MANAGING TEACHING AND LEARNING RECORDS IN THE COMMERCIAL CLOUD: A PUBLIC UNIVERSITY PERSPECTIVE

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Abstract

Cloud Computing (CC) has been gaining significant attention among academics and researchers. Many higher academic institutions are embracing this platform to improve teaching, learning, research and other academic activities. The purpose of this paper is to explore the potentiality of creating and preserving of teaching and learning records in the commercial cloud, and propose a framework of SaaS (Software as a Service) cloud service for Dhaka University. Using GoogleApps, this paper proposed that SaaS platform can be used by teachers and students for managing their teaching and learning records. Moreover, both parties can work on the same document, make corrections as well as improve in synchronized ways. The present paper demonstrates that adoption of GoogleApps can increase student participation and access to learning resources for a range of learners in Bangladesh. Organizational support, sufficient training, ICT facilities and proper policy can help to avail the benefit of using cloud service in Dhaka University. So far, in Bangladesh, this is the first study that highlights the prospect of using SaaS platform for managing teaching and learning records in Dhaka University. This may trigger more such research on this area.

Key-words: Records, cloud computing, teaching & learning, faculty and students, GoogleApps, Dhaka University

Introduction & Background of the Study

Nowadays, many new tools and technologies like massive open online courses (MOOCs), social media and cloud computing (CC) are widely used to facilitate academic activities in many higher academic institutions. These platforms are reshaping the traditional methods of teaching and learning in the classroom environment. Compared to earlier days, students and teachers

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have many new learning needs and demand which are addressing in many ways by using these technologies (Wideman, 2013). In the learning process, more engagement between teachers and students is needed than before. Cloud computing (CC) has the potential to meet those needs where students, researchers and faculty can engage and get benefitted by using this platform. Thomas (2011) reported that cloud; an interactive and ubiquitous platform can facilitate teaching and learning activities by engaging students in more agile ways. In other words, it reduces costs, creating an environment where both teachers and students can create, use, store and give access to their academic records. The present paper defines teaching and learning records are those records which are created in course of teaching and learning times. Records of student works, grade/transcripts, research/theses, assignments, project works, presentation works, course materials and project groups can be stored in the cloud and both students and teachers can access and use them when needed. In the cloud, teachers and students can use GoogleApps for managing there all records of academic activities (Wang & Jin, 2010). Through analysis the features of SaaS (Software as a Service), and taking the GoogleApps as an example, this paper discusses the possibilities of applying SaaS for managing teaching and learning records in a university setting.

Like the developed world, cloud computing in education for the developing countries is not familiar and well-focused. Poor and inadequate access to resources, unavailability of internet connectivity & facilities and lack of proper awareness of using clouds (Greengard, 2010; Okai, *et.al*., 2014). In Bangladesh, very few studies focus on cloud computing: e.g., cloud computing & university admission process (Hasan, *et.al*, 2015); cloud computing technology for social and economic development (Islam, *et. al*., 2015) and proposed architecture for cloud computing systems in education (Al Noor, 2010). None of these studies focused on cloud computing for creating, storing and managing teaching and learning records in a classroom environment. Thus, this study explores the concept of using GoogleApps for managing teaching and learning records in the university. It also focuses on the challenges of managing records in the cloud. This paper does not report on actual use of cloud but it may initiate discussion in Dhaka University and similar universities in Bangladesh.

To address this, a theoretical framework of cloud services for record management in Dhaka University has been developed. Some steps for

implementation are also discussed. The paper is organized as follows: In the next section the research methodology is presented and the relevant literature is reviewed. This is followed by a brief description of Dhaka University. Then, the framework of SaaS for teaching and learning is identified, a conceptual framework is developed, and future plans are described.

Methodology

A substantial amount of literature has been read and analyzed to assess the viability of cloud computing for educational purpose. All the relevant papers highlight the potential benefits of suing cloud for managing learning records in classroom activities. From April to July 2017, a series of discussions were held with some of the faculty members and graduate students of Dhaka University. Under a research fellowship, the author had also discussed with some of the faculty members of University of British Columbia (UBC) in Canada and their experiences of using cloud were taken into consideration. Their experiences of using cloud in research and teaching & learning helps to conceptualize the cloud platform. Thus, opinions and experiences were voiced and shared. In addition, documentary sources and proceedings outputs were analyzed, and direct observations were made for assessing the current situation. Furthermore, a good number of examples have been discussed to establish the emerging popularity of cloud computing in some university settings. Based on review of the literatures and author's teaching experience, the present paper explores some areas which might helpful for using commercial clouds in academic settings.

