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REVIEWS OF CLOUD COMPUTING FOR EDUCATION: SERVICES AND BENEFITS

Ting Sie King
Swinburne University of Technology Sarawak, Kuching, Malaysia
skting@swinburne.edu.my

Abstract

Cloud computing has become popular in the academic sector and has attracted the attention of academe, more specifically instructor and student. In this paper, the author reviews the cloud computing technology used in education and impact of the services on student learning and various educational potential of cloud-based tools and services for exploitation in teaching and learning are studied.

Keywords

Cloud Computing, Impact, Education potential, Tools and services

1. Introduction

The advancement in IT technology influences very much new generation learners to rely on internet services that support rich learning environment. Cloud computing is recognized as a technology for dynamic scalability, flexibility, low cost and accessibility. It is a technology that consolidates IT infrastructure, outsourcing of IT resources and a group of configurable computing resources such as servers, storage, networks and applications that can be shared

through on-demand internet access. It provides evolution of education in term of communication, collaboration, document access and knowledge sharing. User can access virtualized resources on the cloud data center using standard browser from internet enabled devices such as Laptop, PDA, Mobile Phone and Tablet from anywhere and anytime. Through cloud application services, student can synchronously access document, presentation slides, spreadsheet, form and drawing while using chartroom on internet without software installation on local devices (Ming et al., 2015). Large data files can be stored and retrieved from cloud storage either is free or by pay-per-use service offered by cloud service provider. Devices with low processing power can also perform compute-intensive tasks seamlessly over the internet. There are three service models of cloud computing, namely software as a service (SaaS), platform as a service (PaaS), and infrastructure as a services (IaaS). For SaaS service, common cloud application software can be accessible through on demand web services without installation required on the computer for example among the famous apps like Microsoft Live@edu or office 365 and Google Apps. The service further divided into two new services, the communication as a service (CaaS) provides the remote access of virtual e-mail. The desktop as a service (DaaS) provides user permission to access virtual workspace environment for a reserved session (El-Sofany et al., 2013). PaaS provides platform for student to use online application tools to design, develop, test and maintain their own or new applications on the cloud for examples the Google Apps Engine and Microsoft Azure Platform. Cloud computing resources like storage, processing power and networking can be accessed via the virtual computing environment for example the Amazon Elastic Computing Cloud (EC2) is the most common IaaS service. The following sections review the significant benefits of cloud computing on education sector and the influences of several potential of services provided by cloud computing on student teaching and learning.

2. Impact of Cloud Computing on Education and Student Learning

Cloud computing concept offer considerable potential for university to host IT infrastructure with low start-up cost where the high capital expenses for hardware investment are not required, the expenses only charge the utilized resources hosted at the remote servers on the internet. The service provider will take all responsible of IT infrastructure supports, software licenses, installation and updates and maintenance to operate the cloud services to user. The

same benefits also addressed in (El-Sofany et al., 2013) for the SaaS service applied in the E-learning, the service eliminated the need to regular update software license and it allow flexibility in changing and selecting of software use. The Cloud learning environment promotes collaboration on working group assignment at the same time from participants at different location. It allows sharing of ideas, edit of content and save of documents automatically and stored on the cloud without fear that it will loss due to computer crashes. Documents can be accessed easily from anywhere at anytime using standard web browser on the device with internet access. Student run computer-intensive program on the powerful platform from low processing devices.

Cloud computing can be an essential service for effective learning from the student perspective, student exhibited positive interdependence towards collaborative learning among peers and achieved better academic grade using of cloud computing as a learning instruction for example Google Docs used for business writing (Lin et al., 2014). Frequent social interaction, hearing and speaking practices are essentials in language education, video chat like Skype and Google Hangouts provide these opportunities and alternative to the traditional classroom instruction (Khampusaen, 2014). The Massive Open Online course (MOOC) distributed on the cloud promoted self-directed learning based on connectives at which knowledges acquired was developed through global social communication and collaboration in the informal online learning environment (Kop &Fournier, 2010). Moreover, active interaction with others in the cloud learning environment also inspired creativity for learning (Kop & Carroll, 2011).

