International Journal of Management, IT & Engineering
Vol. 8 Issue 2, February 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gate as well as in Cabell's Directories of Publishing Opportunities, U.S.A

ROLE OF CLOUD COMPUTING IN HIGHER EDUCATION

*[*1]. Dr. Syed Masaid Zaman (Department of Information Technology) Shri Venkateshwara university, Gajrula-U.P India*
dr.syedmasaid@gmail.com-
*[*2]. Akash Ahmad Bhat (Department of Computer Science) Shri Venkateshwara university, Gajrula-U.P India*
akashmajeedbhat@gmail.com

Abstract:

Cloud computing and education sounds confusing on the face of it. Naturally, it's because, very few people, publishers and users alike come from the education sector. In most cases, cloud computing is only associated with businesses and how they can influence their efficiencies. Cloud computing, a fast advancing technique in IT has conveyed new change and prospects to the field of information technology as well as education in this modern era. Education plays a vital role in the overall development of a nation. Cloud computing is an incredible option for educational institutes, which are particularly facing deficiency of funds. Such institutes can fulfill their IT needs without spending money for buying PCs and networking hardware. These days, the institutes are focusing on exploring new methods to make teaching more effective and cloud computing is one of those techniques which is to a great extent being fused in field of education for this purpose. Cloud computing provides infrastructure which helps in enhancing the quality of education in educational institutes. Still there are some weaknesses that should be dealt with while executing cloud computing in educational institutes. This paper is an attempt to analyze the significance of cloud computing in Indian education system.

Keywords: *Cloud Computing, ClouComputing, Webservice, Virtualization, Grid Computing, Virtual Computing Lab, Higher education institutions, Remote areas.*

INTRODUCTION

Indian educational system traditionally takes into account the marks and grades of students. However, practical knowledge, experience and analytical thinking are essential to compete in today's competitive world. In schools, colleges and even in the universities, the

contemporary education system has failed to deliver. Due to the new techniques, it has become possible to explain things practically by making use of presentations and animations, making it simple to envision the things now. One of the biggest achievements of this era is Cloud Computing. Using this technology, education can reach to every person in the society even in far flung areas. Cloud computing can be utilized to develop a high quality education system. Cloud computing plays a vital role in society like research, education, business, and in other government as well as private organizations in one or other form. As we are talking about the digitization of information a new buzzword GIG data evolved. Big data is the main source for coming of cloud computing in the show, everyday lots of data in the size of PETA bytes are uploaded in the digital world which required lots of storage and computing resources. Cloud Computing, also known as utility computing, delivering the service as software, platform and infrastructure as a service in pay-as-you-go model to consumers. It's just getting anything for the pay model. Industry surveys says on this services as "Cloud computing, the long held dream of computing as a utility, has the potential to transform a large part of the IT industry, making software even more attractive as a service. Education system has been gradually expanded, and the education object has slowly turned to social staff. Education has evolved from teacher centric to learner centric .Blooms taxonomy(multiple intelligence of learner) of teaching can now is made easy with support of cloud computing where you get everything and now the teaching methodologies like chalk - black board, physical interaction took a new transition to online and is growing fast than ever. line tutor which helps has to take class in any hour is an advance of learning using technology. E- learning and online solution is what we required in education environment.

Awareness and modernization of present society towards digitization, quite a good number of people are receiving education, a series of new problems have emerged. For example: As teaching methods change, the existing teaching-learning methods cannot meet demand and need quite a good amount of infrastructure with high prices and with the constant expansion of education, the existing teaching facilities also need to constantly update. More importantly the present generation student desires to update the very fast changing world and want to compete in this global village. When Cloud Computing appears, it provides a new solution to establish a unified, open and flexible

network teaching platform and reduce the hardware input. Internet is the resource where we can transform cloud computing, it can deliver the most advanced software and educational materials, hardware resources and services to students and educators in even the most backward areas in the state, without the need for advanced IT expertise at those locations. At the same point, it does more for significantly less, providing needed relief for currently strained education budgets. IT companies are eager to encourage educational adoption of cloud computing; for example, Google Apps for Education Suite comprises Google Mail, Calendar, Talk, Docs, Sites and Video with zero cost and without advertisements

