Enriching Education using Cloud Computing

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ABSTRACT

With the growing dynamics, complexities, size, challenges, managing and keep up the development in an educational domain become a challenging task. It is known fact that all educational institutes ranging from primary school, college to universities uses information and communication technology infrastructure in their administration, academics and research. The objective of this paper to focus the need for using cloud computing by an educational institute irrespective of their level in educationdomian.There is definite that the any educational institute can uplift their development at faster rate by adopting cloud computing. Both public and private institutions can use the could to deliver the better services, even as they work with fewer resources. By sharing IT Services in the cloud, an education institution can outsource non core services and better concentrate on offering students, faculty and staff the essential tools to help them succeed.

Key words: Cloud Computing, Education Institute, Cloud Space, IT Services, Cloud Security, Cloud Adoption, ICT

INTRODUCTION

Cloud computing is a concept that is evolving across the information technology industry and academia. Cloud computing is a model for enabling convenient, on demand network access to shared pool of configurable computing resources like networks, servers, storage, applications and services that can be rapidly provisioned and released with minimal management effort or service provider interaction[1].

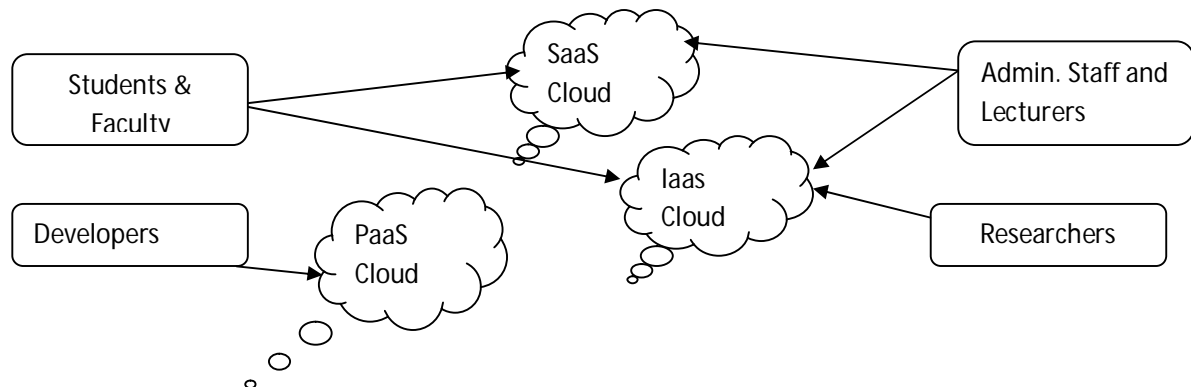Three typical kinds of cloud computing services are: processing clouds, that provides scalable and mostly affordable computing resources that run enterprise programs, which is also sometimes known as Infrastructure as a Service (IaaS), Storage Clouds that offer an alternative to local file systems also known as a Platform as a Service (PaaS) and application clouds also called Software as a Service (SaaS), that allow a thin client to interact with services that are completely hosted on an external infrastructure.

Similarly, cloud may be hosted and employed in different fashions, depending on the use case. Use or deployment type of cloud is stated as; private cloud; this is typically owned by the respective enterprise and/or leased. Functionalities are not directly exposed to the Customer, though is some cases services with cloud enhanced features may be offered. This is similar to Software as a Service from the Customer point of view. Example is eBay. In Public Clouds, Organization may use cloud functionality from others, respectively offer their own services to users outside the Company. Providing the user with actual capability to exploit the cloud features for his/her own purposes also allows other enterprises to outsource their services to such cloud providers, thus reducing costs and effort to build up their own infrastructure. Examples are Amazon, Google Apps and Windows Azure.

