulative Adoption Cycle" provides a conceptual framework for the adoption of cloud computing, over a period of time, for a typical firm.

The red section reflects the relative proportion of the firm's software applications which are delivered by traditional on-premise means. The The impetus to start in cloud computing often comes when a major server or software upgrade is planned.

green section reflects the relative proportion of the firm's software applications which are delivered by some form of software-as-a-service or cloud computing delivery mode, although not necessarily different software, as we shall explain below.

# On-premise versus SaaS Delivery Cumulative Adoption Cycle



#### • Commencement Stage

We begin with a firm using only traditional client-server software applications delivered to the firm's users by traditional on-premise means.

If a new firm were to begin operations in today's environment, it is likely the firm would move straight to the far right hand side by adopting cloud computing from the outset.

This analysis is predicated on an existing firm using traditional software and means of software delivery.

#### • Do You Know?

As mentioned earlier, the firm may already be using pure SaaS software applications, perhaps purchased with a credit card and claimed as an expense. The internal IT team may not even be aware of them. The issues of security and integration may not have been considered.

#### **CASE STUDY TWO**

Golden Services Limited, not its real name for privacy purposes, is a professional services company with around 400 users. Golden Services had reached the end of the economic life of its e-mail physical servers and the version of Microsoft Exchange e-mail Golden Services was using was outdated and needed to be upgraded. An on-premise e-mail upgrade solution, at first glance, looked as if it would cost less than a solution delivered from the cloud. On closer examination, it was found that only the initial cost of servers and licenses were included in the cost estimates.

When the cyclical upgrade replacement cost of servers and software licenses were included, together with an allowance for staff management costs, energy costs, and other ancillary costs which were not originally considered, the cost equation came out slightly in favour of the cloud alternative.

Golden Services previously had a single set of equipment with no IT system redundancy, as they had not experienced an e-mail outage in recent years. However, the CEO understood that Golden Services would be able to take advantage of the cloud computing provider's highly redundant infrastructure, providing greater security, at no additional cost. Golden Services was effectively getting two for the price of one.

When the fact of uncertain future cost changes, likely excess e-mail provisioning costs resulting from employee reductions during an economic downturn, together with the simple administrative self-service model of adding and deleting users, Golden Services, CEO and CIO were convinced to move to cloud computing.



#### SaaS CRM

The typical first use of pure SaaS software applications within the firm is a customer relationship management relationship, or CRM, solution. The reason for this is that CRM has been established as a successful SaaS application over the past ten years.

The speed of implementation of SaaS CRM is usually very high compared to on-premise customised solutions. The driver for implementation usually comes from the sales and marketing team which is frequently frustrated by a slow response from an often over-worked IT team.

The idea of security being a barrier to entry to cloud computing is met with irony in the face of the very high rate of adoption of SaaS-delivered CRM. An external party holds what many would consider to be one of the firm's most important pieces of data, namely, the firm's customers, their buying history and the firm's sales pipeline.

#### Hosted E-mail

There are a number of well established cloud computing providers who deliver hosted Microsoft Exchange e-mail services. In addition, Microsoft now provides its own service, largely in response to Google's own offering.

In most firms, e-mail is considered to be very important, but not critical. Collaboration software applications, such as SharePoint, are also excellent candidates for an early adoption of the SaaS cloud computing delivery model.

#### • Legacy Client-server and Customised Software Applications

The traditional line-of-business software applications which the firm uses to run its business, together with custom-written software applications to solve the firm's unique business requirements and/or to help generate competitive advantage, provide a sticking point in the adoption of cloud computing. Where will you find this functionality in the cloud?

This is the missing piece of the cloud computing jigsaw puzzle. We shall consider this question shortly.

#### Where Do We Find Our Line-of-Business Software Applications in the Cloud?

The software applications a firm uses to run its business, which may be heavily modified, together with custom-written software, which in turn are heavily integrated

into complementary functional systems and reporting systems, are simply not available from the cloud.

Most established software vendors are struggling to convert their products to a SaaS delivery model. The challenge of changing their business model from the sale of lump-sum initial prices plus maintenance fees, to a subscription pricing model is testing them at present.

New software application vendors providing native-born SaaS applications are certainly emerging quickly, but unless the firm's requirements are relatively straight-forward, the cost and problems of changing line-of-business applications, just to change the software delivery model does not make any sense.

Many larger firms invest literally thousands of person hours and millions of dollars over many years to achieve the fully integrated line-of-business applications required to compete effectively. Smaller firms may invest less in absolute terms, but still make a very large investment in relative terms.

Even if a suitable SaaS line-of-business application were available, all of the firm's competitors would have access to it, so the challenge of building competitive advantage from IT would start all over again.

