A Review of Application of Cloud Computing In Education

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Abstract

It is evident that ICT has changed our lives and restructured the nature of daily doings. Where education plays an important role in who we are and what we can realize in our time, Learning has intensely transformed over recent years when globalization has brought different opportunities to learn with the Internet. In Today's era where the Computer becomes one of the pillars of the learning system, the education system is facing challenges respective to resource availability, cost control and storage handling. Cloud Computing is introduced as an alternative solution to overcome these challenges.

Keywords: Cloud Computing, Education, Moodle LMS, ICT, MooKIT LMS

1. Introduction

The term Cloud technology is one of the next buzzwords in the IT industry. It likewise utilizes an analogy for the internet however when "computing," upgrades up it to the succeeding, it gets unrivalled and fuzzier. It is referred to like the updated version of utility computing, access of anything across the firewall but its real existence resides out of this confusion. In real terms, Cloud Computing is all about a way to add capabilities, increase storage at

runtime without any investment in hardware, training and retraining of personnel, or subscribe for the licensing software via the Internet on user demand. Cruz (2011) cited in Jain, J. & Pandey, S. U. (2013), describes, "Cloud computing is a collection of

applications and technologies which can be accessed and manipulated by a large number of users in real-time".

The current educational system, which is applying in most developing and under-developed countries where desktop platforms are used more than chalkboards, Cloud technology can be a better option to be used in Schools, Colleges, Universities and Educational Institutes. Where the IT industry is growing rigorously to step into the education system for their future users, cloud computing provides flexibility to the usage of resources. "Education in the narrow sense does not include self-culture and the general influences of one's surroundings, but only those special influences which are consciously and designedly brought to bear upon the youngster

by the adult persons of the community whether through the family, the church or the state", (Thomas Reymont 1906).

2. Review of Related Literature

Numerous study has been done on the impacts, limitations of using cloud-computing technology. Banerjee delivered a summary of studies accomplished at HP Laboratories in the text "An Intelligent IT Infrastructure for the Future". Delic & Riley judged the current condition of entrepreneurship knowledge and expertise administration, explain structural assessments of cloud computing and examines presently the basic innovations. Piyare & Lee deliberated about incorporating remote gadget web technology to the cloud facilities for information gathering and distribution of resources. Cloud technologies consume an important amount of power. Tuncay Ercan studied what the cloud structure will deliver to educational sectors and in what way the lecturers and target students can help. Jain Anjali and S. U. Pandey discoursed on the impact of cloud technology concept in tertiary institutions.

3. Present State of the Education

Largely private schools have become more reliant on a new system to implement most of their academic daily activities. These developments are gradually providing using ICT resources for both stakeholders such students, parents and staff accessed cloud resources via browsers. These facilities are offered affordably and spontaneously to academic activities, frequently with much-sophisticated accessibility and availability than can be brought by the institutions.

4. Application of Cloud Computing Technology in Education

Cloud technology will bring the answers to desktop or manual educational system problems. Cloud technology permits target clients to have control and convenient access to their information utilizing the Internet-empowered. Main players of higher institution cloud resources include teachers, students, faculty members, parents, and admission unit and examination unit as appeared in figure 2. The primary members of the college are associated with the cloud. Individual access credentials are issues to

them separately for their peculiar works. Lecturers can upload their lecture guide, quizzes, assignments, laboratory evolution via a cloud storage server which active target users will be able to access the resource materials submitted by the lecturer through the internet by using their mobile android, laptops and any other enabled devices anywhere and anytime 24x7. The system of education also will try to make it possible for academicians to detect any unusual issues and problems areas in which learners and parents tend to make mistakes, by inspecting learners' records.

Below are some aspects of the educational system that need to be integrated with cloud-enabled.

a) **Academic activities using Networks:** Current teaching and learning assumptions sense that the substitutes who ought to be the principal group of instructing are not passive but rather active. It will be a tendency of innovative tutoring schemes. In the customary showing environment, individuals have been abandoned to locate a perfect individualized teaching and learning procedure. Study periods spending in the net, the learner as per the kind of cloud administrations, non-cost decision learning materials and learning routines.

b) **Application of SaaS in Educational Material:** Software as a Service (SaaS) is inventive training suggestions feel that the substitutes who ought to be the primary assemblage of teaching are vigorous but rather action. It will be a propensity of existing educating practices.

