

Cloud Technology in Higher Teacher Education Institutions: A Solution to ICT Infrastructure adoption problem

L. Pushparani Devi

Department of Computer science, Ibotonsana Girls' Higher Secondary School, Imphal, Manipur, India

Masih Saikia

Department of Computer science, Pragjyotish College Guwahati, Assam, India

Sanasam Bimol

Department of Computer science, Moirang College, Moirang, Manipur, India

L. Sashikumar Singh

Hexaware Technoloies Private Limited, Mumbai, Maharashtra, India

Abstract—Frequent advancing in information technology has become a great challenge in every academic institution in providing necessary ICT infrastructures. Constantly updating of ICT infrastructures in academic institutions for education process, research and development of training activities is becoming a big issue in this crucial financial crisis facing by every national economy. In such situation a relatively new concept and constantly evolving cloud technology is starting introduce across the world in academic institutions. This fairly short theoretical paper we have given the attention to possible adoption of cloud computing technology in higher education particularly discussed on teacher training college where use of ICT is gaining momentum and interest thought the world.

Keywords- *academic institution; ICT; cloud technology; teacher education; teaching and learning*

I. INTRODUCTION

Introduction of ICT in education system, the college, institutes, and universities clearly changes the way education is conducted. With this influence in education most of the college or institute for higher education use ICT (Hardware, software and networking) to serve their purpose of data storage, processing and reporting for teaching, learning and administration. Therefore, updating the existing ICT infrastructure is the need to cope with the new intellectual challenges being thrown up by the changed in global.

In present scenario of new education system teaching is becoming one of the most challenging professions where knowledge is expanding rapidly and much of it is available to students as well teachers at any time and anywhere. As teacher education is primarily directed towards preparing adoption of ICT to meet the quality of teacher training

education world wide today. Teacher educators have to accept the demands of modern world of teacher education system using information technology according to the needs of learners. Otherwise the teachers will become out-dated in the coming future and it will deteriorate the quality of teacher education.

Since the decade ICT infrastructures adoption in teacher education has provided new possibilities to get an effective teaching and learning process and for continuously development in teaching profession. In this 21st century education system a successful well-established and properly maintained ICT infrastructure is becoming very essential tool to bring a quality teacher education. However, such infrastructures facilities make available to all the learners is a major problem in the education institutes arising from budgetary constraints. And most of the higher education training college or institutions are facing difficulties like Lake of ICT infrastructure due to the cutting budgetary allocation in education. Electricity power energy supply is an input source to get work ICT infrastructure. This electricity - an ICT enable infrastructure, is required available in regular mode and enough backup facilities in the institute. In case of irregularities, use of alternative power energy resource like power generator has shown a high recurring expenditure in annual budgetary of college or institutions. In such scenario cloud computing is becoming an alternative to the use of present financial crisis. This technology has a dynamic scalability of resources that can be used effectively and also utilized the resources under circumstances where the availability is limited.

II. CLOUD COMPUTING

This new concept of computing technology allows the user to use the hardware and software applications on demand networks access without installed in end user computer. The user can access their personal files at any computer, anywhere, anytime trough internet network access on

PAYGO (Pay-as-you-go) basis. There is currently no universal definition of cloud computing, but diverse interpretation, probably because in information technology domain and academic field the concept is very young. The most widely used and normative definition is that issued by the US National Institute of Standards and Technology: “Cloud computing is 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.” [1].

This technology allows for much more efficient computing as it use the centralizing storage, memory, processing of central remote servers to maintain data and applications through it three service. They are - Infrastructure as a service (IaaS) - Processing Clouds service that provides scalable and mostly affordable computing resources like individual servers, disk drives, email servers etc. that run enterprise programs. Platform as a Service (PaaS) - It is a storage cloud that offered an alternative to local file systems. A platform that has the applications run on, it also provides platform which will execute software application with no requirement for administration of the lower level components. and Software as a Service (SaaS) – An Application Clouds allow to the user to access all required application on demand without client installation through completely hosted external infrastructure.

The four main stakeholders that can be considered to use the three cloud service model in the teacher training college are faculty, student, administration, and library. These four main stakeholders can be assigned the various service model of cloud. Faculty and student need to access Google documents for their project preparation that comes under the Paas model. And they need to word processor or other software for their project then they need to access over the net that comes under the Saas. Similarly, other stakeholder like library, linkage of their service delivery is shown in the figure 1.