Benefits of Cloud Computing

- High return on investment(ROI).
- Reduced implementation and maintenance costs.
- Increased mobility for a global workforce.
- Scalable and Flexible infrastructures.
- Short time to market.
- IT department transformation (focus on innovation vs. Maintenance and implementation).
- "Greening" of the data center.
- Increased availability of high-performance applications to small/medium-sized businesses.

APPLICATIONS OF CLOUD IN EDUCATION

Educational cloud computing services represent a growing variety of useful services available on the internet, and the most innovative and rapidly developing element of technology and education. It also promises to provide multiple services that will be very useful to the students; faculty and staff .The role of cloud computing in Higher education should not be underestimated, as it can provide important gains in offering direct access to a wide range of different academic resources, research applications and educational tools. Educational cloud computing is quickly taking the education community by storm as more platforms, applications and services are being developed for academic cloud computing.

Some students and researches are already using a type of cloud computing-based application and services. Furthermore, these applications are heavily investing in cloud computing as being the future of the academic cloud computing. Some of these applications are Microsoft, Google, IBM, HP, Amazon, Sales force, Amanda and Zamanda. Amazon Education Cloud Computing To assist educators in providing cloud computing instruction ,Amazon Web Services (AWS) offer teaching grants supporting free usage of AWS for students in eligible courses. The grants will provide educators with free usage for each student en rolled in courses with AWS as part of the curriculum. Furthermore, AWS provide a highly scalable cloud computing platform for schools and universities which encompasses high availability, dependability, and the flexibility to enable the faculty, students and researchers to build a wide range of applications. With AWS, students and others can requisition compute power, storage, and other services gaining access toa suite of elastic IT infrastructure services for educational purposes. Moreover, AWS can be characterized as Iaas. This means that Amazon provides basic computing capability a virtual machine container, high performance networking reliable and redundant storage, in a remote location. The AWS provides some educational services for the students and faculty:

Research grants for academic researchers using AWS in their work Access to the available resources. Tutorial and project grants for the student organizations using AWS for self directed teaching learning grants for faculty based on AWS efficiency and cost-effectiveness in the institution's IT infrastructure As a result, the deployment and reliability for the educational infrastructure are basically managed by AWS as shown in Figure 1.

International Journal of Management, IT & Engineering
Vol. 8 Issue 2, February 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gate as well as in Cabell's Directories of Publishing Opportunities, U.S.A

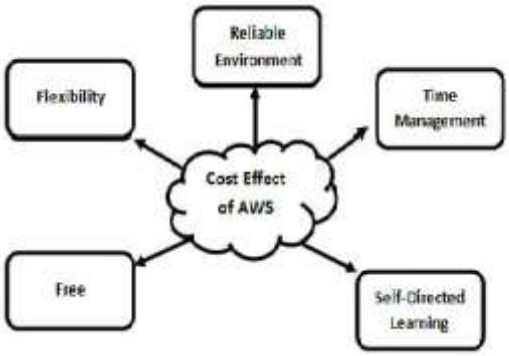

Fig. 1. Cost effect of AWS

Amazon Cloud Services in Education: Amazon Web

Services represent the most extensive cloud service to date that provides resizable compute capacity in the cloud. It is designed to make web scale computing easier for developers.

