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INTRODUCTION OF SAAS-BASED COLLABORATION APPLICATIONS FOR EDUCATION

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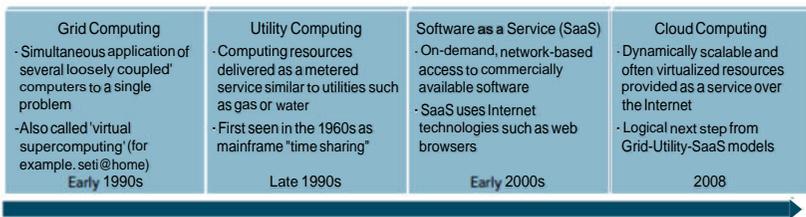
18.1 INTRODUCTION

With the advancement in information technologies (IT), organizations across the world have been continuously developing and deploying IT-based solutions to provide various stakeholders with better communication and decision support [1]. Recently, the information technology sector has witnessed technological turmoil in the form of cloud computing. Further, scholars have argued that most services will be available in the cloud by 2020, which shows that the preliminary work for shifting to cloud is in progress [2]. Cloud computing is an increasing requirement for business organizations and educational institutions [3]. It provides different computing resources on-demand for students and lecturers based on their learning needs [4]. According to a report published by Cisco, cloud computing and its abilities should be considered as an enabler for academic organizations in response to calls for transformation with efficiency and confidence [1][5]. SaaS is a type of cloud computing product that hosts software and data on the internet-connected servers [1]. Existing literature has documented potential benefits of SaaS for communication and

collaboration [1, 6] especially in educational environments [4, 7, 8]. Meanwhile, collaboration tools are found to be central to business value of SaaS in a latest survey of SaaS [9]. Therefore, due to the growing importance of this service as collaboration tool, this chapter has mainly focused on SaaS-based collaboration applications in educational environments.

18.2   CLOUD COMPUTING

Grid computing, utility computing and virtualization technologies can be considered as precursors to cloud computing. Grid computing is the use of distributed parallel computing devices which are connected to each other and worked on a single problem [10]. Grid computing led to utility computing which is a model of renting computer capacity such as storage, hardware, CPU, network bandwidth, pay based on demand and consumption. SaaS provides users commercially available software through the internet, charging for used services instead of offering licensed applications [10]. Cloud computing is considered as a broader form of utility computing and grid computing. While it is very difficult to describe cloud computing in a form of one definition, the basic characteristics of this technology are that applications run somewhere on the "cloud", scalability, performance and reliability, all without any concern as to where the applications actually run. Cloud computing helps organizations by offering high degree of return on investments. Figure 18.1 demonstrates the evolutionary steps of cloud computing from 1990 to 2008.

Grid Computing	Utility Computing	Software as a Service (SaaS)	Cloud Computing
· Simultaneous application of several loosely coupled' computers to a single problem · Also called 'virtual supercomputing' (for example. seti@home) Early 1990s	· Computing resources delivered as a metered service similar to utilities such as gas or water · First seen in the 1960s as mainframe "time sharing" Late 1990s	· On-demand, network-based access to commercially available software · SaaS uses Internet technologies such as web browsers Early 2000s	· Dynamically scalable and often virtualized resources provided as a service over the Internet · Logical next step from Grid-Utility-SaaS models 2008

Source: [10]

Figure 18.1 Evolution of cloud computing

There are many definitions for cloud computing and different researchers emphasize different aspects of this technology and define it from different viewpoints. Most of the definitions discuss delivering computing services through the Internet. However, explanations should take into account both "cloud services" (such as products, services, and solutions) and "cloud computing" (such as emerging IT development, deployment, and delivery model) [11].

Gartner defined cloud computing as: "A style of computing where scalable and elastic IT-related capabilities are provided as-a-service using Internet technologies to multiple external customers." [12]. Miseviciene, Budnikas [7] described cloud computing as a technique to provide computer applications for users without the need to buy or install related software on their nearby computers and/or servers.

Cisco defined cloud computing as: "a broad term that deliver infrastructure, services, and software via the network on demand, and at scale. Cloud is based on a foundation of virtualization, in which pools of (virtualized) resources are dynamically organized for the benefit of software applications and services. This will change the way that applications are written and delivered" [10].

The National Institute of Standards and Technology (NIST) defined cloud computing as:" a model for enabling ubiquitous, convenient, on-demand network access to a shared computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models" [13].