Though public clouds allow enterprises to outsource parts of their infrastructure to cloud providers, they at the same time would lose control over the resources and the distribution/management of code and data. In some cases, this is not desired by the respective enterprise. Hybrid clouds consists of a mixed employment of private and public cloud infrastructures so as to achieve a maximum of cost reduction through outsourcing and maintaining the desired degree of control over sensitive data by employing local private cloud[2].
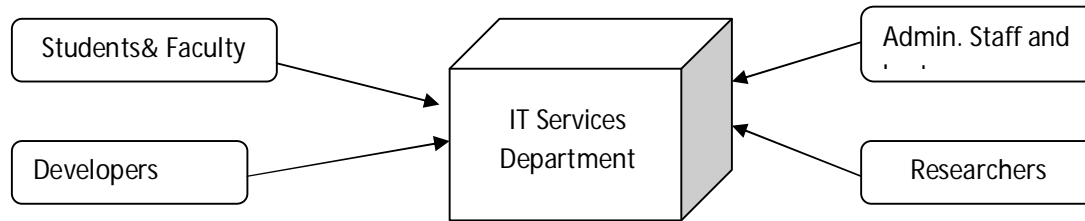
Fig 1 shows the simplified structure of the main users of IT services in a typical educational Institiute.

Fig 2 shows the simplified structure of the main users of IT services in a typical educational Institute using the services of cloud computing.

NEED FOR CLOUD COMPUTING IN EDUCATION

The classroom is changing. From when the school bell rings to study sessions that last well into the night, students are demanding more technology services from their schools. It's important not only to keep pace with their evolving needs, but also to prepare them for the demands of the workplace tomorrow.

At the same time, education institutions are under increasing pressure to deliver more for less, and they need to find ways to offer rich, affordable services and tools. Those instututes who can deliver these sophisticated communications environments, including the desktop applications that employers use today, will be helping their students to find better jobs and greater opportunities in the future.

Cloud computing can help to provide those solutions. It's a network of computing resources located just about anywherethat can be shared. Cloud Computing bring to education a range of options not found in traditional IT models. In fact, the integration of software and assets institute own with software and services in the cloud provides institute with new choices for balancing system

management, cost, and security while helping to improve services.

One should move towards a cloud based approach in an education institution for under mentioned issues [3]

- Annual software license are not essential
- Empower students to be literate digital citizens.
- Improve communication with all stakeholder groups
- Engage parents more by using the internet to share their children's learning.
- Get all the features that one want in a learning platform and none that we don't
- Easy interface to connect with the World
- Stop paying for legacy software and platforms which are to difficult and too expensive.
- Simply the process of deciding how to integrate new hardware and software in to the strategy
- Access school's important assets and student's work from anywhere in the world.
- In the current tight funding situations low cost option to high end computing.
- Offering an easy way to scale up and down, based on their needs.

- Several fold increase in efficiency thereby, helping Researchers to get their results fast.

HOW CLOUD COMPUTING CAN HELP SCHOOL EDUCATION

It is not just the academic research that will benefit form cloud computing, its impact can be felt even at the school level. It is not necessary that only cash strapped countries can gain from the use of cloud computing. Every country can save millions by plugging their education system into the clouds. It is not just the millions that makes the cloud attractive to education. It is the boost in efficiency and productivity of both the teachers and the students that are equally important.

Vital points which we overlook while taking about IT in any organization is the issue of software licensing .This become all the more important when it comes to always in a tight financial crunch. In fact, some of them are even exploitative. These licenses suck the money and time from the school system. They desperately need a simpler licensing model. They don't want to spend more and more on licenses and, also, want to invest minimal staff in managing their computing requirements. Cloud computing shows them an easy way to get over the clutches of the traditional licensing models. The amount of money and time saved by schools due to the switch to a cloud based system is very vital in strengthening the education system.

The greatest advantage of cloud computing is the shared management resources,either by running these management systems on a cloud based infrastructure or by tapping in to the SaaS ecosystem, the Education Institutions can maximize their efficiency while keeping the costs low.
The basic philosophy behind any school system is learning and experimentation. It is only natural that Education Institutions would want to experiment with different kinds of applications and platforms under the traditional software system, this is expensive and difficult to implement.Cloud computing offers greater flexibility to experiments with newer applications and platforms.
The low cost of cloud computing associated with ubiquitous availability makes it a suitable candidate to level the playing field in education across many countries. Not only it is possible to implement an

universal curriculum for all the Education Institutions within a country at specified level, cloud computing makes it easy to give students from America to Africa to Asia the same experience in education.
Cloud computing has tremendous potential in remaking the education system for efficiency and cost savings. It is time for managers of the Educational Institutions to seriously consider cloud computing for all their computing needs [4]

ROLE OF EDUCATIONALINSTITUTIONS
For their part, institutions must approach cloud aggregation in a multifunctional manner. This requires fiscal, IT, and academic officers among others to collaborate across their institutions. In doing so, cloud sourcing stands to transform the way IT-related decisions are made on campus. Partnership in a shared services model will also require synchronizing institutional clocks. And, institutional partners must be willing to commit from the beginning to participate in the pilot testing in which the industry will need to engage.

