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Is cloud computing positioned to become a dominant business information technology?

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Executive summary

The report is aiming to answer one question, “Is cloud computing positioned to become a dominant business information technology?” by providing an overview about cloud computing as a concept and technologies. Cloud computing has the potential to change the whole IT industry and how it works currently by offer IT and computing as *utility*.

Cloud computing is combining both software and hardware together and offer them as services to customers via the internet. By using virtualization and other technologies, users have full access and nearly full control to whatever hardware needs they may require.

This research has used a secondary sources; it has been conducted by collecting and then analyzing the information about technology, market, service offerings and finally challenges and issues.

Currently, the main cloud computing services providers are Amazon, Google and Microsoft. There is no detailed information available in public about the technology components used by each company. However, all of the mentioned companies are using the same concept, but different set of protocols and procedures. Additionally, these three providers are using different languages for programming and coordinating the cloud applications.

The three leaders each have a different purpose. Amazon gives users access to a fully-controllable hardware and software system. Google restricts access to a focus on the web applications; this limits general purpose computing. Finally, Microsoft offers a solution that is suitable for general purpose computing and provides more control to developers and users.

Cloud computing at its current form is a business model that consists of three main layers. The first later is the cloud providers, the second layer is the software as a service (SaaS) provider and the third layer is the Saas users.

Furthermore, Cloud Computing is facing numbers of challenges and issues. The main challenges and issues are about the migration of existing application, the overall management, the legal risks, the actual absence of service level agreements and also the vagueness in cost advantage.

Thinking about the cloud computing from Friedman’s point view “The world is flat”, and by following the IT trends, we start to see a future of the creation of a global cloud which supplies a global market and is doing so via a global platform, the Internet. This will create

huge opportunities, challenges and changes that required being able to work and compete in a world that has became even more flat due to the advent of cloud computing.

The report conclusion highlights the cloud computing future, and suggests that cloud computing is coming and that it will be accepted by organizations and more importantly by people.

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1 Introduction

Cloud computing has been described as “the long held dream of computing as a utility” (Armburst et cal, 2009, p. 1.). As a concept and technology is evolving rapidly and forces itself into the Information Technology equation aggressively.

A Gartner (2009) report mentions that worldwide cloud services revenue is on pace to surpass $56.3 billion in 2009, a 21.3 percent increase from 2008 revenue of $46.4 billion. Furthermore, the market is expected to reach $150.1 billion in 2013.

According to IDC (2009), as the cloud computing model offers a much cheaper way for businesses to acquire and use IT, IDC expects its adoption to be amplified by the cost-cutting mantra of most organizations today.

History has shown us that there are many transformations in the business environment that affect the way and manner that business is conducted. In the beginning of last century, the power generation was transformed from a corporate function to a utility, as Carr (2005) illustrated in his article “The end of corporate computing”.

In this research we examine the question: *“Is cloud computing positioned to become a dominant business information technology?”*

Cloud computing as a concept and technology has the potential to repeat the history once again and transfer IT from assets to expenses. Therefore, it is important to develop a reasonable understanding about this technology, in order to be able to point out what are the effects that cloud computing may cause and how these effects will impact IT industry.

Furthermore, this report will examine the enablers of Cloud computing that potentially place it at the forefront of Business Information Technology. Then, it will provide an overview of the business models and identify market players. It will give some reflections about the flattening forces that have enabled Cloud Computing and how Cloud Computing fits into a flat world model and and the possible long term impacts of this.

2 Methodology

The research mainly will be conducted by using **secondary sources.** The secondary soruce research method is suitable for this project and its purpose. Therefore, we will collect the needed information from the relevant books, e-journal and IT magazines.

In due course, the data collected will cover the theoretical part of the report. The primary part of of the research is to provide a solid background about cloud computing, which will lead to further understanding and comprehension of its concept and scope.

The research will also use a major source of information the World Wide Web. This research is investigating a subject which is relatively new; therefore, the World Wide Web is significant tool to research current data, opinions and emerging technologies.

Generally, the research aims to collect and analyze data on the emerging technology that is cloud computing and put forward a proposition that Cloud Computing is in fact positioned to become a dominant global business technology.

3 What is cloud computing?

Leonard Kleinrock, the MIT professor who has made important contributions into the networking of computers and is one of the early researchers who has had a broad vision about computing and networking and its future, said that "We will probably see the spread of 'computer utilities', which, like present electric and telephone utilities, will service individual homes and offices across the country", Kleinrock (1969).

