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## The reality of using the teaching of the faculty of applied sciences at Samarra university for applications of cloud computing in the teaching

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### Abstract

This research seeks to ascertain the reality of faculty members at the College of Applied Sciences / Samarra University in relation to the utilization of cloud computing applications within the teaching process. Additionally, it aims to define cloud computing applications concerning their concept, development, objectives, and the advantages of their implementation in universities, as well as to identify the most significant challenges, obstacles, and difficulties encountered by faculty members in their use within universities. This research was conducted on a purposive sample of (40) faculty members in the Department of Pathological Analysis and the Department of Applied Chemistry at the College of Applied Sciences / Samarra University. To accomplish this, a questionnaire comprising (20) items was developed, which served as a tool for data collection and included two axes:

- The first axis: What benefits do cloud computing applications offer in the teaching process by faculty members in the College of Applied Sciences?
- The second axis: What obstacles do faculty members in the College of Applied Sciences face when using cloud computing applications in the teaching process?

The findings of the research indicated that there are challenges and barriers to the adoption of cloud computing applications at the Faculty of Applied Sciences /University of Samarra. In light of these findings, the current research proposed a series of recommendations, which include:

- Offering training programs for faculty members at the Faculty of Applied Sciences /Samarra University regarding the use of cloud computing applications.
- Establishing a center specialized in cloud computing applications at Samarra University, equipped with all modern tools, technologies, and equipment.
- Employing specialized technical staff in each computer laboratory.
- Ensuring computer laboratories have uninterrupted Internet access.
- Training students in computer skills.
- Conducting further research on cloud computing applications in other contexts.

**Keywords:** Cloud computing, teaching

### 1. Introduction

Technologies for e-learning have experienced swift and considerable advancement in the current era. These technological advancements have turned into vital, crucial, and efficient instruments in the processes of conveying and sharing information to students, learners, and educators in every nation worldwide. This has aided in the evolution and enhancement of educational techniques employed in educational and pedagogical institutions <sup>[1]</sup>.

"Cloud computing is a technology that revolves around the concept of moving processors and storage capacity from computers to a system known as the cloud. " The cloud signifies a collection of devices and hardware committed to servers, which can be reached through the Internet. In this technology, software is converted from products into services that users or beneficiaries can readily access through the Internet, without requiring expertise or familiarity with the devices and hardware utilized <sup>[2]</sup>.

With the proliferation of applications for cloud computing, which have been utilized in various educational domains, the topic is no longer simply a theoretical notion but has transformed into tangible private applications that we are observing in several common services on the internet, particularly concerning the area of e-learning.

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For instance, the procedure of creating tests has transitioned from specialized software that can be installed on computers to online services that do not necessitate any specific software to take advantage of them, with the capability of presenting test questions randomly, or in accordance with certain arrangements, along with the option of distributing tests through e-mail or via web pages [3].

The practice of utilizing "cloud computing applications" stands out as one of the most notable and significant contemporary trends in higher education institutions, owing to its advancement and modernity, and consequently the opportunity to leverage it for enhancing teaching and educational techniques, and subsequently the chance to alleviate open expenditures to attain competitiveness in the educational process, elevate quality standards, and enhance educational outcomes [4].

"Cloud computing applications" offer a broad array of beneficial services for students, faculty, and staff within educational institutions. Furthermore, these applications deliver rapid and straightforward access to an extensive selection of programs, applications, and academic resources. [5].

Cloud computing offers considerable financial advantages to nations and educational institutions. Those funds are allocated to upgrading current hardware or purchasing new hardware and acquiring new software. Therefore, cloud computing aids in alleviating the financial and technical