Learning from past initiatives. In moving forward, on should focus on gleaning lessons learned from other higher education collaborations in order to establish hallmarks of success that might be transferrable to the cloud. United Educators and Common Fund are examples of successful aggregator models.

The need for a paradigm shift
Overcoming institutional and cultural resistance to change might require creative new tactics. Fresh approaches should include finding ways to make the higher education market more appealing to providers. A cost shift in our traditional models could provide a really dynamic force that we should consider.

Organizing a standard interface, providing clear specs, and creating a single sign-on environment for corporations to engage higher education as an industry would go a long way toward building a bridge between commercial providers and institutions. The reality is that institutions will opt in and out based on political issues and needs and their own risk tolerance.
The cloud offers prospects for greater savings and efficiencies for a host of common business processes. Institutions would be wise to first focus

on no differentiating, high-transaction activities that don't carry a lot of institutional or cultural baggage. These might include accounts payable, procurement, and benefits management. Other opportunities could include archiving, library repositories, and low-value administrative services. Important to keep in mind, however, is that even for a common business practice such as travel management, an internal cultural transformation may need to occur to gain acceptance.

While many higher education services could be provisioned through the cloud, it's not necessarily in a provider's interest to identify those needs for the industry.

Toward a sustainable business model. Although higher education has proven that it has the capacity to deal with tough issues, too often the bar has to be very high to make institutions commonly motivated. The common motivation for many institutions today is survival in both the short run and in the long term.

Cloud leadership challenge. Institutional leaders likewise can't afford to get stuck in the weeds. One of the fundamental changes that higher education in beginning to understand is that institutions are competing as an alliance that moves the whole industry forward. One of our greatest leadership opportunities is to not simply think about optimizing our local campuses but the entire industry. This leads to the notion that institutional leaders must be willing to be uncomfortable in being out in front of their campuses leading this charge[5]

SOME RECOMMENDATIONS TO INSTITUTIONS

In the spirit of building a education cloud, following are few recommendations

Understand the Services: Services such as Google Apps and Amazon's Elastic Cloud are well known, but beyond a relatively short list, little is known about what IT infrastructure, applications, or services are available "as services" in the cloud. Research the cloud services market, especially in areas that are good candidates for higher education. Specifically, develop a map that describes by category (infrastructure as a service, platform as a service, applications as a service, and

software as a service) available cloud-based services and the companies competing in these categories.

Develop a roadmap for Campus Cloud Develop a "roadmap" to guide an institution's decisions about whether to create or operate a service or infrastructure element on premises or in the cloud.

Prepare a business model for Cloud Sourcing Develop a short document that describes the key questions to ask to frame an effective decision about hosting a system or service on campus or in the cloud. What is compelling us to consider change? Economics? Is cloud sourcing cheaper? What about functionality? Are cloud options more full featured?
Reliable?Robust?Accessible?Nimble? What are the comparative risks? What is the risk of inaction?

Develop a template for cost estimation Identify uniform cost categories in both on-premises and cloud-based delivery alternatives, and recommend preferred guidelines and methods for calculating said costs, when appropriate.

Prepare a risk assessment frame work Thisframework should help practioners and policy makers to do risk analysis of premises based and cloud based delivery alternatives.

Workout on audit guidelines to asses Cloud offerings This document would guide auditors through a risk assessment and audit of cloud-based transactions and portfolios.

Develop a Cloud Computing guide Prepare a simple and well understandable guide, which enlightens the all stakeholders about cloud computing, it's offerings, systems, services.

Identify required skills and develop acurriculum for faculty and bold staff working in cloud based environment and mixed premises IT professionals, business professionals, lawyers, auditors, and others will need new skills to manage an

infrastructure and service portfolio that is hosted elsewhere or merely invoked "as needed" as an Internet service. Skills such as contract management, creation of service level agreements, and security management change as the portfolio changes. A new curriculum needs to be articulated and new professional development opportunities offered.

