

IMPACT OF CLOUD COMPUTING IN EDUCATION SECTOR

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Abstract - With the development in the economy, education has become a major factor in ensuring economic growth of the country. Nowadays, students are expecting more technology - related services from their schools as they have more technological awareness. Teaching - Learning process uses more advance technology. It has now become important to prepare them for better tomorrow and to keep pace with their changing needs.

Education institutions are constantly under pressure to deliver more services and tools for a lesser price. Those education institutions that can provide these sophisticated information technology (IT) environment, will help their students find better job opportunities in the future. Cloud computing can play an important role in providing these solutions.

Public or private leaning institutions can take maximum advantage of cloud computing technology to ensure high quality service regardless of the minimal resources available. The impact of cloud computing in education is very clearly visible. Educational institutions are making use of the cloud to accelerate collaboration between schools and their students.

Keywords: *Cloud, Benefits, Drawbacks*

1. INTRODUCTION

Over the past few years, advanced technology and cloud computing have caused brilliant modification in education and the way students learn. Student accessibility services work to make sure that all the needs of students are satisfied. There may be some students who may face difficulty regarding mobility outside of school and may find it difficult to attend lectures. The fact is, students are not always in condition to attend the class physically. With the increase in eLearning, accessibility for all students is changing in their favor.

Similarly, sharing notes for the teachers has never been easier as well. Before notes were handwritten and then students used to copy manually by hand or get it photocopied. But with the advent of Cloud computing in education, you can share notes with your friends from anywhere with an internet connection. Not only that, teachers are also able to share valuable information and additional resources with students. It's no longer a question of having to be physically present at the right place and at the right time, cloud computing enables for the distribution of resources for everyone.

Cloud computing is the distribution of various services and resources with the help of Internet. These resources include tools and applications like databases, web servers, data stores, networking and software. Cloud computing is of a great choice for people and organizations for a number of reasons such as speed, efficiency, cost savings, increased productivity, security and performance.

Rather than owning their own infrastructure for computing or data centers, companies can now rent or access to anything from applications to storage from a cloud service provider.

One of the biggest advantages of putting into effect, the cloud computing services in the business organization is that it can avoid the cost and difficulty involved in owning and maintaining their own infrastructure for Information Technology, and instead of that they have to simply pay when they use and for what they use it. In return, providers of cloud computing services can benefit from significant economies of scale by providing the same services to a large number of customers. Cloud computing

service provider provides a wide range of alternatives, from networking, storage facility and processing to natural language processing and artificial intelligence. Any such services that does not require you to be physically close to the computer hardware that you are using can now be delivered via the cloud [1][2].

Even though many benefits are associated with cloud computing, it also has various limitations that emerge from the fact that all applications and resources are situated within the internet. In Cloud computing teachers and students not only have free access to different applications and services within the cloud in the education sector, but it also guarantees mobility and flexibility in the utilization of resources. It also helps in creating a customised teaching - learning environment. Cloud computing makes sure that students, trainers as well as staff can access any form of information from anywhere, with the help of any type of device. Thus, private as well as public academic organisations can utilize this type of cloud technology for providing improved services using the limited resources.

The implementation of cloud computing in educational institutions has provided many advantages to universities, colleges and schools. Cloud computing is cost effective thus it will prove efficient where there are minimum resources. Moreover, the productivity of IT staffs is increased with the use of cloud computing. In recent times, cloud platforms like Google and Microsoft are providing various application and services totally free of cost to their staff and students in different academic organizations.

In the remaining section, we have discussed the following topics like the basic characteristics of cloud computing, services provided by cloud computing as well as challenges concerned with cloud computing services. We have also discussed about the current scenario of our education system. Then we have also stated about the benefits and challenges involved in education cloud computing technology.

2. CLOUD COMPUTING

Cloud Computing can be defined as a pool of computing resources, services and applications that are delivered on the internet.

