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Cloud-Based Centralizing system for academic history, plagiarism prevention management in Higher Education Institution IN DRC: Benefit, Challenges

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ABSTRACT: *Cloud computing is becoming increasingly popular in the twenty-first century, with demand coming from all sectors of industry, including higher education institutions. In this paper, we address the benefits and limitations of cloud computing in the context of higher education institutions in DRC. Adopting modern cloud computing technology is projected to minimize the cost of IT-based solutions and services, as well as ICT infrastructure. The purpose of this work is to establish a system on cloud based that will enable the centralization and exchange of data on students' academic careers, to prevent plagiarism, to avoid fraud and falsification of transcripts, Share the researches and academic works between the universities to avoid plagiarism. Many challenges must be resolved before cloud computing can be successfully deployed in higher education.*

KEYWORDS: Cloud computing, benefits, challenges, higher education institution, DRC and IT

INTRODUCTION

With the advent of technologies like "Cloud Computing," which is considered to be the fifth generation of computing after client-server computing, mainframe computing, personal computing, and mobile computing, the Internet is rapidly evolving from a traditional medium of merely providing information to users to an indispensable requirement for the users who want to store data, perform computations, and even run software applications at any time from any part of the world. [2]Cloud computing is a concept that has been researched more and more in some recent years. However, it is not an entirely new technology. The services and applications of cloud computing are growing steadily at a rate of about 40% per year [3].

By providing many benefits for training such as availability, scalability, agility, elasticity, and reliability for on-demand services to make teaching, learning, collaboration, information, and research more accessible, information technology can help reduce the excessive cost associated with its resources.

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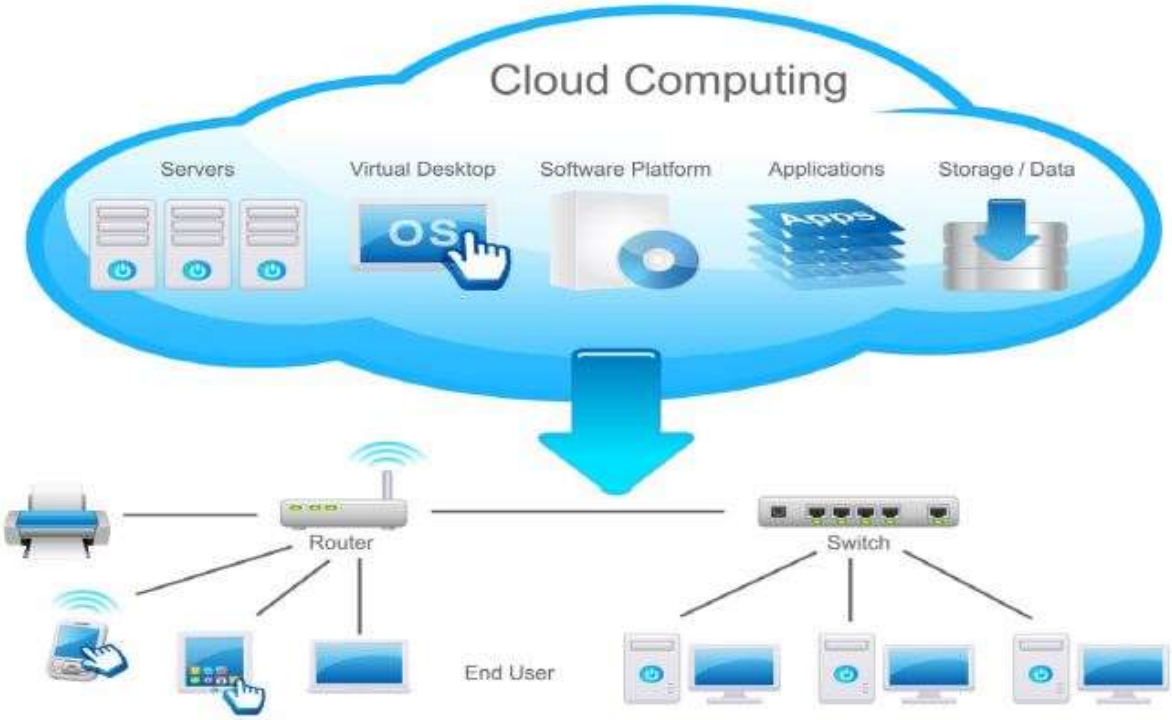
Students and instructors have the chance to increase their productivity thanks to the rapidly expanding interest in and use of cloud computing, particularly in education. [4], In [5] the authors showed that, Additionally, it enables the client to store their critical information and access it whenever they need to, from anywhere via the internet.
The cloud services and applications enable the client to store and access their local data in the remote data centre by using their personal computers, or mobile devices. The delivery of IT resources as services through the Internet is referred to as cloud computing. This contrasts with hosting and running these resources via pay-per-use, monthly or yearly subscriptions, or pay-per-use. Cloud computing has characteristics like virtual infrastructure, network access, scalability, flexibility, and management as well as metering that distinguish them from other common Internet services
Technology [6].