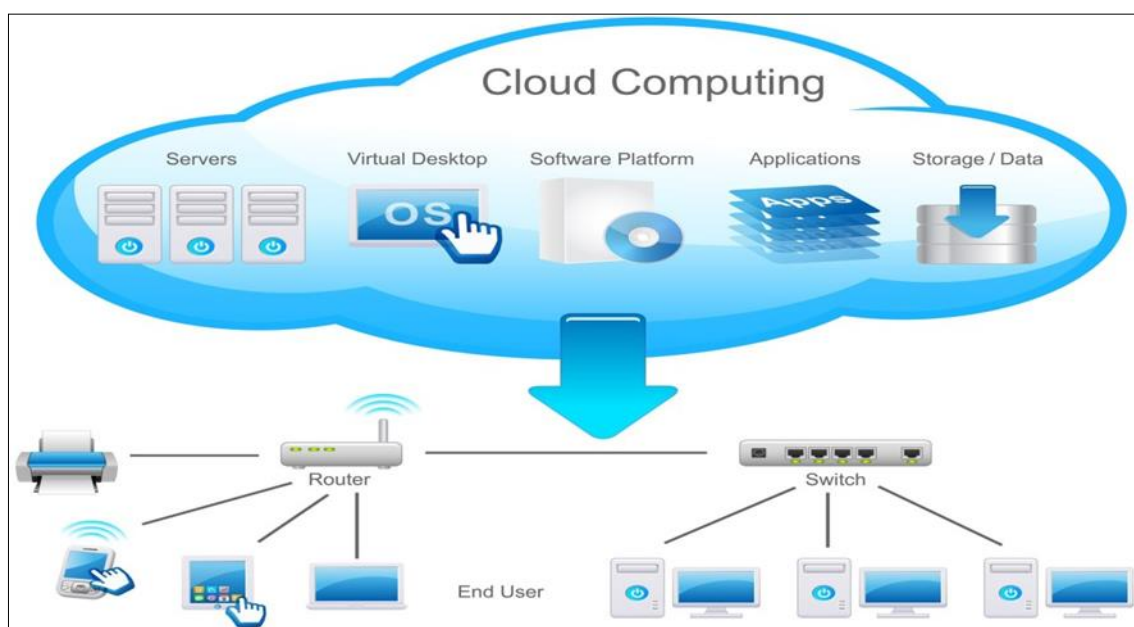
challenges associated with keeping up with technological advancements. It supports productivity and success for educators, pupils, and learners, even during individual tasks, enabling the opportunity to work from anywhere at any time [6].

By utilizing "cloud computing applications" in the educational process, e-learning can be improved among students and learners, as students can effortlessly subscribe to journals, references, and software. This is achieved through the employment of cloud storage services, and this approach promotes engagement with instructors and teachers by facilitating the sharing of diverse types of information and written materials through cloud computing capabilities [7].

[8] Cloud computing is characterized as "the utilization of the Internet or alternative networks to fulfill the requirements of users of information technology resources at various levels, ranging from physical elements and software to infrastructure and technical know-how."

[9] "Cloud computing applications" are described as "a technology that depends on collaboration, collective effort, and the transfer of processing and storage capabilities for computers to the Internet via the so-called cloud, utilizing a central device that offers support, services, and collaborative applications through the Internet."

**Figure (1) shows the basic structure of cloud computing.**



Source: National Institute of Standards and Technology ([www.defenginc.com/solutions/cloud\\_computing](http://www.defenginc.com/solutions/cloud_computing))

Source: NIST ([www.defenginc.com/solutions/cloud\\_computing](http://www.defenginc.com/solutions/cloud_computing))

**Fig 1: Cloud Computing Model**

A study suggested: [10] The necessity to focus on the execution of workshops and training programs for computer educators by utilizing "cloud computing applications" and strive to implement them in the educational framework to achieve the enhancement of various skills among students.

Both [11] and [12] concurred that "cloud computing applications" represent a unique solution for educational institutions given the critical shortage of operational funds, where information systems operate efficiently, without requiring additional expenditure on computers or networks, and this is accomplished by leveraging the available cloud

computing applications offered by service providers, which enable users and students to carry out their administrative and academic responsibilities.

The significance of cloud computing applications in higher education has been highlighted by numerous researchers. Where [13] discusses the acceptance of cloud computing applications by the University of California, and the Faculty of Electrical Engineering and Computer Science at Washington State University. It also notes that additional higher education institutions in the UK and Africa have embraced cloud computing. This suggests the potential of

cloud computing to improve the effectiveness of the learning environment. Despite the rising demand for cloud computing, there are several issues that raise concerns. These are associated with aspects of trust, security, and privacy.

The application of cloud computing in education is not something new, as it has been implemented in higher education institutions across numerous developed nations where various government bodies have aimed to enhance ICT infrastructure to lower expenses. Within the education field, the employment of cloud computing has become vital to enhance the teaching and learning experience, fostering self-directed learning among learners <sup>[14]</sup>.