2.1 CHARACTERISTICS OF CLOUD COMPUTING

In this section, we will discuss some of the important characteristics [3] that a cloud should have. The following are the characteristics of a cloud.

1. On-demand self-service

Cloud computing resources can be provisioned without human intervention from the service provider. An organization can provision additional computing resources such as database, storage space, virtual machine instances, and so on as and when needed without approaching the cloud service provider.

2. Broad network Access

Cloud computing resources are easily available over the network and are accessible by a variety of customer platforms. It means that cloud services are available over a network such as the internet, or it could also be a local area network (LAN).

3. Resource Pooling

The meaning of Resource pooling is that the same physical resources are shared by multiple customers. The resource pool of service provider should be fairly large and flexible enough to serve the needs of multiple clients and to provide for economy of scale. Basically, the customer has no idea or knowledge about the exact location of the resources.

4. Rapid Elasticity

The ability to quickly add resources in the cloud when manufacturing organizations need them and to remove them when they don't need them is one of the important characteristic about cloud computing. Cloud computing resources are scalable. That is, it can automatically scale the resources, up or down according to business demands. Therefore, the usage, capacity and cost, can be scaled up or down with no additional contract or penalties. Elasticity means that any of the cloud computing resources can be easily provision and de-provision by manufacturing organizations.

5. **Measured Service**

The consumption of Cloud computing resources is computed and the respective organizations have to pay for the resources which they have used. The provider and consumer of the utilized service can monitor, control and report about the usage of any resource to ensure transparency. The cost calculation is based on the principle - “pay for what you use”.

2.2 **CLOUD DEPLOYMENT MODELS**

1. **Public Cloud**

Public Cloud is a type of cloud that allows the clients/users to easily access the system and its services. Some of the examples of those companies which provide public cloud facilities are IBM, Google, Amazon, Microsoft, etc [4]. This type of cloud service can be used openly and easily by any clients. A public cloud does not mean that the data of the user is globally been seen by other people because vendors of public cloud usually provide greater access control mechanism for their users. This type of cloud is of greater priority to businesses although it has low privacy issues.

2. **Private Cloud**

Whereas, the public cloud is available to general public, a private cloud can be owned by a specific company or organization. That is why it is also known as corporate cloud or an internal cloud. ‘Internal Cloud’ [5] means that it allows the accessibility of systems and services within a specific boundary or organization. Only authorized users are allowed to access private cloud, providing the organizations greater control over data and its security. Private cloud should be owned by only those business organizations that have dynamic, critical, secured, management demand based requirement.

3. **Community Cloud**

In community cloud, various organizations having same type of backgrounds share their infrastructure and resources. Such organizations include banks, government organizations, or commercial enterprises. Same amount of privacy, performance, and security are shared among members of this community cloud.

4. **Hybrid Cloud**

Hybrid Cloud is the combination of both: public cloud and private cloud. They can still remain as individual entities. Generally, this type of cloud is used for large organizations where in deployment of a single cloud may not be sufficient to meet its workload. Tasks that are not so critical in nature, such as development and test workloads can be done using public cloud whereas critical tasks that are sensitive such as organization data handling are done using a private cloud. Therefore, a hybrid cloud hosting can attain the benefits of both deployment models as well as the community deployment model.

2.3 **SERVICES PROVIDED BY CLOUD COMPUTING**

Cloud computing provides various types of services. Among them, there are three main categories of services [8] that it provides.

1. **SaaS (Software-as-a-service)**

SaaS is a method for providing software applications over the Internet according to the demand and on the basis of subscription. SaaS helps you host and manage the software application and underlying infrastructure and handle any maintenance like software upgrades.

2. **Infrastructure-as-a-service (IaaS)**

IaaS is the most basic category of **cloud computing services** that allows you rent IT infrastructure from a cloud provider on a pay-as-you-go basis. Any business unit can access to important facilities, such as servers, storage space and connections, without the business need of purchasing and managing this internet infrastructure themselves. IaaS clouds are the integration of both PaaS and SaaS clouds, as the company that provides the software as service will also provide the infrastructure needed to run the software. Amazon EC2 and Rackspace Cloud are examples of IaaS [9].