In his article "IT in 2018: From Turing's Machine to the Computing Cloud" Nicholas Carr, writing about the 1936 invention of the concept of the universal computing machines, notes that "The only real constraints on a universal computing machine are the size of its memory and the speed with which it can carry out its calculations and transmit the results"(Carr, 2009, p. 2)

These statements represent visions of a future based on work from both the early and mid twentieth century. They clearly demonstrate that the cloud as a concept is not a new one, however with the advent of what is being referred to as cloud computing and computing as utility, we are now starting to see these visions realized.

Another fundamental point is that cloud computing and software as a service (SaaS) are not same and there is a fundamental difference between both. SaaS is offering a certain application over the Internet. For instance, Salesforce.com offers a Customer Relation Management CRM application, in this case Salesforce's customers using CRM only to manage their daily work. On the other hand, Google provides Salesforce.com with all their IT infrastructure needs in terms of software and hardware systems and these services provided by Google's cloud. Salesforce doesn't invest directly in their IT infrastructure but they use Google's cloud to provide them with IT infrastructure via the cloud. Therefore, SaaS and cloud differ in concept as to their intended use but Saas facilitates, or rather provides a market for, the 'cloud'. SaaS however is an older technology concept than that of Cloud Computing.

In order to understand the technological aspects of cloud computing, we need to consider the milestone points in IT history for the last 30 years.

We can generalize and say the IT era started with the introduction mainframe computers in 1960s and 70s. Since then, organizations have moved towards PCs and client-server models in 1980s. This has enabled organizations to build and manage their own networks which they use to share information.

The next significant development was the WWW, the internet and an explosion in investment in this technology during what people refer to as dotcom bubble in the late 1990s.

Looking closely at these phases of development, we see that computers have become interconnected in Local and Wide Area Networks The main facilitator was TCP/IP protocols developed by Vinton Cerf and Robert Kahn (MIT 2000); secondly, documents and information in various forms and formats became linked together using the standardized protocols discussed by Friedman (2009 p. 82 – 84), protocols such as HTTP, HTML, and XML. Thirdly, the applications got linked and integrated together over the Internet as Web Services Applications; this was facilitated by protocols like Simple Object Access Protocol SOAP, and other significant protocols and procedures such as API's (Application Program Interface), Service Oriented Architecture SOA, also discussed by Freidman (2009, p 85) and (Foster et al. 2008).

As a result of the above developments in technology, organizations started to build datacenters in order to manage their IT infrastructure at the hardware and software level. Additionally, we have seen in early 2000s many of successful grid computing examples with organisations linking their hardware in order to utilize parallel processing power mainly for researches purposes requiring enormous amounts of computing power, a concept designed to overcome the limitation the availability of computing resources (Weiss 2007).

In order to explain the cloud computing in a very simple idiom, if we could integrate and link the current huge datacenters of today's datacenter owning organizations together by using the common computing protocols and procedures ,such as APIs, SOAP, SOA, etc. and virtualisation technologies such as those offered by VMWare, and Microsoft, the result of this integration will lead to we are referring to as the *Cloud.* Obviously, the integration and linkage will be done at both levels - software and hardware (Milojicic 2008). Armbrust et al (2009 p.1) define cloud computing as "both the applications delivered as services over the Internet, and the hardware systems and software in the datacenters that provide those services".

Reviewing Carr, (2009) and Armbrust et al (2009), we see a picture emerging of a globally available 'utility' delivering software applications and services via the Internet. This is what we are coming to understand as Cloud Computing and globalised companies such as Amazon, Google and Microsoft are positioning themselves to build and operate public "clouds", that offer Software as a Service (SaaS) and raw computing capacity to the public and business on a pay as you go, or per usage basis.

The question then is will this become a viable and leading business technology and change the way that Information Technology is accessed and used globally? That is what this research aims to explore.

3.1 Insights of Cloud computing technology

In is important to highlight that the market leaders in cloud computing so far are Amazon, Google and Microsoft. Each of those companies has a different technology set up to form their clouds. There is no exact detailed information available in the public domain about the technology components that each company is using in developing, configuring and maintaining its cloud.

However, the report will discuss the general concept of the technology that used by each company.