Finally, it will be the firm's users and changed processes which are likely to be the biggest challenge. Customisation requirements, training time, potential disruption and delays in implementation are common issues associated with new software selections.

CEOs who have worked through the implementation of new line-of-business software understand the high indirect costs and associated challenges.

#### • Select the "Best-fit" Software First, Before the Mode of Delivery

If the firm is at a crossroad and wants to consider, or is determined to change its line-of-business software for compelling reasons, there is one rule we consider the firm should follow.

It is the selection of the "best-fit" software for the purpose, rather than the mode of delivery of that software to the firm's users, that should dominate the software selection decision process.

This principle allows for the widest possible range of choice, without being bound by whether or not the application is provided by a "SaaS" delivery model.

# **OneNet**



The source of the firm's line-of-business software applications from the cloud is the missing piece of the cloud computing jigsaw puzzle.

#### New SaaS Solutions

Once the existing software applications and earlier SaaS solutions have been bedded down, the firm is then able to add new SaaS applications, without any concerns about mixed software delivery models.

# Where Do We Find the Missing Piece of the Cloud Computing Jigsaw Puzzle?

If the firm has adopted, say, some minor SaaS applications, SaaS CRM and hosted e-mail, delivered in a SaaS model, and does not want to change its line-of-business software applications, it is now in a half-way state.

The source of the firm's line-of-business software applications from the cloud is the missing piece of the cloud computing jigsaw puzzle.

The good news is that some competent cloud computing providers are able to take those line-of-business software applications, with all of the custom-written software, complementary functional software systems and reporting systems, and deliver them to the firm's users in a SaaS-style mode of delivery.

That is, virtually all of the benefits of cloud computing, from an IT infrastructure point of view, can be achieved without the firm having to replace its current software applications.

In addition, the software partnerships, software support resources, whether internal or external, do not need to change.

Using software delivery technologies such as Citrix, the cloud computing provider may group all of the applications an individual user may need, whether or not they are "native" SaaS applications, into a single Web form on the user's screen.

This means the user does not change anything, and his or her experience is consistent with the current processes.

Accordingly, the firm is able to move forward and gain the advantages of cloud computing by finding a competent cloud computing service provider that understands how disparate line-of-business software applications and custom-written applications can be delivered to the firm's users in a manner that is virtually indistinguishable from an on-premise delivery model.

#### **CASE STUDY THREE**

Majestic Industries Limited, not its real name for privacy purposes, is a business unit member of a group of companies with over 2,000 users. Majestic Industries is a distributor and deploys a highly customised line-of-business legacy software application as its core software solution. Prior to its acquisition by its current owner, the delivery of this software application was highly unstable, lacked scalability, and was expensive to run in terms of IT support staff.

Following a review of available options, Majestic Industries moved the software application to a cloud computing provider to deliver the software application as a service back to its users, at a lower cost than the then current IT staff costs alone. The cloud computing provider employed Citrix software delivery technology, installed the software on scalable IBM server equipment in a secure data centre and managed the software application to its normal enterprise-class computing standards.

The cloud computing provider's pricing model was based on a per user rate, so that most of the benefits of cloud computing were secured by Majestic Industries for a legacy software application.

Majestic Industries' CIO was able to focus on more pressing and opportunistic market competition issues, while he had confidence that the software delivery problem had been solved, and while also knowing that the lower costs of doing so in the future, were known with certainty.



# What Should You Look for When Selecting a Cloud Computing Provider?

What are the attributes that should be evaluated when selecting a suitable cloud computing business partner?

- 1) Does the cloud computing provider have a long and stable history? What is their market reputation?
- 2) Does the cloud computing provider have a culture of innovation and demonstrated leadership in the industry, while still being conservative?
- 3) Is the cloud computing provider's market positioning a good match to your current and future requirements?
- 4) Can the cloud computing provider gain access to critical IT technology partner global support networks? Are there requisite vendor certifications to demonstrate capabilities and competencies?
- 5) Does the cloud computing provider have a thorough legal service engagement agreement with performance SLAs, clarity on the legal ownership of your data, a well documented process for the transfer of your software applications and data from the provider at end of the engagement to an on-premise arrangement, or alternative service provider, if necessary?
- 6) What due diligence can you perform? Can you view the data centre, meet the cloud computing staff, and conduct a technical evaluation of the service provider? Are there suitable reference check contacts available?
- 7) Is it possible to arrange an independent audit of the cloud computing provider's systems with your own auditors or an independent specialist IT security firm? How much transparency into the cloud will the cloud provider allow for your IT team for on-going monitoring?
- 8) Can you meet key executives from the cloud computing provider?
- 9) What help will you need to identify and recognise differences in quality among alternative cloud computing providers?

