# Chapter 23
# Cloud Services in UK Higher Education:
## A Feasibility Study for Providing IaaS in the Computing and Library Services of a UK University

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## ABSTRACT

*The current chapter reports an investigation of Information Technology (I.T.) enablement for a Higher Education Institution (HEI), with focus on the feasibility of Infrastructure as a Service (IaaS) using Cloud Computing technology. A pragmatist - mixed-methods research approach was followed to establish the Feasibility Study, which included the potential IaaS risks and benefits for a HEI such as the Computing & Library Services of a UK university. An analysis of the advantages and disadvantages, as well as a legal, social, operational and Service Level Agreement (SLA) discussion are provided. Furthermore, the authors outline the potential impact on the institution's employment. Finally, based on the Feasibility Study, the authors recommend a list of selection criteria and evaluation methods that could be regarded as the basis for a future IaaS Cloud decision model for HEIs. The findings of the current investigation contribute to the body of knowledge for both academics and I.T. managers.*

## INTRODUCTION

In 2006, M. V. Charles, president emeritus of MIT, asserted: "We are seeing the early emergence of a meta-university—a transcendent, accessible, empowering, dynamic, communally constructed framework of open materials and platforms on which much of higher education worldwide can be constructed or enhanced" (Charles, 2006). Cloud Computing technology is being taken un-

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der consideration by many higher education I.T. leaders, but, in general, there is some hesitation in applying it due to variations in decision-making and implementation (Grajek, 2013). Each Higher Education Institution (HEI) has its own needs and requirements. Despite that, the current state of Cloud Computing in higher education is characterized as evolving. According to a 2014 Educause publication, higher education is in the midst of an exciting transformation (Educause, 2014). The agility, resiliency, flexibility, and economies of scale provided by Cloud Computing are rendering the construction and maintenance of on-premises data-centers obsolete (Furht & Escalante, 2010). It is believed that over the next decade, the availability and advantage of new technology models will result in a substantial decrease in the use of on-premises data-centers. Higher education I.T. moves from a traditional data-centered model to a one-centered on the public Cloud and Cloud services (Educause, 2014).

At the same time, there is great focus on how to make learning and teaching more efficient and more effective for both academic staff and students (Gutiérrez De Ravé, 2011; Zhou, 2012). The constant need for enhanced learning and improved teaching has led Higher Education Institutions (HEIs) to an increased use of technology (Fernandez, 2012). Consequently, this affects the educational experience, and providing up-to-date information systems, as well as maintaining them, can be very challenging for HEIs (Universities UK, 2011). Cloud Computing is a technology that offers attractive advantages to higher education through its network-based infrastructure, platform and software on-demand services (Armbrust et al., 2010a). The current chapter focuses on Infrastructure as a Service (IaaS) and its current application in HEIs. Furthermore, the authors conducted a Feasibility Study on the potential provision of IaaS services in the Computing and Library Services of a UK university.

In order to understand IaaS's dynamic and potential application in UK HEIs, an analysis of IaaS's current status and its relationship with Cloud Computing is required. Before doing this though, we have to first define IaaS.

## BACKGROUND

### Cloud Computing Overview

Many I.T. managers, from both academia and industry, argue that Cloud Computing is nothing more than another form of outsourcing similar to data-center outsourcing (Cisco, 2009). Even if there is a correlation, Cloud Computing is differentiated by its primary characteristics of resource pooling, on-demand self-service, pay-as-you-go pricing, and rapid elasticity (Mell & Grance, 2009; Armbrust et al., 2010a). These characteristics make it problematic to some and attractive to others. For instance, elasticity of storage and computer power, and on-demand self-service may be attractive options for a research scientist, but it could be a potential issue for the I.T. manager of a HEI who is accountable for the integrity of the research data (Cisco, 2009).

The most important factor in promoting Cloud Computing has been the recognition that large data-centers have thousands of servers which, in general, do not operate at full capacity, creating a surplus of computer capacity (Dillon et al., 2010). Cloud Computing enables greater returns on data-center investments, by using these resources more efficiently through virtualization (Cisco, 2009; Dillon et al., 2010). In addition, it gives the opportunity to an organization like a HEI to develop its own private Cloud within its own infrastructure.

### Definition of Infrastructure as a Service (IaaS)

Infrastructure as a Service (IaaS) is defined in the literature as a data center-as-a-service model (Linthicum, 2009). Specifically, according to the