

## Cloud Computing Services in Higher Education in Iraqi Universities

Zahraa Abed Aljasim Muhisn<sup>1</sup>, Sawsan Ali Hamid<sup>2</sup>, Atyaf Sami Noori<sup>3</sup>, Sinan Adnan Muhisn<sup>4</sup>

Submitted: 10/02/2023

Revised: 13/04/2023

Accepted: 05/05/2023

**Abstract:** The widespread COVID-19 virus encourages businesses and organizations—and educational institutions in particular to use electronic services rather than the more traditional ones. In this case, cloud computing contributes significantly to the e-learning educational offerings. There has been considerable research into cloud computing in higher education across the globe, but little has been done in Iraq. This study was conducted to investigate the viability of cloud computing for higher education in Iraq. Interviews method were conducted with IT staff as a participants of this study at a public university in Iraq. The participants took part in an interview, the results of which indicated that the implementation of cloud computing services lead to reduce cost, save time, improve the service's quality, help the researchers and improve the research and education process.

**Keywords:** *Iraqi Universities; Cloud Computing; Higher Education*

### 1. Introduction:

Due to its ability to distribute resources and services in a standardized manner, cloud computing has recently attracted significant attention from and been adopted by many businesses and institutions [1]. Due of its simplicity, users of this technology can operate it without extensive training or technical expertise. However, since the COVID-19 virus, the significance of using cloud computing in educational institutions has grown significantly [2].

Since this virus is regarded as contagious and contributes to a number of deaths, it is possible to use e-learning during this time. The use of e-Learning Management Systems to enhance teaching and learning possibilities has been acknowledged as being powerful and successful on a global scale [3]. Despite the many benefits of cloud computing, such as its acceptance, ease of use, accessibility, and affordability, this technology has only recently begun to advance [4]. Due to this, numerous scholars have focused on researching cloud computing in higher education globally [1], [2], [4]. On the other hand, [5] pointed out that little research has been done in Iraq.

In the sphere of higher education, cloud computing providers give colleges the option to replace these conventional campus workstations with existing data centres, servers, and applications by storing their data and information in the "cloud"[6]. Additionally, an alternative designed to establish a virtual environment

for keeping students data for the administrative body, as well as for students and instructors, is cloud computing. Virtual laboratories inside a modelling environment are among the cloud computing services that help students comprehend concepts better and make teaching easier [7].

According to [8], it is not necessary to provide evidence to highlight the significance of using technological innovations to create educational practices for creating educational curricula in Iraqi universities; rather, Using technology advancements in the educational process is crucial, but it must be done in a way that addresses the problems the system is now experiencing.

### 2. Literature Review

#### Cloud computing definition

Most educational institutions prioritize the provision of high-quality learning and teaching, as well as cloud computing helps universities improve their operations in both professional and academic service sectors [9]. The term "cloud computing" refers to a computing environment where one party can outsource its processing requirements to a different party, and that party can then use the resources or computing power, like emails or databases, as needed. According to the "National Institute of Standards and Technology (NIST)" in the United States, cloud computing is "a model for enabling convenient, on demand network access to a shared pool of configurable computing resources"[10].

Education is one of the industries that cloud computing has had a major impact on. To automate operations, connectivity, and storage, many educational organisations have turned to cloud platforms [11]. These

<sup>1</sup>Computer center, Al-Qasim Green University, Iraq

<sup>2</sup>Computer Department, College of computer science, Tikrit, Iraq

<sup>3</sup>Department of computer science, Dijlah University College, Iraq

<sup>4</sup>College of Biotechnology, Al-Qasim Green University, Iraq  
zahraa.a@uoqasim.edu.iq

resources include servers, storage, networks, software, and services.

Cloud computing is a type of computing that uses virtualized resources that users can share and is extremely scalable [12]. According to [13], cloud computing is a method of sharing information or providing services through the internet and intranet. Depending on their needs, customers can select the information or services they want to use.

### **Benefit of cloud computing in higher education**

According to numerous research reports, cloud technology has a wide range of advantages in the education industry. Services for cloud computing are absolutely essential for educational institutions. New web applications have made it possible for lecturers to complete their work in web browsers rather than storing and transporting data on hard drives thanks to the advent of private and educational clouds. The lecturer can complete tasks without experiencing software issues, view the files from anywhere, back up your data, exchange content more easily, and more [6].