Insist on new governance The rapid evolution of the consumer market delivered via cloud computing—where faculty, students, and staff are choosing to use a wide variety of consumer services in lieu of services being offered by the institution—may have untoward economic effects and may create undocumented risks of security and privacy spills, data corruption . The unregulated movement of IT and services off the campus represents an important opportunity to rethink IT governance. The deliverable would be an essay that would guide "safe" consumerization of IT infrastructure and business and academic services.

Work on new policies Frame new policies to address privacy and the cloud, data ownership and the cloud, above campus services and exit strategies[6]

CONCERN OVER ADOPTION
There are several obstacles that cloud computing faces before it can be widely adopted.[7]

Security: A very basic point comes to every one's mind in adopting cloud services is security.

Institutions worry about confidentiality. It's a responsibility of a cloud service provider to ensure about the security and there should be a strong and legal understanding between institute and service provider.

Performance and Availability experiments, that are required for research endeavors required extensive computing power. Some of the concerns include how to guarantee such performance from an outside vendor. Availability of services is another related concern in terms of the possibility of massive vendor outages. This is especially true since it may impact student learning or the timely delivery of research results, which are typically tied to strict timelines.

Integration with In-house IT and Customizability Institute IT administrators typically use their own in house applications with a considerable portion that is customized to their own IT Lab structure. A paramount concern is the transitioning of such inhouse applications to the cloud environment and how much of the customizability will be lost in that process.

Cost: Another important concern is cost for adopting cloud service. The adoption of service should not lead to additional investigations. Things are to be focused in finalising the service provider.
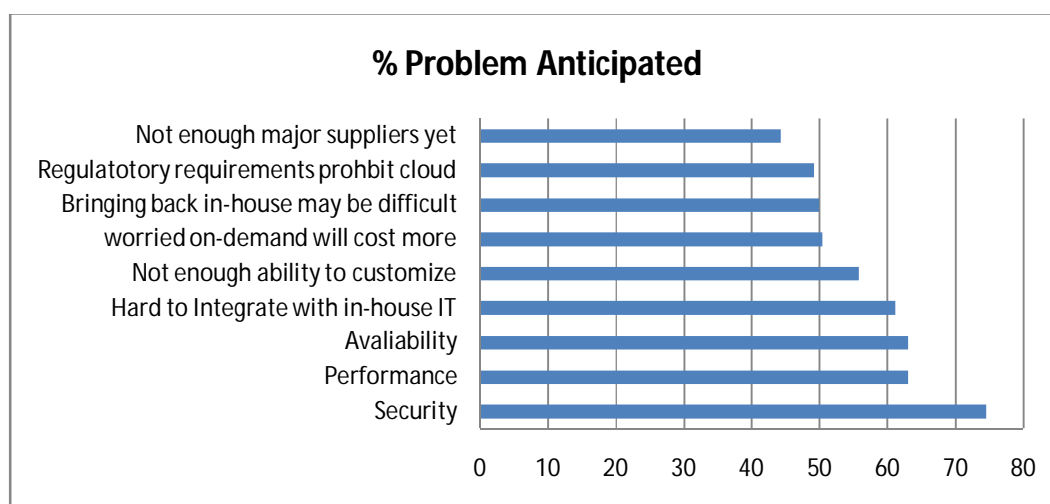
Fig 3: Challenges anticipated from adoption of Cloud Computing [6].

SECURITY

A primary concern that cloud computing adopters have is the security of enterprise information. Data placed in storage clouds, can potentially be located in, and sent across the communication channels of a totally different country, with potentially different data privacy laws, and therefore expose potentially sensitive data to the prying eyes of unauthorized individuals. However, in a sense, this is not much different than the current outsourcing endeavors that tend to make such information available to varioususers and administrators in an offshore location, such as in the case of call centers that are located in various countries. The majority of intellectual property breaches typically result from internal attacks and therefore do not impact the decision whether or not to adopt cloud computing. On the other hand, in education institute, this can become more challenging especially with research projects that address issues of national security or hospital patients' confidentiality.

This requires enough trust to be placed into the vendors, along with strict Service Level Agreements (SLAs), in order to safeguard such information and prevent intrusion and data theft. [8]

Integration of cloud security controls with institute-wide departments and their various applications is another important challenge.. One concern is how seamless this integration can be and how effective itwill be in maintaining the same level of information assurance of such applications, including their confidentiality, integrity, and availability.