#### Cloud Computing is Not a Commodity to be Bought on Price

Cloud computing is not a commodity to be bought on price. It is necessary to understand that problems in IT will always be with us.

It is what your cloud computing provider does to prevent this and their market reputation in dealing with problems when they occur, that will likely be the most important selection criteria to consider.



#### **PART SIX:**

# How quickly will Cloud Computing be adopted?

#### **How Quickly Will Cloud Computing Be Adopted?**

Most CEOs are very familiar with the product life cycle, or technology adoption cycle. Everett Rogers, author of the leading textbook, "Diffusion of Innovations", is regarded as the originator of many of these ideas. Terms such as "early adopters" or "early majority" are commonly used. Other readers may be more familiar with the terms "visionaries" and "pragmatists".

The graph entitled "The Categorisation of Innovation Adopters", adapted from Everett Rogers' textbook, describing the different types of adopters in the life cycle of a product, technology or idea, will be well known to most readers.

# Innovators Early Early Late Majority Laggards

**The Categorisation of Innovation Adopters** 

In determining the likely rate of adoption of cloud computing, we need to consider three principal stakeholders, namely, the CEO and CFO, the CIO and the firm's users.

#### 1) Adoption by the CEO and CFO

The benefits of lower costs, reduced risk and greater profits generated by cloud computing are well canvassed in this document. Provided issues of IT governance, statutory compliance and good practice are addressed, together with appropriate due diligence processes for the selection of a cloud computing service provider, there are few rational barriers to adoption.

However, it is likely that the primary barrier to adoption will lie in the cultural or psychological bias of wanting to maintain control or reluctance to pass critical company data to a third party.

Organisations that already outsource existing IT systems or other parts of their firm's supply-chain, are less likely to have this inhibition.

#### 2) Adoption by the CIO and IT Technical Team

As noted above, cloud computing poses a clear and present danger to some CIOs and members of his or her IT technical team. Depending on the nature of the firm's IT leadership, there may be resistance to cloud computing or a cautious, tentative adoption or a warm embrace.

It is likely that some CIOs will see cloud computing as a threat, whereas CIOs focused on creating value for the firm's clients or customers will likely adopt cloud computing more quickly.

#### 3) Adoption by the Firm's Users

The firm's users of the software applications will adopt cloud computing most readily. The reasons for this are covered in a separate section below.

However, there is a likely difference in adoption rates, depending upon whether the firm has already adopted "thin client" application software delivery within the firm, or whether conventional PCs are used.



#### Perceived Adoption of Cloud Computing in the IT Industry

It may be useful to appreciate where the IT industry considers the adoption of cloud computing lies. The most comprehensive analysis of this is provided by Gartner Group, one of the three leading global IT market analysts. Gartner Group publishes regular reports on emerging technology and their probable state of market adoption.

Gartner has, since 1995, popularised the concept of a "hype cycle" which reflects advances in technological capabilities, likely time to mainstream adoption and changes in the provider marketplace.

In 2009 Gartner introduced cloud computing to its list of the technologies it tracks. Gartner describes cloud computing as the "latest super-hyped concept in IT". While cloud computing is about a very simple idea, namely the delivery and consumption of IT services from "the cloud", there are so many variations in the detail that Gartner considers cloud computing to be "ripe for a Gartner Hype Cycle". The following material uses the terms "hype curve" and "hype cycle" interchangeably.

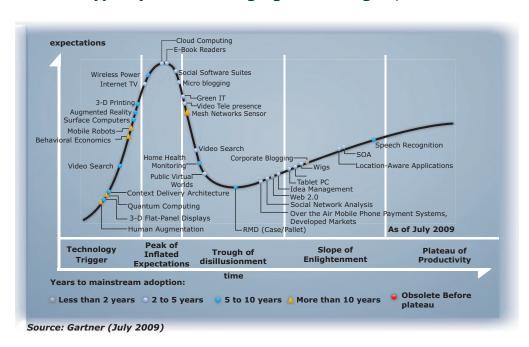
The Gartner Hype Cycle graphic "characterises the typical progression of an emerging technology, from over-enthusiasm through a period of disillusionment to an eventual understanding of the technology's relevance and role in the market".

The graph entitled "Hype Cycle for Emerging Technologies, 2009" is sourced from Gartner. This graph lists all of the IT-related technologies Gartner was tracking as at July 2009, placed within Gartner's framework of analysis. The complete graph is provided for illustrative purposes only, as we need to focus on just a few elements for our purpose.

