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Impact of Cloud Computing on Data Management and IT Department

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Abstract: Cloud computing has brought a revolution in daily lives at homes and at work places, as the technology has made computer power available at affordable price. Cloud computing undoubtedly changes the role of the ICT practitioner. However, instead of introducing an entirely new set of professional skills it rearranges the importance of skills already in the practitioner's toolbox. After a review of IT departments implementing Cloud technology, we are seeing the following differences: they are able to do more IT planning, implement systems faster and spend more time performing business analysis to improve solutions. Cloud computing will not eliminate the need for the IT team but it will shift the roles that the IT Staff play within an organization.
Key words: Cloud Computing, Data Management, IT Department

INTRODUCTION

The success of modern day technologies highly depends on its effectiveness of the world's norms, its ease of use by end users and most importantly its degree of information security and control. Cloud computing is a new and emerging information technology that changes the way IT architectural solutions are put forward by means of moving towards the theme of virtualization: of data storage, of local networks (infrastructure) as well as software [1].Cloud computing has recently become a prevalent technology and is currently one of the main trends in the information and communications technologies (ICT) sector. The 2011 Gartner hype cycle, for example, referred to cloud computing as the "most hyped concept in IT [2]. Cloud computing" has been a trending search on Google since 2009 with continued interest[3].

While the traditional IT delivery model is focused on the development, maintenance and operation of computing hardware and software, the cloud computing model focuses on providing IT as a service[4]. In Cloud Computing, the IT infrastructure supporting your business is hosted in a Data Centre somewhere on the Internet, which is where the term "Cloud" originates from since the Internet itself is traditionally depicted as a cloud in network diagrams. The most notorious advantage of Cloud Computing is the reduced cost when compared to managing your own IT infrastructure. With the Cloud you only pay for what you

need and use with no hidden costs or risks involved. However, Cloud Computing also offers greater flexibility and opportunity. Business needs often fluctuate over time and you may need to increase the computing resources either permanently or for a short time such as for the duration a particular project. The cloud makes it very easy to double or triple your computing resources within a moment's notice and more importantly allows you to reduce it again once you no longer need it. Since you only pay for what you use, there are no investment costs and moreover no redundant hardware once you no longer need it.Another considerable advantage of the Cloud is access to software that is critical to the business. Instead of having to purchase costly software licenses and worry about maintaining them, a business can rent software as a service from the Cloud and only pay for how many people use it and how often[5].

Cloud Computing Defined

There seems to be many definitions of cloud computing around. A study by McKinsey (the global management consulting firm) found that there are 22 possible separate definitions of cloud computing [6]. The National Institute of Standards and Technology (NIST) defines cloud computing as:

" A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., Networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction".

There are three main types of cloud services offerings by NIST:

•**Infrastructure as a Service (IaaS):** Products offered via this mode include the remote delivery (through the Internet) of a full computer infrastructure (e.g., Virtual computers, servers, storage devices, etc.).

•**Platform as a Service (PaaS):** To understand this cloud computing layer one needs to remember the traditional computing model where each application managed locally required hardware, an operating system, a database, middleware, Web servers, and other software. One also needs to remember the team of network, database, and system management experts that are needed to keep everything up and running. With cloud computing, these services are now provided remotely by cloud providers under this layer.

•**Software as a Service (Saas):** Under this layer, applications are delivered through the medium of the Internet as a service. Instead of installing and maintaining software, you simply access it via the Internet, freeing yourself from complex software and hardware management. This type of cloud service offers a complete application functionality that ranges from productivity (e.g., office-type) applications to programs such as those for Customer Relationship Management (CRM) or enterprise-resource management[7].

TYPES OF CLOUDS

There are four basic cloud delivery models, as outlined by NIST, which relate to who provides the cloud services. Agencies may employ one model or a combination of different models in delivery of applications and business services:

Public Cloud

A public cloud is a model which allows users' access to the cloud via interfaces using mainstream web browsers. It's typically based on a pay-per-use model, similar to a prepaid electricity metering system which is flexible enough to cater for spikes in demand for cloud optimization. This helps cloud clients to better match their IT expenditure at an operational level by decreasing its capital expenditure on IT infrastructur[8].