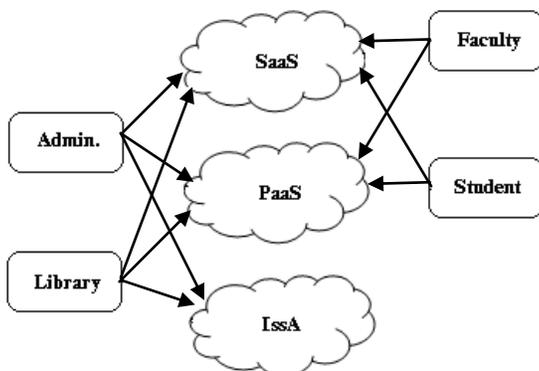


Figure 1: Cloud service delivery model across the main Stakeholder of higher education teacher training college

III. LITERATURE REVIEW

This study refers to a variety of materials in order to carry out a thorough and comprehensive literature review in relation to cloud computing in higher education, teaching and learning. Resources are mainly drawn from books, academic journals, magazines, information on World Wide Web etc.

Amrit Shankar Dutta has provided educational cloud architecture and use of cloud computing in education. He has also provided many examples through the world where educational institutes have taken initiatives in cloud computing to better serve their faculties, students and researchers. He has also suggested the benefits of cloud implementation in education. Improvement process till higher technical Education attained their goal [2].

Shahid Al Noor et, al has developed a proposed cloud computing architecture for Bangladesh education system and they have discussed the impact of their proposed architecture on current education system of Bangladesh [3]. Saju Mathew has been carried out a basic research to show how cloud computing can be introduced in the education to improve teaching, agility and have a cost-effective infrastructure which can bring a revolution in the field of education. It also tries to bring out its benefits and limitations [4].

Marinela Mircea has provided an approach to use the mix of SOA, BPM and cloud computing in higher education. He has presented the current state of Romanian universities regarding the implementation of integrated solutions based on the latest technologies [5].

P. Sasikala, Makhnallal Chaturvedi have elaborated the concept of Cloud Computing from the perspectives of diverse technologists, cloud standards, services available today, the status of cloud particularly in higher education, and future implications [6].

Karla Hignite, Richard N. Katz, Ronald Yanosky explore what shape a higher education cloud might take and to identify opportunities and models for partnering together in their paper [7].

CISCO white paper has discussed the potential benefit and challenge to adopt in small colleges other than larger University that have not yet achieved high levels of computerization, or do not have and have trouble recruiting people with adequate IT skills, or those worried about their ability to secure and protect data. By contracting with a cloud service provider (perhaps another, larger university), that small college can adopt state-of-the-art applications and services, enabling the college to skip a whole generation of academic computing, thereby bypassing many of the costly and debilitating challenges [8].

S.Rajasekar, the aforesaid techno pedagogical competencies are only indicative and are not exhaustive in nature. In short, it is the high time for the teaching community to develop passion towards the application of new technology in teaching and learning process, in order to make the process simple, easy and understandable [9].

Samir Tout and William Sverdlik has reveal that application of cloud computing in higher education and aspired benefits as well as its expected limitations. Also concluded that cloud computing may have considerable potential in improving the IT application and infrastructure the higher education institutions. Cost factor also discuss on concern over the adoption [10].

Abdulsalam et. al. has studied the cloud computing is a solution of ICT in higher education and reveal higher institutions may benefit greatly by harnessing the power of cloud computing, including cost cutting as well as all the above types of cloud services. They also explores the application of cloud computing in higher education in Nigeria, issues with ICT in Nigeria and touches upon some aspired benefits as well as expected limitations of cloud computing. On-demand services can reverberate positively with the current university tight budgets across the nation and other parts of the world [11].

L. Pushparani Devi et. al. has studied on present scenario of ICT in teacher education and cloud computing. They have developed a proposed conceptual framework model of cloud computing for higher teacher training institution in Indian environment and discussed the implementation processed [12].

IV. ICT ADOPTION IN TEACHER EDUCATIO

The basic understanding of ICT adoption in education is vital in keeping abreast of rapid technology change. Infusion of ICT in higher education institutions all over the world are under continuously increasing in presence of its benefited to faculty members, students, staff, and management where lots of collaboration and safety of data is need in academic. The main goal of ICT adoption in teacher education is to meet the demand and challenge of the 21st centaury education system that making education more affordable and accessible. The modern age of information technology scenario has lead to integrate ICT in teaching and learning process for the welfare of faculty members and students. The continuously increasing the growth of quality information available on the web and then has become a great resource of teaching and learning. However ICT infrastructure available in the most of the teacher training institutions to make the facility of accessing the required right quality information from any where, any time in the country are not at par of satisfactory. The implementation of ICT network infrastructure and integration of ICT in teaching and learning is becoming a challenge in teacher education. Adoption of ICT in teacher education is still at infant stage compel up with issue that are limiting it. Some issues that are limiting the adoption of ICT in teacher education in Manipur could relatively consider the following three –

Firstly. Inadequate of ICT infrastructure and lack of access. Here underlying assumption of ICT infrastructure is considering related to network and universal access to the network. The infrastructure issue can be viewed from two

main dimensions i.e. Lake of investment and Lake of maintenance on such infrastructures.