18.3 1CLOUD COMPUTING CATEGORIES

Cloud computing is increasingly supported by new acronyms and definitions to explain different aspects of the features. The NIST listed deployment models of cloud computing as:

1. Private cloud: the cloud infrastructure is only used for a business or organization. This is an on-premise or off-premise cloud that is managed by a third party or organization.
2. Public cloud: or external cloud if referring to delivering service, infrastructure, and software in general or to an industry group. It is also described as a self-service of the internet provided by an off-site third party.
3. Community cloud: The on-premise or off-premise cloud infrastructure is jointly used by several organizations and supports a specific community that has shared concerns.
4. Hybrid cloud: a type of cloud that consist of two more internal or/and internal clouds (private, community, public). It will be a unique technology with some standards and specific features that enable data and application portability [13].

Infrastructure As a Service (IaaS), Platform As a Service (PaaS), Software As a Service (SaaS) are considered as main service models of cloud computing [14, 15]. Infrastructure as a Service (IaaS) is the lowest level in which customers can rent basic computing resources such as processors and storage, and use them to run their own operating systems and applications. Amazon's Elastic Compute Cloud is one example; organizations can use this infrastructure to run Linux servers on virtual machines and scale up usage as required. Platform as a Service (PaaS) is the next level up which enables customers to install their own applications using a platform specified by the service provider. Google Apps Engine is one example; where developers can write and install applications using the Python language. The highest level of cloud computing service which is primarily used by individual end-users is known as SaaS [1]. SaaS has the potential to provide substantial opportunities for organizations to improve their information technology without cost and management concerns [6]. Since the focus of this chapter is on SaaS-based collaboration applications in educational environments, explanations, examples, and successful

case studies of these applications in different universities will be discussed further in next sections.

18.4 SAAS-BASED COLLABORATION APPLICATIONS

SaaS is the well-known cloud computing model which is described as offering applications by service provider over the internet instead of installing or running on the individuals' computer. This service is accessible from different client devices. Customers do not control or deal with the basic cloud infrastructure such as network, servers, storage, and operating systems [3]. Organizations adopting SaaS can save time and cost of installing and maintaining software, security problems and a variety of other administrative tasks for on-premise software solutions [16].

Currently, SaaS is of most interest in education. According to a survey conducted by Gartner in 2012 among education institution CIOs, it is reported that "Many institutions cannot seem to wait to get rid of their back-end IT operations. In fact, in last year's CIO agenda (2011), 64% of higher education CIOs (128 respondents) expected to move more than 50% of their infrastructures into the cloud before year-end 2015. The corresponding number for SaaS was 49%. In this year's higher education sourcing survey (92 respondents), we find that 49% of institutions are already involved in some type of cloud sourcing, and 67% expect to be by year-end 2012". Figure 18.2 shows use of and plans for using cloud SaaS such as Google Apps, Microsoft live@edu, and Office 365 in this survey [17]. Google Apps and Office 365 are two well-known examples of SaaS-based applications which are mainly used for email and collaboration purposes. These cloud-based collaborative learning applications offer online productivity applications like word processing, spreadsheets, and presentations that can be used for teaching and learning purposes [4]. Furthermore, they provide email, calendar, instant messaging, video conferencing, teamwork planning, task management, news feed, office web apps, file storage and sharing features into one unified whole package. Redbooth and Huddle are two other examples of SaaS-based

collaboration applications which can be used in education. They offer the same collaboration opportunities to educational institutions as Google Apps or Office 365 except emailing.
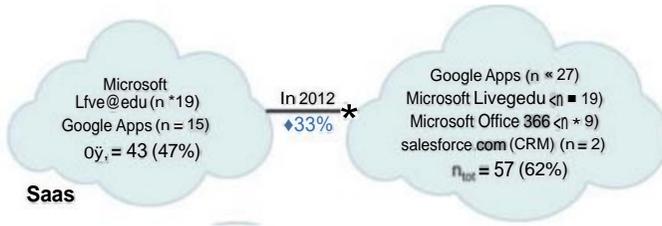

Figure 18. 2 Use of and plans for using SaaS cloud [17]

18.4.1   Google Apps

Google Docs is a popular suite of applications which enables college faculty to provide their students with productivity and collaboration opportunities. This application is essential for higher education environments to prepare students for workforce by teaching them how to use cloud computing solutions [18]. Google Apps for education was launched in 2006 and its first deployment was at Arizona State University. Google Apps for Education is a free seamless platform designed for performing active communication and collaboration in schools and universities. Google Apps includes Gmail (webmail services), Google Docs (online document, spreadsheet, presentation, and form creation and sharing), Google Calendar, Google Video, and Google Sites, as well as administrative tools, customer support, and access to APIs to integrate Google Apps with existing IT systems. Taylor and Hunsinger [19] believe that Google Docs is a widely used example of cloud computing. Google Apps lists free unlimited storage, seamless collaboration, world-class data security, and affordable, sustainable infrastructure as some benefits of this application for education.