Private Cloud

A private cloud is set up within an organization's internal enterprise datacenter. It is easier to align with security, compliance, and regulatory requirements, and provides more enterprise control over deployment and use. In the private cloud, scalable resources and virtual applications provided by the cloud vendor are pooled together and available for cloud users to share and use. It differs from the public cloud in that all the cloud resources and applications are managed by the organization itself, similar to Intranet functionality. Utilization on the private cloud can be much more secure than that of the public cloud because of its specified internal exposure. Only the organization and designated stakeholders may have access to operate on a specific Private cloud [9].

Hybrid Cloud

A hybrid cloud is a private cloud linked to one or more external cloud services, centrally managed, provisioned as a single unit, and circumscribed by a secure network [10]. It provides virtual IT solutions through a mix of both public and private clouds. Hybrid Clouds provide more secure control of the data and applications and allows various parties to access information over the Internet. It also has an open architecture that allows interfaces with other management systems. To summarize, in the cloud deployment model, networking, platform, storage, and software infrastructure are provided as services that scale up or down depending on the demand [11].

Evaluation of cloud computing

1. Advantages

When it first emerged in 2007, cloud computing received a mixed reaction. While some analysts saw merits in its application, others (including highly respected IT individuals) such as Richard Stallman, creator of the GNU operating system and founder of the Free Software Foundation and Larry Ellison, founder of Oracle, regarded it as a useless business model [12, 13]. But cloud computing continued to attract many followers and increasing numbers of ICT companies embraced it and began to offer many of their services in the cloud. Having passed

the fad stage, few people now doubt the economic attractions of this new computing service paradigm. Cloud computing delivers a variety of essential software and hardware services (e.g., applications, storage, processing power, virtual servers) over the medium of the Web (i.e., the cloud) on a pays- you-go price structure, thus offering scalability and obviating the need to make large investments in expensive hardware and software licenses and offering organizations significant cost advantages[14,15].

Continuous upgrades of software and hardware have become common (and expensive) practices in many organizations. This situation is likely to be made worse in the current economic climate following the near collapse of the world's financial systems. Cloud computing can provide many of those organizations with the opportunity to continue to take advantage of new developments in IT technologies at affordable costs. While cloud computing seems to make economic sense, some people think this can only be achieved in the long run. Reflecting on his company's successful implementation of a SaaS solution, Doug Menafee, CTO of the Schumacher Group, a leading US emergency and hospital medicine management company, admitted that a cloud solution could be more expensive to run in the short term due to the heavy connectivity demands that require the installation of expensive high speed cables such as fiber optics. He explained that it takes a three year ROI (return on investment) period to break even and over five years to realize the economic benefits[16].

2. Cloudy issues

Despite, the economic and flexibility attractions of cloud computing there are still many issues that it needs to overcome: security, vendor-lock and outages are the most problematic [17]. Security is no doubt one of the main concerns for organizations contemplating the adoption of this ICT service modality. A survey of 244 chief information officers and IT executives conducted in 2008 by IDC (International Data Corporation), the market research firm, revealed that 75% of the respondents rated security as their main cloud computing concern while performance and availability were the next two concerns for 63% of the respondents [18]. Moreover, various governments, such as those in the European Union (EU), have privacy regulations that prohibit the transmission of some types of personal data outside the EU. This issue, however, is no longer a problem as many cloud vendors now (such as Amazon, Microsoft and others) were able to establish some of their cloud data centers in various locations across the EU region and elsewhere in the world and can offer their cloud clients the option of where they want their data to be stored. Organizations are likely to adopt a careful approach to cloud computing. Another survey by EDUCAUSE, US-based non-profit organization that promotes the intelligent use of information technology in higher education, involving 372 of its member institutions revealed that a great proportion of the respondents with use cases that involved cloud-based services reported that data privacy and data security risks were among their top barriers to overcome[19].