3. Platform as a Service (PaaS)

Platform-as-a-service (PaaS) renders an on-demand environment for developing, testing, delivering and managing software applications. It is designed to quickly create web or mobile applications, without worrying about setting up or managing the infrastructure of servers, storage, network and databases needed for development. **Many times, PaaS** clouds are created inside IaaS Clouds by some experts to provide the scalability and deployment of any application and therefore help to make your expenses scalable and predictable. Some examples of a PaaS system include Mosso, Google App Engine, and Force.com [9].

2.4 CHALLENGES IN CLOUD COMPUTING

Resources such as apps, data, services, servers and computer networks can be accessed universally with the help of cloud computing. The business organization can either rent a cloud or it can own it privately. Cloud technology attains economy of scale and is highly cost-effective so many small business organizations and firms can easily afford cloud technology.

However, there are also many challenges involved in cloud computing. In this section, we have discussed some of the common challenges with cloud computing technology that we should consider when implementing cloud computing.

1. **Cost** - Cloud computing is economical but customizing the cloud according to the demand of customer can be expensive sometimes. Moreover, it can be a cost - challenge to the small-scale organization who wants to modify the cloud as per their requirement. In addition to that, it might get costly while transferring the data from the Cloud to the premises.
2. **Security and Privacy** - The data stored on the cloud must be confidential and secured. Usually, the customers have much faith on the cloud provider. Therefore, it is responsibility of every cloud provider to take necessary measures for security to protect the data of the customers. Apart from cloud provider, it is also the duty of the customer for strong security mechanism. They should keep a strong password, should keep the password secret and update the password at regular interval. However, anyone who is aware of your password will be easily able to access the information stored on the cloud. More the people accessing your cloud account, the less secure it will be.
3. **Reliability and Flexibility** - The capacity and capability of a technical service provider are as important as price. The service provider must be easily available whenever it is required by the customer. The most significant aspect is regarding the sustainability and goodwill of the service provider. Usually, majority of the business organizations rely on the services provided by third-party, hence it is the responsibility of the cloud systems to be reliable and flexible.
4. **Portability** – Portability [6][7] means that the applications running on one cloud platform can be moved to new cloud platform and it should operate correctly without making any changes in design, coding. Portability is one of the biggest challenges in cloud computing because each of the cloud providers makes use of different standard languages for their platform.
5. **Down Server (Low Internet Connectivity)** - Downtime is the common challenges of cloud computing. No cloud provider will guarantee a platform that is without any downtime. Internet connection also plays a very significant role because if a company has a slow and untrusted internet connection, then it may create a problem as they can face downtime.

3. CURRENT SCENARIO OF EDUCATION

The main focus of our education system has always been on marks, grades and numbers. But in reality, the practical knowledge and innovative thinking is needed to survive in the competition [14]. Moreover practical knowledge is of utmost importance to be in competition nowadays. Therefore, institute should possess latest and most advanced configured laboratory for this reason to impart the practical knowledge. Institute has to build latest configured Laboratory which incurs high cost for hardware configuration to impart practical knowledge for the students. Hence to address this problem, the solution is Cloud

Computing Technology. The Institute can subscribe a service or rent any resources from any cloud service provider on the pay as you go basis.

Cloud computing in education is of great use to the teachers, students and administrative staff. Cloud Computing allows students to access learning material from anywhere and at any time wherever internet connection is available. Teachers can easily upload their notes or learning materials and administrative staff has economy in data storage. Various features are offered by Google including Google Talk, Mail, Forms, Classroom and Docs which enhances the online student collaboration and their learning experience [2]. cloud computing identifies the importance of Mobile learning (M-Learning) by making use of mobile devices as a source of enriching online research which will ensure sharing of information and knowledge leading to good quality research work.