c) **Development of electronic teaching and leaching Database:** Cloud technology made a recent educational system, which came up with asset library building where numerous resources can gain. Library structure is a long haul project; there must be a reasonable fund set aside. To empower comprehensive and maintainable development in electronic teaching and learning.
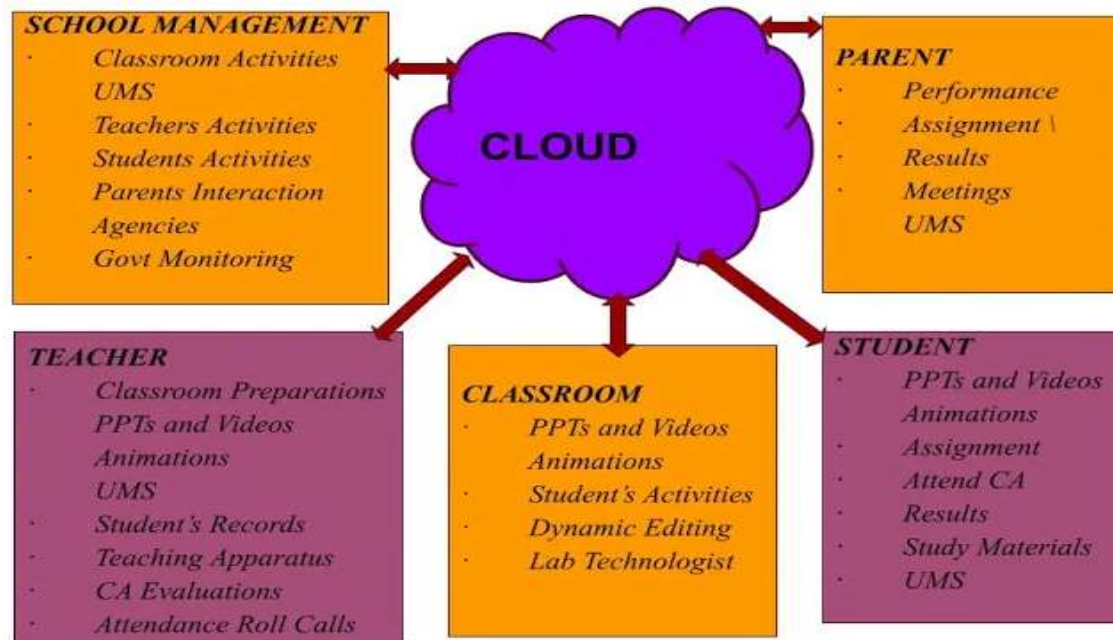
Fig. 1: Architecture of Cloud Computing Technology In Education

5. The Concepts

Cloud Computing defined "as a set of hardware and network resources that combine the power of multiple servers to deliver different kinds of services via the web". The U.S. NIST described cloud-computing technology and outlined them as:

"Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction". In an organization, effective cloud computing technology can create high quality and more efficient applications and service as well as higher levels of satisfaction among end-users".

6. Essential Features of Cloud Computing Technology

a) **Broader Network Access:** Cloud computing abilities are obtainable over the net and accessed via typical instruments that encourage use by diverse thin or thick client platforms (like workstations, tablets, mobile phones, laptops, terminal etc).

b) **Measured Service:** A distributed computing consequently screens and improves all asset use by utilizing a metering capability at some degree of deliberation reasonable to the sort of facility (e.g., storage, processing, bandwidth and dynamic client accounts). Asset utilization can be watching, controlling, observing and detailing any unexpected issue.

c) **On-demand Self-Service:** The consumers can independently deliver computing capabilities, such as network storage and server time, as needed robotically without demanding human interface with every facility service provider.

d) **Rapid Elasticity:** Cloud technology can be flexibly provisioned and discharged, in certain gears mechanically proportional quickly approaching and active proportionate with the request. To the clients, the capacities existing for provisioning much of the time appear to be unlimited and can be suitable in any measure at given a time.

e) **Resource Pooling:** Providers cloud assets are pool to help various customers utilizing a multi-inhabitant architect, with differing physical and consistent assets powerfully dispensed and reallocated best on client request.

7. Cloud-Based Learning Management System

The utilization of LMS in the cloud made an extraordinary advancement change in the manner the client considers utilizing the

Internet as a method for electronic learning, and gives him greater adaptability for a client to learn and connect with the learning framework, Users can make their records and advantages from various accessible administrations. Right now, instances of the popular foundation of LMS frameworks that utilize cloud computing is surveyed.