The application of technology in education offers significant chances for delivering knowledge, as educational systems can be tailored to satisfy various student requirements and stringent standards. Furthermore, cloud technology can create opportunities for part-time learners who lack access to conventional libraries. The aim of these initiatives is to provide quality education and improve the learning experience for students <sup>[15]</sup>.

In the context of the researcher's work at Samarra University, particularly in the Faculty of Applied Sciences, where the researcher instructs on computer applications, the researcher observed that many faculty members in the Faculty of Applied Sciences at the university experience weaknesses and deficiencies in utilizing "cloud computing applications". Additionally, the researcher observed that the seminars and training courses accessible to faculty members at the university in this area are limited and inadequate. Consequently, it was essential to educate the teaching staff in the Faculty of Applied Sciences about the importance and benefits of employing cloud computing applications in the educational process. Furthermore, it is crucial to identify the most significant challenges and obstacles associated with the use of "cloud computing applications". Based on what has been stated, the research problem can be articulated and defined in the following question:

What is the reality of faculty members at the Faculty of Applied Sciences, /Samarra University using "cloud computing applications" in the teaching process?

A research study <sup>[16]</sup> highlighted the significance of utilizing "cloud computing applications" in improving the cognitive abilities of Qasoun University students.

Another study <sup>[17]</sup> demonstrated the importance of the cloud-based training program in boosting the technical performance of faculty at Taibah University.

A further study <sup>[18]</sup> also highlighted the significance of employing cloud computing in e-learning at universities to address the challenges of high expenses associated with constructing and developing information systems and the issues arising from university colleges being located in various and distant areas.

He indicated <sup>[19]</sup> in his research that the uses of cloud computing, like (Google Drive, Dropbox), assist users in identifying the regulations adhered to in research, as well as the administration of electronic content, to enable enhanced control for educational institutions in the efficient management of the educational system.

A research study <sup>[20]</sup> suggests the potential of employing cloud computing technology in e-learning at Qassim University. The research focused on the definitions of cloud computing, its features, services, the obstacles of utilizing it, and the feasibility of implementing it in e-learning.

<sup>[21]</sup> He also emphasized the significance of cloud computing security in institutions of higher learning. The research aimed to present cloud computing, as well as to recognize cloud computing services and applications, in addition to identifying the challenges confronting cloud computing in higher education institutions.

The researcher is convinced that the uses of cloud computing will emerge as the dominant language of the technological era, facing no rivals, and that the Internet landscape will slowly transform into a digital repository (Digital Repositories) where the majority of the world's data is housed at the scale of individuals or public or private entities, particularly educational institutions. These institutions endeavor to leverage these diverse applications in the administration of educational content and offer it in an outstanding manner, making it easier for learners or students to access it from anywhere and at any time.

## 2. Literature Review

### 2.1. Definition of Basic Terms

#### 2.1.1. Cloud Computing

Defined by <sup>[22]</sup>: "It is a prevalent empowerment model that is suitable for ensuring sufficient and enduring access to the network at any moment and from any location globally, in order to share a diverse array of computing resources and assets with the potential for deploying, supplying, and initiating them rapidly and with little effort or engagement with the service provider. "

#### 2.1.2 Teaching

Defined by <sup>[23]</sup>: "It encompasses all the possibilities and conditions offered by the teacher within a particular teaching context, along with all the actions taken by the teacher to assist students in reaching the specific goals of that context. "

### Cloud Computing Components:

<sup>[24]</sup> Citing Zhang *et al.* (2009) emphasized that cloud computing is made up of four fundamental components as follows

1. **Devices:** This category encompasses all tangible resources of the cloud, which are tasked with its management, including servers, power and cooling systems, routers, transformers, and others.
2. **Infrastructure:** This is one of the most crucial components of the cloud and is also referred to as the virtual layer, which forms a cluster of storage spaces and numerous sources that utilize virtual reality technologies.
3. **Platform:** This platform is reliant on the infrastructure and incorporates operating systems and applications, with its primary aim being to alleviate the load on users' devices by launching applications through virtual devices or servers.
4. **Applications:** These applications are positioned at the top of the hierarchical structure and encompass all applications that the cloud offers to students and learners. Cloud applications are distinct from conventional applications due to their accessibility at a lower operational cost.

