Chapter 72
Harnessing Cloud Computing Services for E-Learning Systems in Higher Education:
Impact and Effects

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ABSTRACT

The use of e-learning suggests the use of ICT to enhance the quality of learning and teaching. However, many higher education institutions, does not have e-learning platforms, resources and infrastructure necessary to implement this type of training. This is due to the need for high cost of basic infrastructure and applications challenges related projects it has to face. This article puts forward an overview on what is the current state of the use of cloud computing in e-learning in higher education context, where the use of computers is increasingly intensive. The article analyzes e-learning systems challenges and trends, the convenience of cloud computing for e-learning and the key benefits of e-learning on the cloud. The article exposes also some application solutions using cloud computing in e-learning for higher education, by presenting the most common architecture that has been adopted. Finally, this article discusses issues related to the implementation of cloud-based e-learning systems and presents some potential ways to overcome them.

INTRODUCTION

Nowadays, e-learning technology offers a wide range of new opportunities for the development of higher education practices. Due to the rapid growth of internet technology, universities are investing heavily in e-learning systems to improve their students' learning experience and performance (Kattoua & Alrowwad,

2016). Recently, with the evolution of Web 2.0 technologies, providing rich and simple collaboration tools (wiki, blog, forum, social networks, etc.), one of the most important benefits of e-learning is that it enables collaboration and interaction between various actors involved.

Nevertheless, with these new orientations of e-learning practices, featured by social interaction and collaboration and with the daily rising trend on requirement's dynamic changes in service, e-learning systems deployed in universities are facing many challenges of optimizing large-scale resources management and provisioning, according to the huge growth of the number of users, services, courses and resources (Paul & Santhi, 2014). Indeed, the evolution of e-learning systems has affected different dimensions (courses, users, hardware and software resources, etc.). Firstly, the infrastructure provisions those are necessary to provide a competitor service for a large amount of users clearly exceed the capabilities of a simple web server. On the other hand, the demands of software and hardware resources usually vary in a dynamic and very quick way, and presents high peaks of activity for e-learning systems. To attend flexible and dynamic requests of resources, it will be necessary to prepare a quite superior infrastructure than that required for the regular working of higher education institutions (Fernández et al. 2012).

To confront these issues, an alternative solution for higher education institutions would be to offer those services depending on the demand and only paying for the resources that are actually used. With these characteristics, cloud computing arises as an accurate alternative to traditional e-learning systems. Much research work has been done on analyzing how cloud computing influence learning experience and effectiveness in e-learning systems (El Mhouti et al., 2016; Li et al., 2011; Huang & Liu, 2014).

This work is a contribution to the research efforts in cloud computing used in e-learning systems deployed in universities, where the use of computers is increasingly intensive (online labs, computing centers, data centers, etc.). The objective of this paper is to bring forward an overview of the current status of the forms of cloud computing technology and e-learning deployment solutions in higher educational context. Thus, the paper consists to explore and discuss the potential of cloud computing services to design open and dynamic e-learning systems for higher education purposes. The paper gives details of the architectures that have been developed for cloud-based e-learning systems and provides some examples of cloud-based e-learning systems that can be found in the specialized literature. The paper discusses also issues related to the implementation of cloud-based e-learning systems for higher education and presents some potential ways to overcome them. By leading this review study, it is concluded that cloud-based e-learning systems are emerging as an attractive method for providing flexible and scalable e-learning services that can be accessed anytime, anywhere and from any device.

The remainder of this paper is arranged as follows: e-learning concept and e-learning systems trends and challenges will be discussed in the next section (section 2). Therefore, section 3 gives a review of cloud computing model within its characteristics, services and deployment modes. Section 4 introduces the reasons for the move towards e-learning based on cloud computing and presents the benefits of e-learning on the cloud. This section discusses also the applications' solutions of cloud computing in e-learning and describes the basic cloud-based e-learning architecture. Issues facing the implementation of cloud-based e-learning systems and recommendations to overcome them are discussed in section 5. Conclusions and perspectives can be found in the last section of this paper.

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