3. Cloud-Based Tools and Services for Education Support

Effective teaching and learning cannot take place without careful consider potential of novel instructional and learning services. Cloud based teaching can be a creative and innovative teaching solution in the 21st century. Google Apps is one of the feature-rich cloud application, it allow collaborative work on writing and editing documents online, share, upload and store in the cloud storage space. The gain flexibility access of the apps allow student co-edit document on real-time with different internet enabled device from anywhere. Microsoft Live@edu cloud platform provides environment for teaching resources sharing, cloud storage with free SkyDrive, collaboration and online application such as Word, Excel and PowerPoint. Live@edu (Chu et al.,

2013) was used as learning and reading instruction platform to study student reading attitude and learning effectiveness. Students learning improved through discussions and frequent interactions on the platform services; they act positive reading attitude and learning satisfaction. Owing to upgrading, the Live@edu was rebranded as Microsoft office 365. Microsoft Office 365 provides comparable but enhancedcloud services. Likewise, Baihui a platform offer online cloud computing applications that support group collaborative learning. Always, frequent online interactions and participation in group discussions would eventually develop communication skills and spirit of teamwork (Na & Li, 2013). The Moodle, an open source learning management system has been integrated with enhanced cloud-based grading tool to access student performance. The Learning Analytics Enriched Rubric (LAe-R) (Petropoulou et al., 2014) was used with its enhanced rubric to assess student interaction and learning behavior in the Moodle. Student performance was monitored through the Learning and Interaction analysis indicator.

In cloud classroom, Prezi was used to present knowledge to student through storytelling and provide zooming function on the content presented on the slide. In the survey (Mustaffa et al., 2013), students pay more attention in classroom learning and show interest and desire towards subject content. Interactive classroom required student active participation in teaching and learning activities, the cloud based Lecture Tools (Chiu & Li, 2015) offer student with an online note-taking synchronized with presentation slides stored in the cloud server and allow response to inquiry on real-time in the form of text format. Through questionnaires study, student found themselves motivated in their studies and instructors found that the platform useful in large class engagement.

4. Cloud Laboratory

Virtual computing laboratory (VCL) is one of the clouds computing service that provides remote access to real or virtual computer laboratory to usehigh performance computing applications like Matlab, Solidwork or even real experimental equipment onlineby reservation. The pioneer of VCL was first implemented at the North Carolina State University (NCSU). In the VCL environment, student can experience collaborative learning while conduct experimental works online without present in the lab that could restricted by limit of resources, tight schedule and inadequate space for large number of groups. Student access to cloud based virtual

laboratory platform to conduct collaborative programming practices where coding, debugging and executing of program achieved on the web (Qing et al., 2012). Elastic-R provides student a user friendly workbench to run computationally intensive application and access cloud resources using only a standard web browser. Students at remote locations use mathematical and statistical tools such as R and Scilab from Amazon Elastic Cloud (EC2), the learning of statistics and applied mathematics take placed through the virtual collaborative environment (Chine, 2010). At Lab@ home (Saliah-Hassane et al., 2011), open source Bing Blue Button software installed on virtual server was used to provide networked conferencing environment where users interact through network collaboration when conduct laboratory on cloud, in conjunction with cloud based Dropbox software, user can share, store, back up and synchronize files during collaboration session. Two portables software embedded laboratory kits were proposed to allow virtual laboratories conducted remotely on the real instruments e.g. Diligent Electronic Explorer board and Circuit Gear.

5. Conclusion

Cloud computing enabled learning environment was recognized as flexible education setting where services are provided by pay-per-use pattern, the services deliveredby mean of sharing computing facilities via internet where student away from campus can virtual access to academically related software application with possibility to run high computationallyintensive program, working on labexperimentonline in group at where students interact virtually with real equipment situated at physical labcollaboratively,create social learning environment using of online social media tools andstore, backup, share and access files conveniently on the online cloud storage. From student's perspective, cloud computing are essential learning instructions for effective learning, students gain benefit from using cloud applications online to facilitatecommunication and collaboration among peers when carry out group work, an active social interaction in the open online learning environment promote creativity and self-directed learning. Students show interest, desire and positive reading attitude, pay more attention in the classroom and feel learning satisfaction with the new teaching style, they learning improved and therefore achieve better academic grade. As a whole, cloud computing as an educational instruction can be creative, innovative and effective teaching solutions. Although this paper

emphasizes only benefits of cloud computing in teaching and learning in an education, but there are also challenges and drawbacks. The research will carry on the practical studies of cloud teaching effectiveness on student learning in the coming work.

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