Literature Review

Cloud and records

Many researchers and practitioners have discussed on Cloud Computing (CC) and no widely accepted definition is arrived of (Grossman, 2009). A commonly used definition by Mell & Grance (2011) is "cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources with minimal management effort." Considering the features of cloud service model, three common ways cloud services can be categorized such as Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) (Figure. 1)

(Lenk, 2009). In this three different service model, processing, storage and networks are used by consumer are treated as IaaS; a development platform for software cycle treated as PaaS and Software usage by end users as service are treated as SaaS.

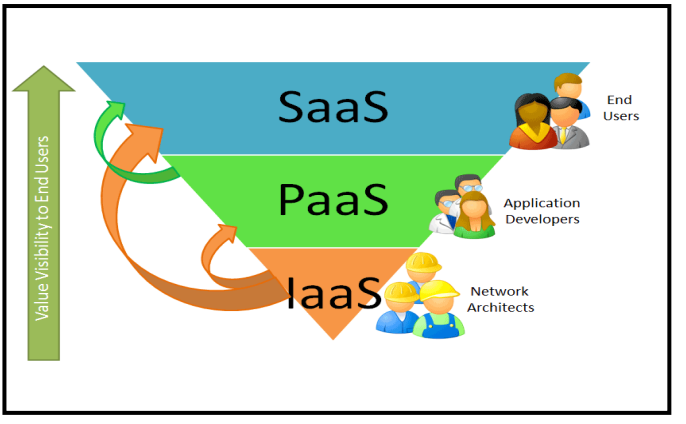

Figure 1: Cloud service model (Lenk, 2009)

In figure one, end user comfort, ease of use and experience becomes the core capability for the SaaS providers. Considering the end user need, organizational pattern and adaptation of tools, cloud service model can be changed. For example, in a university setting (Figure 2), faculty members, admin, students and library users are the end users who can come under the SaaS platform. They need to use GoogleDocs or Drive or other software for their project and academic work where SaaS is offered to users using a thin client via a web browser.

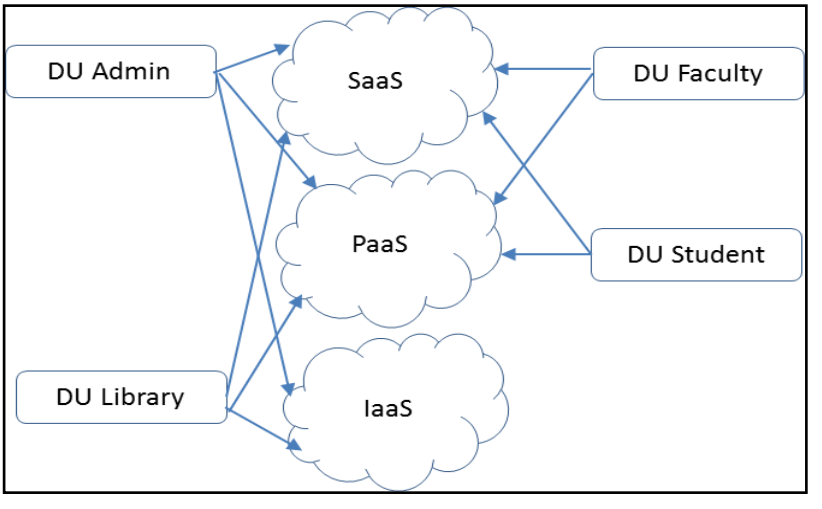

Figure 2: Cloud service model of Dhaka University (adopted from Devi, *et.al.*, 2014)

Similarly the other service model (Paas & Iaas) has their own functionality and activities in the cloud service model of Dhaka University. The use of servers and backup for the library service only falls under IaaS when these servers are virtualised and not actually on-premises. Due to necessity and reputation, some of the commercial cloud services and service providers are already available in the marketplace. Some of these are Amazon, Yahoo, Salesforce, Desktop Two, Zimdesk, and Google cloud platform. Among the commercial cloud service providers, Google's platform have widely used by many researchers, education leaders, academicians, students and business people (Delaney and Vara, 2007).