### 2.3. Stages of Cloud Computing Development

<sup>[25]</sup> alludes to the phases involved in the evolution of cloud computing, highlighting that cloud computing has

**undergone several phases throughout its developmental journey, which are outlined as follows**

1. Centralized computing: where multiple users access large systems through the use of various workstations.
2. Computer Computing: Independent desktops have grown more powerful and can fulfill the requirements of every user.
3. Network computing: where desktop computers connect with laptops and servers via local networks to share resources and enhance performance.
4. Internet Computing: Where local networks connect to other local networks to create a global network like the Internet to utilize remote applications from different sources.
5. Cloud Computing: "Cloud computing has delivered greater shared resources online in a structured and easy way"

#### 2.4. Cloud Computing Models

[26, 27, 28] mentions four primary models of cloud computing technology as follows

1. **Public cloud:** The concept of public cloud describes the infrastructure that is owned by companies from which these businesses can offer their services to the general public. This occurs via private web networks that are operated by the companies. The public cloud is accessible to the general populace. It is controlled by private corporations that provide cloud services, such as Google, for instance. Thus, it enables users to utilize specific resources of a service in the cloud based on the principle of renting at a lower cost compared to owning services. The public cloud is considered to be less secure than other cloud models since all data and applications hosted on the public cloud are susceptible to malicious attacks. An effective solution to this issue is to perform and enforce security checks on both ends, conducted by the cloud service provider and the customer alike.
2. **Private cloud:** It is a technology utilized exclusively by a single company or institution, functioning for that institution by delivering its services and is overseen by the IT department within that institution or company, or by the service provider, who assumes full responsibility for the use of private "cloud computing" technology, regarding the security of the information provided on the technology platform, in addition to the installation, configuration, and operation of the technological infrastructure. The researcher posits that the private cloud resides within the internal data center of the institution or company, and the owner of the private cloud can manage, maintain, and upgrade the software and devices of the cloud, making it straightforward to implement security management and oversee the deployment and utilization process.
3. **Community cloud:** This is a technology that several institutions possess, allowing for the creation of a shared cloud platform among various institutions and organizations aiming to achieve a common goal and purpose: for instance, universities and communication firms. In this technology, the cloud infrastructure is shared, and the community cloud is noted for its capability to distribute the costs among multiple users. Thus, each user incurs a minor expense in return for the provision of their services on the cloud platform.

Furthermore, there is a significant level of security and privacy for the data belonging to the beneficiaries on the cloud platform, as access to this data is only possible with the consent of the companies involved in the community cloud platform.

4. **Hybrid cloud:** It is a blend of public and private clouds. Organizations frequently turn to hybrid computing to take advantage of the private services offered by the public cloud for processing information and data, while also sustaining computer business operations through the private cloud. Consequently, we can state that the hybrid cloud represents a fusion between the cloud host and the dedicated management servers, as the hybrid cloud services are powerful because they provide companies significant control over their private data.

#### 2.5. Applications of cloud computing:

These applications depend on a collection of common servers and resources located in extensive data centers and are overseen by providers of cloud computing services. Below are a few illustrations of "cloud computing applications" [29]

1. **Google Drive application:** This application plays a role in the storage, sharing, and synchronization of existing technological services and is regarded as one of the free sharing platforms online, offering a storage capacity of up to (150) gigabytes and access to document editing tools via it, which aids in delivering new educational capabilities such as the sharing of documents and files online, enabling teachers and their colleagues to collaborate on the same document, thereby fostering idea generation, and the creation of new texts with comments added in the margins, which facilitates direct modifications on shared texts, and thus preserves the confidentiality of information among the participating groups for the same files [30].
2. **Google Slide Presentations:** The application for creating presentations that consists of a collection of slides. This is accomplished using the slide editing tool, which includes a variety of features such as combining videos and animations, selecting transitions between slides, and formatting them. Additionally, it allows for the import and export of different presentation files and offers the option to publish them on web pages, enabling all users to view or share them widely [31].
3. **Location (drop box):** This application offers complimentary storage space, which can be enhanced for certain fees, as the transaction process occurs online, and this platform permits the ability to view the files stored within it, even if the connection to the network is lost, and it also provides the option of storing files on the platform's servers (drop box), rather than keeping them on the user's computer [32].
4. **Docs (Google Docs):** This tool can be utilized for creating documents, processing text, and formatting on the web, allowing users to change files into Google documents and import them, along with the option to translate documents into a different language, in addition to the ability to share documents with others via e-mail.
5. **Google Forms:** By using Google Forms, electronic assessments can be crafted and generated, as well as electronic test forms dispatched through e-mail, with

the option to track the results of the questionnaire or questions, alongside the capability of obtaining a graphical overview of the assessment or questionnaire outcome <sup>[33]</sup>.