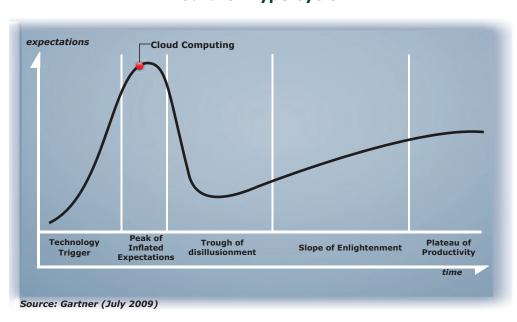
The second graph, entitled "Gartner Hype Cycle", is simply the previous graphic stripped of all the technologies, other than cloud computing. The purpose of this graph is to highlight Gartner's positioning of cloud computing at the apex of their "Hype Cycle", as at July 2009. We shall consider what the peak of the Gartner Hype Cycle means in a later section.

The third graph in this series, entitled "Gartner Hype Cycle – Selected Components", is the Gartner Hype Cycle with selected elements denoted by red dots on the curve as milestones. The full Gartner Hype Cycle may be viewed in the book entitled "Mastering the Hype Cycle – How to Choose the Right Innovation at the Right Time" by Jackie Fenn and Mark Raskino.

#### **Hype Cycle for Emerging Technologies, 2009**

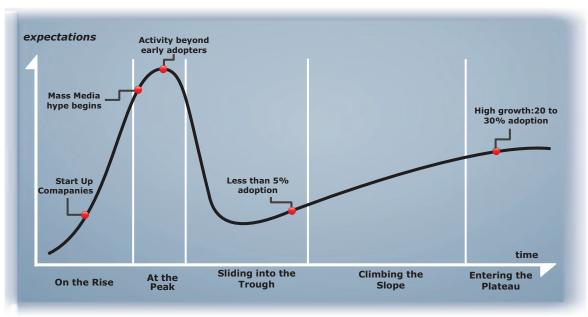


#### **Gartner Hype Cycle**



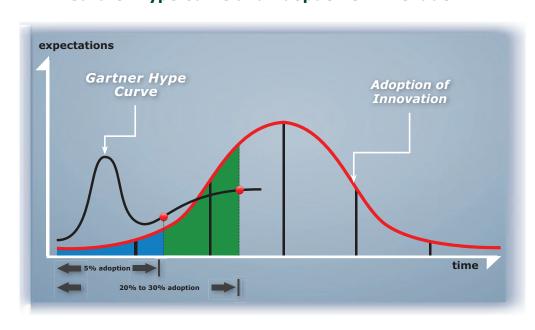


#### **Gartner Hype Cycle – Selected Components**



Source: Gartner (July 2009)

#### **Gartner Hype Curve and Adoption of Innovation**



This graph shows where Gartner considers the adoption of the technology they are reviewing to be. In particular, the red dots on the graph denoting "Less than 5%

Gartner expects that cloud computing will reach mainstream adoption within two to five years.

adoption" and "High growth: 20% to 30% adoption" are what is relevant, as we shall see in the next graph. The labels on the graphs are not necessarily Gartner's original labels, as some labels have been reduced in size for this purpose.

The graph entitled "Gartner Hype Curve and Adoption of Innovation" is a composite of the graphs entitled "The Categorisation of Innovation Adopters" and "Gartner Hype Cycle – Selected Elements".

The point of this graph is to overlay the normal technology adoption curve over Gartner's Hype Cycle. This is an approximate indicator of where Gartner considers the adoption of cloud computing is, as at July 2009.

According to Gartner, the adoption of cloud computing has barely begun. How long it may take to reach the full 5% adoption, as reflected by the blue area under the curve, or the green area, which would reflect a total adoption of approximately 30%, is a matter of conjecture.

However, according to Gartner's Hype Cycle for Emerging Technologies, as at July 2009, Gartner expects that cloud computing will reach mainstream adoption within two to five years.

We will also consider other evidence which suggests that Gartner may have under-estimated the short term adoption rate of cloud computing among medium and large enterprises in Europe and the USA.



#### What Does the Gartner "Peak of the Hype Cycle" Really Mean?

Some industry commentators have dismissed cloud computing as being at the "peak of inflated expectations" or the peak of the Gartner hype cycle and, therefore, somehow not relevant in the short term.

What is happening at the peak of the Gartner hype cycle is, in our view, the reflection of what behavioural economists would describe as the "endowment effect". This idea was developed by Daniel Kahneman, who won the Nobel Prize in economics in 2002, and Amos Tversky, another psychologist.

Kahneman and Tversky demonstrated that psychological bias strongly affects decision making and that people do not make rational economic decisions. That is, people make decisions on subjective or perceived values rather than objective values.

In addition, buyers make decisions based on a reference point, which is often the product or service they are consuming already, and make assessments in light of this.