5. MANAGING CLOUD COMPUTING

The move to a cloud computing environment has started in earnest with the complete spectrum of businesses, from large multinationals to smaller organizations, moving their IT services to cloud computing platforms. There are many drivers for this, with reduced costs being the most commonly cited reason[20].

A major driver of cloud computing is the pressure on IT departments to deliver more and enhanced services with reduced budgets, whilst responding to ever-increasing and ever-changing business requirements. Cloud computing is also seen as a way to free up IT resources to concentrate on core activities, by outsourcing non-core activities such as management of e-mail systems. An internal IT department running cloud-based services can focus its energy on services that offer core business value to the business, whilst letting the cloud service provider deal with the non-core services. While cloud computing promises significant benefits, there are many challenges to successfully delivering cloud-based services. These challenges need to be understood and managed before attempting to take advantage of what the cloud has to offer[21] .

6. CHALLENGES WITH MANAGING CLOUD PROJECTS

There are a number of key challenges faced by companies that want to move to a public cloud. These challenges include:

• Security: With cloud computing, you are heavily dependent on the service provider for security. Cloud service providers can claim to provide complete security for access, compliance, data segregation, backup, recovery, etc. With so many new players in the market how do you know if you can trust the supplier? Do you know what their security policies are[22,23,24]?

• Data Ownership: What happens to your data when it leaves your organization to reside in the cloud? Companies who move to the cloud probably will not completely lose track of their data but they are likely to lose some level of ownership and, in particular, control. It is important to understand who can access the data and for what purpose[25,26,27] .

• Lock-in and Interoperability: Today each service offering provides its own unique way for the cloud to interact with applications, data and clients. It can be very difficult to use multiple vendors and to seamlessly integrate legacy and cloud services. Do you have a plan to integrate your cloud services or to move to another cloud supplier in the future[28, 29, and 30]?

• Standard Architecture: There is no standard open architecture being used for cloud services.

Each of the major cloud providers (Amazon Web Services, Salesforce Force, Google App Engine and Microsoft Azure) imposes different architectures that are dissimilar to the common architectures currently used for enterprise apps [31]. Although a customer's functional and technical requirements may be satisfied, the lack of standards will compromise the customer's ability to seamless migrate

from one service provide to another and may need a complete re-write of their software to do so.

• Enterprise Support and Service Maturity: Cloud computing services may not provide the levels of reliability, manageability, and support required by large enterprises. Is the cloud supplier mature enough for your needs[32]?

• Loss of Data: Data stored in the cloud can be replicated across multiple machines and backed up. However, not all cloud services have the same redundancy for disaster recovery. Does the cloud supplier have an appropriate disaster recovery strategy[33] ?

• Return on Investment: The expectation is that external cloud computing can reduce costs. However, the cost advantages for large enterprises may not be as clear as for SMEs. Currently, many large enterprises can reap the benefits of significant economies of scale in their own internal IT operations. What is the real TCO of the cloud service[34]?

• Requirement for online connectivity: Cloud computing is impossible if you cannot connect to the Internet. A dead Internet connection means it is not possible to work, and in areas where Internet connections are few or inherently unreliable, this could be a problem. What network redundancy exists between you and the cloud supplier [35]? In order to overcome these challenges, organizations need a systematic means of reviewing their business needs and weighing up the potential gains and opportunities against the risks, so that the transition to cloud computing is strategically planned and understood.

DATA MANAGEMENT AND CLOUD COMPUTING

When asked about placing their data in the cloud, most in enterprise IT quickly run and hide their servers. Data seems to be the one thing that many in IT are reluctant to turn over to a cloud computing provider. However, with new capabilities and cost advantages of cloud computing, as well as better security mechanisms, those days are rapidly coming to a close. There are a few trends when it comes to cloud computing and data management. One is the movement to big data, or creating new and huge databases in the cloud. Two is the relocation of operational data to the cloud. “Big data” is all the rage these days. This is due to the arrival of map-reduce technology such as Hadoop and the availability of commodity servers that exist on public clouds which can be self- or auto-provisioned. This approach to data management allows many database processes to be spread across hundreds, perhaps thousands of server clusters, mapping the query out to the server cluster (map) and then consolidating the result set (reduce). The end result is that a database query against very large databases, a petabyte plus, may take minutes versus what previously took hours. Map reduce database technology is really built on older “share nothing” database approaches that have existed for many years. What was missing was access to hordes of commodity servers. However, with the arrival of IaaS, cloud computing providers quickly made access to these services a cost effective reality. Clouds provide the ability to allocate these servers for only the time required to support