Records in the cloud are well discussed and covered areas in the existing research literature. The International Research on Permanent Authentic Records in Electronic Systems (InterPARES) Project is one example of such a global initiative which is made of America, Europe, Asia, Africa and Australian team management. Research on records in the cloud usually covers access, storage, preservation, challenges, trust & trustworthiness, privacy and policy (Duranti & Thibodeau, 2006; Duranti, 2012). Stuart & Bromage (2010) focused on the current environment of, and challenges for, managing and storing records and information in the cloud. Stuart & Bromage (2010) noted that examining the risk factors of an organization, and later organization can take the decision of using cloud. Taking an archival theoretical framework, Duranti & Shaffer (2013) examined how the use of social media can play an important role for preserving the educational institutions' records created by the students, faculties, and other people. They found that proper policies and procedures addressing intellectual property and copyright can help to create and use educational records in the institutions. Askhoj, Sugimoto & Nagamori (2011) focused on comprehensively integrating records transfer and preservation in cloud systems. Kemoni (2009) presented empirical research findings in Eastern and Southern Africa Regional Branch of the International Council on Archives (ESARBICA) region where various challenges found for managing electronic record.

Nowadays, many cloud services are utilized in teaching and learning sectors as well. Some of these are Microsoft (Office Live Workspace, Windows Live SkyDrive, Windows Live Spaces, Microsoft Shared View Beta, Microsoft Outlook Live, Windows Live Messenger and Windows Live Alerts) and Microsoft Live@edu is primarily for academic purposes.

Amazon Web Services for Education (AWS) provides the cloud services in categories of Compute, Software, Content Delivery, Database, Storage, Deployment & Management, Application Services and Workforce. The present study focuses on SaaS features of CC that are relevant to managing teaching and learning records in the university. In this paper, the author did not discuss any detailed technical areas of CC which are not the primary focus of this paper. This fairly short theoretical paper focuses on the potential use of cloud computing in higher educational institutions. The paper in that sense is more about the potential use of records in the cloud rather than their creation and management which in itself is an interesting aspect which does not the focus of the paper.

Existing scenario of teaching and learning records in the cloud

Nowadays, timely access to educational resources, availability, reasonable costs, various features of student-teacher engagement, and many interactive tools of cloud make the learning environment more vibrant in the higher education institutions. For example, using cloud service model university can offer the services to their students and faculties when they need. Cloud like GoogleApps allows institutions to use their own domain name that can help to brand their institutions. Lakshminarayanan, Kumar & Raju (2013) suggested that learning institutions, universities, colleges or school can use GoogleApps for teaching and learning from anywhere and anytime. Sultan (2010) found that cloud likely to be a very interactive and significant tool for education and learning purposes in university. As a result, cloud is being implemented successfully by many of the prominent companies like eBay, Amazon and Google in education sector (Iskold, 2006). Among these, a number of cloud services are offered by Google. GoogleApps. It is categorized under different pattern of services. Some widely used features for communication are Gmail, Google Talk, collaboration and sharing for GoogleDocs, spreadsheets and storage are GDrive. Sultan (2010) found that how Google helps for email and solved the cost and flexibility issues at the University of Westminster. Considering the easy to use and friendly features of cloud computing, many universities in the USA and UK are currently utilizing the different features of cloud computing in their academic settings. Fox (2009) and Hicks (2009) discussed how SaaS platform is used in some of the curses in the University of California at Berkeley and in UK higher education institutions. Hicks (2009) found that