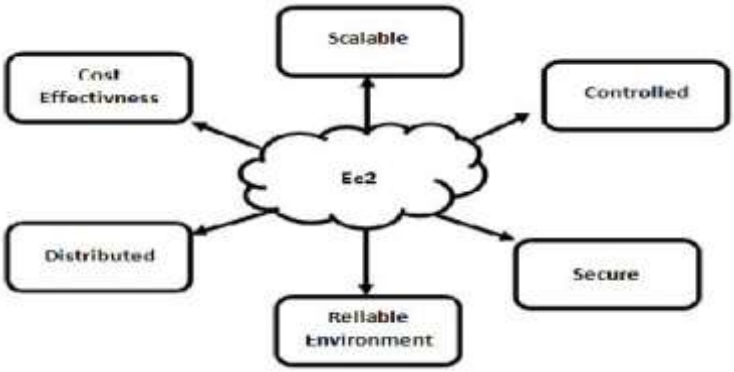

Fig. 2. Amazon EC2 Services

Amazon offers many cloud services, including: Amazon Elastic Compute Cloud (Amazon EC2): A web service that offers virtual machine and extra CPU cycles for the institutional organization. Figure 2 presents the services of Amazon EC2 Amazon Simple Storage Service (Amazon S3): Allows the students, faculty and researchers to store items with a limited size in Amazon's Virtual storage. Amazon Simple Queue

Service (SQS): Offers different kinds of messages passing API, so that educators can talk to each other Amazon Simple DB: A web service for running queries on a structured data set in the cloud in real time. Amazon Virtual Computing Laboratory (Amazon VCL): A free source implementation of a secure production level on-demand utility computing for accessing a wide-area of computational resources, storage and software. Figure 3 illustrates the implementation of VCL .

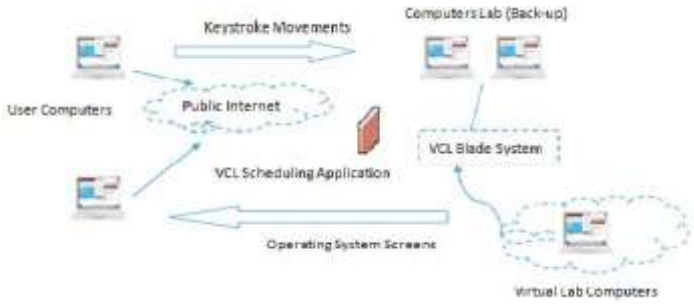

Fig. 3. Implementation of VCL

Microsoft Education Cloud Computing

The Microsoft software and services strategy are about the power of choice a hybrid model of resources that enables the students and researcher to transfer to the cloud. It also lets the researchers to arise workloads across the infrastructures and complement their actual IT assets with Web-based services. Microsoft cloud services give students and researchers the ability to make full use of the same Microsoft technologies in the educational institution. Additionally, all services offer greater financial flexibility to educational institutions and enable lower costs to develop, scale, operate and migrate the systems that are distributed between the cloud and the data center. Microsoft Live@edu can serve a range of needs as shown in Figure 4.

International Journal of Management, IT & Engineering
Vol. 8 Issue 2, February 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gate as well as in Cabell's Directories of Publishing Opportunities, U.S.A

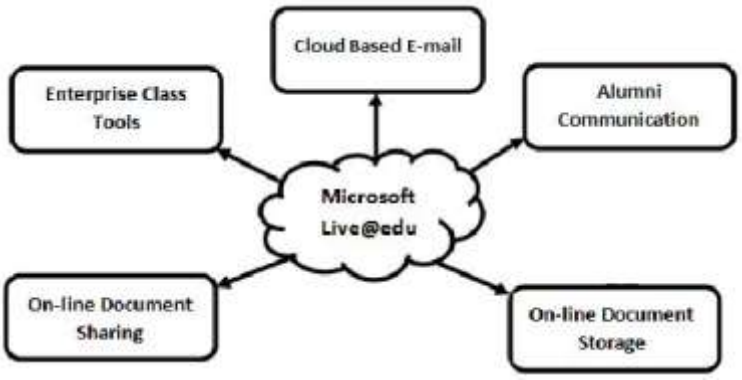

Fig. 4. Features of Microsoft Live@edu

Microsoft Live@edu is usable through popular web browsers for various types of operating systems. It is available at no cost, and it helps IT departments: Reduce the costs for IT infrastructure, such as maintenance ,Minimize time spent maintaining e-mail systems and on strategic initiatives, Provide flexibility and collaboration with peers and faculty, Reduce the time evaluating risk and help make informed decisions about the use of educational cloud computing, Improve high student expectations, including anywhere access to the latest technology , Free on demand resources, Test and deploy large-scales applications in different environment , Create applications that can be shared by many students simultaneously.