Amazon is using Elastic computing EC2 is at one end of the spectrum. An EC2 instance considered as a physical hardware a PC for example, and users can control nearly the entire software stack, from the kernel upwards. The difference between PC or server and EC2 instance is that server is a physical machine, whereas, EC2 instance is a virtual hardware that user can perform on it whatever he or she could perform in a normal server or PC. Additionally, the instance will be stored on Amazon AWS datacenters and the user is given access to EC2 instance via the internet (Armbrust et al, 2009 p. 9).

EC2 works based on the API procedures, a few dozen API calls to request and configure the virtualized hardware. There is no a priori limit on the kinds of applications that can be hosted; the low level of virtualization—raw CPU cycles, block-device storage, IP-level connectivity—allow developers to code whatever they want. On the other hand, this makes it inherently difficult for Amazon to offer automatic scalability and failover, because the semantics associated with replication and other state management issues are highly application-dependent (Golden, 2009) .

Amazon offers several higher-level managed services, including several different managed storage services for use in conjunction with EC2, such as SimpleDB. However, these offerings have higher latency and nonstandard API's, and our understanding is that they are not as widely used as other parts of AWS.

Google is offering their cloud services via AppEngine and it is based on traditional web applications. However, AppEngine applications are expected to be request-reply based,

therefore, they are strictly rationed in how much CPU time they can use in servicing a particular request. AppEngine's impressive automatic scaling and high-availability and reliable mechanisms (Palmer, Brew & Xia 2008). Additionally, for storage Google using MegaStore (based on BigTable) data storage available to AppEngine applications and work in harmony with all AppEngine set of procedures and protocols. AppEngine is not suitable for general-purpose computing; it is more focused and suitable for web based application. A good example of a company using Google's AppEngine is SalesForce.com, the company is offering a customer relation management CRM solution via the internet by hosting the application on Google datacenters and so far SalesForce.com seems to be a successful business model by looking at their customer portfolio and yearly growth.

Microsoft is delivering its cloud services through Azure. Azure is offering good balance between the flexibility and programmers/developers convenience. Azure applications are written using the .NET libraries, and compiled to the Common Language Runtime, a language independent managed environment, which developed by Microsoft. The system supports general-purpose computing, rather than a single category of application. Azure users have a choice of languages, but cannot control the underlying operating system or runtime. The libraries provide a degree of automatic network configuration and failover/scalability, but require the developer to declaratively specify some application properties in order to do so. Thus, Azure is intermediate between complete application frameworks like AppEngine on the one hand, and hardware virtual machines like EC2 on the other (Armbrust, 2009).

3.2 Cloud computing business models

According to Gartner, cloud computing is still in the hype cycle and expected it to reach the maturity level by 2013.

The report argues that by this estimation it would reach its maturity level by 2013 for two main reasons. Firstly, we are in the middle of global financial crisis and the current global economy performance is forcing the organizations to rethink about their business models and reevaluate their capabilities and performance in order to survive. The current tipping point in the history is very challenging and poses a significant question as to whether organizations been efficient in managing IT resources in the last 30 years.

Secondly, cloud computing is facing challenges that are yet to be addressed. The report will mention these challenges in section 3. By examining these reasons, we come to understand that organizations more likely need more time to work out their best possible strategy to

sustain their business. Therefore it can be argued that this estimation of cloud computing maturity is optimistic.

Realistically, at the present it would be inaccurate to draw a complete business model for the cloud computing, because the technology has not been adopted broadly by the organizations. However, cloud computing can be more readily understood based on Software as a Services (Saas) business model.

As we have explained with cloud technology, the cloud has three main layers:

- **Layer 1** is the cloud providers or the utility providers such as Google, Amazon and Microsoft. These companies will provide the cloud computing services in both forms software and hardware.
- **Layer 2** is the SaaS providers, cloud users, those companies will utilize the utility companies (layer 1) to produce their applications which will be delivering over the internet. A good example of this is Salesforce .com, who offer their CRM application over the internet but at the same time they are using Google's Appengines to manage their application and services.
- **Layer 3** is the Saas users, the organizations or individuals who are interested to use any of the offer applications and services by the Saas providers.

The above business model offers brilliant opportunities for companies as cloud providers, SaaS providers and SaaS users (Watson et al. 2008). The benefits of each category can be concluded as follow:

Cloud computing providers:

- Investment opportunities and therefore, new revenue channel
- Cloud providers can generate profits by franchising their services across the globe
- Leverage and enhance the customer relationship with their current customers and it could lead to a new form of partnership, which has not been existed before.