good number of universities in UK, e.g., the University of Aberdeen, Leeds Metropolitan University, the University of Glamorgan, the University of Westminster, the Royal College of Art (RCA) and the London University's School of Oriental and African Studies (SOAS) are using GoogleApps for academic purposes. Thomas (2011) identified that CC as an interactive platform facilitates educators, researchers, and scientists for many of their scholarly activities. In a survey study, González-Martínez (2015) found the threats and advantages of using cloud in education. It was found that use of cloud in education is still immature. The Majority of the papers are theoretical and reviewed where the practical aspect of using cloud are introductory. Considering various features of cloud computing, Ramachandran, *et.al*., (2015) focused some issues on choosing the suitable cloud computing model. In a case study of academic Institute in India, it was found that use of private cloud is convenience for cost savings. Taking cloud into the classroom setting, Wideman (2013) evaluated the Google cloud computing in the three district schools in Ontario, and it was found that Google's applications were widely used by the students for preparing classroom works, project presentations, and avail the storage facilities of preserving reading materials online. Denton (2012) examined the attitude of teachers towards using cloud-based tools and found that teachers prefer to use cloud tools for teaching purposes. This result is in line with the findings of Yang's (2012) study where author used GoogleDocs for one of the educational technology courses.

With under developed IT infrastructure, poor internet access and lack of awareness, many developing countries in Africa are embracing the cloud computing. Many higher academic institutions in Africa are utilizing cloud in classroom setting. Many features of Google Suite (G Suite) are widely used in the East African educational industry. Wanjiku (2009) focused how Google has provided support to the Kigali Institute for Education, the National University of Rwanda, the University of Nairobi, the Kigali Institute for Science and Technology, the Kenyan Methodist University, the United States International University, and the University of Mauritius for teaching and learning purposes in Africa. Facilities offered by cloud computing help many universities in Africa by waiving the ICT costs. Cloud in Africa facilitates education in many ways more efficient than before. Like African countries, cloud computing and its

application to the educational institutions in Bangladesh are not well discussed. Despite advantages of cloud computing in education either in developed or developing nations, the literature on how this platform facilitate to create, store and preserve teaching and learning records are still be immature. It is also worth noting that there is no work has been carried out to preserve teaching and learning records in the commercial clouds in Bangladesh.

Dhaka university: A brief review

Literacy rate in Bangladesh is low which is about 66.5% for males and 63.1% for females (CIA, 2014). ICT status in Bangladesh is not satisfactory as the percentage of households with access to computer is 5.6% and internet 4.8% only (BBS, 2013). Bangladesh has 40 public, 97 private as well as 3 international universities (UGC, 2018). Among those universities, Dhaka University is the largest and oldest university in Bangladesh. This university started its journey in 1921 and the number of students and teachers has risen to about 37,018 and 1,992 respectively. At present the University consists of 13 Faculties, 83 Departments, 12 Institutes, and more than 56 Research Centers (Dhaka University, 2018). It is evident from the faculty websites that all of the faculties have central computer lab facilities where the students and teachers can use the internet facilities. The faculty is connected with central Wi-Fi and teaches and students can enjoy this freely. After browsing the central website of Dhaka university, we found that very few Departments and Institutes like Institute of Information Technology (IIT), Information Science & Library Management (ISLM), Computer Science & Engineering (CSE), Peace and Conflict Studies, Development studies and others have their own website. It is not the comprehensive lists as the present paper did not examine the website of all Departments. Islam (2010) explored Facebooking class work and experiment with graduate students of a small Department in the Faculty of Arts in Dhaka University. Author discussed how he replaced blackboard with a Facebook and GoogleDocs combination to connect academic writing, preserving, storing and updating all records of a particular course. It was found that more than 90% students use the Facebook and they were interested to use it for the academic activities. In a study, Jahan & Ahmed (2012) found that perceptions and academic use of SNSs by Dhaka University students are quite high. Authors suggested for appropriate policies to use SNT's to support academic activities. However,

it is apparent from observation that most of the teaching and learning activities like submitting assignment, preparing class lectures, preparing exam results, grading students results, and exchanging course materials and academic resources between teacher and students are mostly conduct in the conventional ways. Students prepare, print and submit it to the course teachers or respective sections. Here conventional process of learning is meant where the learning environment is controlled by the teacher; materials given by the teacher in printed and other academic activities are done by conventionally. This process treats students in a passive way rather than an active ways where students can interact more. To overcome this situation and make the classroom activities more vibrant between teachers and students, this paper offers the following SaaS model for managing teaching and learning records.

