Chapter 10
Harnessing the Potential of Cloud Computing to Transform Higher Education

P. Y. Thomas
University of Botswana, Botswana

ABSTRACT
While the adoption of new technology is being increasingly recognised as a catalyst for transformation in higher education, the high cost of technology infrastructure and other related resources is a financial burden, and hence, a barrier to many higher education institutions, especially in the context of the recent economic recession. Indications are that the adoption of the low-cost and even free (in some cases) cloud computing solutions could bring about large scale adoption of new technology by higher education institutions. This chapter provides an overview of cloud computing, explores the challenges around cloud computing, details the significant benefits that it can bring to higher education, and discusses how organizations could harness cloud services to significantly reduce capital and maintenance costs on educational technology and to enhance its scalability, accessibility, and flexibility. The chapter further recommends the use of hybrid cloud deployment to achieve a balance between risks and benefits of this new computing paradigm.

INTRODUCTION
The use of new and emerging technology is being increasingly recognized as a catalyst to bring significant transformation in higher education. The proliferation of online education has grown tremendously over the past decade (Li & Irby, 2008). Access to quality education by more people, increased student engagement in authentic problem solving environments anytime anywhere and better opportunity for collaborative social learning are notable benefits of technology adoption. Further, it helps teachers to track students, document student progress, and put specific practices in place to ensure student success.
The benefits that technology brings to education are not only for teaching and learning but also for management and administration. However, the huge initial cost of educational technology infrastructure and the maintenance expenditure to keep up with the constant need to replace or upgrade software, servers and other computing devices are financial burdens to many organizations around the world especially at this time of crippling economic downturn. Being mindful of reducing expenses without compromising quality and efficiency, the core focus for many organizations today revolves around adopting infrastructures such as open source systems (OSS) and cloud services. Cloud computing is believed to transform the way technology is used in the education environment as it is now a growing revolution within IT. Many OSS have provided the foundation for many cloud computing implementations (“Cloud computing”, n.d.).

The excitement about cloud computing is growing fast in the world of education as it has opened new dimensions for organisations to harness the potential of technology to enhance their learning environment, and help to lower costs in ways that have not been previously possible. Indications are that the cloud model will ultimately serve to overcome one of the major barriers – high cost – to technology adoption and help transform higher education in an unprecedented way. However, there are both risks and benefits to cloud adoption. Therefore, it is important for organizations to understand ways to maximize the potential benefits and minimize risks of adopting the cloud.

Cloud computing is still relatively new and immature in the education landscape. As with every new emerging technology in their initial stage, there are numerous conceptual and implementation issues around cloud computing and as a result, some educators are still skeptical about its promises in education. This chapter provides an overview of cloud computing, explores the challenges around cloud computing, details the significant benefits that its adoption can bring to higher education and discusses how organizations could harness cloud services to significantly reduce capital and maintenance costs on educational technology and to enhance its scalability, accessibility, and flexibility. The chapter further makes recommendations to enable higher education institutions to capitalize on this new computing paradigm.

BACKGROUND

What is Cloud Computing?

Although the underlying concept of “cloud computing” as a public utility service dates back to the 1960s, it is still in its infancy in its true sense as it is used today. The term “cloud” is used as a metaphor for the Internet (Bestpitch, 2010). The first scholarly use of the term “cloud computing” was done by Rammath Chellappa (1997) in a lecture. According to him, it would be a new “computing paradigm where the boundaries of computing will be determined by economic rationale rather than technical limits alone.”

In general, the term “cloud computing” refers to a new computing delivery model for on-demand, cost-effective, shared IT services and computing resources (e.g., networks, servers, storage, applications, and services) accessible to clients over the Internet often from a remote data centre or host. The “on demand” feature means resources will be dynamically allocated using cloud’s ability to scale up or down depending upon demand. Clients can tap into the cloud when they need it and pay for only what they use.

Cloud computing is evolving as a key computing platform for sharing resources. Its underlying infrastructure that includes hardware, software, data and other computing resources resides on the host’s servers and is what is generally called the ‘Cloud’. Machines in large data centres can be dynamically provisioned, configured, and reconfigured to deliver services in a scalable manner,
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