the operation, and you only pay for what you use. They are auto provisioned and auto de-provisioned, as needed. The applications for "big data" are endless, including the ability to place all operational data on-line for use within operationally focused applications that are required to access some historical data. Or, it could be the ability to support business intelligence applications, such as those that now leverage data warehouses or data marts. An example would be the ability to determine trends within a business to make better tactical or strategic decisions .

Those who migrate traditional operational systems to cloud providers typically move to a relational database, which is delivered out of a cloud. The idea is simple. Replicate the database within a cloud computing provider, which eliminates the need for on-premise hardware and software, and thus reduces costs. Most database technology we leverage on premise these days has an analog in the cloud, including MYSQL, SQL Server, and Oracle. Also, there are new database services in the cloud such as Amazon's Simple DB, and data persistent services that are part of PaaS providers, including Google App Engine or Force.com. Migrating to a cloud-based database comes with the same problems as migrating from database-to-database on premise. You can upload the data, or, in many cases it's better to physically ship the data to the provider, as strange as that seems. From there the data should be loaded and checked for quality issues. Then you would access the database from the cloud much as you access the database down the hall. The great migration of data to the cloud has clearly begun. But, you need to understand how the technology works before you make the move. Core to this will be performance management, and other governance activities that cloud computing will change but not eliminate. The existence of data within cloud providers will just make those governance activities that much more important[35].

1. What happens to your data?

One of the central things impacting your cloud computing decisions is your data. You will be taking data, including confidential information, outside of the servers in your office and hosting it outside on these service providers' networks. You will need to[11]:

• Ensure that data is kept safe, with proper backups. A lot of providers promise redundant connectivity and fault tolerance. Some promise that your data will be backed up automatically. But does this mean that you are safe from data loss and your data will be intact? Be sure to ask your service provider if it will be guaranteeing data integrity or if it will be liable for any data loss.

• Know the physical location of your data and remember that each country and each state has a different set of rules on how data is to be handled.

• Make sure that you retain ownership of your data. You may be storing your data on your provider's infrastructure, but ownership would stay with you. Make sure that this is clearly stated in your service contract.

• Lay down the provider's liabilities and obligations for a data breach. The contract you have should be clear on what the service provider should do in the case of a data breach. This includes anything from notifying your company of a data breach as soon as it happens, to telling you how extensive the data breach is and the corrective actions needed to resolve the breach, to informing you of the preventive action that it has put into place to prevent similar breaches in the future. It should also be clear that you will be rightly indemnified when data breaches occur. For example, you should be clear that the service provider would shoulder all fines and damages arising from the breach, as well as face legal action or other corrective measures.

2.Impact of Cloud on IT department

Cloud computing will change the role of the IT department , Many roles will move from the enterprise to the cloud provider and the responsibilities and importance of the surviving IT roles will change in this new world. Cloud removes the requirement for an IT department.

These new roles and responsibilities will ensure that the IT departments have a much greater involvement in the financial planning process than ever before and we envisage that large enterprises will need to invest in analytics and modelling to help them make the most cost-effective use of the resources they have. Strategic and tactical functions will have greater longevity than operational ones. This implies that IT professionals will need to ensure they have the right skills to meet these new challenges[14].

One of the great promises that cloud vendors make is that the adoption of cloud computing greatly reduces IT costs for any company. A crucial part of this promise, that you can find on most "cloud cost calculators" available on the web, is the reduction in manpower costs. If you host a server internally, you need a System Administrator to manage that server; if you hire a virtual server with the same specifications from a public cloud provider, you don't need anyone, and whatever you were going to pay that person becomes "cost savings". This naturally leads us to the following question: Will cloud computing be the end of the conventional IT department?