Towards a Theoretical Framework of Managing Teaching and Learning Records in the Cloud

Students have more expectations in the 21st century, and they are not interested to traditional teaching-learning process. They need more interactive learning process in learning. For understanding the class lectures and research project, students need more time, resources and more engagement with the teachers. As the teacher and student ratio is quite high in Dhaka University, it becomes very difficult for the faculty members to teach many courses, conduct deep discussion with students as well as spending ample time for supervising students in research works. It is supported by many studies that research and collaborative learning environment is often not a primary part of many universities in developing countries (Rena, 2009). Faculty members are busy with taking classes to end semesters in time, administrative works, examining manuscripts, and other routine works they have. Faculty members spend less time to discuss on research, guidance and other student supporting academic activities. Many studies show that cloud computing has some distinct benefits such as creating, efficient resource utilization, students activities monitoring, interactive learning and other collaborative research features which are widely applicable to the teaching and learning activities as well (Armbrust, *et. al.,* 2010). Several studies have analyzed how SaaS features of cloud computing are helpful for the teaching and learning process. For the present study, we adopt the SaaS cloud service model with GoogleApps.

SaaS (Software-as-a-Service)

SaaS cloud service is designed for the end users which are delivered over the web. This removes the expense of hardware acquisition, provisioning and maintenance, as well as software licensing, installation and support (Kepes, 2015). Dhaka University can adopt this service model primarily, where students and teachers do not need to buy the software any more. Different Departments can use this service model that can eliminate the necessity for the Departments' to purchase, build and maintain the infrastructure and application process. Compared with other platforms, SaaS user can spend less time to use and maintain (Wang & Jing, 2010).

GoogleApps is a series based internet applications offered by the Google Company. Under the SaaS model anyone, no matter institution or the individual, who use the GoogleApps don't need to install or purchase the software. They avail and use it without restrictions over the Internet. By using these GoogleApps, teachers and students in Dhaka University can perform various activities mutually, increase their academic engagement and store their teaching & learning records based on their need. GoogleApps for Education (GAFE) is a core suite of productivity applications that Google offers to schools and educational institutions for free. A report shows that over 10 million students, teachers and educators are using Google app education (Weinberger, 2010). Many tools like for communication-Gmail, productivity-Google Docs, a customizable start page-iGoogle and Google Sites-develop web pages are helpful for the learning activities. User can avail freely or purchased premium edition for more storage (Grodeka, 2008). Nowadays, SaaS has become the well-known platform to the large number of community people. Before selecting tools or applications, students/teachers should first evaluate the quality of the tools, as the evaluation of the tools or applications would suggest appropriate way to use them. For example,

GoogleDrive

Teachers and students of Dhaka University can use GoogleDrive to create, store, use and synchronize documents and files across computers, tablets, and smart phones. Course teachers can store teaching materials, class records and make it more readily accessible when it is needed. In addition to making learning activities easier, teachers can introduce this tool with their students. Teacher can create a sharing folder for each class/research student and can make records available to students. Since all

academic records are stored to same virtual place, every student can access his or her materials via one log-in which is time saver also. Google Drive is especially useful for creating docs that students can edit. As a teaching assistant (TA), author of the present paper had working experience in many foreign universities where author and graduate students worked together in spreadsheet for many research projects. Acton (2015) noted an example in York University where he utilized GoogleDrive for teaching assistant program with the students.

GoogleDocs

GoogleDocs is a freely available program which is used for word processing and spreadsheet. For example, using GoogleDocs teachers and students can create, edit, display documents and co-operate with other users real-time. In addition, teachers can use Google form to give student a pre-assessment at the beginning of the class, survey students at the beginning of the course to find out their interests, and based on that can change course contents for the next semester. GoogleDocs help to prepare group assignments, share docs with team members and collect information via online (Reyna, 2010).

