Chapter 83
Cloud Computing Big Data Adoption Impacts on Teaching and Learning in Higher Education: A Systematic Review

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ABSTRACT

There is a rapid evolution in the purpose and value of higher education brought about by technological advancement and data ubiquity. Data mining and advanced predictive analytics are increasingly being used in higher education institutions around the world to perform tasks, ranging from student recruitment, enrolment, predicting student behaviour, and developing personalised learning schemes. This chapter evaluates and assesses the impact of big data and cloud computing in higher education. The authors adopt systematic literature research approach that employs qualitative content analysis to establish their position with regards to the impact, benefits, challenges, and opportunities of integrating big data and cloud computing to facilitate teaching and learning.

INTRODUCTION

The advancement in technology has impacted every facet of human endeavour and the higher education sector is consequently not left out. The impact of technology has infused the heart of higher education teaching and learning and contributes to providing and enhancing student experience and positive engagement. In today's world, technology has been cleverly infused in higher education teaching and learning to augment various elements, components, and processes like teaching, learning, curriculum design, and assessment. When associated with apt learning objectives and standards, the impact is overwhelming. For instance, some universities have already partnered with IBM to provide cloud-based access to the

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emergent big data analytics platform – IBM's supercomputer Watson. Even though the service provided is only basic, it still provides an illustration of the impact of big data and cloud computing on teaching and learning in higher education. The paradigm of higher education is constantly evolving, therefore emphasizing the need for rapid and dynamic adaptation by higher education institutions. There are strict requirements from accrediting and regulatory agencies, government and parastatals, as well as other stake holders to explore new methods and techniques for enhancing and monitoring student success and experience.

Within the higher education, technology trends comprising data mining and predictive analytical techniques are progressively being adopted in higher education for the purpose of classifying students to categories based on performance, learning history, and future prospect. Higher education institutions that have seldom collaborated with commercial partners, have commenced the adoption of these methods to recommend courses, monitor student progress, customise learning curriculum, and even develop collaborative networks amongst students. Big data analytics is a critical component of business intelligence and industrial analytics and is fast becoming part of a revolutionary and disruptive technology for higher education in which the ability to forecast individual consequences completely transforms management and allows institutions to better understand their students (and their needs) by exploiting the vast amounts of data that higher education institutions generate in their day-to-day actions (Collins et al., 2018; Poonia et al., 2018; Wang et al., 2018).

On the other hand, the last two decades has witnessed the evolution of distributed computing, a disruptive technology that has altered the application of scientific and commercial applications. This progress has birthed several more recent and relevant applications. The most recent member of this family and consequence of the development of distributed computing is Cloud computing. Using Cloud environment, all the applications can be delivered as a web service (Ali, 2019; Ali et al., 2019, Ali et al., 2020). Cloud facilitates the delivery of applications, software development languages and server/hardware as a service. The concept of cloud computing relates to the delivery of IT services that typically run in a web browser as a service. These services range from modifications or enhancements of common applications, such as email, admin/secretarial and personal finance to innovative solutions such as virtual and physical social networks. A very critical and essential service provided by cloud computing is the storage of digital data. Therefore, cloud computing can be defined as a computing platform that is resident in a network provider's data centre and is able to randomly and rapidly give its numerous servers the capabilities to deliver a wide range of services to its clients (Dillon et al., 2010). The notion of 'cloud' is a metaphor that represents the internet. In other words, the cloud refers to a computing paradigm, one where tasks are allocated to a permutation of services, software and connections read over a network. This holistic network comprising the servers, client base, and connections is collectively referred to as the cloud. Performing computing on a large scale on the cloud creates opportunities for users to access computing resources at a clustered level. Rather than purchase, develop, maintain and administer their personal data centres, firms prefer to purchase this computing power and storage capacity as a service from a provider, typically on a 'pay-as-you-use' model, just as with regular bills of electricity or water. This model has also been described as "utility computing," in which the availability of computing resources is addressed as any other metered utility service (Jain and Bhardwaj, 2010).

Cloud computing serves many functions and can provide solutions to a myriad of challenges posed, even in the higher education institutions. Typical uses of cloud computing in the higher education sector include cloud computing as Personal Learning Environments (PLEs), which can substitute for organisation-wise Virtual Learning Environments (VLEs)/LMS, like blackboard, with various personalised