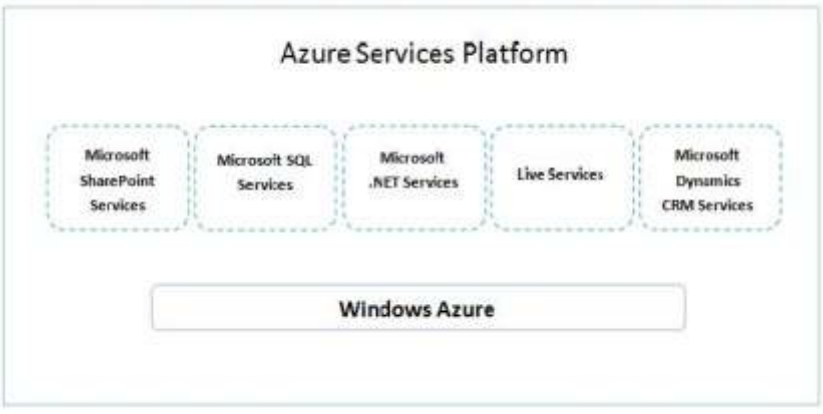

Fig. 5. Azure Services Platform

The solution of Microsoft's cloud computing is also called Windows Azure, an operating system that allows the universities and colleges to run operating system

applications and stores data by Microsoft server. Furthermore, the Azure Services Platform (ASP),includes services that allow the faculty, students and researchers to establish user identities, manage work flows, execute other functions such as Microsoft's online computing platform as shown in Figure 5. ASP consists of different keys illustrated in Figure 6

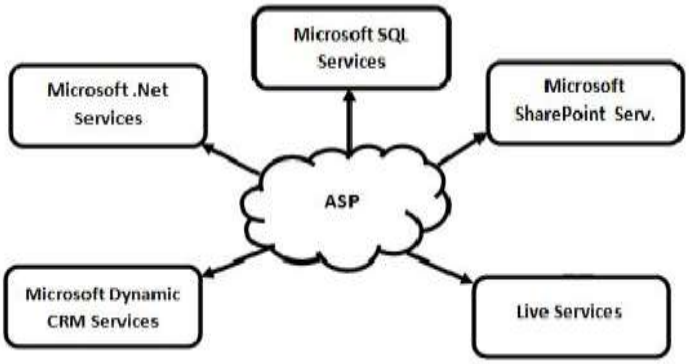

Fig. 6. Key components of ASP

Google Applications for Educational Cloud Computing

Google App Education (GAE) as a new generation of cloud computing-based Web application development platform, enables its users such as the faculty, researchers and students and so on, to operate Web applications within the Google Infrastructure.GAE is available at no cost to institutions, universities and education community . The teachers, students, and staff can share ideas more rapidly and get things done more adequately they have got an efficient communication and sharing tools. Google Apps Education Edition lets technical administrators provide a collection of Web-based messaging tools such as Google Mail, Google Talk, Google Sites, Google Video and Google Calendar to the faculty, students and staff for free in addition to productivity and collaboration tools such as Google Docs Package.

1) Google Applications For Educational Cloud Computing: GAE provides a range of online tools and services that give secure communication and collaboration capabilities to the institutional schools and let the faculty, researchers and students choose the solutions that suit their unique needs.