Model Cloud Computing



Cloud computing's usage in education is not a recent development. The majority of developed nations, including the USA, Europe, and Japan, already use cloud computing in their universities.
In order to reduce costs, several government departments have installed ICT infrastructure.
Cloud computing is no longer useful for improving the teaching and learning process in the educational industry [6].

Higher education and universities in the DRC, a booming sector, are becoming increasingly competitive. There are more private and public higher education institutions available to students **[7]**, making it easier

for them to move around. This makes it more difficult for national and international organizations to access information about students' academic careers, which can lead to fraud and the falsification of documents. Universities and other higher education organizations can lower the danger of fraud by exchanging information about academic backgrounds by using a centralizing system in cloud.

In fact, a student's academic history serves as both a reputation for the worth of the credential in the DRC as well as a key indicator of his employability.

The purpose of this work is to establish a system on cloud based that will enable the centralization and exchange of data on students' academic careers, to prevent plagiarism to avoid fraud and falsification of transcripts, Share the researches and academic works between the universities to avoid plagiarism, Share information and service of different universities to reduce services and infrastructure costs and manage universities activities securely and efficiently, Manage the large volume of data and information on different university department or campuses efficiently to retrieve the necessary information in real time by the Ministry of education ;also known as information services on university rankings, provide benefits to the nation, national and international organizations, and their citizens .

In [7], the authors considered the lack of infrastructure, maintenance of that infrastructure (if it exists), and upkeep of a vast variety of hardware and software devices are some of the most significant difficulties schools and universities encounter while trying to provide education.

These solutions may be made available at a fair price with the use of cloud computing. The term "stakeholder" is used to describe everyone who has access to educational services in higher education institutions, including students, lecturers, researchers, staff members [8], etc.

The main cloud computing stakeholders at higher education institutions are shown in Figure

LITERATURE REVIEW

In [9], the authors asserts that virtualization, utility computing, elasticity, distributed computing, grid computing, storage, content outsourcing, security, and web 2.0 are all components of the new technology known as cloud computing. There are various forms of cloud computing, each with their own benefits and delivery methods.

Three various cloud deployment models, including public, private, and hybrid, are described in the literature reviews.

[1] Delimits it as “Cloud computing is an emerging approach to shared infrastructure in which large pools of systems are linked together to provide IT services.”, as one of the most well-known service providers of cloud computing to the corporate sector, IBM's definition was included.