6. **Google Classroom:** It serves as a digital educational platform offering numerous services to educators, pupils, and learners, and it also aids in the creation of virtual classrooms <sup>[34]</sup>.

### Cloud Computing Features

Each of <sup>[35, 36]</sup> pointed to a collection of attributes of cloud computing, which include the following

1. **Cost:** The utilization of cloud services is noted for its very low expense, as there is always an external entity that supplies the infrastructure, enabling students and learners to access all cloud services without any charge.
2. **Device and location independence:** Users can access the cloud through a standard web browser without needing to connect to particular operating programs or requiring a specific device or a geographical proximity to the cloud.
3. **Versatility:** Resources and services can be shared among a broad range of beneficiaries and users, which is facilitated by the hub of cloud infrastructure, thereby enhancing cloud efficiency and loading speed.
4. **Reliability:** If operations are conducted from various locations on the same cloud, and subsequently issues arise at a particular location among these sites, this does not affect the other cloud sites and does not diminish their performance.
5. **Scalability:** "The utilization of the cloud relies on the service on demand, which signifies the gradual allocation of services to users without putting excessive strain on the cloud platform."
6. **Security:** The information that is kept on the cloud is noted for its security owing to the centralization of data via the cloud, which simplifies both the management of it as well as overseeing it.
7. **Maintenance:** The tasks for cloud upkeep are straightforward and can be carried out easily, since they are only connected to the main server device, which the cloud entirely relies on for managing its applications, and the maintenance actions do not necessitate any activities on the devices of beneficiaries and users.
8. **Measurable:** All resources and sources of the cloud can be quantified through each beneficiary or user based on a daily, weekly, monthly, or yearly schedule.

### 2.7. Advantages of Using "Cloud Computing" in Education:

There are numerous studies that highlight the necessity to broaden the application of "cloud computing applications" in education to address the issues of conventional education, where <sup>[37-39]</sup> pointed out several benefits associated with using cloud computing as follows:

1. **Virtual classrooms:** Virtual classrooms serve a crucial and essential function in replacing traditional classrooms to enhance the learning process through the Internet, and to transform this sector. There exists a wide array of applications and tools accessible via the Internet that can assist in the educational, learning, and engagement process. Students and learners from various locations can be united in a single virtual

classroom, where they can exchange views, engage in discussions, and subsequently collaborate on shared programs and projects.

2. **Reduced expenses:** Utilizing applications for cloud computing is an economical process, since there is no longer a requirement to purchase computers with advanced and specific specifications to serve as servers for organizations or individuals; rather, any standard computer can access various cloud services and execute all necessary tasks through an Internet browser.
3. **Simplicity of execution:** Cloud computing applications offer students and researchers a user-friendly and efficient academic experience, as the cloud consolidates all data and information in one location and offers up to (15) gigabytes of storage space, enabling everyone to utilize the infrastructure provided by cloud computing services to conduct scientific tests and experiments.
4. **Convenient accessibility through mobile devices:** Students and faculty can connect to the Internet via the cloud using laptops and smartphones, so they can easily access educational content, and these devices facilitate ongoing collaboration and communication between users no matter where they are situated.
5. **Uninterrupted service continuation:** The utilization of "cloud computing applications" guarantees that the learner or student operates continuously without interruptions, as the organization delivering the computing service is dedicated to offering support 24/7.
6. **Employing online explanatory tools:** All learners, students, and faculty members have access to numerous simulation and video resources for elucidating, clarifying, and sharing issues. Help can be sought from online platforms, enabling the exploration of innovative and exceptional educational approaches.
7. **Protected setting:** Everything that is generated and accessible through "cloud computing applications," and stays within the registered limits, can be accessed and entered by any unauthorized student or learner.
8. **Collaborative licenses:** Utilizing applications for cloud computing does not necessitate that students or learners possess licenses to use those applications or programs, since they operate under a single license from the institution that owns the server.