Since Google Docs does not need to be installed on physical devices it is an example of SaaS. Google in its official website describes that sharing information is becoming easy with Google

Docs. Each student can have access to the latest version of created documents with just a couple of clicks. Everyone reviews and edits at the same time in the shared documents. No more back-and-forth email attachments and versions that you can't keep track of. There are many successful stories of universities migrating to Google email and collaboration. Boise State University started to evaluate new email services as they faced technical obstacles with their email service. Furthermore, they wished to provide a fully functional and reliable mail system as well as introduce new tools to enhance collaboration capabilities of users. In May 2008 they successfully deployed Google Apps for Education as the students' email system in the university. Team leaders in Boise State's Office for Information and Technology report a range of advantages resulting from the migration to Google Apps for students and faculty:

1. Ability to re-allocate IT Staff to work on other value added projects
2. Saving costs of infrastructure, support, and maintenance costs
3. Increase in faculty access to functionally superior tool sets
4. Provide a system that fosters collaboration among faculty and students
5. Reliance upon market driven product improvement and innovation
6. Minimized downtime and maximized access to messaging
7. Ability to support disparate computing and hand-held platforms
8. Significant reduction in calls to the help center

After evaluating the possible vendor solutions, the University of Texas in Austin successfully adopted Google Apps for email system. This university upgraded their email systems and became a member of Google Apps for Education family, to achieve better communication and collaboration capabilities. Utah State University tried to replace some systems such as email because these systems were outdated, time-consuming and expensive to

support. They emphasized that careful consideration should be taken into account on strategic enterprise solutions to help reach educational goals, not simply managing services like email. Therefore, they looked at a number of open-source alternatives and adopted Google Apps Education Edition. They explained that Utah State students are currently creating, editing, and revising documents collaboratively, without need to email attachments back and forth, or worrying about accessing their documents from computers all over campus. Moreover, they understand that the latest version of each document exists securely online. With Google Apps Education Edition, Utah State save infrastructure, support, and maintenance costs, plus they fully enjoy the collaboration capabilities of Google Docs[20].

18.4.2   Office 365

Office 365 was officially launched on June 28, 2011. Around this time, Microsoft also introduced an app store to accompany Office 365. The initial offering had 100 apps and 400 professional services from more than 16,000 Microsoft cloud partners. Recently, they have announced that Office 365 combined most trusted communication and collaboration services such as Microsoft SharePoint Online, Exchange Online, and Lync Online) with the most recent version of their office desktop suite and friendly web applications for organizations of all sizes.

Office 365 has been designed with the belief that most customers would prefer to choose Office 365 over competitors because of its worthwhile security, privacy, compliance and accessibility advantages. Microsoft has a long track record of investment in the provision of enabling technologies across its product set. Moreover, it is the only vendor that offers a business associate agreement as part of the service terms. Office 365 lists gaining access virtually anywhere, reduced cost and increased flexibility, enterprise security, minimized learning curve, exceptional email, collaboration, online meeting solutions, and providing 24/7 support

as key areas where customers find major benefits when they choose Office 365.

Office 365 provides staff, faculty, and students with email and calendaring, instant messaging, web conferencing, file storage and sharing, office online, team sites, reliability, mobility, security, and privacy (Office 365 education, accessed 24th Feb 2014). Findings of a case study conducted on MS live@Edu in Kaunas University of Technology show the usefulness of the adoption of MS Live@Edu environment it during e-learning and blended learning. Furthermore, document storage, collaborative use of the same document, social communication, discussion, email, and documenting using web office apps are main important features of MS live@Edu for lecturers and students during the course [7]. There are many successful stories of universities migrating to Office 365 E-mail and collaboration.

In 2010, Georgia State University decided to move to modern technology that would better support anywhere access and scale to support new communication services. Therefore, they switched to Office 365 because of its significant features. They believed that "by deploying Office 365, Georgia State University gains an easy-to-manage cloud-based communication and collaboration solution that meets the university's IT storage, reliability, and interoperability needs, all while minimizing IT costs and improving employee productivity". Before 2012, Queen's University in Kingston Ontario Canada had used an outdated version of the email system for faculty, staff, and students and they faced difficulties with calendaring service, allocated inboxes, and storage. Therefore, they decided to replace its email solution with Office 365 to provide cloud-based communication and collaboration applications for students. They believed that "Office 365 is more than email; it's a whole collaboration suite with Microsoft SharePoint Online and Lync Online". By adopting Office 365, Queen's University improved student productivity, enhanced campus life, and reduced IT Costs. They took a staged approach toward cloud-based applications that fits with its IT@Queen's strategic plan.