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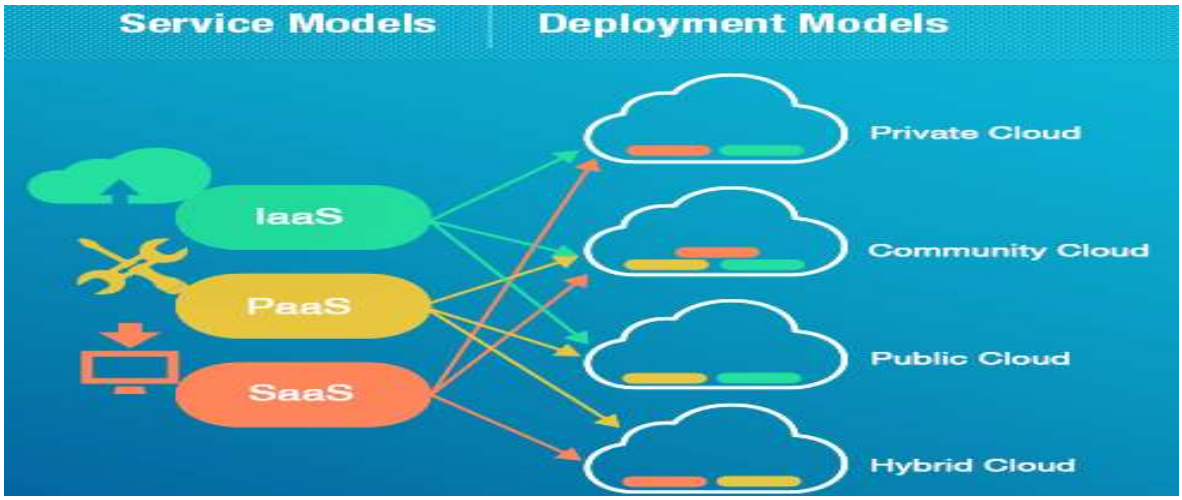
All three paradigms (IaaS, PaaS, and SaaS) are offered by IBM Smart Cloud, Software as a service (SaaS), Platform as a service (PaaS), and Infrastructure as a service (IaaS). In the SaaS model, users have remote access to apps that the service provider hosts and maintains so that clients can use them whenever they choose.

In PaaS, service providers provide an environment for developers to create or modify their apps.
IaaS is a self-service model that gives developers access to totally remote infrastructures in the data center, such as virtual machines, storage, networking services, etc. The cloud vendor enables this access, monitoring, and management through the use of a web interface.

Security is currently the top worry and biggest difficulty in cloud computing, along with trust difficulties connected to how people access and share services in a situation where it's unknown who may obtain and handle their data.



Cloud Educational Models

Modern informational technologies are not necessary for educational institutions to operate effectively in the twenty-first century. In addition, maintaining and developing one's own IT infrastructure is quite expensive and requires frequent updates. The level of the stated expenses is increasing yearly.
The institutions are investing significant sums in hardware, software, and technical and telecommunications equipment. The need for expenditures to sustain the staff's high degree of professionalism is another crucial concern [6].

Higher institution cloud-based is a centralized system that has several management information systems software embedded together to make up enterprise software.

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Users may manage and access data via the internet thanks to the use of cloud computing. The main users of a typical higher education cloud include the Ministry of Higher Education, students, faculty/department, Universities' s administrative staff, Examination Branch and Admission Branch, as shown in Figure 1. All the main users of the institution are connected to the cloud. Separate login is provided for all the users for their respective work. Institutions can upload their students' research and results to the cloud server so that other universities' members and the Ministry of Higher Education can utilize it to identify examples of document manipulation, plagiarism, and cheating in students' submitted research work and transcripts. Sharing information is essential to facilitate cloud-computing infrastructure. In cloud computing infrastructure, the Ministry of Higher Education can easily and quickly manage all information related to the universities such as the numbers of student among universities (local and international), the amount of graduate student (local and international), the number of lecturers (local and international) and all related information [10]. Using the Cloud computing services the Ministry of Higher Education caneasily monitor and access all the resources for higher institutions [11] . For instance, the Ministry of Higher Education can know the requirements of each university so that they can take action directly.