If we follow the vendor's logic to its final conclusion, we would end up in a situation where the only place where one could find infrastructure (server, networking, even operating systems) management jobs would be with the cloud infrastructure providers themselves. These crucial areas of IT would essentially disappear over time, as jobs became more and more scarce. The idea of not needing IT is a double-edged sword: on one hand, business users, especially those that have a poor relationship with IT, find this very appealing, and use it as a big reason to promote the cloud; on the other hand, it generates resistance from IT departments, who understand that the whole idea of not needing anyone is just a myth. For most people, a cloud server is just like an internal server, only it gets "stored" somewhere else. This means you need a systems administrator just as you would on any other server.

The same goes for managing users and passwords: the responsibility is entirely on the hands of the user. If all your accounts are configured with default or weak passwords, you're running a real risk of someone invading them and stealing sensitive data. As more and more data moves to cloud apps, they are becoming interesting targets, and attacks will take an upward trend. This means that, more than ever, you need IT people to manage your cloud application environment, just as you needed people to manage your infrastructure.

The cloud, then, does not threaten IT jobs, nor does it reduce the importance of IT departments. If anything, the short-term trend is an increase in importance as users realize that they need the help of IT to manage the complex server and application environments that are being created ad-hoc in their rush to move to the cloud. As with most new technologies, cloud computing won't promote a destruction of IT jobs, but rather a change in their nature. Just as developers have to adopt new mindsets to develop cloud-based applications and services, DBAs will have to adapt to cloud-based and big data oriented systems, and system administrators will move from the low-level infrastructure issues (which will be more and more the exclusive province of large providers) to managing complex environments, spanning multiple applications, cloud providers, virtual and physical servers, and even merging the internal data center with the public cloud.

3. Impact of the cloud on IT Service Management (ITSM)

Cloud computing fits the typical modus operandi of emerging technologies in it is not new at all, but has progressed and matured into a viable, accessible, and cost-effective IT resource. Cloud computing has been used by most organizations for a long time, especially those organizations that use the open internet—it can be argued that the internet itself is a version of cloud computing. Once an organization adopts cloud computing it quickly becomes apparent that the traditional approach to IT service management needs to be reviewed. Failure to change traditional IT principles and approaches when adopting a cloud service will greatly increase the chances of failure. But, as opposed to locally managed services or outsourced services, reversing back to a previous status is much more difficult. It is like the difference between a flesh wound and a psychological problem; a flesh wound can be seen and easily treated, whereas a psychological illness may not been seen, is hard to determine and cure. It is the difference between what you own and control as opposed to the invisible and remote[14].

4. The relationship between ITSM and cloud computing

According to the Information Technology Infrastructure Library (ITIL®) there are four phases in the lifecycle of a service or application: service strategy design, service transition, service operation, and continual service improvement. The four lifecycle phases are more critical for cloud computing than they are for traditional computing because most of the activity occurs remotely, which reduces the

amount of control that can be levered locally and leads to problems, unexpected outages or unmet expectations.

Successful cloud computing starts with careful strategic planning to decide which service strategy to adopt (e.g. to utilize cloud computing as a strategy to improve a current service or to implement a new service). From the service management viewpoint this encompasses portfolio management, demand management, and financial management. Portfolio management provides a description of the cloud candidate, while demand management calculates the workload and financial management calculates the costs required to supply and meet the workload demands. If these calculations are inaccurate or ignored then not only could the wrong delivery service be selected but also the incorrect charging algorithm could be adopted. Service strategy is essential because it is the foundation stone for cloud computing .