SaaS Provider:

- Huge market opportunities, which would create new revenue channels
- Reduce the cost of investment of IT infrastructure
- Opportunity to compete based on innovation and analytic capabilities

- Enhance the operating efficiency and reduce the overhead costs

SaaS users:

- Access to software products without the need for expensive in house licensing or support
- The availability of information
- Dramatic drop in IT infrastructure investment
- Facilitate opportunity to create new business models based on operation efficiency and creativity.

4 Cloud computing market

As seen previously, Cloud computing encompass a large range of technologies and categories; as a result the market is also reflected in this perspective.

As Kim (2009) explained in his article *"Cloud Computing: Today and Tomorrow"*, it can be noted, some already highly-used technologies can be contained into the Cloud computing umbrella that create confusion (Gartner 2008), like managed services (online virus-scanning for email, desktop management or also security services) and Webservices (Google map, credit-card processing, etc.). However, in an objective to focus on the emerging technologies, we will divide the market into 2 big categories: Software / Platform as a Service (SaaS) and Utility computing (Kim 2009).

4.1 Platform or Software as a Service (PaaS / SaaS)

This sector contains a large number of P/SaaS vendors, focusing exclusively on enterprise or generally on end-user desktops. Examples for the former are Salesforce.com, Oracle and Siebel through their CRM applications, Workday with an ERP, Citrix through a desktop and meeting applications; whereas, examples for the latter are mainly Google Apps (with all the existing applications like Gmail, gTalk, gCalendar, gDocs and the recent gWave), but also Zoho Office, Microsoft Windows Live, Linked In and in general all the internet portal or search engines websites (Hayes 2008; Kim 2009).

4.2 Utility computing

The utility computing is the most emerging technology in Cloud computing through large rallying from companies of every sort.

The most spoken and discussed are Amazon, Google and Microsoft through their powerful and sophisticated but totally different infrastructure. Following to these leaders, large companies like Sun Microsystems, IBM, AT&T, but also small start-ups like Nirvanix, Hatsize, Hoyent, Cloudworks have joined the market because of the Cloud computing expectations (Armbrust et al. 2009; Kim 2009).

It can also be noted some vendors that take a different position from the 3 leaders by providing a fully functional virtual desktops as a utility use; for example GOPC.net, Zimdesk, Sun Microsystems or also Desktop Two (Kim 2009).

5 Challenges and issues

Cloud computing as a new technology, encompassed a range of challenges and issues. These problems have been debated throughout studies, reports and articles. Bernard Golden, author of *"Virtualization for dummies"* and *"Succeeding with Open Source"*, describes the major challenges and issues in an article *"The Case Against Cloud Computing"* on CIO (Golden 2009); furthermore these are complemented by the study *"Above the Clouds: A Berkeley View of CloudComputing"* from Berkley university (Armbrust et al. 2009).

5.1 Challenge: Application migration

The major challenge that discourages most of companies is the migration of existing application to cloud architecture. As a consequence of technologies use in Cloud computing, the provided infrastructure is totally different from a traditional physical architecture. As a result, the migration of an application to a cloud will necessitate a rewriting of some part: usually the network, storage and scalability management (Golden 2009).

Moreover, the non standardization of cloud infrastructure create a problem of data lock-in. Data are embedded into the architecture and are very difficult to get them out; this has for consequence to immobilize customers within a single infrastructure. As a result, the failure of the cloud can lead to the lost of data or the impossibility for the business to run normally. Another challenging aspect is the vulnerability of Cloud computing customers to the change in pricing of cloud providers (Armbrust et al. 2009)

5.2 Challenge: Managing the cloud

With a new infrastructure, come new management tools, it is the case with cloud providers. To date, the traditional tools used by company are no more compatible with cloud, and people must have to adapt themselves to new ones. This will oblige manager to use different tools for managing internal and external system (Golden 2009).

Furthermore, the performance unpredictability will make harder the management of this kind of infrastructure. Even if the CPU sharing is reasonably well managed throughout the cloud, the I/O accesses are more problematic with some regular deviation in bandwidth. In some intense computing, a fall in I/O performance can slow down the application treatment (Armbrust et al. 2009).

Moreover, the problem in data transfer will join this problematic. Conversely to the high evolution of hardware, the bandwidth speed and cost are the slowest to evolve, it create limitation and high costs for injecting or sending back home some data from the cloud (Armbrust et al. 2009).