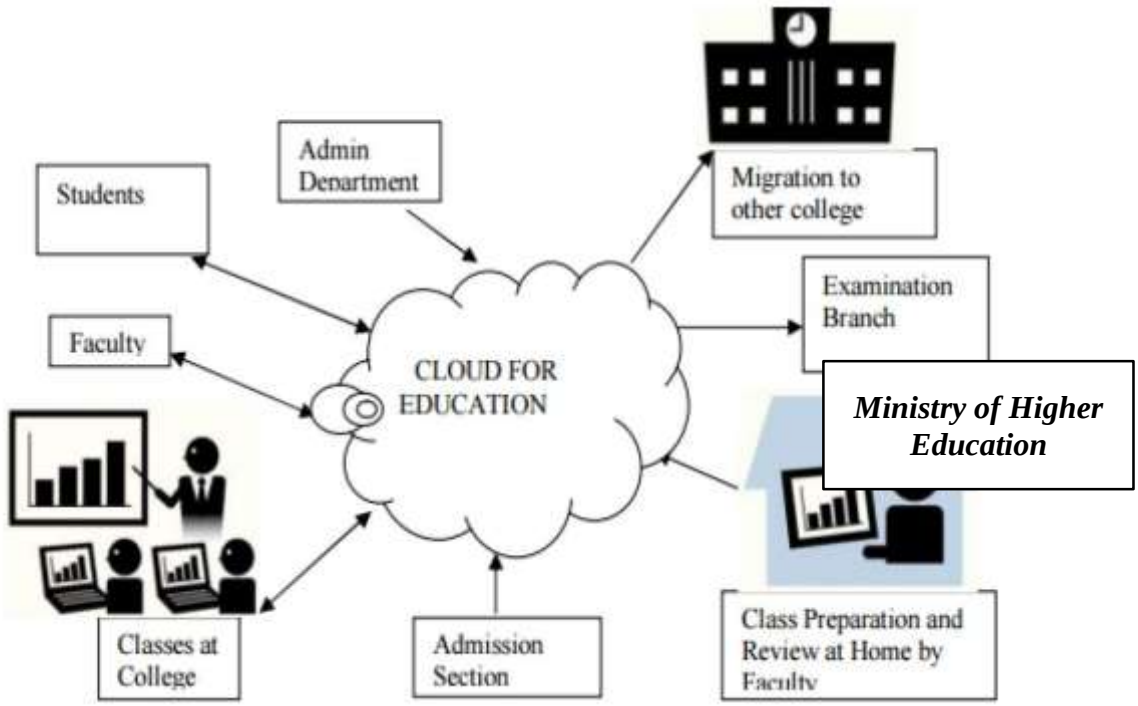

Figure 1: Diagram of cloud computing implementation in education system

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In numerous nations, including the United Kingdom (UK), Australia, Lithuania, the United States, and USA, cloud computing technology has been integrated into the educational system.

Table 1.0 Democratic Republic of Congo higher education cloud Model

education institutions	**Application/system**	**Cloud Computing Benefits**
	▪ Integrated Library system ▪ Research system	(SaaS , PaaS and LaaS) - Share the researches and academic works between the universities - Plagiarism detection - communication among the researchers, students and faculty members
	▪ E-portal (Student system Registration, academic history Management)	- Manage the large volume of data and information on different university department or campuses efficiently to retrieve the necessary, information In real time about their academic background. - Ministry of Higher Education can easily monitor and access all the resources for higher institutions - Control of student mobility - Control migration from one university to another
		- Disaster Recovery system - Big Data management - Cockpit for management - Green ICT environment

Using cloud computing, they can create a collaborative group more easily. It allows them to upload files or documents and gives the ability of sharing PCs to PCs, unlimited number of users [12].

It will help to facilitate the students, lecturers and Ministry of Higher Education to store data on the cloud. Use of cloud computing will provide services to universities that are more systematic and available 24/7.the author in [13] Since cloud computing programs and data are hosted online, they have high availability and are accessible to users at any time and from any location.
Here are some advantages that DRC's higher education system will experience as a result of adopting cloud computing:

1. **Constructing a bridge in education**: Implementing the cloud computing in higher education to build the information bridges among the higher education institutions.
This educational bridge will enable the Ministry of Higher Education to monitor university statistics, and by registering a student, we will have a way to check his academic record to prevent fraud and false statements. In addition, this will enable teachers to spot instances of plagiarism in research.

2. **Reduced spending on technology infrastructure in higher education institutions:** Maintain simple information access with little outlay of cash. The cost of the higher education institution will depend on utilization. [14]

3. **Low-cost workforce globalization:** Using cloud computing, nationwide educational network can be set up.
4. Simplify procedures: Less manpower can be used to do tasks in an efficient manner**.**

5. Improved networking between universities: Higher education institutions have 24 hour access to information anytime, anyplace. [15]

6. Disaster recovery Centre: To cut expenses, only one disaster recovery center will be constructed for use by all higher education institutions in the Democratic Republic of the Congo.

CHALLENGES OF CLOUD COMPUTING IN HIGHER EDUCATION

Whether a cloud-based ERP solution is being implemented from scratch or as a migration from an existing one to the cloud as SaaS, the main issues vary to some extent. Furthermore, both approaches face the same major difficulties [16].