International Journal of Management, IT & Engineering
Vol. 8 Issue 2, February 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gate as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Service	Service details
Support	Phone support
Application	3rd party applications
Video	Google Video
Cost 3	Google Video
Scheduling	Resource scheduling
Storage Enough Space	Enough Space
Users	No limit

Tab A: GAE Services

2) Google Calendar: Google Calendar is a published, shared, integrated and accessible calendar for scheduling courses. Moreover, the faculty, researchers and students can use the Google calendar to manage their business and organize their work groups.

3) Google Sites: Google Calendar enables the faculty, researchers and students to build, create and publish information with Google tools.

4) Google Video: Google Video allows the faculty, researchers and students to share information using secure and private video tools.

5) Google Talk: Google Talk is an Instant Messaging (IM) tool of Google. Colleagues can communicate remotely with limited conservation by IM.

6) Google Mail: Google Mail uses labels and filters to help students, faculty and researchers organize their email, manage the flow of incoming messages and get mail from other email accounts in their Gmail inbox in addition to sending messages from different addresses.

7) Google Docs: It is considered the main task tool of the course, because it allows participants to collaborate synchronously in the same document.

Amanda Enterprise was built to address these challenges providing a backup and added functionality that support fast installation, simplified management, enterprise-class functionality, and low-cost subscription fees. As an open source backup and archiving software, Amanda Enterprise only uses standard formats and tools, thus effectively freeing the students from being locked into a vendor to retrieve the data. Zmanda Cloud Computing is a radically simple-to- use and cost-effective backup and disaster recovery solution. Backup and recovery solutions have been focused to several products such as Amanda Enterprise, Zmanda Recovery Manager for MySQL and Zmanda Internet Backup to the educational organizations.

RISKS OF CLOUD COMPUTING IN EDUCATION

There are clearly some major potential benefits to institutions deploying cloud services however; it challenges computing service personnel who may fear the consequences of their roles being outsourced. The universities and schools should consider the challenges and risks prior to transferring to the cloud. Examples of these risks are:

Cloud Service Failure: Insufficiency of financing and immature markets could guide some cloud providers out of business and any loss or deterioration of service delivery performance, as well as a loss of investment, make the universities and schools to the risk of having to perform their own duties and obligations, thus being exposed to contractual or legal liability to their employees, third parties, the students or even the public.

Compliance Regulations: Due to the increasing number of regulations and need for operational transparency, the educational institutions are increasingly adopting consolidated and consistent sets of compliance controls

Data Privacy: The multi-tenancy, reuse of hardware and software profiles, and resiliency due to the redundant nature of cloud means a greater risk of incomplete or unlock deletion or denial of service attacks on institutions' confidential data.

Assurance to Service Provider: This proposes a dependency on a particular cloud service provider for service preparation, especially when data portability is not supported.

ROLE OF CLOUD SERVICES IN FIELD OF EDUCATION

Various Cloud services and their role in the field of education are listed below:

Infrastructure as a Service (IaaS)

The customers are rented the primary resources like storage space and processor etc. This service provides an extraordinary aid in the field of education as educational institutes can access a great computing power without installing new hardware, consequently giving cost viability. An example for IaaS is Amazon Elastic Cloud.

Platform as a Service (PaaS)

Here, the service provider provides a platform to customers for developing new applications. In short, PaaS provides a platform that is used by teachers and students to run their applications; thus, they need not purchase the related software and hardware and can use cloud infrastructure for this purpose. Google Apps Engine, Amazon's Relational Data Services are some examples of PaaS.

Software as a Service (SaaS)

This service has great application in the field of education. It gives software usage to its clients. The client can pick the software from various options given by the service provider according to his/her need. Here data as well as applications are stored. Teachers and students get access to particular software based on their need without putting any budgetary burden on the institute. Google's Education Apps and Microsoft live@edu are best examples for PaaS.

International Journal of Management, IT & Engineering
Vol. 8 Issue 2, February 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gate as well as in Cabell's Directories of Publishing Opportunities, U.S.A

DEPLOYMENT MODELS

The cloud space is quickly receiving a plenty of new short structures and expressions to assign diverse parts of the offering, which is the bringing revolutionary changes in the Internet. The National Institute of Standards and Technology (NIST) definitions given below are utilized for deployment models:

Private cloud

Such cloud works exclusively for a particular institute. It might be maintained by the organization itself or some third party and may exist in camps or outside the campus.