18.4.3   Redbooth

Teambox is a communication and collaboration platform founded in Barcelona in 2008. In January 21, 2014 Teambox announced it has rebranded as Redbooth and launched the broadest collaboration platform in the market. Redbooth provides a single place for creating and managing tasks, task reporting, file and content management, discussions, file sharing. New features are added to Redbooth as:

1. Increasing usability and performance of organizations' customers
2. Overseeing complex projects by adding subtasks and detailed description capabilities
3. Fully-integrated chat environment with presence awareness
4. Increased capacity for 100 HD video conference participants
5. Executive dashboard and reporting capabilities as well as enhanced search tools
6. Providing additional external storage and workflow tools
7. Supporting more languages to answer the demands of a growing number of users in Asia Pacific region.

Redbooth changes the way organizations and groups cooperate and foster accomplishment of tasks. Companies like Kelly Service and Griffin Technology evaluated some business collaboration tools including SharePoint, Huddle, Asana and Basecamp, and found that Redbooth provides a much broader set of features and can respond to various business needs better and smarter. In February 2013, Redbooth announced that "Over 60 prestigious Universities across the United States have implemented it to communicate, collaborate and streamline work processes". Educators are looking for simple and effective collaboration solutions with less IT cost. This is why the usage of Teambox is growing in the education sector. Meanwhile, features like helping a wide range of users,

ease of set up, ease of use, and help on the go make it appealing for universities.

Some of the world class higher education institutions, including Stanford University, Colgate University, Cornell University, Harvard University, Auburn University, Rice University, University of California Irvine and University of Michigan have selected Teambox as a collaboration solution. Redbooth has offered a single cloud-based platform for educational institutions to communicate and collaborate in an effective and efficient manner. Western Wyoming Community College needs to deliver Problem-Based learning which is a highly interactive nursing program in an online environment. So, after evaluating many groupware solutions they chose Redbooth to best match with their collaboration demands of students. Savannah College of Art and Design selected Redbooth as a key application for communication and collaboration for students and to support the production of video lectures. They believe that Redbooth supports functions like @mention other users which helps to bring students into a discussion. They believe that Teambox helps them to work and collaborate in a quicker way.

18.4.4   Huddle

Huddle is another cloud-based collaboration application which was established in 2006. Huddle can be used as a seamless collaboration platform which securely manages projects, shares files and collaborates with people. It currently covers 15 languages, including English, German, French, Italian, Portuguese, Spanish, Russian and Japanese. Huddle is a powerful provider of cloud-based collaboration and content management solutions for government and organizations. However, there are a small number of cases using Huddle in educational settings. Reviewing these cases shows that their focus is mainly on intra-organizational collaboration in the education industry. In Auburn University's Raymond J. Harbert College of Business Huddle is selected as a collaboration solution to help teams to access, edit, share, and

collaborate together on information and content. Association of Commonwealth Universities adopted Huddle to find a platform to share and manage 20,000 scholarship applications with a number of external organizations. Pixl selected Huddle to find an online platform to share and collaborate on large files with a number of users across the UK.

Consequently, universities are trying to switch from their old email systems to cloud-based collaborative learning applications which can provide economical, full functional and reliable email system as well as collaboration solutions for them. Although some universities have successfully adopted Redbooth or Huddle, the trend is mostly toward adoption of Google Apps or Office 365 as cloud-based applications for email and collaborative learning. It means universities prefer to adopt a seamless platform for emailing, collaboration, file management and sharing, instant messaging, video conferencing, project management, and task management and facilitate collaborative activities in one centralized location. Therefore, Google Apps and/or Office 365 can also be considered as potential cloud-based collaborative learning applications for Malaysian universities.

18.5 CONCLUSIONS

SaaS is a software delivery method that offers applications by service provider over the internet instead of installing or running on the individuals' computer. Due to the growing importance of this service in educational environments as collaboration tool, this chapter has mainly focused on SaaS-based collaboration applications. For that reason, Google Apps, Office 365, Redbooth, and Huddle were introduced as examples of SaaS-based collaboration applications and successful case studies of them in different universities around the world was discussed in this chapter.

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