### 2.8. Challenges Facing the Use of Cloud Computing Technology

<sup>[40-43]</sup> refers to a set of challenges facing the use of cloud computing as follows

1. Administrative and organizational factor:
2. Absence of a strategy and long-term plans for businesses.
3. Not adhering to the designated timeframe for the transition and staying within the defined financial budget for it.
4. Failure to maintain ongoing communication and collaboration among stakeholders involved in this initiative.
5. The insufficiency of support from senior management within the organization; all these elements pose significant hurdles to the successful advancement of the project towards cloud adoption.
6. **Technical aspect: Security risks:** These arise from the challenges associated with ensuring data and privacy, as

there exists concern among officials in companies generally and telecommunications firms specifically. This apprehension is manifested in the scarcity of data and information within the physical setting of organizations, alongside the fact that the management process is overseen by a third party (service provider), in addition to the reality that data and information are predominantly transmitted via the Internet, resulting in potential theft and hacking.

7. **Internet network:** A significant risk and challenge linked to cloud computing is its reliance and dependence primarily on Internet connectivity. If there is a loss of connection to this network, we effectively lose access to the cloud, which means we cannot retrieve data, information, and applications. This critical issue represents a risk factor not just for the users of cloud computing, but also poses a threat to the service provider as it obstructs service delivery to customers.
8. **Data management and loss:** There is a significant chance of losing the data and information that is available on the cloud, whether it is the data of service providers (cloud computing technologies service) or that of the beneficiaries. Thus, without a backup of the beneficiaries' data on the cloud, that data will be at risk of being lost and consequently jeopardize the beneficiaries' data.
6. **Efficiency or performance of applications:** Although the applications that are available on cloud computing may have a fast Internet connection, they can still be slow, particularly when the cloud platform network is under pressure from beneficiaries and users. Consequently, some applications might experience a slowdown due to some servers being in a state of sluggishness, which will cause disruptions in immediate access to several applications by users.
7. **Training and support:** Faculty members might require continual training and support to comprehend and utilize cloud computing technologies efficiently. Adequate training programs and support resources should be made available to help with technical and educational obstacles.
8. **Integration with existing systems:** Faculty members might encounter challenges in merging the cloud system with the current systems used at the university. This could necessitate additional efforts to transform existing learning materials into cloud-compatible formats and educate members on utilizing cloud tools and applications.
9. **Privacy and data portability:** One of the challenges and issues surrounding the use of "cloud computing technology" is the risk of losing or exposing the data of beneficiaries to unauthorized individuals or organizations, especially if the data is stored in a public cloud that permits sharing of its resources.

## Previous studies

### Study <sup>[44]</sup>

This research intended to define the concept of "cloud computing" and its objectives and components, and to examine the current reality of cloud computing usage by institutions and organizations, as well as identify the key challenges and difficulties encountered in utilizing this contemporary technology, and subsequently assess the

present and future risks along with the most significant challenges and difficulties for these applications. To carry out this study, the researchers based the data collection process related to the study's themes on the questionnaire as a research tool. The study adopted a descriptive methodology. This study reached a conclusion outlining several challenges and difficulties confronting cloud computing. The most notable of these challenges include: the absence of Internet access or the continuous occurrence of interruptions in it, in addition to a lack of sufficient trust and awareness regarding the importance of utilizing "cloud computing technology," whether in public or private sectors, as well as an absence of a clearly defined infrastructure adequate for developing cloud computing in governmental institutions. This study suggested the necessity of providing the prerequisites for "cloud computing applications" to be implemented in governmental institutions.

### Study <sup>[45]</sup>

This research sought to determine the extent of engagement of faculty members at Imam Muhammad bin Saud Islamic University with cloud computing applications in academic education and learning. The study employed a descriptive methodology. The sample for the study comprised all faculty members at Imam Muhammad bin Saud Islamic University. The researcher selected the sample randomly and it included (353) individuals. A questionnaire was utilized as the instrument for data collection. The findings of the study indicated that all faculty members agreed, to a significant extent, on the necessity of enhancing the use of cloud computing applications in the teaching process. The results demonstrated their strong inclination towards promoting the utilization of cloud computing applications in the teaching process.