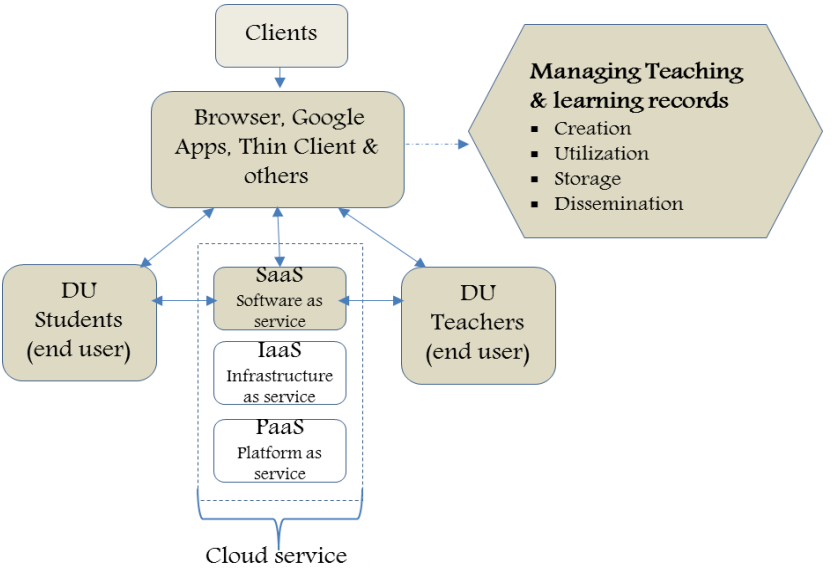

Figure 3: Teaching and learning records in the SaaS at Dhaka University (author proposed)

Moreover, both faculty members and students can use a Google account branded with the institution's domain name, recorded and stream video lectures in YouTube. By utilizing such tools and approaches,

managing and preserving the teaching and learning records of classroom activities can be done which will increase more engagement between two groups. The present paper has adopted models/frameworks from the research literature to serve as a theoretical lens. The present framework has adopted the Sultan (2010)'s framework on cloud computing for typical university settings; Thomas (2011) works on GoogleApps for cloud computing in (SoLT); Miseviciene, Budnikas and Ambraziene (2011) works on MS Live@ Edu case in a university setting and Okai, et.al., (2014) model for increasing ICT efficiency in universities.

By taking the elements of these frameworks, the present study proposed a framework of teaching and learning records in the cloud. The framework (fig.3) consists of the following three elements : (1) the teacher sphere (giving lectures, research guidance, distributing learning materials, attendance records, grading records, and others) (2) the student sphere (student learning resources, preparing course work, class assignment, research progress report, syllabus and others) , and (3) the platform for creating, managing, preserving and sharing records using GoogleApps. Using the SaaS platform, both teachers and students can create, manage, preserve and share academic records in more agile ways.

The figure needs to be seen from top and then right to left. Teaching & learning records encompasses a wide range of records that do not directly relate to student-teacher interaction but also to administrative records such as transcripts and grades which have very different management requirements. Here for this paper, based on Chinyemba (2005) study, the present author consider the teaching and learning records are registered students for a particular course, class lists, attendance lists, examination questions, student evaluation policy, research proposal, class notes, presentation slides, academic syllabus, question papers, grading reports, course materials either books or journal papers, project reports, question bank, and other relevant records relating to the academic activities. Teaching & learning records are created through engagement/interaction between the students and teachers. They create records using various tools of GoogleApps. Once the record is created, in the next phase, these records are stored in the GoogleApps under SaaS cloud service model. In academic environment, primary actors are the teachers and students. To make the academic and learning environment more agile and interactive, both of these actors have their significant role. For the present paper,

author chose to use the value co-creation model for the academic libraries (Islam, Agarwal and Ikeda, 2015). Here SaaS model can increase the engagement between students and teachers, and making the sharing process easy. From the right side, using GoogleApps, teachers can plan and design engaging opportunities and discuss with students in course wise. In this, the teachers would seek to understand the needs and wants of the students, the tasks they need to get done, and the barriers they face. The teachers would then need to implement its design, measure the degree of success and must regularly learn from the implementation, and revise/improve the cloud design/experience for the students (Islam, Agarwal and Ikeda, 2015).

