Benefits and Challenges of Cloud Computing Adoption and Usage in Higher Education: A Systematic Literature Review

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ABSTRACT

The aim of this article was to provide evidence pertaining to cloud computing (CC) adoption in education, namely higher education institutions (HEIs) or Universities. A systematic literature review (SLR) of empirical studies exploring the current CC adoption levels in HEIs and the benefits and challenges for using CC in HEIs was performed. A total of 20 papers were included in the SLR. It was discovered that a number of universities have a keen interest in using CC in their institution, and the evidence indicates a high level of successful CC adoption in the HEIs reviewed in the SLR. In conclusion, the SLR identified a clear literature gap in this research area: there exists limited empirical studies focusing on CC utilisation in HEIs.

KEYWORDS


1. INTRODUCTION

Cloud computing (CC) according to the National Institute of Standards and Technology (NIST) is “a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) 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.” (Mell & Grance, 2011) In Sultan’s view, CC is a computing style where elastic and scalable IT-driven capabilities are made possible via internet technologies (Sultan, 2010).

Krelja et al. indicate that CC is a highly innovative technology for businesses to adopt and provides a new technology platform to enable them to develop and deploy their own applications. For the end-user, CC is a more cost-effective and flexible way of using applications (Krelja et al., 2014; Kyriazis & Jeffery, 2018). Through the delivery of many cloud-based applications to potential users, such as teachers and students, which can support their educational needs, CC can provide greater

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scalability, flexibility and mobility in the utilization of resources for teaching purposes (Alharthi et al., 2015; Scholten, 2017; Stergiou et al., 2018).

Since CC is an internet driven technology, it brings many advantages and also disadvantages, besides to the educational cloud (Alharthi et al., 2015; Lakshminarayanan et al., 2013; Yuvaraj, 2016). The benefits include cost efficiency, collaboration, greater flexibility, improved availability, reduced environmental impact and user satisfaction (Krelja et al., 2014; Shayan et al., 2014; Sultan, 2010; Verma & Rizvi, 2013), whereas the limitations include security, maturity and cultural resistance (Alharthi et al., 2015; Amron et al., 2017; Haider, 2014; Shakeabubakor et al., 2015; Sultan, 2010). In addition, CC is a highly compatible technology, which makes it usable in a number of everyday activities, including education. As well as delivering various cloud-based applications and services to teachers and students, which can be used in both formal and informal education, CC can provide greater scalability, flexibility and mobility in the utilization of computing resources for teaching and learning purposes, increased collaboration, communication and resource sharing, and allows institutions to establish virtual communities for teaching and learning i.e. a customised learning environment (Askari et al., 2018; Kayali et al., 2016; Willcocks et al., 2014).

1.1. Research Motivation

Existing research on CC usage in education only focus on CC frameworks, security and implementation, and there is a lack of studies that explicitly focus on the benefits and challenges of CC adoption and usage in education context, particularly in higher education institutions (HEIs), such as Universities (Hussein & Omar, 2015; Jawad et al., 2017; Mokhtar et al., 2016; Scholten, 2017)

This paper aims to identify and evaluate empirical evidence pertaining to the benefits and challenges of CC adoption and usage in the higher education context by employing a systematic review method. This research will help to identify the potential challenges and gaps in the existing literature and recommend areas for further research going forward.

2. RESEARCH METHOD

A systematic literature review (SLR) is essentially a process in which the researcher identifies, assesses and interprets all available literature and empirical evidence in an attempt to provide answers for specific research questions. To support the researcher during the SLR procedure, Kitchenham’s and Charters’s method of conducting SLRs was adopted (Kitchenham & Charters, 2007; Salleh et al., 2011). The search procedure involved the use of various online databases, such as ScienceDirect, IEEE, Springer, Scopus and ACM.

2.1. Research Questions

This SLR included a range of empirical studies, exploring the benefits and challenges of CC adoption and usage in higher education (HE). Research papers that have explored usage and/or implementation of CC in education, besides other studies that have determined a particular outcome for successful CC implementation in HE were included. Therefore, researches that merely presented a proposed framework or research design without any empirical assessment were omitted from the SLR. Basically, the SLR only included studies that have explored and examined data pertaining to CC adoption in HE or other researches that have conceptualised CC implementation in HE.

The focal point of this SLR was to provide awareness and determine whether or not Universities and higher education institutions (HEIs) have adopted CC to support their teaching and learning activities. While the main justification for CC use in HE is to reduce IT-infrastructure costs and facilitate the teaching and learning process (organisational level), students can also take advantage of not having to purchase additional computing equipment as they can learn via the cloud (user level), which does not require extra resources, just an Internet connection, and so that they can collaborate and communicate effectively with other students and teachers on the cloud (Al-Badi et al., 2017;
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