Community cloud

Various organizations can share the cloud infrastructure. Community cloud provides support to a particular community having same interest (e.g., mission, security prerequisites, etc). It might be overseen by the organization itself or an external entity and may exist on camps or off campus.

Public cloud

This cloud infrastructure provides service to general public or a substantial industrial group. The ownership of such cloud resides with the association offering cloud services.

Hybrid cloud

Such cloud is an organization of two or more clouds (private, community, or public) that while remaining distinct parts yet are integrated by institutionalized or exclusive technology which empowers portability of applications and data. (For example, cloud blasting used to adjust load among clouds).

ATTRIBUTES OF CLOUD COMPUTING

The five attributes given below, as characterized by NIST, are viewed as fused in the cloud computing services [**Mell and Grance, 2011**]

On-Demand Self-Service

Clients can consequently procure computing abilities and resources as and when required on their own without requiring third person intervention.

Broad Network Access

The network provides access through standard equipments. For example, phones, laptops, PDAs, and so forth.

Resource Pooling

Using a multi-tenant model, pooling of various resources is done to provide service to various customers at the same time. These resources include network bandwidth, virtual machines, processing power, storage capacity, etc. That is; virtual and physical resources are powerfully allocated and de-allocated taking into account needs and requests by the clients

Rapid Elasticity

Resources and capabilities can be rapidly and automatically assigned and scaled at any time and in any quantity depending upon the demand and needs of the customers.

Measured Service

Automatic monitoring of the use of resources and services by customer is done. Controlling and reporting offers transparency for the client as well as vendor.

It is necessary to comprehend that the service models, deployment models and the five attributes of cloud computing as depicted by NIST do not run autonomously however are fundamentally integrated and associated with each other. This visual exhibits that a cloud-based technique can provide various configurations based upon the organizational needs. It is not phenomenal for institutes' to start with one service model, for example, SaaS and a Public Cloud deployment model as a pilot, and after that gradually scale if the pilot model is proved to be effective. It is additionally conceivable to utilize various deployment models to bolster one or more service models.

Conclusion

Education Sector in our country especially the higher education faces a huge problem to reach the remote areas and imparting "equal and quality education to all" can be solved with mere small gadgets like ipad's, iphones, tabs thereby saving on purchase of computing infrastructure, licensing and purchase of software's and support personnel. In the era of "Big data" cloud computing has immense role in improving quality and huge educational content available for students and research scholars. The success and high return on investment (ROI) of cloud infrastructure vests in the hands of bigger organizations and the public sector in particular. The success of cloud computing in education can be attributed to the acceptance of cloud computing by everyone in the field of education with good chunk of support by government. The problems related to security, reliability, interoperability are some issues that should be managed if we want to use cloud computing in education sector.

This paper presents educational cloud computing and how the Higher Educational Institutions Government as well as private are already taking advantage of it, not only in terms of cost but also reliability and portability. Several general examples of cloud computing in education such as Microsoft, Google App, IBM, Amazon and others were provided and a case study of the applications was presented and explored in more details.

REFERENCES

[1] C. Justin, B. Ivan, K. Arvind and A. Tom, Seattle: A Platform for Educational Cloud Computing, SIGCSE09, March 37, 2009, Chattanooga,Tennessee, USA, 2009.

[2] P. Shanthi Bala, INTENSIFICATION OF EDUCATIONAL CLOUD COMPUTING AND CRISIS OF DATA SECURITY IN PUBLIC CLOUDS, (IJCSE) International Journal on Computer Science and Engineering Vol.02, No. 03, 2010, 741-745. 2007.

[3] M. Armbrust, et al, Above the clouds: A Berkeley view of Cloud Computing,

UC Berkeley EECS, 2009.