The most important insight is that people place a much higher value on losses, rather than gains. They call this "loss aversion" or "loses loom larger than gains".

Loss aversion means that people value products or services they already have, or their "endowment", much higher than those they do not have.

Behavioural economist Richard Thaler called this bias the "endowment effect". Many studies have shown that this behaviourial bias is widespread, but few people are aware that they actually behave in this manner.

Interestingly, sellers of new products or services have a similar bias. At some stage, the vendor becomes so enveloped in the new product or service, their reference point shifts to the new offering. The same endowment effect works in reverse with the vendors convincing themselves that the new solution is so obviously beneficial that buyers will queue up to obtain the new product or service.

Studies have shown that both buyers and sellers overvalue their respective "endowments" by up to three times. This means that there can be a mismatch of 3x3, or nine to one in total, between rational and perceived benefits among buyers and sellers.

We suggest the point on the Gartner Hype Cycle indicating that cloud computing is at the peak of inflated expectations reflects the psychological bias, or "endowment effect", of both the incumbent IT team "buyers" and the IT vendor "sellers". The incumbent IT team is likely to value its "endowment" of knowledge, skills, processes and attitude towards on-premise computing up to three times more highly than a rational economic analysis would suggest.

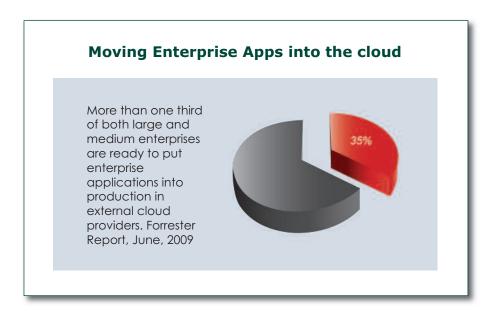
In contrast, IT vendors promoting cloud computing are just as likely to value their "endowment" of the new cloud computing paradigm up to three times more highly than a rational economic analysis would suggest.

The CEO will benefit from an understanding of the psychological bias that may permeate any recommendation on cloud computing, irrespective of its source.

## Is Enterprise Cloud Computing More Highly Adopted Than Many People Think?

Forrester, a leading IT industry analyst firm, recently completed a survey of medium and large enterprises located in North America and Europe. The very interesting outcome of this survey, published in June, 2009, was that more than one-third of both large and medium enterprise companies are ready to deploy their enterprise software applications into production with external cloud computing providers. This survey result is reflected in the graphic entitled "Moving Enterprise Apps into the Cloud".

This result is surprising because most cloud computing commentators consider that cloud computing is really only suitable for smaller businesses. In addition, it has been conventional wisdom that larger enterprises would focus only on internal clouds and eschew the public cloud domain. This survey has also surprised industry pundits in the relative speed of adoption of cloud computing in the enterprise market.





## Likely Adoption of Cloud Computing by a Firm's Users

Once the firm's leadership understands the benefits and risks of cloud computing, it is essential to understand how easily the firm's users may adopt this new paradigm of computing. This is an important consideration because the introduction of any new process or technology carries inherent risks of non-adoption by the firm's users, with obvious lower productivity, higher costs and foregone benefits.

The decision to adopt cloud computing within the enterprise is normally made by the firm's leadership, not the firm's users. This difference is important because the users will not proceed through the normal adoption life cycle, or at least not consciously, because the decision to adopt cloud computing is given to the firm's users, rather than provided as an individual optional selection process.

However, the likely success of adoption by the firm's users is heavily predicated on the differences between the "product" they use, before and after the change.

The normal technology adoption curve reflects "people differences". This is compared to "product differences".

#### • "People Differences" versus "Product Differences"

What may not be so familiar to CEOs is that five key factors or variables, intrinsic to a good or service, account for between approximately 50% and 90% of the variability in the rate at which new technologies are adopted by a community.

#### • Telephone versus Cell Phone Adoption Rates

Consider as a comparison, the difference between the technology adoption rates of the telephone and the cell phone. Many technologies, at first look, seem to their proponents as being so advantageous that they would sell themselves.

In 1876, when Alexander Graham Bell invented the telephone, it seemed to be a "no-brainer" to solve the time and distance information delivery challenges of the day.

However, the adoption of the telephone extended over 100 years. By 1900 only 10% of US households had a telephone. By 1935, some 60 years later, it was 30%. It was not until the 1980's that 90% of US households had a telephone.

By contrast, the adoption rate of the cell phone is regarded as one of the fastest in history. Why was that the case? The answer lies in the product characteristics, rather than any person's propensity to adopt.

### • Consider the Likely Adoption Rate for Cloud-based Fully Hosted Desktop

To evaluate the likelihood of the adoption of cloud computing, we examine an example of one of its variants, in terms of the five product differences with respect to adoption.