4. BENEFITS OF CLOUD COMPUTING IN EDUCATION

Cloud Computing Technology provides several benefits [16][17][18] in the field of education. We have discussed some of the advantages in the following section.

1. Reduces Cost

Information technology infrastructure costs are reduced, as the university pays only for the resources and services it consumes and the storage it requires. The technical team and software engineers can concentrate more on the quality of a service, by coordinating that online services are synchronized with the remaining educational institutional systems. Academic institutions can rent any software packages to be used online from any place, which considerably reduces the cost of purchasing licensed software for a number of computers. Moreover, schools will be able to access online latest textbooks or learning materials which will save money and ensure that students are learning from the most recent books.

2. Enhances collaboration in Work

Without installing a specific program, students, teachers and administrative staff can access any information from their computers. Thus there is flexibility in accessing data which results into interdepartmental collaboration. Forms, text files, spreadsheets and presentations can be edited at the same time by different people from any computer. This leads to an efficient distribution of tasks. It creates the easiest way to create an environment where educators, students, and parents can stay on the same page.

3. Easy Access and Availability

A cloud computing education platform also improves virtual and digital access to various applications and resources. It makes it easier for Students are able to access the learning materials, notes and resources very easily and efficiently, regardless of whatever devices or internet browsers they use. At the same time, students can also access to a repository of online books and materials, as the usage of online documents and digitized print media is increasing tremendously and the learners from different campuses can access the same material online.

4. Convenience in Time

One of the biggest challenges for teachers is time. Since teachers and students can access materials from any place, teachers can save their time from making copies. Teachers will no longer have to face with the problems regarding misplacement of assignments and materials all this information is stored on a cloud. Instead of grading and marking manually, teachers can now grade and offer feedback on assignments and notebooks easily from their device. Teachers can store their lesson plans and assignments to the cloud. From there, it can be shared with other teachers and administrative staff and receive feedback on them. By chance, if laptop or device of any teacher crashes, their notes and materials will not get destroyed as they are stored on a cloud.

5. Backs up Information

Information is stored on large servers around the world with the help of cloud computing technology.

This guarantees for a speedy access at any time, and helps in taking back up of data in case of any digital problem. Universities also store critical data on the cloud.

5. DRAWBACKS OF CLOUD COMPUTING

Despite of its benefits, there are also some cloud computing issues and challenges in education sector. They are as follows:

1. Reliance on Network Service Provider

Cloud platforms are totally dependent on the network connection of an institution. The higher the volume of data managed through the cloud, the higher will be the use of broadband which in turn, proves to be costly. On the other hand, there may rise a situation in which an institution suddenly goes offline due to breaking down of a server and its software application is fully dependent on internet connection. An unfortunate reality of cloud computing in education sector is its dependence on internet connectivity.

2. Less Control

One of the benefits of cloud is easy accessibility to services and resources in the education sector. But we will have less control over updates, data and other services. Everything is stored on the cloud off-site, so we will have less control over the system and infrastructure setup. Everything is controlled and handled by cloud service provider.

3. Privacy

When all the resources are stored online, there are few privacy risks. Cloud systems having lack of proper security measures, may be exposed to cyber attacks, and data security becomes a big challenge. If a device with saved credential information gets stolen, the cloud platform and its resources become accessible to an unauthorized fraud user. To avoid these issues, we will need to undertake security steps.

6. CONCLUSION

Cloud computing is developing technology in the recent years which provides various advantages to students, administrative staff, and academicians. Despite of its drawbacks and limitations, cloud computing offers range of services to student and teaching staff so that teaching learning process become efficient and interesting. Moreover, by availing cloud services from cloud, institute can now minimize their expenditure in maintaining their laboratory. The main objective of this paper is to highlight the implementation of cloud computing in education sector and how it proves to be a boon as well as challenging for an education system.

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