From the left side, students sphere consists of the course materials need or wants of the students, past experience or knowledge and his (or her) loyalty to class or courses, potential to be engaged and so on. As a part of this process, students would contribute to this process through submitting all his academic records in the using GoogleApps that he/she activated. Students also learn from the experience and decides on the degree of his/her future engagement based on his/her learning and reflection on the experience. The more the student feels wanted and valued, and the better student needs are met, the more he or she would want to remain engaged by using clouds for class activities.

The focus of the framework is on the top sphere where teachers and students create, store, preserve and share their academic records. Engagement and sharing all the learning resources for particular course/thesis project are the basis of the framework for records in the cloud. Here in this framework, clouds are in a powerful position to influence the teachers and students to use this platform. Abrams (2012) discussed how chemistry lab students shared data using Dropbox. Through this tool, students could create access, analyze and store data for a particular project. It is in line with the previous study where it is identified that technology boosts the student engagement activities in their academic and research life (Hastings, 2014; Islam, 2010 & Hicks, 2009). Thus, we believe that having this opportunity of sharing teaching and learning records in cloud, both teachers and students will be benefitted; classroom activities will be more interactive and boosting collaborations and engagement. The framework highlights the primary role of the teachers and students and how their records are stored in the cloud.

In this framework, Iaas & PaaS cloud services are not a part of interest for this present paper as well as we did not highlights other technical issues. E-learning, web-based education and others many areas may come under the cloud platform. We simplify this framework where only the major building blocks are included and partly which are free of costs.

Steps to Managing Teaching and Learning Records in the Cloud: Dhaka University

For introducing cloud computing in a university, it always seeks a well-defined policy which may facilitate to start the process. Initially, we identified the following ways of going with this path.

- Primarily arranging seminars, workshops and discussion sessions with the students, researchers and faculty can be a starting point for this new journey. Make them understand how teaching and learning records in the cloud can be convenient for their academic activities. The success of the phase depends on the successful story of different universities and the best usage practices of GoogleApps. Faculty people can look into the existing cases of GoogleApps using in different universities by Barlow & Lane (2007); Miseviciene, Budnikas & Ambraziene (2011); Wang & Jin (2010); Zhou, Simpson, & Domizi (2012)'s studies where they utilized GoogleApps in educational settings. Author suggests 'Google for the University of Minnesota Duluth' case study for deep understating of using GoogleApps for the Dhaka University (University of Minnesota, 2016). Dhaka University could start a partnership with Google where the faculty members, students, researchers and staff could use Google Suite for the academic, research and administrative purposes. Under this suite, users could enjoy the different features of Google.
- Like the other universities, ICT status of Dhaka University is not commendable. Computer facilities to students, availability of access to Internet and campus wide Wi-Fi facilities and other online facilities are extremely inadequate. Comparing number of Departments and Institutes, very few have dedicated ICT/computer facilities where students and faculty members could use for their teaching and learning purposes. Moreover, students, university officials and staffs are not well oriented with the use of

ICT in academic purposes. They have lack of ICT literacy, computer skills, web-based searing skills and few of them have formal education and training on ICT. Present author of this paper conducted a study of cloud perceptions among the faculty members, and found that faculty members are generally aware of cloud services and use some cloud applications in their teaching & learning purposes (Islam, 2019). However, a short survey of using cloud among the Department and Institutes could bring the actual status of using cloud in Dhaka University. After considering the status of using cloud applications, a pilot project can be taken with those Departments and Institutes which have moderate ICT infrastructure and other facilities. Then, in Phase one, a training program and workshop can be arranged for the selected Departments and Institutes to run cloud-based applications in teaching, learning and other administrative purposes. Later, other Departments and Institutes could come under this training and workshop.

- University Grants Commission of Bangladesh (UGC), a statutory apex body of higher education in Bangladesh should come forward to support for designing and developing cloud services in Dhaka University. Under Higher Education Quality Enhancement Project (HEQEP) project, a program of UGC, many Departments and Institutes in Dhaka universities are renovating their class room with modern ICT facilities, and it will be a great opportunity to accommodate cloud services in this renovating program (HEQP, 2016). Similarly, Bangladesh Research and Education Network (BdREN) project of UGC could support ICT facilities for teaching and learning in Dhaka University. BdREN could provide online platform for academic purposes and provide high-speed internet connectivity.
- Teaching & learning records in the cloud refer that academic activities entering into new and meaningful relationships with teachers and students. However, faculty members, students, Departments and Institutes will not have the same approach to adopt cloud application. There would be variations of adopting this technology. Thus, first, a champion for records in the cloud must be found within the university. Second, goal of teaching &