5.3 Issue: Legal and regulatory risks

With outsourcing or software as a service (SaaS), many problems of this kind were already existing, Cloud computing is not exempted. In case of demand capability, data confidentiality and auditability, cloud providers have a lack of experience and momentum (Golden 2009)

For data confidentiality, certain countries have laws to enforce cloud providers keeping customer data within the boundaries. Moreover, the cloud infrastructure is opened to the worldwide internet and can be more exposed from external attacks. Then, accountability is part of some regulation laws (for example in USA) that must be provided for any corporate data that would be deployed into a cloud (Armbrust et al. 2009).

5.4 Issue: Absence of service level agreements

The service level agreements (SLA) are an important part of the business continuity plan. When it comes to Cloud computing, the providers do not offer sufficient guarantees. Even if the cloud infrastructure is redundant, most of the providers have been subjected to some outages. As a result of this young technology, providers do not have enough experiences to face all the problems. Without a concrete business continuity, organization can be easily reluctant to deploy its critical product into a cloud (Armbrust et al. 2009; Golden 2009).

5.5 Issue: Vagueness in cost advantage

The transparency of cloud providers about price has created another immense debate between pro-cloud computing, pro-traditional way and pro-outsourcing. At first sight, price of cloud computing seems insignificant but when it comes to make real case calculation and compare it to outsourcing or internal data centers, the doubt appears (Golden 2009).

As most outsourcing companies provide a global pricing for managing a set of systems, it can be difficult to compare, but for some 24/24h and 7/7d application, the battle is won by outsourcing. In case of temporary work that need more power than time, Cloud computing become a lot more interesting than traditional ways (Armbrust et al. 2009). Moreover, Golden

(2009) advices to make real simulation by deploying applications into the cloud and comparing them with a deployment into a traditional data centers.

6 Reflection on Cloud computing

6.1 The flat world according to cloud computing

How does Cloud Computing fit with the concept of the "flat world" as described by Thomas Friedman in his book "The World is Flat – The Globalized World in the Twenty-First Century"? In his thesis, Friedman (2006) writes about a flat world. The flat world has enabled companies (and individuals) to operate efficiently across multiple borders and for people and businesses to interact with each other from separate countries as if they were working in the same building. They collaborate using connected hardware and interactive and connected software. Friedman explores in some detail the 10 forces that have led to the 'flat world'. This component of the research examines some of these flattening forces and their contribution to the enabling of Cloud Computing technology. In particular, the focus is Globalization forces and on the physical platform of the Internet.

With Cloud Computing, we are seeing the development of computing hardware and software that enables the sharing of the computing capacity of multiple hardware resources and the distribution of applications, including entire Virtual Machines (VMs) via the Internet. We see providers of enabling technologies such as virtualization software are positioning themselves for market share (Brodkin & Gedda 2009). Finally, we are seeing providers of "cloud computing" services such as Amazon with their Elastic Compute Cloud (EC2) services and Google with Google AppEngine competing to bring cloud computing services to the global market in the form of "public clouds" (Ambrust et al, 2009p. 2).

6.2 Enabling Global Clouds

In "Above the Clouds: A Berkeley View of Cloud Computing" (Armbrust et al p. 1), it is argued that "the construction and operation of extremely large-scale commodity-computer datacenters at low cost locations was the key necessary enabler of Cloud Computing".

Armbrust et al pose the question (given the enormous cost involved to setup these datacenters) "Who would become a cloud computing provider, and why? They write that given the extraordinary growth of Web services provided by companies such as Google, Microsoft and Amazon, in the early 2000's many of these companies were already underway with large scale (and scalable) infrastructure in order to handle the growth in required capacity to support their existing buisness models. This is effectively saying that because of

the enormous success and anticipated further growth of their existing web-based services using the globalised Internet platform, that further investment in the what can now be seen as necessary cloud computing infrastructure was already underway. This provides us with evidence that phenomenal success of a business model on one platform (The Internet) has led to significant further investment in infrastructure that can be used for future business models (provision of application services) on that same platform (The Internet) using highly optimised hardware platforms (the Cloud).