[4] S. Al Noor, G. Mustafa, S. Chowdhury, Z. Hossain, and F. Jaigirdar, A Proposed Architecture of Cloud Computing for Education System in Bangladesh and the Impact on Current Education System, (IJCSNS) International Journal of Computer Science and Network Security, VOL.10 No.10. 2010.

[5] M. Luis, R. Luis, C. Juan and L. Maik, A Break in the Clouds: Towards a Cloud Definition, ACM SIGCOMM Computer Communication Review, Volume 39, Number 1. 2005.

[6] Cloud Computing Articles. Cloud Computing Education, http://www.code2cloud.com/cloud- computing-education/

[7] Cloud Computing Articles, SaaS+PaaS+IaaS. Free Cloud Apps for Educational Institutes: Schools, Colleges, Universities, http://www.technopulse. com/2010/08/free-cloud-apps-educational- institutes.html/

[8] IBM Academic Initiative. Cloud computing: Delivering Internetbased information and technology services in real time, https://www.ibm.com/developerworks/university/cloud/

[9] IBM Sales and Distribution - Solution Brief for Education. IBM Cloud Academy Education for a smarter planet, ftp://dispsd-40-www3.boulder.ibm.com/

[10] R. CJB and N. Evans. A PROPOSAL FOR THE ADOPTION AND USE OF CLOUD COMPUTING IN SECONDARY EDUCATION IN SOUTH AFRICA, 11th DIS Annual Conference 2010, 2nd 3rd September,Richardsbay, University of Zululand, South Africa, 2010.

[11] THE ABC'S OF ENGINEERING EDUCATION: ABET, BLOOM'S TAXONOMY, COOPERATIVE LEARNING, AND SO ON

[12] K. Youry and V. Volodymyr. Cloud Computing Infrastructure Prototype for University Education and Research, WCCCE '10, May 78, 2010, Kelowna, Canad, 2010.

[13] M. Grimes, T. Jaeger and J. Lin. Weathering the Storm: The Policy Implications of Cloud Computing, iConference, 2009.

[14] Microsoft Education Cloud Computing. The most comprehensive solutions for

the cloud. On earth, http://www.microsoft.com/en-us/cloud/

[15] Microsoft in Education — IT solutions. Microsoft Live@edu, http://www.microsoft.com/education/en-us/solutions/Pages/liveedu.aspx/

[16] R. Elumalai and V. Ramachandran. A Cloud Model for Educational e-Content Sharing, European Journal of Scientific Research, ISSN 1450-216X Vol.59 No.2, pp.200-207. 2011.

[17] N. Sultan. Cloud computing for education: A new dawn?, International Journal of Information Management, 109116, 30 2010.

[18] M. Victoria, and D. Brbara. Cloud computing for education: A new dawn?, A design of a postgraduate course on Google Apps based on an Institutional Personal Learning Environment (iPLE).

[19] Anand, H.S., & Kamayani (2015), "Scope of Cloud Computing in Educational Sector", *International Journal of Recent Research Aspects,* Vol. 2(2), pp. 150-152.

[20] Ercan, T. (2010) "Effective use of cloud computing in educational institutions", *Procedia-Social and Behavioral Sciences*, Vol. *2*(2), pp. 938-942.

[21] Hayes, B. (2008). "Cloud computing", *Communications of the ACM,* Vol. 51 (7), pp. 9-11.

[22] Hignite, K., Katz, R. N., & Yanosky, R. (2010). "Shaping the higher education cloud", *EDUCAUSE White Paper*.

[23] Mell, P., & Grance, T. (2011) "The NIST definition of cloud computing", *National Institute of Standards and Technology, U.S.*

[24] Pocatilu, P., & Boja, C. (2009). Quality characteristics and metrics related to m-learning process. *Amfiteatru Economic,* Vol. 11(26), pp. 346-354.

[25] Rani, R., & Singh, S. (2015), "Role of Cloud Computing in Higher Education",