If we consider the fully hosted desktop, delivered as a cloud service, as recently announced by IBM, it may be useful to examine each of the five variables to provide some guidance as to how successful the adoption of cloud computing may be among the firm's users.

#### • Five Critical Factors of Adoption

The five factors are the relative advantage obtained from the new idea or technology, the ability to observe it, whether or not the new idea can be trialled, how close the new idea or technology is to the old in terms of the degree of new skills required to use it, and the added level of complexity of the new technology.

Cloud computing is defined for this purpose as:

- i) a managed desktop comprising all of an organisation's current and future software applications
- ii) delivered by an external cloud computing provider
- iii) to the quality level of enterprise-class computing

#### a) Relative Advantage

Relative advantage is the degree to which an innovation is perceived as being better than the idea it replaces. The emphasis is on the user's perception. Obviously, the higher the degree of relative advantage, the higher the likelihood of adoption.

The benefits of cloud computing have been documented earlier, and generally do not accrue to the end-user, except in a subtle way, but more to the firm itself.

However, the relative advantage to the firm is very substantial, as outlined in earlier sections.



#### b) Observability

Observability is the degree to which the results of an innovation are visible to others. It follows that if the level of visibility of the new technology or idea to potential adopters or users is high, the likelihood of early adoption will be high.

Can a user easily observe the use of cloud computing, as it is defined for this purpose? A user can easily observe another user within the firm using exactly the same set of software applications with the cloud computing delivery model, as defined.

The firm may validate its observability by reference checking and direct observation of a potential cloud computing provider's existing clients, as well as trialling the service itself.

#### c) Trialability

Trialability is the degree to which an innovation may be experimented with on a limited basis. The easier it is to test out an innovation, the higher the likelihood of adoption.

The firm, with any particular user, may trial this type of cloud computing service without having to make an irrevocable purchase decision.

Most cloud computing providers have a "guest" user account whereby common applications such as e-mail or Microsoft Office may be trialled to test the user experience, without any on-going commitment.

#### d) Compatibility

Compatibility is the degree to which an innovation is perceived to be consistent with the existing values and experiences of the potential adopter. Clearly, the closer the compatibility match, the higher the probability of adoption.

As the firm's user does not see any change in the software applications the firm may employ, irrespective of whether the software applications are delivered to him or her through traditional on-premise means or by an external cloud computing provider, the user will notice little difference, once the application has been opened by the user.

From the firm's point of view, the portfolio of applications remains the same. What changes is the delivery model. Accordingly, there is a very high degree of compatibility.

#### e) Complexity

Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use. Obviously, the lower the relative complexity of the new technology or idea to potential adopters or users, with respect to the current levels of complexity, the higher the chance of adoption.

As noted above, there is no additional complexity or requirement to learn new skills. If anything, complexity is reduced and the opportunity for user mistakes may be reduced.

As noted in an earlier section, from the firm's point of view, complexity is reduced very significantly.

## A Firm Already Using "Thin Client" Computing Has a Big Advantage in the Speed of Adoption of Cloud Computing

A firm which has already changed its on-premise computing to a "thin client" environment will have a significant advantage in the likelihood of successful adoption of cloud computing.

"Thin client" computing, as explained earlier, means that software technologies such as Citrix are used to deliver the firm's applications to its users from within the firm's own firewall.

Rather than users having a PC to do the processing, the heavy work is done on centralised servers with only screen refreshes, key strokes and mouse clicks being transmitted.

This arrangement is very similar to cloud computing, except that few of the business advantages of external cloud computing are realised. However, it is the stage of moving the firm's users from PCs to "thin clients" that helps very significantly in the adoption of cloud computing.

A PC user often becomes accustomed to loading his or her favourite software on the PC they use for many different reasons. Company data is often saved on the PC's local storage, either inadvertently or for the user's own convenience. Users often heavily customise the PC's settings.

The removal of these user advantages is a cultural barrier to the adoption of "thin client" computing, as well as cloud computing.



From the firm's point of view, the adoption of thin client computing is a very beneficial first stage to cloud computing. Thin client computing lowers user support costs by around 40% because the user PC complexity is almost eliminated.

All company data is stored centrally, new software upgrades do not require an upgrade visit to each PC, the initial and life cycle cost of thin clients is lower than PCs and they last longer.

Energy consumption is at least halved, personal software cannot be loaded on a thin client to distract users, security risks are reduced as new software cannot be introduced on the thin client, and potential data leakages are more easily controlled.

It is this reduced flexibility and loss of personal customisation opportunities that provide the greatest cultural barrier to user adoption of thin client computing and cloud computing.