Secondly, Poor maintenance of equipment and lack of technical support Maintenance. It has a great role to keep the equipment in well working condition but there is a technical knowledge must to have. Technical know how to operate or work will not serve for proper maintenance. At any given point of time, one or two computers are suddenly down with some technical problem or other in the computer hence teachers are looking for technical support. In such cases teachers are little frustrated with technical problem as they are far form technical knowledge. Due to such poor maintenance and lake of technical support has result the teacher in loss of instructional time and the teaching and learning materials that will get from web resources.

Lastly, High cost and low availability /reliability of power supply. Availability of electricity is an important input element to keep on work all the electric gadgets. Now at the edge of information technology a real issue and challenge in educational institutions is availability of electricity power supply both in terms of quality and quantity. However, the present status of electricity power supply to the educational institutions has only some few hours rather than sufficient supply within working hours. In such scenario it is madding to start new ICT project and even it become worse to embark on executing the ICT project. In addition high cost of electricity power supply is directly linked with the use of ICT infrastructure for the teaching and learning. Alternate sources of power supply for using the computer is increasing to recurring cost and college cannot foot to high cost of bill for marinating oil consume by the generator per hour.

V. CONCERN OVER BENEFITS ON ADOPTION OF CLOUD COMPUTING

Due to continuously development in IT technologies infrastructure and frequently upgrades in hardware and application software has put more deal on expenses and pressure on educational budgets. Cloud computing services provide higher education institutes/college of the new IT technologies to take advantage at an affordable cost. The following are the benefits of adopting of cloud computing small college university and training college.

A. *Reduction of costs*

Cloud system will reduce the cost by allowing the facility of Pay per use. The user institute/college has to pay only for using of resources to the service provider. As such there is less chance on any financial burden on any part to the institute, government or student.

B. *Elasticity and scalability of service*

In a single moment any stakeholders of the institute/college can store data, and there is no limitation of space. The user's data store capacity is increased to a larger extent. And allocation of resource can get bigger or smaller depending

upon on demand. Scalability means application software can scale in terms of increased in user and change in application requirements.

C. Availability and quality of service

In any mode service the most important is availability of quality and the same is desired by the educational cloud service user. 24/7 service availability is not the user requirement, but the service is needed without system failure with quality. In the maximum cases where exact necessities have to be fulfilled by the outsourced resources and outsourced services when the users are required.

D. Support teaching and learning

It has significant impact on the teaching and learning environment. Teacher could prepare their lecture note, presentation anytime without software hassles and stop worrying about additional software.

E. Reduce maintenance cost and resource cost

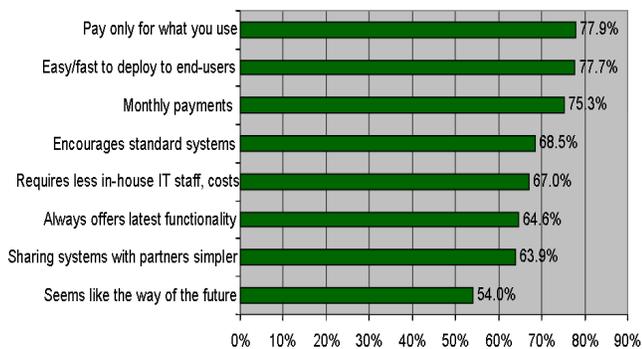
Cloud computing could help training college to reduce the operation and maintenance cost. In particular maintenance cost is important in IT infrastructure. Using cloud computing technology, academicians can focus on their own research, instead of dealing with high performance computing systems complexity. As such institutions could eliminate IT infrastructure capital expenditures and reduce ongoing operating expenses by paying only for their used services and potentially reducing IT staff.

F. Ease of Implimentation

Without purchasing the hardware, licenses software, or implementation services, any small college, training institute/college, and university can deploy cloud computing easily.

Some of the advantage ascribe to the cloud computing /on demand model as describe in [11] is shown below in fig. 2.

Figure 2: Q. Rate the benefits commonly ascribed to the "Cloud"/on-demand model



Source: IDC Enterprise Panel, 3Q09, n = 263, September 2009

<http://blogs.idc.com>

VI. DISCUSSIONS

With increasing awareness the needs of Information Communication Technology (ICT) in education sector educator are taking interest to adopt better IT capabilities in the institutions.