## 3. Research Methodology and Procedures

### 3.1. Presentation and analysis of the study results

**This section focuses on data presentation, as the researcher utilized the questionnaire as a primary method for collecting data.**

1. "The researcher purposefully chose the research sample to guarantee the uniformity of the research sample. The researcher selected (20) faculty members from the Department of (Horticulture and Garden Engineering) at the Faculty of Applied Sciences, Samarra University, as well as (20) faculty members from the Department of (Field Crops) at the Faculty of Applied Sciences, Samarra University. Consequently, the total research sample consisted of (40) members categorized by gender and specialization variable" are displayed in the following table.

**Table 1:** Distribution of the research sample by gender and specialization variable

Variables	Specialization
Male members	30
Number of female members	10
Total	40

- The paragraphs of the questionnaire were written based on the five-point Likert scale. The questionnaire was created in its initial version and contained two axes:
- "The first axis: What benefits do faculty members in the

Faculty of Applied Sciences, University of Samarra, gain from using "cloud computing applications," and this axis comprises (10) paragraphs. "

- "The second axis: What difficulties do faculty members in the Faculty of Applied Sciences, University of Samarra, encounter when using "cloud computing applications," and this axis includes (10) paragraphs. "

### 3.2. Validity of the research tool (questionnaire)

#### Validity of the research tool (questionnaire)

To confirm the evident validity of the questionnaire paragraphs, the researcher submitted them to a selection of knowledgeable and skilled arbitrators to determine their appropriateness and formulation as well as how effectively they met the intended purpose for which they were created. The arbitrators expressed their endorsement of the

questionnaire, and their feedback was mainly focused on adjusting the phrasing of certain paragraphs within the questionnaire. These suggestions were accepted, and the opinions of the arbitrators were regarded as evidence of the questionnaire's apparent content validity. The questionnaire was presented in its ultimate form, with a total of (20) paragraphs.

### 3.3. Tool stability:

The reliability of the questionnaire was confirmed by employing the Alpha Cru Nebbach technique to determine the reliability coefficient of the questionnaire, during which the reliability coefficient of the questionnaire dimensions was computed. The outcomes demonstrated that the research instrument exhibits stability, as indicated in the following table":

**Table 2:** The stability coefficient of Alpha Crew Nabakh for the questionnaire axes.

Questionnaire axes	Number of items	Cronbach alpha stability coefficient
The first axis: Advantages of using cloud computing applications by faculty members at the Faculty of Applied Sciences, /Samarra University	10	0.85
The second axis: Challenges of using cloud computing applications by faculty members at the Faculty of Applied Sciences of Applied Sciences, /Samarra University	10	0.64

### 3.4. Presentation and Discussion of Results

#### View and discuss the results.

**First: Presentation and discussion of the results related to the first question: What are the advantages of using "cloud computing applications " by faculty members at**

**the Faculty of Applied Sciences, /University of Samarra.**

In order to answer this question, the researcher calculated the arithmetic averages and standard deviations of knowledge. The respondents answered about the advantages of using applications for cloud computing.

**Table 3:** The arithmetic averages and standard deviations of the answers of the study sample on: The advantages of using applications for cloud computing by faculty members in the Faculty of Applied Sciences, /Samarra University "

The order of the paragraph in the questionnaire	Paragraph order after statistical processing	Paragraphs	Mean	Standard Deviation
5	1	The utilization of "cloud computing applications" aids in the sharing of scientific resources among faculty members.	1.97	1.320
9	2	The utilization of "cloud computing applications" assists in obtaining and saving data and scientific studies in significant quantities.	1.92	1.288
2	3	The utilization of "cloud computing applications" helps enhance the quality of education in universities.	1.85	1.251
1	4	Utilizing "cloud computing applications" simplifies the process for educators to access data and information more quickly.	1.82	1.237
3	5	The utilization of cloud computing applications enhances the potential for self-education.	1.77	1.164
4	6	The implementation of "cloud computing applications" enhances the standing of universities.	1.74	1.126
7	7	The utilization of "cloud computing applications" aids in staying up-to-date with recent advancements in educational methods.	1.70	1.042
10	8	The utilization of "cloud computing applications" simplifies the process for faculty members to publish research and scientific materials effortlessly.	1.64	0.580
8	9	The utilization of "cloud computing applications" enables faculty members to store data and information centrally.	1.62	0.627
6	10	The utilization of "cloud computing applications" eliminates the requirement for universities to have a team focused on hardware and server upkeep.	1.60	0.631

**Second: Presenting and discussing the results related to the second question: What are the challenges of using applications for cloud computing by faculty members at the Faculty of Applied Sciences, /University of Samarra in**

order to answer this question, the researcher calculated the arithmetic averages and standard deviations of knowledge. The research sample answered the challenges facing the use of applications for cloud computing.

