Chapter 1
Overview of Cloud Computing and its Application in E-Learning

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ABSTRACT
As an introduction, the goal of this chapter is to provide an overview of this book. This book is designed to provide a comprehensive coverage of cloud computing and its application in e-learning. This chapter first provides some technical background about e-learning. It reviews the progress of e-learning along with the improvement of information technology before introducing the history and recent developments in cloud computing. Following the introduction of cloud computing, this chapter describes how e-learning can benefit from cloud computing. Next, the chapter reviews open source products in cloud computing, research areas in cloud computing as well as the recent development in cloud based e-learning. Finally, there is a discussion about the future trend in the cloud computing, followed by conclusions.

INTRODUCTION
Along with the rapid development of information technology, e-learning has been significantly improved in many ways. The Internet and mobile network have facilitated the creation of a true anywhere-and-anytime learning environment. Teaching and learning are no longer limited to the classroom in a certain time period. The Internet and mobile technology have also raised the level of collaboration. Students can study as a group through audio and video conferences even when they are on the move. On the other hand, as more and more technologies are involved in teaching and learning, educational institutions have to take the responsibility for developing and managing the IT infrastructure to support e-learning. It is challenging to accomplish all these tasks by an individual educational institution, especially for those small universities and schools that have much less computing resources. The newly developed cloud computing shows great potential for relieving some of the burden on supporting e-learning.
Overview of Cloud Computing and its Application

When properly implemented, cloud computing can improve the quality of online teaching and learning, and significantly reduce the cost of IT infrastructure development and maintenance.

INTRODUCTION TO TECHNICAL FOUNDATIONS OF E-LEARNING

E-learning is a teaching and learning platform that is supported electronically by various forms of technology. One of the early forms of e-learning is computer-based training (CBT) which used computers in teaching and learning. As early as 1960s, Hall (1970) reported that computers were used in teaching and learning. In those days, CBT did not deliver training through the Internet. The use of computers to assist instruction started long before the creation of the Internet.

After the Internet became available, the Internet technology was adopted by educators for teaching and learning. Internet-based applications such as e-mail and TELNET were used to enhance computer-based training (CBT) (Searfoss & Doyle, 1976). Through the Internet, students were able to access course materials and share information. Collaborations among students and instructors could also be carried out electronically through the Internet. Kozma (1994) found that the combination of electronic media and teaching methods did have some impact on learning. He analyzed how understanding could be influenced through students’ interactions with the electronic course materials.

The next milestone in information technology was the invention of the World Wide Web. In the early 1990’s, the World Wide Web was used to carry out computer-based training (Szabo & Montgomery, 1992). The GUI based Web browser and various features in handling multimedia content made the World Wide Web an ideal environment to carry out e-learning. Web-based training (WBT) was invented to deliver computer-based training by using the World Wide Web (WWW or the Web). Through the Web, educational institutions have offered a variety of online courses. Since then, various Web-based learning tools have been developed to enhance Web-based learning. Learning Management System (LMS) software has been used by educational institutions to manage online courses. Video conferencing, computer graphics, and Voice over Internet Protocol (VoIP) are also widely used to support online collaboration. Social network software, such as Facebook and Twitter, has been used as learning tools by educators for e-learning. Various educational games have also been developed for Web-based teaching and learning.

Research on the use of these Web-based learning tools has been active. Researchers are eager to learn how these Web-based learning tools influence students’ learning behavior and how these learning tools can help students to better understand the course content. Nott, Riddle, and Pearce (1995) studied the impact of WWW technology on learning. There were controversial reactions to the student centered learning. They also discussed different opinions on the role of WWW technology in teaching and learning. In 1999, Chu (1999) analyzed the positive and negative sides of Web-based remote interactive teaching systems and also addressed the issues related to assessment, cost, students’ feedback, and collaboration in the Web environment.

In the early 2000’s, several books were published to comprehensively cover WBT. By summarizing the experience in designing, developing, and implementing WBT, Horton’s (2000) book presents a wide-ranging coverage of WBT. It provides information about the courseware products available at that time and offers strategies on teaching and learning through the WBT approach.

To help technically-oriented readers to better understand WBT from the pedagogical point of view, the book by Driscoll (2002) covers the pedagogical aspect of WBT design. For readers