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Learning Management System Advancement with onCloud Based System

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Abstract

The widespread use of the internet has resulted in the emergence of new business models across various industries. Companies such as Grab and Airbnb have experienced rapid growth by implementing internet-based approaches, thereby replacing traditional business models that did not rely on technological advancements. Consequently, several sectors, including education, are experiencing rapid transformations. The education sector, responsible for equipping individuals with the necessary skills, must adapt to these changing times. Previous research has demonstrated that an enhanced Learning Management System (LMS) can enhance student self-efficacy and time management skills. Technological advancements indicate that the adoption of cloud technology can boost productivity and effectiveness, while also reducing system costs significantly. This article aims to provide a comprehensive perspective on how the onCloud Learning Management System can assist the education industry in embracing a new business model that caters to the demands of the modern era. By examining previous studies in the relevant field, we explore how the LMS can be made adaptable to meet the diverse needs of its users while maintaining cost-effectiveness. Additionally, we evaluate how the inherent features of a cloud-based system contribute to achieving optimal performance in the LMS. This article proposes the adoption of the onCloud learning management system model as a means to enhance the overall functionality of the LMS. The findings indicate that the cloud-based learning management system model offers various learning benefits in the era of modern technology, while also accommodating the need for computing resources and ensuring the quality of the LMS. It is expected that this model will propel the learning management system to a higher level of improvement.

Keywords: *learning management system, cloud-based system, cloud-based learning, learning technology*

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Introduction

Education is one of the primary pillars of Sustainable Development Goals (SDGs), and digital technology has become an essential part of education nowadays (Islam Sarker et al., 2019). Many schools or learning and training places use learning tech to facilitate the learning process. Research conducted in Russia in 2015 concluded that the use of a learning management system can improve the experience, self-efficacy, and learning objectives of learners. From the teacher's perspective, the learning management system is a relevant way to upgrade their skills (Shchitov et al., 2015). The learning management system's modular object-oriented dynamic learning features make it possible to have self-paced, distanced, and free paths in the learning process.

Cloud computing is a new development that has revolutionized the way businesses operate (Hassan et al., 2022). The adoption of cloud computing technology has improved the core business functions of many organizations. This paper aims to explore the possibilities and considerations of technology collaboration between learning management systems and cloud computing. By integrating the two technologies, we can take learning tech to a new level, where almost unlimited learning resources are available as long as there is an internet connection. In this paper, we will discuss the possibilities and considerations of this collaboration and provide a simple review of the journey of collaboration. The research method of this study was reviewing the previous literature on learning management system advancement with oncloud based learning system. The significance of this study is rooted with the connection of online resources and technologies.

Literature Review

Learning Management System

As defined by the Oxford English Dictionary, a learning management system is a set of digital components designed to oversee and regulate the transfer and absorption of knowledge. The roots of the Learning Management System date back to 1924, when Sydney Pressey pioneered the use of a Teaching Machine to ask and answer questions in educational settings. Since then, the learning management system has evolved, with notable advancements including the era of PLATO (Programmed Logic for Automatic Teaching Operation) and the rise of self-paced learning. In 2019, the system proved its versatility and value during the global pandemic, providing a valuable tool for educators and learners alike.

Cloud Computing

According to Microsoft, a cloud-based system is a collection of digital components that enable the delivery of a wide range of computing services via the internet network. A recent report by Fortune Business magazine reveals that the market value of this system has soared to an impressive USD 405.65 billion. Given their exceptional affordability, cloud-based systems are expected to emerge as the driving force behind computing and are anticipated to experience exponential growth in the next five years (Avaram, 2014).