With increasing awareness the needs of Information Communication Technology (ICT) in education sector educator are taking interest to adopt better IT capabilities in the institutions. This concept of advance technology is providing new avenues for educational industry to explore the potential growth. Purchasing, hardware, software, installing, and maintaining extensive hardware contributes to some of higher budgets that college to allocate. In such case, new advance networking technologies make to move to cloud computing a logical choice [13]. Cloud Computing appears that provides a new solution to ICT infrastructure adoption problem in higher learning teaching education by establishing a open and flexible network teaching platform and reduce the hardware input. Within this present economical crisis context, use of cloud computing has becomes a necessity and not an opinion for option in many higher learning institutions. The Cloud Computing solution will allow to all categories of users access to database and stored files, e-mail, and other applications from anywhere at request that leads to more efficient use of information [14].

From the finical perspective and high cost of hardwire and software cloud computing has prospect of efficient ability to satisfy the necessities of students and staff. Cloud computing satisfies all elements of the technology acceptance model [15]. There is no need to purchase the licenses to the software for one time use. They can easily be hired on the cloud using pay per use facility. Moving to cloud actually does not necessary installation of servers and physical computing information structure which can be seen as a move towards green computing which can fetch higher points on the quality assessment scale for the college.[16]. The cloud supports a client need of data stores and access of remotely hosted application at any time from anywhere. These infrastructures enable companies or organization to cut cost by eliminating for physical hardware needs, allowing companies to outsource data and computation on demand [17]. In this way the user only need to buy the service and do not need to buy a server.

Adoption of cloud computing in academic institute has increased recently. Using ICT teacher trainees prepared their seminar presentation on power point and excels and also uses internet search engine and e-mail regularly [18]. But investment in infrastructure implementation is not affordable due to law budget involvement compare to other academic institutions. Cloud computing is one of the new technology trends likely to have a significant impact on teaching and learning environments [19]. Today teacher training institute/college involved many research projects and uploaded research articles in national wide level uses for the benefits of nations. This technology is very helpful and suitable for teacher training institute/college where

integration of ICT becomes an essential tool that helps to make the learning process much easier for the teacher trainees. This distributed computing technology that offer the user required software, hardware through internet and provide storage, computational platform and infrastructure on demand by user according to their requirement. Faculty and students can access the word processor, power point, excel and other software over the internet on demand to prepared lecturer note, seminar presentation etc. through SaaS delivery mode. Cloud platform can support teachers to prepare teaching portfolio; presentation on teaching to a local audience; a conference presentation; a manuscript to be submitted for publication, etc.[20]. Unnecessary investments in purchase of licenses for dedicated software that are required for one-time use only and need periodic updating can be avoided. Similar software can be rented on the cloud at pay per use basis. The applications are not deployed in every machine, so maintenance is a concern of the cloud provider. Educational institutions are saved from hiring trained maintenance staff separately for looking after the infrastructure. Cloud providers take care of software update and maintenance [21].

Despite the fact cloud computing is relatively young concept in education sectoring most of the educator, academician is not well aware the advantages of high performance communication technique service in the institute/college. Teaching and training are activities which require an effective and secure communication, as recommended in [22] the teacher has to communicate with students in order to deliver notes, presentations, examples, computer software and even books. Cloud technologies have significant concept implications as a communication medium. Using of this technology may not be highly interactive in a physical sense, but has strong potential for professional and social interactivity. Most developing countries are face financial, infrastructure and power constrains that largely prohibited development of reliable networks communications, data centers, and local ICT-related activity. There may have facing the power problem that creates an illness performance of stakeholder in working with ICT related work in the academic institute/college. Adoption of cloud computing permits significant saving electricity power in the area of its supportive technologies like as the air-conditioning and electric waste that can be cause by the number of system in the datacenter. Cloud offer effective centralized infrastructure and can be efficiently used to minimum population this will have gain benefits by reducing the power consumption in datacenter. Furthermore, Cloud computing can be reduced by additional savings that cloud achieved in terms of physical security requirements such as door locking security system. And remote storage service provider manages the backup complexities, replication, and disaster recovery needs from natural calamities like flood, earthquake etc. Backups stored locally do not help when there is fire, the stakeholders are not need to worry even if

some file is deleted accidentally. And there are seemingly endless benefits to be gained from the cloud inspite of to be considered.

VII. CONCLUSIONS

Cloud Computing appears that provides a new solution to ICT infrastructure adoption problems in higher learning teaching education by establishing a unified, open and flexible network teaching platform and reduces the hardware input. Within this present global economical crisis, use of cloud computing is becoming a necessity and not an option for many higher learning institutions. It also provides the three dynamic requirement of ICT adoption in small college, university. The cloud allows system to dynamically provide the computing resources their user need, reducing management cost, resources cost, energy consumption and improving on their scalabilities.

In future we will develop a conceptual framework of study for detail investigation on ICT integration problem in higher teacher education institution with required variables. This will help to get a detail report on present scenario of ICT infrastructure integration problem in the teacher training college in context of Manipur and a clear idea of practical implementation of cloud technology to solve the ICT network infrastructure integration problems.

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