learning records in the cloud and priorities must be identified and ways of working with the students agreed – our examples provide ideas, for example, using GoogleDocs or Drive for creating/storing /disseminating records based on need/opportunity of the students. Third, the university needs to examine the current state (attitudes, culture, constraints) of cloud applications. Information culture seems to be a first and necessary steps to start offering cloud based services (Foscarini, 2010). Based on these, the university needs to decide GoogleApps. Fifth, the university needs to come up with measures to determine the success of teaching and learning records in the cloud. The university can then develops an action plan, launch a pilot project and share success stories.

Challenges and Future Work

- Like other developing countries, Bangladesh has lack of connectivity, inadequate bandwidth, and instable power supplies which are hindering to adopt technology in many sectors. Ahmed (2014) found access to computers, Internet and other ICT services of the university students in Bangladesh are inadequate. ICT status of Dhaka University is not worth mentioning as well (Islam, 2010). Not all the Departments have the ability to take full advantages of cloud opportunities. Apart from university readiness (Is DU ready to adopt cloud technology), the cloud does have certain drawbacks. Dhaka University might not have to buy licences for software when using GoogleApps but has the university IT expertise and technical requirements for implementing this on a large scale for students and staff? Securities, conflict of interests, trustworthiness, protecting teachers and students right to privacy as well as policy issue are need to be considered (Barlow & Lane, 2017). Even the records are stored can be moved at any time without knowing, hacking, unauthorized access or records might be gone (Duranti, 2014). The possible tensions between enabling access and collaboration to teaching and learning records and their management to satisfy legal and organizational management requirements are not discussed in the present paper. It widely did not discuss or take into account the concerns about the management of records such as information security, integrity and also preservation and access

issues in this environment. The paper mentions security and management concerns around storing records in the cloud but does not apply professional concepts such as the characteristics of records (authenticity, integrity and accessibility) or preservation to analyze and explain how records could or should be managed in the cloud to keep them authentic and accessible.

- Once the university decides to use cloud application, the authority should frame security and trust policies. These policies should be formulated through open dialogue between the students, teachers and information and communication technology units. Organizations like Microsoft, Google and Amazon are providing grants and free access for Universities, Colleges, Researcher and students, and Dhaka University can use the services with less effort. It is obvious that cloud service will not come unless there is a proper understanding of the processes of cloud and a positive mindset towards cloud culture. The present paper did not focus in details what are the barriers may arise if the Dhaka University start to use cloud for preserving teaching and learning records. It is not measured how the faculty members and students in Dhaka University feel and what are their perceptions of using clouds in their teaching and learning activities. Considering those, we have noted few limitations that can be addressed in future study.
- First, most of the studies cited from commercial context, and very few of papers are clouds in education perspective. Second, the model is based on conceptualization. Students might also have questions about the extent of their involvement as well as teachers also might have reservation to store confidential records (exam questions, grading paper and others report). The model needs to be tested against actual adoption and use by faculties and students. Third, we did not focus on the technical aspects of cloud services (e.g., models public, private, hybrid; platform and its structures; and guidelines). The steps and the framework will need to be applied in actual university settings to see if they actually work out as intended.
- The present paper did not focus on publications from institutions in the records management field such as National Archives and Records Administration (NARA), Association of Records Managers and Administrators (ARMA) and National Archives of

Australia (NAA) that are directly concerned with the management of records in the cloud which could have informed a deeper discussion of records management issues in the paper. It would also have been worth discussing standards in the field such as ISO15489:2016 or the ISO30300 series in this context. Future work will involve designing interviews and surveys to gather the perceptions of students and teachers in adopting the framework. A web-based study on the perceptions of the faculty members and students at various Departments and Institutes in Dhaka University would help to identify whether they are interested with this cloud platform. Finally, the findings of this paper could be supplemented with a case study or in depth interviews of university patrons to get a more in-depth picture.

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