Application problem resolution and auditing are part of yet another challenge to the adoption of cloud computing. The main question is how available the application and system logs will be to campus ITadministrators and support staff, who usually create their own in-house scripts in order to scrape such logs and resolve these problems.

The main question that arises in this respect is how the cloud vendor would ensure the implementation of all the provisions that stem from such government laws, such as the accreditation andcertification of their information systems.

Another related concern, which pertains to an earlier point about information security, is how to apply specific law requirements for data preservation such as the data in research projects.

Finally, a major concern to institutions is moving their data to an external provider. While such sites are likely equipped with state of the art disaster recovery and business continuity capabilities, they may become an attractive target for attackers since they would potentially host the data for multiple institutions rather than the isolated nature of research labs that are typically found in institutions.

EXAMPLE OF IMPLEMENTATION

The University of Westminster (UOW),which has more than 22,000 students, is one of a handful of UK educational establishments to embrace cloud computing. Interest in cloud computing began when the University's student email service began to look out-dated; an issue which was highlighted by a survey that showed that 96% of students were setting up their email accounts so that received emails were automatically forwarded to their external third party accounts. In 2007, the University started to look for an alternative option in order to address this issue. Google Apps (Education Edition) was that option. This platform can provide a whole campus with free email (with a capacity of 7.3GB of disk space for each student), messaging, and shared calendars with no advertising for students or staff. Furthermore, the Google email system enables users to retain their domain names in the email. For example, a user whose email address is "rishis@wmin.ac.uk" will continue to beable to use this email address. The Google platform also provides a suit of productivity applications (e.g., word processing, spreadsheet, presentation) with functionality that supports collaboration (i.e., users can share documents remotely) which can be potentially useful for students working on group-based assignments.

After a period of piloting, testing and user consultation, Google Apps was rolled out for the 2008-09 academic year. It was clear that the University's existing student email system was not looked upon very favourably by students who were abandoning it in favor of their personal email

systems. One of the problems the University faced with students forwarding their University emails to their personal email accounts was that their personal email accounts were beginning to treat the forwarded emails as spam, bogus or rogue messages and were being blocked on many occasions. This meant that urgent and key emails from the University were not getting through to students.

Storage issues with network servers and email also meant that students were, more often than not, saving their work to USB memory sticks which are often prone to loss or misuse. The new Google system provided each student with up to 7.3GB of email storage capacity, which meant the likely end of using USB memory sticks as students would now have plenty of storage space online to store their large graphics and multi-media files.

In addition to providing a good student experience, there were also economic reasons behind the University's decision to adopt of Google Apps. The cost of using Google Mail was literally zero. It was estimated that providing the equivalent storage on offer on internal systems would cost the University around £1,000,000 (in terms of installation, ongoing maintenance, upgrades, staff costs, licenses, servers, storage, etc.).

Furthermore, the spam issue associated with students' personal email accounts was no longer going to be a problem. Google Apps also provided the University with the option to use friendly names for email rather than use the traditional student ID number. Google Apps also enabled students to use their mobile devices in order to access their emails and saved documents remotely. Interestingly, students using Google Apps can also retain their email addresses and continue to get access to their University work, stored online in Google Docs, after graduation. When asked: "What does Google get out of this free service?", Catherine Titherton, IT Project Manager at UOW, replied: "A huge pool of tomorrow's business leaders familiar with Google Apps".

Despite the fact that Google Apps for Education is free, the University ensured that it followed policy guidelines when it rolled it out. For example,

University records and Intellectual Property (IP) policy required that all calendar, teaching, research, legal and employment information be maintained on University-owned systems. Staff Google mail is provided for the purposes of collaborating with colleagues or students in the Google environment. However, Exchange/Microsoft Outlook (the university's old email system) remains the official staff email system. This was obviously a conscious decision by the University which was concerned about the legal implications of transferring the safe keep of their data to a third party [9].

CONCLUSION

There is a long way to goto adopt cloud by all educational institutes over the world. By analyzing the need, securities issues concern, cost involved, switching process involved, it is advisable to migrate to the cloud support at appropriate level. Particularly when the investment on infrastructure, software is an issue, Cloud is the available alternative.Though some issues are involved in security, authentication, control point of view, things are still manageable. Software Licenses is another issue, which forces educational institutions to plug into Cloud Computing. Cloud adaption will enrich an educational institution in all aspects.

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