Once a strategy has been adopted then the next step must be to design the service that will best deliver that strategy. It is important to understand that when services are delivered from a distance (e.g. cloud computing), specifying and designing the service are vital because errors can be costly and slow to correct, especially if binding contracts are to be signed. Service levels need to be prepared and agreed upon so all parties understand their deliverables and properly set expectations; ideally the Service Level Agreement (SLA) s should be included in cloud contracts. Availability and capacity analysis and calculations are to be performed to ensure that the services described in the portfolio and specified in the SLAs can be delivered by cloud computing suppliers. Remember you can abdicate responsibility, but you cannot abdicate accountability. So although the external cloud supplier may be directed to meet the SLA targets, IT is accountable for failed or poor SLAs. The essential back office functions concerning IT service continuity management and information security management have to be in place before the service enters the live[6].

5. Impact of the cloud on e-Skills requirements

In the following, we identify specific e-skill requirements related to cloud computing in different practitioner functions[19].

PLANNING

The primary planning-related task facing practitioners in cloud -utilizing companies is to define and describe demands for cloud services and suggest actions to accommodate these. The practitioner must therefore have solid analytical skills for evaluating existing or potential future cloud systems and how their performance corresponds with the service needs of the organization. The next step is to close the identified gaps, and this requires a solid understanding of the performance, costs, benefits and risks of

Different cloud systems. It also requires knowledge of different solutions, a good ability to formulate explicitly demands for adjustments and solid communication skills to communicate needs and demands internally in the

organization as well as to cloud providers. The key here are abilities related to capturing and prioritizing demand, assigning resources based on business objectives and initiating projects that deliver business value.

Building

With cloud computing, the sharp division between the role of the architect and the developer becomes blurry, as companies do not need to build everything the way they did before. Because cloud computing will standardize infrastructures, ICT departments will spend far less time managing platforms and infrastructures and instead focus on understanding how the multiple cloud offerings could work together and how they could be used to benefit their organization. Fewer people will be needed to carry out

the work of implementing applications, while an increasing number of practitioners will work on tying together different cloud services and hooking these services back to in-house systems.

Running

Although a number of traditional running-related services will move to the cloud, it will still beat the core of the ICT practitioner's role to ensure that they operate smoothly together on a user-friendly and stable platform. In terms of support, the general view of experts is that support functions follow the systems. In other words, if systems move e to the cloud, so do user-support tasks .

Nevertheless, a number of IT support functions will still be in demand. The physical maintenance of hardware is difficult for companies to outsource to clouds, because internet connections, printers, computers, etc. ., still need to be installed and maintained. Furthermore, as the software is placed in cloud, ICT practitioners working in the IT support area can be placed in new job roles as brokers and translators internally between business units and externally between en the organization and cloud computing vendors. This requires communication and cooperation skills. ICT departments will thus support business units in researching cloud computing services and negotiating contracts and service levels, rather than continue to operate all of the IT infrastructure themselves.

Enabling

The primary task of the practitioner in terms of enabling is the ability to develop robust and on-point strategies for service delivery, quality and security. In a future cloud-driven environment, companies will increasingly rely on the quality and security measures of vendors, and the practitioner will therefore increasingly be involved in formulating requirements and vendor contracts, engage in dialogue with vendors and evaluate purchased systems .

Managing

The ability to implement the formulated quality and security strategies was pointed out as being the primary management related responsibility of the future

ICT practitioner. This includesthe ability to evaluate and analyses process steps to identify strengths and weaknesses in quality and security and to monitor, understand and act on quality and security indicators. The ability to manage business change was also mentioned among the most I important management-related skills headed into the increasingly cloud-driven future.

4. Cloud Computing Forces Changes in IT Departments

When IT departments at midsize businesses start to implement cloud computing and transfer some noncritical IT functions from their own data centers into the cloud, the location of the infrastructure is not the only thing that changes. IT departments in such situations suddenly have new and unfamiliar responsibilities and have to develop new skills. At the same time, many traditional computer and network functions are no longer in high demand. ZDNet looks at how some of the skills required of IT professionals are evolving based on recent discussions with a CIO panel. Many aspects of IT work are changing, including such fundamentals as who pays for services and who fixes problems.