Accordingly, if a firm has already adopted thin client computing, the probability of successful adoption of cloud computing by the firm's users is likely to be much higher than with a conventional PC-based computing arrangement.

## Why is the Speed of Cloud Computing Adoption Likely to be Relatively Fast?

The adoption of cloud computing, as defined above, is likely to be successful, compared to a new unknown technology, for at least five reasons, as follows.

- 1) Rapid growth in client success stories from early adopters of this form of cloud computing.
- 2) Legitimatisation of the idea following the entry of similar solutions from leading IT players such as IBM.
- 3) A high degree of adoption cycle product compatibility, as described in this section.
- 4) Cloud computing is a disruptive business model innovation rather than a technology innovation. This means that the technology risk is very low.
- 5) The business benefits of consuming computing as a service from the cloud are extremely compelling.

As a result, it may cautiously be predicted that cloud computing, as defined in this section as the delivery of a firm's existing software applications to its users by an external cloud computing provider, using a secure, managed cloud, delivering enterprise-class computing, will be rapid over the next several years.

#### • PC Adoption Rates Compared to Cloud Computing

As a further guide, the difference in adoption rates between telephony and cell phone technology may also be seen in parallel with the first personal computers within the firm and cloud computing, as defined in this section.

The early level of PC technology in 1981 meant that communications between users was not possible and each PC was an "island", incompatibilities between PC vendors caused many problems, e-mail on PCs did not exist, software on PCs was very limited, and data storage and processing power was very primitive by today's standards. Learning to use a PC for the first time was invariably difficult for many people.

By comparison, cloud computing, as defined in this section, maintains all of the advantages of Intel server and PC software, communications and system compatibilities, and familiarity with current systems.



#### **PART SEVEN:**

# Conclusion

Cloud computing is, in our view, a radical transformation of the IT industry, building on the confluence of PC, Internet and communications technologies developed over the past 30 years.

The CEO should care about cloud computing because it is a disruptive business model innovation which offers early adopters a competitive advantage in securing lower IT costs, stronger IT security and a more flexible and agile future.

The CEO, CFO and CIO need to work in partnership to evaluate the risks and benefits of cloud computing. The firm's leadership is likely to embrace the new paradigm of cloud computing, once their concerns about security, reliability and cost are satisfied.

It is relatively easy to adopt the new cloud computing business model without betting the farm. The probability of a rapid rate of adoption of cloud computing by the firm's users is very high.

The principal commercial benefits of lower costs, reduced risks and increased profits derived from cloud computing invite close examination.

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# Why OneNet?

OneNet is a pioneer and market leader in the new computing paradigm of cloud computing. We have established best practices and a proven history over more than twenty-five years of introducing new information technology to support a wide range of organisations, from entrepreneurial firms to global multinational corporations, in leveraging emerging information technology to drive their market success.

We approach cloud computing on the premise that firms seeking to lower their IT costs, gain stronger IT security and build a more flexible and agile future, will seek a trusted and experienced technology business partner who is competent and experienced in delivering outstanding results.

We focus on building a highly resilient, secure and scalable computing infrastructure foundation to leverage the economies of scale of technology and scarce IT talent, to deliver enterprise-class computing, one user at a time, to firms of all sizes.

OneNet values the high market reputation it has earned from solving technical challenges and delivering exceptional value to its clients over the past nine years of its cloud computing history. This heritage extends the same strong enterprise client reputation that OneNet's shareholders and directors built with Financial Systems Limited and The Great Elk Company Limited in earlier years. This more than twenty-five year lineage and pedigree reputation provides security and comfort for CEOs considering dipping their toes in the new ocean of cloud computing.

Cloud computing is a new and rapidly emerging computing model. Accordingly, OneNet works closely with its clients to ensure that risks, security, regulatory requirements and governance concerns are fully addressed. OneNet, paradoxically, adopts both a conservative and an innovative approach to new information technology, ensuring clients gain the maximum benefit from their solution, while limiting any potential risk.

We continue to learn, develop and build on our role as a trusted partner to help our clients succeed in the new and exciting field of cloud computing. We invite you to join us on that journey.



# What is OneNet's History?

OneNet Limited represents the continuing lineage and heritage of its progenitor, Financial Systems Limited, and The Great Elk Company Limited, with the same shareholders and directors, Paulette Snowden and Michael Snowden, during the past twenty-six years.

## **Financial Systems Limited**

Founded in 1983 when IBM launched its PC in New Zealand. An inaugural IBM Business Partner, Financial Systems Limited provided PC and related emerging technology, custom-software development, and education services to large enterprise and multinational firms over many years. Long-standing multinational clients included 3M, Fuji Xerox, Kodak, Fuji Film, Johnson and Johnson, S C Johnson, Ford and McDonalds.