According to [14], cloud computing can benefit educational institutions by:

1. Keeping a lot of accessible information and sensitive data in storage
2. Staying up to date (gives students access to digital campus storage for projects, papers, and class notes, for instance)
3. Purchasing and putting into use the most recent updates to software and applications.
4. Simplifying the expensive and time-consuming enrollment and admissions processes.
5. Providing low-cost high concept computer systems to colleges, universities, and others. All that is required is a cheap internet connection.
6. Collaboration without the use of paper Paper-based learning is no longer an effective method of instruction because it is expensive for the environment and financially.
7. Storing sensitive data centrally in the cloud, where it is less vulnerable to dangers like the theft or loss of USB flash drives or laptops.
8. Using the cloud to teach youngsters who would not often have access to education in emerging or poor nations.

Additionally, according to [15], switching from on-premise solutions to the cloud computing model could provide higher education institutions with a number of immediate benefits, such as eliminating the need to buy, install, and maintain software programs on-premises and eliminating the need to maintain servers or IT infrastructure. More hardware and money are typically

needed to increase IT storage. There is more flexibility on the cloud. Massive amounts of data may be stored affordably, and resources can be purchased when needed.

### **Example of using cloud computing in higher education**

There are numerous examples of universities employing cloud computing effectively throughout their campuses, including:

1. Google Apps for Education, which offers free email, messaging, and shared calendars and doesn't show adverts, has been adopted by the University of Westminster in the United Kingdom. The Google platform also supports word processing, spreadsheets, and presentations, making it easier for group projects to be collaborated on [16].
2. Over the past few years, Roger Williams University (RWU) has used cloud services in an expanding number of ways. Bridges, an online learning platform used by RWU students, hosts all of the course contents on an external cloud operated by Amazon Web Services (AWS). Bridges enables instructors and students to publish, watch, and download lectures, homework, grades, and much more using a range of mobile devices from any location with an Internet connection.
3. The information services for education that must assist and ensure data integrity for schools, universities, parents, and the ministry of education were also covered. The study has also provided a glimpse of the learning services that offer cloud computing capabilities for digital libraries, E-TV, and Teacher TV, as well as educational broadcasting services. The services enable educators to deliver material that is simple to access, use, create, and reuse anywhere, at any time. Additional features of learning cloud services include a number of integrated applications, such as a website, ability to adapt to new, pictures and videos sharing, social media site usage, e-book and e-learning, participant sharing application, and collaborative tools like email, messaging, blogs, Skype, and conferencing system. Additionally, the services offer e-book directories, union catalogs, digital collections, e-journals, and reference database services [17].

### **The service models are categorized into three basic models:**

#### **"Software as a Service (SaaS)"**

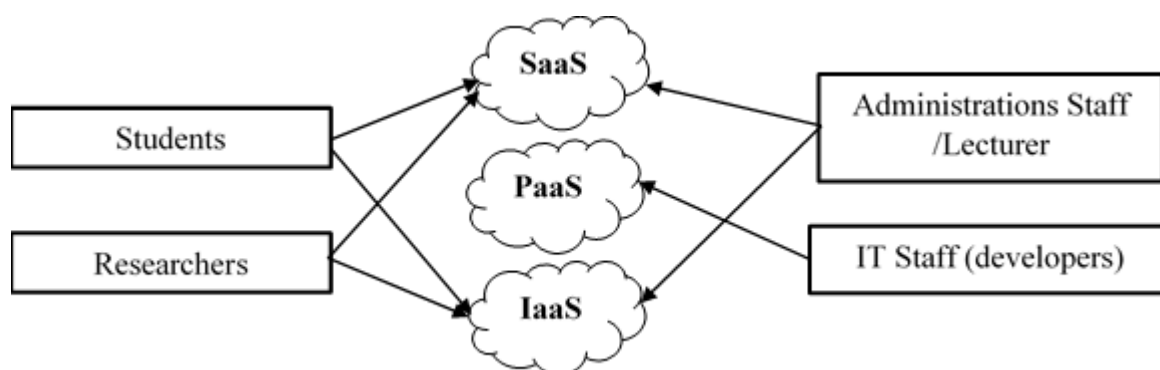
Using the internet instead of installing and running the applications on user's computer eliminates this requirement. Available commercially software that is accessible and maintained via a network, with consumers having remote internet access to these programs that are

controlled from a single location [18]. Higher Education Institutions realized the benefits of SaaS services. These services include programming environment databases, applications software, email management software, middleware, antivirus and firewall [19].