**Table 4:** Arithmetic averages and standard deviations of the answers of the study sample on: Challenges of using applications for cloud computing by faculty members in the Faculty of Applied Sciences, /Samarra University "

The order of the paragraph in the questionnaire	Paragraph order after statistical processing	Paragraphs	Mean	Standard Deviation
1	1	Weak infrastructure of universities regarding the availability of electronic devices and necessary technologies.	1.79	1.323
2	2	Insufficient abilities necessary to manage "cloud computing applications. "	1.77	1.250
6	3	Applications for cloud computing necessitate prior training from faculty members.	1.74	1.170
8	4	The shortage of adequate technical personnel in laboratories is one of the factors that restrict the utilization of "cloud computing applications".	1.72	1.061
10	5	The inability of universities to provide financial rewards is a significant factor contributing to teachers' hesitance in utilizing cloud computing applications.	1.71	1.042
4	6	Insufficient understanding among certain individuals employed in universities regarding the significance of utilizing cloud computing applications.	1.67	0.970
3	7	Issues concerning the security and safeguarding of data and information.	1.65	0.892
9	8	Insufficient resources available for acquiring cloud hardware and software.	1.62	0.490
7	9	Hesitation to utilize cloud computing applications because of concerns regarding hardware damage.	1.60	0.495
5	10	Unstable internet connectivity issues.	1.54	0.817

#### 4. Discussion on The Research Findings

Through the research questionnaires, a collection of results was disclosed that pertains to the themes of the current study and are as follows:

- "Regarding the first axis: What are the benefits of utilizing applications for cloud computing by faculty members at the Faculty of Applied Sciences, /Samarra University": The research findings indicated the most significant of these benefits: The utilization of applications for cloud computing aids in the process of sharing scientific resources among faculty members Table No. (3), and also that the utilization of applications for cloud computing assists in retrieving and storing information and scientific research in large volumes Table No. (3), and also that the utilization of applications for cloud computing plays a role in enhancing the educational level in universities Table No. (3), in addition to that the utilization of applications for cloud computing facilitates quicker access for teachers to data and information Table No. (3), as well as the utilization of applications for cloud computing contributes to expanding opportunities for self-learning Table No. (3).
- "For the second axis of the research: What are the challenges of using cloud computing applications by faculty members at the Faculty of Applied Sciences, /University of Samarra":

The research findings indicated the most significant of these challenges, which are: the inadequacy of university infrastructure regarding the availability of electronic devices and essential technologies. Table (4), and also the insufficient skills needed to handle cloud computing applications. Table (4), and additionally, cloud computing applications require prior training for faculty members Table (4), along with the lack of adequate technical staff in the laboratories being one of the factors that restrict the utilization of cloud computing applications Table (4), as well as the universities' failure to provide material incentives being a crucial factor contributing to the

hesitance of teachers to adopt cloud computing applications. Table No. (4)

#### 5. Recommendations

1. Conducting training sessions to qualify and prepare faculty members in universities on the use of applications related to cloud computing.
2. Offering up-to-date electronic devices, technologies, and software in computer labs at colleges and universities, to facilitate the effective use of applications related to cloud computing.
3. Taking initiatives to supply technical and specialized personnel in computer labs at universities, with the purpose of training students in the skills necessary for utilizing applications related to cloud computing.
4. Providing Internet access at suitable and stable speeds in computer labs.
5. "Raising the awareness of faculty members in universities about the significance of using applications related to cloud computing. "
6. Encouraging universities to offer financial incentives to educators who implement applications related to cloud computing.
7. Motivating faculty members to assist and guide students in the use of "cloud computing applications. "
8. Establishing centers focused on applications related to cloud computing in universities, equipped with the latest tools, technologies, and devices.
9. "Perform additional research and studies on the application of cloud-related tools in different academic settings. "

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