Learning Management System Topology

Seeing based on its structure, the learning management system is an information system that utilizes a database management system to manage and regulate the learning process. With the advent of different structural schemes and programming languages, there are now many different learning management systems available. A significant majority of the above mentioned systems, approximately 76%, are web-based (Bouchrika, 2022) and can be operated on the cloud. While not all learning management systems have been accepted by the community, four widely accepted systems have been identified in a study conducted by American academics in 2022: Canvas, Blackboard, Moodle, and Brightspace. Interestingly, all of these accepted systems are not web-based. Like other web-based information systems, web-based learning management systems use computational resources such as processors, RAM, storage memory, graphic rendering, and network bandwidth in their operations. The

above mentioned systems are typically placed on client-server computing operations, with server resource specifications tailored to the needs of the system load. However, it can be quite expensive for education providers to provide computing resources for learning management systems, particularly if the learning needs are substantial, fluctuate frequently, or are accessed from disparate locations. Additionally, there are other risk factors such as power outages, cooling failures, and the relatively high operational costs of IT teams. By installing and operating a learning management system on the cloud (Avram, 2014), these costs and risks can be significantly reduced.

Cloud Computing Topology

The emergence of computer networks gave birth to cloud computing, which grew from resource-sharing computing models and distributed computing. Simply put, cloud computing technology centralizes computing resources in a carefully designed center that can be easily compiled, modified, and expanded. This center can be a data center, service center, or part of distributed computing that is connected and communicates with each other. The computing center is carefully planned and operated with high-standard procedures, requiring a reasonable investment. It is generally connected to several world-class computer network backbone lines, enabling it to provide computing services via the Internet network. Cloud computing's centralized nature and wide range of computing services make it a cost-efficient and effective risk management solution (Avram, 2014). However, due to its dependence on internet quality and delivery of all computing services through the internet network, this technology requires relatively higher security features than a privately operated web-based system (Hassan et al., 2022).

Research Methodology

Within this section, we discussed the important factors that we found during our literature review regarding the incorporation of a learning management system into a cloud-based system. Specifically, we explored how such a system can be made adaptable to serve the diverse needs of its users, while keeping the operational costs effective. Firstly, we examined how the inherent characteristics of a cloud-based system helps in achieving the optimal performance of a learning management system. Subsequently, we addressed the different requirements that must be taken into account in order to effectively cater to the users' needs.

Base Characteristic of Cloud System

Cloud-based systems possess several fundamental characteristics that offer significant benefits to the services that run on them. Certain key features of cloud-based systems recommended by Bello et al. (2021) can enhance the capabilities of learning management systems: (1) Wide-ranging service characteristics that are not constrained by time or location, as long as they are covered by an internet connection. (2) Sharing centers and computing resources that enable cloud-based systems to cater to the interests and requirements of multiple users and different applications operating within them. (3) Elastic attributes attached to cloud-based computing services, which allow users or companies to increase or decrease computing resources as required within a certain time frame. (4) On-demand self-service, enabling users to install and manage personalized computing resources without relying on customer service for assistance or scheduling. (5) Operational costs that align with the resources that are needed. In the ensuing discussion, we will explore how the above mentioned characteristics can significantly support the development of a learning management system at an elevated level.

The Need of Next Level Learning Management System

Within this section, we explored the essential requirements that learning systems must meet in the modern era (Shchitov et al., 2015). Firstly, it is vital to enhance the quality of learning. This is particularly important because in today's learning environment, systems must produce high-caliber graduates capable of managing diverse and unpredictable scenarios. Improving

the quality of learning is also crucial for the student body, which is comprised of individuals with varying ages, educational backgrounds, cultures, locations, and histories. Therefore, a high-quality learning system that can cater to the needs of this diverse group is necessary.

Secondly, there is a need for increased cost efficiency in the learning system's operations (Avram, 2014; Shchitov et al., 2015). As we previously mentioned in the possibilities section of this article, implementing high-quality learning management systems can be costly for educational institutions. Operational costs include expenses for electricity, backup systems, modern information technology infrastructure, IT operational teams, maintenance of computing cooling systems, and risk management. However, the above mentioned costs may not align with the educational fees paid by students. Additionally, the number of students in an educational institution tends to fluctuate. When the number of students is sufficient, operational cost alignment may be achieved. However, when the number of students is excessive or inadequate, managing the operational costs of a high-quality learning management system becomes challenging. This makes it challenging for educational institutions with limited capital to provide a good quality learning management system.