### "Platform as a Service (PaaS) "

Cloud users may develop cloud services and apps (like SaaS) directly on the PaaS cloud thanks to the "Software Lifecycle" assistance provided by the PaaS development platform. PaaS offers a development platforms that hosts both completed and ongoing cloud applications, in contrast to SaaS, which only hosts cloud applications that have already been developed. PaaS must include both an environment that supports hosting applications and development infrastructure, which includes programming, tools, configuration, and other components. A good PaaS example is Google AppEngine [20].

### "Infrastructure as a Service (IaaS) "



**Fig.1:** Users of Cloud Computing Services in Higher Education.

Figure 1 shows that students, lecturer, and administrations staff member can take advantages the services of providers of IaaS and SaaS clouds. the best way to use these services is through the clients. Any software developed by these organizations is hosted online on the SaaS cloud provider's servers. The IaaS cloud provider promptly implements any request for increased hardware or storage space online.. Meanwhile, IT staff (developers) may now utilize a PaaS cloud provider to host their apps and use all the hardware they require for development online. Finally, an IaaS cloud provider enables researchers whose work need a lot of processing power and/or more server capacity to do so with the press of a mouse.

### 3. Methodology

The literature review methodology was adopted to identify and interpret existing studies relevant to the research objective, furthermore an interview method was used in order to demonstrate the viability of cloud

The supply of processing, storage, networks, and other fundamental computer resources enables the deployment and execution of any software, including operating systems and applications, by the customer. Although the customer does not control or have access to the underlying cloud infrastructure, they do have some limited control over particular networking components, such as host firewalls. Instead, the client is in charge of the operating systems, storage, and distributed software [14].

Cloud computing is becoming a crucial component of university education systems and delivery methods, especially when it comes to linking distant learning and online programs. Universities are increasingly utilizing one of the three cloud computing models to enhance student experiences [21].

The following figure displays who uses cloud computing services in higher education [6], [22].

computing for higher education in Iraq specifically Tikrit university.

Interviews were conducted with IT staff at Tikrit university, IT staff are the participation of this study. This is due to the fact that the government provide the services like cloud computing for the public sector first, then they implement it in private sector. In this regard, the sample frame of this study is the IT unit at Tikrit University, which is one of the largest universities in Iraq. The researchers made the interview and ask the IT staff four main questions,

1. Does cloud computing services implemented in Iraq universities?
2. What are the advantages of implementing cloud computing services in Higher education universities in Iraq?
3. What are the barriers to implement cloud computing services in higher education in Iraq?

The most recent practical knowledge was obtained in the process of answering the above questions, adding to the academic knowledge at Tikrit University. For all academics and higher education institutions, this knowledge is significant.

#### 4. Results:

During interview with IT staff at Tikrit university, the staff mentioned that the cloud computing is still un-used. Hence, this study considered as a first study that tries to cover this gap. In addition, through the interview some points has been highlighted such as the benefit of cloud computing in university for lecturers, researchers and students. Furthermore, the interview highlighted that the weak of internet services could be the main reason that prevent the implementation of cloud computing services in Iraq. As well as, the privacy and security is disadvantage to deploy cloud computing.

The interview also shows that the implementation of this services could lead to reduce cost, save time, improve the service's quality, help the researchers and improve the research and education process.

#### 5. Conclusion

In the higher education field, Universities that use cloud computing have the option to replace their traditional campus computers with information stored in the "cloud" using their current data centers, servers, and applications. As a result, cloud computing emerges as a crucial element in the advancement and growth of the educational process in higher education. Despite this, neither the faculty nor the personnel at the university in Tikrit use cloud computing. The Tikrit University System ought to benefit from the use of cloud computing.

Although cloud computing is becoming more and more popular, as this article has shown, there are still some important and valid worries about it, such as security. Cloud service providers eager to create best practices are addressing some of these problems. However, The barriers to cloud adoption that many educational institutions are now facing must be removed. Thus, the researcher proposes more study in cloud computing security.