## The Great Elk Company Limited

The Great Elk Company Limited was established in the mid-1990s, pioneering the development and marketing of CRM, or customer relationship management, software to multinationals. Clients such as Eli Lilly, Fuji Xerox, Pfizer and GlaxoSmithKline used The Great Elk CRM package in many global affiliates. At one point, 3M chose The Great Elk CRM software as a global solution. A version in Mandarin was installed in China in 1996 for GlaxoSmithKline. Canon distributed a Japanese version of The Great Elk software in Japan in 1997.

In 1999, a software-as-a-service version of The Great Elk CRM software package, called "SplashNet", was launched in the US market. The SplashNet software-as-a-service hosted product was based on Web 2.0 tools, was multi-tenanted, and was offered on a per user, per month, pricing model. The Great Elk Company's SaaS product SplashNet was, in terms of the history of cloud computing, a pioneering first.

### **OneNet Limited**

The Snowdens sold their shareholding in The Great Elk Company in 2000, just weeks before the dotcom melt-down began. OneNet Limited was established in 2000. By 2002 OneNet's clients had their software applications delivered to their users through OneNet's cloud computing services. In 2003 a cloud storage service was introduced, followed a year later with self-service credit card capability.

Since 2003, many new cloud computing capabilities have been established, with OneNet's revenue and client number growth mirroring the explosive growth in the new paradigm of cloud computing, as well as OneNet's capabilities in harnessing that potential.

# Who are OneNet's



AT&T (NYSE:T) is a global telecommunications company and provides enterprise-quality Internet and data communication services for OneNet. AT&T also provides data centre resources for OneNet. AT&T carries in excess of 25% of global Internet traffic. Total revenue is US\$120 billion and total assets are US\$285 billion.



BlackBerry (NASDAQ:RIMM) is the trade name for mobile communications products developed by Research in Motion (RIM). OneNet is one of three RIM Alliance Partners in New Zealand, and is qualified to offer hosted Microsoft Exchange e-mail and other software on BlackBerrys. RIM's revenue is US\$11 billion and total assets are US\$8 billion.



Cisco (NASDAQ:CSCO) is the global leader in networking and security solutions. OneNet is a long-standing Cisco business partner, and deploys dual Cisco firewalls, routers, switches and intrusion detection systems exclusively. Cisco's revenue is US\$36 billion and total assets are US\$68 billion.



Citrix (NASDAQ:CTXS) is the global leader in software used for the delivery of Windows and Linux/Unix software applications over the Internet or dedicated communications links. OneNet, with Financial Systems Limited, has had a twenty year business partnership with Citrix. Citrix's revenue is US\$1.4 billion and total assets are US\$2.5 billion.



HP (NYSE:HPQ) is a global leader in IT systems and hardware. OneNet recommends HP "thin client" hardware to its clients for use with OneNet's cloud computing services. HP's revenue is US\$118 billion and total assets are US\$51 billion.



# **Business Partners?**

IBM (NYSE:IBM)) is a global leader in IT. OneNet has, with its progenitor Financial Systems Limited, been an IBM Business Partner for over twenty-six years. OneNet uses IBM blade server, server and storage equipment exclusively. OneNet also delivers its clients' software applications from IBM Data Centres. IBM's revenue is US\$104 billion and total assets are US\$109 billion.



Intel (NASDAQ:INTC) provides microprocessors for the majority of server technology products, as well as more than 95% of PC products. OneNet uses Intel processor-based servers exclusively. Intel's revenue is US\$37 billion and total assets are US\$51 billion.



Iron Mountain (NYSE:IRM) specialises in the secure retention of company data. The Iron Mountain Digital Division has partnered with OneNet since 2003 to provide data storage in the cloud. OneNet's off-site tape backups are held in Iron Mountain's vaults. Iron Mountain's revenue is US\$3.1 billion.



Microsoft (NASDAQ:MFST) has a twenty-six year business partner history with OneNet and Financial Systems Limited. OneNet is a Microsoft Gold Certified Partner with specialty qualifications in networking infrastructure solutions, security solutions, advanced infrastructure solutions and information worker solutions.



VMware (NYSE:VMN) is a market leader in server virtualisation software, which is an enabling technology in cloud computing. OneNet is a registered VMware partner. VMware's revenue is US\$1.9 billion.



# **Contact OneNet**

We hope that you have found some value in these pages and that we have provided a framework for your thinking about the new paradigm of cloud computing.

We would very much like to hear from people about what they think of our ideas about cloud computing and what has worked for them to date. This is a second edition of what may be further editions in the future, as the new computing model of cloud computing makes its path into history.

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