Therefore, this article offers the adoption of the On Cloud Learning Management System model to enhance the learning management system. This model is expected to take the learning management system to a higher level of improvement.

Results and Discussion

Results

Expanding upon our previous section, we presented the conventional model of the OnCloud Learning Management System for learning management system advancement. In this model, the learning management system application and database are hosted on a cloud-based system, where transactions are carried out within the cloud. The system is accessible to educational institutions and users of the learning management system via the internet network and cloud-based operations (see Figure 1).

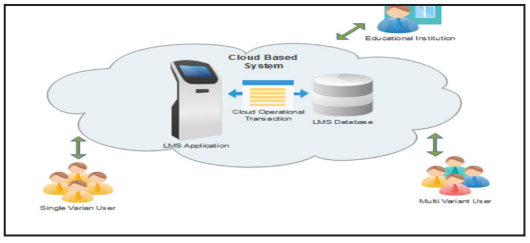

Figure 1: *OnCloud Learning Management System Model*

Discussion

Cloud-based systems are the optimal choice for learning management systems seeking to improve the quality of education while increasing cost efficiency. When a learning management system operates on a cloud, it inherits the basic service characteristics of the cloud-based system (Avram, 2014), allowing for high heterogeneity of users to be accommodated. This flexibility enables educational institutions to adapt computing resources to the needs of service users (Bello et al., 2021), ensuring a personalized and effective learning experience (Shchitov et al., 2015). Additionally, the on-demand self-service characteristics of cloud-based systems automatically allow users to personalize access to the learning management system, improving usability and accessibility. Finally, the cost of computing resources can be customized and paid as needed (Avram, 2014), providing significant benefits to both educational institutions and students.

This paper also presents a fascinating case study on a Vocational School in Indonesia, sharing the surprising discoveries of our comparative study conducted through Cost Comparison Analysis.

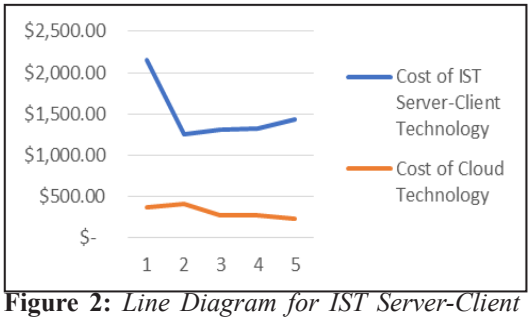

Figure 2: *Line Diagram for IST Server-Client*

and Cloud Cost Comparison from 1st to 5th Years

Our diagram indicates a significant reduction in operational costs for learning management systems utilizing cloud technology, with an almost 80% decrease over five years. This translates to substantial savings, as costs decreased from around 7472 to 1522 US Dollars. We also found that the majority of students (85%) and teachers (70%) reported feeling happier due to the freedom of access to learning materials beyond the school walls (Reis et al., 2008). The above mentioned positive outcomes highlight the potential of innovative technology in education. Nevertheless, it is crucial to conduct additional research to implement proper security measures in proportion to the placement of the learning management system on the cloud, ensuring a safe learning environment for all stakeholders.

Conclusion

While the cloud-based learning management system model offers many learning benefits in the modern era and can accommodate the needs of computing resources and the quality of learning management systems, this article has not explored security management when implementing a learning management system in a cloud-based system. As previous research has shown (Armbrust et al., 2009; Hassan et al., 2022; Kim, n.d.; McKinsey Company, 2009), there are potential risks involved in using cloud technology, which must be managed properly. Without proper knowledge and management, the use of cloud-based systems can elevate the degree of potential risk to very high levels (Tawalbeh & Saldamli, 2021). Future research should focus on appropriate and proportional security management that can be implemented in a learning management system that is placed on the cloud.

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