Expertise: Traditional IT functions have focused on keeping the company computer systems in operation, integrating new equipment and maintaining security. As new applications migrate to the cloud, these skills become even more important with regard to the critical functions that the company retains in its own data center. At the same time, the scope decreases as fewer changes are made in these existing applications. The emphasis shifts to software maintenance of a reduced application base and increased coordination with external cloud suppliers. IT departments have to develop additional expertise in making their in-house systems work with standardized external applications that often have limited adaptability.

Management: In addition to continuing to purchase IT equipment, though at a reduced volume, IT departments have to manage long-term relationships with cloud suppliers. When buying computers, servers and networking equipment, IT managers have been able to shop for what they need and to customize their purchases to match the requirements of their systems. Midsize businesses do not often have the clout to ask cloud suppliers to develop custom solutions for them. Instead, IT managers have to identify cloud computing suppliers that offer the best solution to their long-term needs. Since they know their own systems, IT managers are ideally placed to identify these suppliers and to develop plans to integrate company systems with the cloud where needed. They then have to focus on managing the relationship rather than on managing employees and equipment.

Budget: Because cloud computing services are budgeted as expenses, their purchase often falls outside company controls that channel IT equipment purchases through the IT department. IT management has to address this issue on a company-wide basis. While departments such as marketing may be able to buy stand-alone, customer-related cloud applications, when it becomes necessary to integrate the data into management information systems, it may

prove difficult, costly or impossible. A cooperative approach to both the budget and functional decisions can help with the development of an integrated cloud computing strategy for the whole company.

CONCLUSION

Cloud computing can provide many of those organizations with the opportunity to continue to take advantage of new developments in IT technologies at affordable costs. A major driver of cloud computing is the pressure on IT departments to deliver more and enhanced services with reduced budgets, whilst responding to ever-increasing and ever-changing business requirements. An internal IT department running cloud-based services can focus its energy on services that offer core business value to the business, whilst letting the cloud service provider deal with the non-core services.

• There are a number of key challenges faced by companies that want to move to a public cloud. These challenges include: Security, Data Ownership, Lock-in and Interoperability, Standard, Architecture, Enterprise Support and Service Maturity, Loss of Data, Return on Investment, Requirement for online connectivity In order to overcome these challenges, organizations need a systematic means of reviewing their business needs and weighing up the potential gains and opportunities against the risks, so that the transition to cloud computing is strategically planned and understood.

Cloud Computing is a loose term which is used to describe a revolutionary approach to consuming Information Technology. The main objective of Cloud Computing is to take away the hassle of managing a complex IT infrastructure and instead offer a simple worry-free solution that focuses on making the business operations simpler and more productive[6].

Migrating an existing system to a cloud-based solution requires project management skills in order to have a successful implementation. Without solid project management, the move to the cloud might either fail (connectivity, general access issues, etc.) or could end up being significantly over budget. As organizations expand use of the cloud to include applications, IT staff need to play the role of the business analyst. In that role, IT staff are delivering value by streamlining overall use of systems, integrating the systems into the organization and helping assess the inter-relationship between the applications and other infrastructure in their organization.

Cloud computing can offer services that, just a few years ago, were unattainable for organizations. Understanding these types of services and resources is a key factor putting together a better IT strategy for your organization.

The cloud is quickly transforming how information is stored, processed, and managed. Gone are the days of companies needing large data centers, with thousands of servers and an army of people to manage them well managed IT departments are spending more time on business initiatives that drive the company's growth and revenue instead of work that just maintains the status

quo. So the cloud is great -- and the right direction -- as it allows a shift from lights-on type work to more value-add work.

However, the cloud is just another technology. Sure there is less work to do with servers and storage, but it will be a very long time before the impact is substantial enough to make a difference. There will be situations that require cloud services, and situations that require work to be done in-house. It won't eliminate the IT department, or most of the roles. Over time, the cloud might even increase the IT department's headcount needs. Think about the major shifts that have happened in the past. Standalone to the Internet, mainframes to servers, PCs to tablets, and phones to smartphones—each was supposed to make things easier, but instead it seems each has added to the complexity. The cloud will do the same.

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