#### References

- [1] M. A. Al-Sharafi, Q. AlAjmi, M. Al-Emran, Y. A. M. Qasem, and Y. M. Aldheleai, "Cloud computing adoption in higher education: An integrated theoretical model," in *Recent Advances in Technology Acceptance Models and Theories*, Springer, 2021, pp. 191–209.
- [2] N. Samyan and P. O. St Flour, "The impact of cloud computing on e-Learning during COVID-19 pandemic," *Int. J. Stud. Educ. Sci.*, vol. 2, no. 2, pp. 146–172, 2021.
- [3] Z. A. A. Muhsin, S. A. Almansouri, S. A. Muhsin, M. Ahmad, and M. Omar, "The Effectiveness of Knowledge Combination in E-Learning Management System (eLMS).," *Int. J. Emerg. Technol. Learn.*, vol. 17, no. 16, 2022.
- [4] G. A.-M. Taufiq-Hail, A. R. A. Alanzi, S. A. M. Yusof, and M. Alruwaili, "SOFTWARE AS A SERVICE (SAAS) CLOUD COMPUTING: AN EMPIRICAL INVESTIGATION ON UNIVERSITY STUDENTS' PERCEPTION.," *Interdiscip. J. Information, Knowl. Manag.*, vol. 16, no. 2021, 2021.
- [5] A. M. Ahmed and O. W. Allawi, "a Review Study on the Adoption of Cloud Computing for Higher Education in Kurdistan Region-Iraq," *UHD J. Sci. Technol.*, vol. 4, no. 1, pp. 59–70, 2020.
- [6] S. Mathew, "Implementation of cloud computing in education-A Revolution," *Int. J. Comput. theory Eng.*, vol. 4, no. 3, p. 473, 2012.
- [7] Y. A. Najm, S. Alsamarace, and A. A. Jalal, "Cloud computing security for e-learning during COVID-19 pandemic," *Indones. J. Electr. Eng. Comput. Sci.*, vol. 27, no. 3, pp. 1610–1618, 2022.
- [8] D. K. A.-R. Al-Malah, I. A. Aljazeera, H. T. S. Alrikabi, and H. A. Mutar, "Cloud computing and its impact on online education," in *IOP Conference Series: Materials Science and Engineering*, 2021, vol. 1094, no. 1, p. 12024.
- [9] M. Rezaeian and M. G. Wynn, "The Impact of Cloud Computing on the IT Support Function: A Case Study From Higher Education," in *Handbook of Research on Digital Transformation, Industry Use Cases, and the Impact of Disruptive Technologies*, IGI Global, 2022, pp. 1–17.
- [10] P. Mell and T. Grance, "The NIST definition of cloud computing," 2011.
- [11] M. I. I. Khalid and M. F. Zolkipli, "Review on Cloud Security and Challenges on Higher Education," *Malaysian J. Appl. Sci.*, vol. 7, no. 1, pp. 1–9, 2022.
- [12] C. Tankard, "Big data security," *Netw. Secur.*, vol. 2012, no. 7, pp. 5–8, 2012.
- [13] K. Gai and S. Li, "Towards cloud computing: a literature review on cloud computing and its development trends," in *2012 Fourth International Conference on Multimedia Information Networking*

*and Security*, 2012, pp. 142–146.

- [14] A. Jain and U. S. Pandey, “Role of cloud computing in higher education,” *Int. J. Adv. Res. Comput. Sci. Softw. Eng.*, vol. 3, no. 7, pp. 966–972, 2013.
- [15] M. Attaran, S. Attaran, and B. G. Celik, “Promises and challenges of cloud computing in higher education: a practical guide for implementation,” *J. High. Educ. Theory Pract.*, vol. 17, no. 6, pp. 20–38, 2017.
- [16] W.-L. Shiau and P. Y. K. Chau, “Understanding behavioral intention to use a cloud computing classroom: A multiple model comparison approach,” *Inf. Manag.*, vol. 53, no. 3, pp. 355–365, 2016.
- [17] P. Tantatsanawong, A. Kawtrakul, and W. Lertwipatrakul, “Enabling future education with smart services,” in *2011 Annual SRII Global Conference*, 2011, pp. 550–556.
- [18] Y. Jadeja and K. Modi, “Cloud computing- concepts, architecture and challenges,” in *2012 international conference on computing, electronics and electrical technologies (ICCEET)*, 2012, pp. 877–880.
- [19] A. O. Akande and J.-P. Van Belle, “Cloud computing in higher education: A snapshot of software as a service,” in *2014 IEEE 6th International Conference on Adaptive Science & Technology (ICAST)*, 2014, pp. 1–5.
- [20] T. Dillon, C. Wu, and E. Chang, “Cloud computing: issues and challenges,” in *2010 24th IEEE international conference on advanced information networking and applications*, 2010, pp. 27–33.
- [21] M. A. Mohamed Hashim, I. Tlemsani, and R. Matthews, “Higher education strategy in digital transformation,” *Educ. Inf. Technol.*, vol. 27, no. 3, pp. 3171–3195, 2022.
- [22] N. Sultan, “Cloud computing for education: A new dawn?,” *Int. J. Inf. Manage.*, vol. 30, no. 2, pp. 109–116, 2010.