Looking to Freidman's flat world forces we see obvious examples of globalization forces that are facilitating this infrastructure investment. We understand that the physical cloud – the low cost datacenters referred to by Amburst et al (2009) can be built thanks to low cost manufacture of hardware in the lowest cost manufacturing regions, even where hardware manufacturing companies are based away from these regions. The "Cloud" can be setup in datacenters at lower cost, lower risk and secure locations (such as countries were security and supply of electricity are stable. The Google data centre in Dalles is described in the NY Times article "Hiding in plain sight" (Markoff & Hansell 2006) as being the size of 2 football fields that is "at the intersection of cheap electricity and readily accessible data networking" and is "the backdrop for a multibillion-dollar face-off among Google, Microsoft and Yahoo that will determine dominance in the online world in the years ahead". Of the Google Datacenter (which opened 18 months after the article was written), Markoff & Hansell (2006) make this important point which ties directly to Friedman (2006) in his discussion on fiber optics: "The complex will tap into the region's large surplus of fiber optic networking, a legacy of the dot-com boom". Here then is a large global IT business – Google - building a massive datacenter to compete globally with Microsoft and Yahoo (amongst others), tapping in to a known global flattening force described by Thomas Friedman, being the large surplus of fiber optics.

6.3 Global Utility Platform

Carr (2009) makes the analogy of cloud computing as a utility that is comparable to electricity as a utility. However, electricity supply can be generally regarded as a local utility, and can only be distributed via the local platform of wires and poles, power stations and sub stations and switchboards. Supply is limited to a regional scale which at most might be a national electricity grid as is the case in Australia. For Cloud Computing however, we are referring to a global utility. It supplies a global market and is doing so via a global platform. That platform is of course the Internet.

In our discussion on Globalisation and Cloud Computing, it is important then to focus on the platform - the Internet, because that is the power lines and power stations likened to in Carrs analogy with the electricity industry that enable cloud computing. Whereas Amburst et al remark that low cost datacenters is a key necessary enabler, it is clearly evidenced that the Internet enables the Cloud to survive as a business model and deliver its services to the customer.

In his discussion on the Internet before the advent of the more service oriented flatteners such as uploading, outsourcing, offshoring, supply chaining , insourcing and in-forming, Friedman describes the evolution of a "flat world platform" –that is the physical platform of the Internet. In discussing the web browser, fiber optics, and "standardised transmission pipes and protocols that connected everyone's machines" Friedman concludes "what you end up with is the crude foundation for a whole new global platform" (Freidman, 2006).

Let us take a further example of a Global Internet based service and its relationship to the enabling of cloud computing, that of financial transacting. Ambrust et al (2009) in looking at Cloud Comuting from a *"*Why now, not then*?"* perspective write that web based payment technologies such as PayPal represent a "new technology trend and business model". In particular, Paypal allows "any individual to accept credit card payments with no contract, no long term commitment and only modes "pay as you go transaction fees". An internet based service such as this reduces cost for both customer and vendor, removes complexity, or in other words, "flattens" part of the business process that would otherwise add cost and complexity to transacting online. As cloud computing is about transacting online – buying, selling, using capacity and software services online, we clearly see the evidence of how a globalized technology such as Paypal is just one more of many "world is flat" forces are contributing to the potential ongoing business viability what we are coming to know as cloud computing.

7 Conclusion

Most of researches have focused on the technology and business aspects and how cloud computing is going to change the IT industry and therefore, they have been focusing on new business models, cloud computing technology and new skills and expertise, new perspective of IT, etc.

In this report, we wish to tackle the cloud computing from three perspective; economy, people behaviors and technology.

At the present, we are experiencing a global financial crisis GFC and the global economy is facing a serious challenge. We believe that the impact of this crisis will have a significant change as government, organizations and people will realize that the current economy theories are not good enough to generate a sustainable economy.

More likely, the new changes will address issues such as the efficiency, economy of scale issues and technologies. Cloud computing can offer a great economy of scale option for organizations hence the utility will be run and managed by companies that have the expertise in IT infrastructure. The market movements are supporting this assumption, by looking at IBM strategy and their focus in services, Microsoft and their strategic shifting towards services and devices networking.

On the other hand, by taking a closer look at Web 2.0 impact on people and the way they are communicating currently with IT technology on social life as a result of applications like Facebook.com, MSN, Email, Web services; we can safely conclude that these people are in fact utilizing the cloud. Therefore, by analyzing people behaviors and how they respond to technology, we can safely conclude that cloud computing will be greatly accepted especially by the younger generations which form the forthcoming workforce.

The last point is the cloud computing technology is a powerful and based on reliable supported technologies, such as virtualization, APIs, etc.

To sum up the above, the report believes that cloud computing is coming and will apply a huge change on IT industry that will position it as a dominant technology. However, the report is strongly recommending further researches on the cloud computing hence it is a fairly complex subject. The further studies ultimately need to focus on cloud computing business models, cloud computing economy of scale, market growth and more importantly the adoption rate.

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