Using cloud computing in education in a way that would support its quick and significant growth.
The biggest obstacles to educational institutions' early embrace of technology include a lack of resources and competence, security, and compliance.The Democratic Republic of the Congo is still working to improve the effectiveness and speed of Internet access in rural regions as a developing nation. The country is having trouble deploying a cloud computing system widely in the management of higher education due to the system's ongoing weaknesses.

This is due to the fact that using cloud computing requires consistent, high-speed Internet access. Data cannot be rapidly or conveniently retrieved or stored without an Internet connection.
The demand for knowledge has increased as more schools and universities are moving more workloads to the cloud.This problem can be solved by training IT and development employees.
Although data centers do implement strict security procedures, worries regarding cloud security persisted [17].

Cloud computing security covers a wide range of topics, including network security, data security, compliance, governance, and more.

In [18] , the authors conducted a state-of-the-art study on cloud security and came to the conclusion that the top three security difficulties enterprises face when adopting the cloud are legal concerns, compliance issues, and a loss of data control.

Other studies identified top cloud security threats as listed below [19] [20] :

- Relying on the security model of the vendor
- Physical loss of control
- International privacy legislation and the dissemination of data
- Promises for service quality
- The possibility of widespread outages
- Cloud service abuse and nefarious insiders
- Service Phishing, buffer overflow attacks, and password loss are examples of traffic hijacking.
- Service dependability of cloud providers
- Data management, security management, and lock-in
- Transfer security, firewalling, and security setup for networks
- Cryptography, redundancy, and disposal for data security

The cloud infrastructure is always a resource that is available to anyone. As a result, cybercriminals use it as their main target.Both insiders and outsiders may launch harmful attacks against cloud computing infrastructure and services. Attacks through side channels, identity theft, and the dissemination of malicious code have all been recorded [2]. Therefore, it's important to thoroughly assess and maintain security management in cloud systems. The price of cloud management and the speed at which files are uploaded. For instance, the cost of specific modifications to satisfy educational demands could quickly rise in the cloud. Large data uploads can take a while, which is frustrating and inconvenient for daily operations. The complexity of constructing a private cloud, determining which services should go to the cloud, governance and control issues, and performance problems are additional difficulties. Moreover, as our research explores the challenges in deploying cloud systems in educational institutions, it's essential to address the issues associated with diverse data sources. M. Muniswamaiah, T. Agerwala, and C. C. Tappert, in the paper titled 'Approximate Query Processing for Big Data in Heterogeneous Databases,' present a valuable approach to managing data from heterogeneous databases efficiently, offering insights into optimizing query processing and mitigating issues related to data diversity, a subject highly relevant to our investigation.

CONCLUSION

Cloud computing has become a prominent topic, and it is seen as the next generation of IT enterprise design.Cloud computing is expected to dominate the IT sector in the future years.Cloud computing offers substantial benefits to higher education organizations striving for global education rankings. Cloud computing faces obstacles in higher education, such as a lack of competence, security and privacy, and internet speed in Democratic Republic of the Congo rural areas.

By implementing the cloud, computing in higher education is to build the information bridges among the higher education institutions.This educational bridge will enable the Ministry of Higher Education to monitor university statistics, and by registering a student, we will have a way to check his academic record to prevent fraud and false statements. In addition, this will enable teachers to spot instances of plagiarism in research.

Institutions can upload their students' research and results to the cloud server so that other universities' members and the Ministry of Higher Education can utilize it to identify examples of document manipulation, plagiarism, and cheating in students' submitted research work and transcripts.

Cloud computing, on the other hand, has the potential to become a safe, practical, and economically feasible IT solution in the future through cost savings, information sharing, quick access, storage, and easy operations in management systems in higher education institutions.

Many of these organizations that use cloud computing trust in its promise of increased accessibility and efficiency. These will incentivize institutions to use cloud-based services. According to [21], today's cloud computing providers present higher education with the option of substituting a presence in "the cloud" for institutions' current data centers, servers, and apps, so replacing these machines' conventional physical presence on campus.

This study advises that academics look at the prospect of making data centers' roles in higher education institutions more dynamic.

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