7.1 Characteristics of Learning Management System (LMS)

a) **Security**: It incorporates passwords and encryption to shield from unapproved access to enter in LMS. It additionally incorporates the security of the information or substance put away in it to maintain a strategic distance from alter.

b) **Registration**: Registration of teachers or mentors to creator course content, students to discover, select or appointing courses and directors to oversee the entire system.

c) **Delivery**: On-demand conveyance of learning content wherever and whenever on any gadget, for example, cell phones, tablets or PCs.

d) **Interaction**: Communication between students or coach, shared and specialists. It likewise associates with a social network, discussions with up close and personal collaboration.

e) **Assessment**: After the culmination of each course assessment, testing and evaluation to pass judgment on the exhibition of the student.

f) **Tracking**: It empowers the full following of learning assets or course and execution of student by educators and guardians.

g) **Personalization**: Setup of capacities and highlights of LMS appropriately to client inclinations and hierarchical needs.

h) **Interoperability and Integration**: LMS ought to have the option to help outsider courseware and assists with getting to courses in a simple mode by some course convertors and it works with other system and gives extensibility to outsider items for item upgrade.
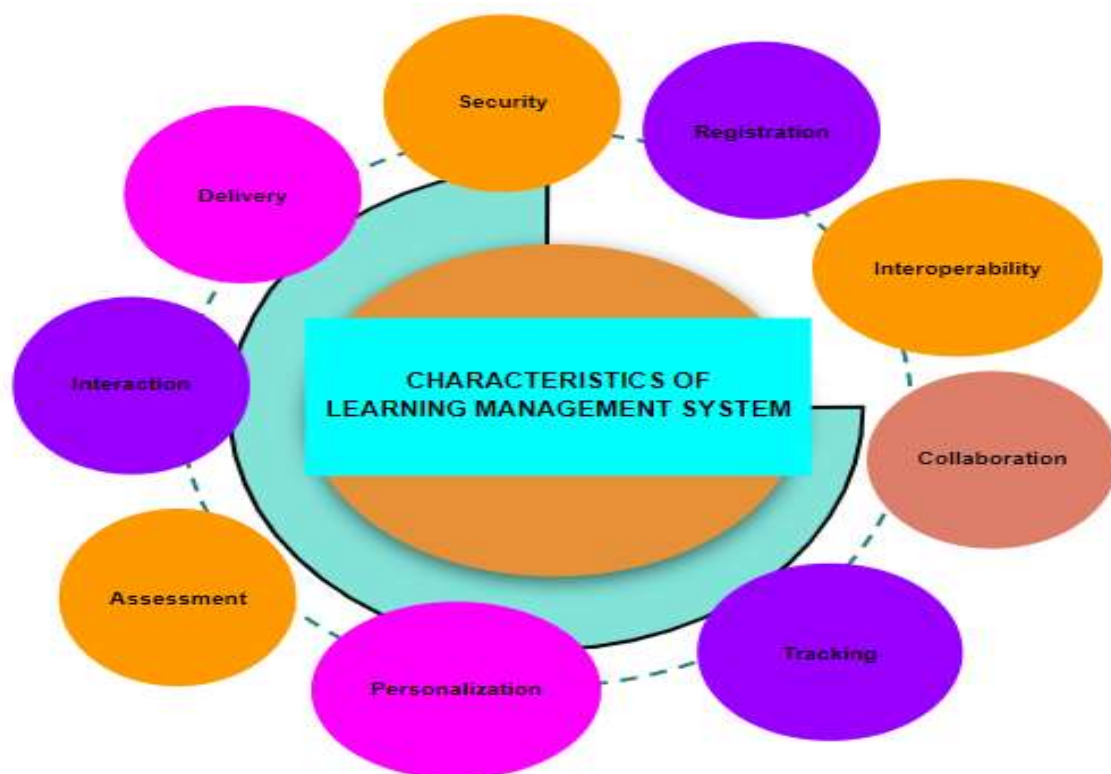

Fig. 2: Characteristics of LMS

7.2 Types of Cloud-Based Learning Management System (LMS) Framework

Below are the introduced some recognised based-cloud LMS framework that provides varied of gears online to a student (Prabhakar, T. V. Balaji, Venkataraman Revathy, 2018).

a) **Blackboard LMS**: It is an industry-driving programming application used to control virtual learning situations. Blackboard is a Web-based LMS intended for learners and staff to permit them to take part in classes conveyed on the web. Then again, the Blackboard LMS is an exhaustive and adaptable e-Learning application platform that conveys a total course management system. Following are the highlights that we are utilizing right now :

- **Creating Courses**: through the simple work process. Teachers can utilize the wizard to finish the underlying arrangement of a Course in one simple-to-follow procedure.

- **Course Management**: permits instructors to refresh any component of the course.

- **Course Content**: permits educators to post article, materials, assignments, recordings and so forth.

- **Calendar**: can be utilized to post due dates for assignments and tests.

- **Assessments and Surveys**: Permit educators to convey on the web, consequently scored appraisals and studies.

- **Assignments**: can be presented and for learners on have the option to submit assignments on the web.

- **Availability Control**: Teachers can make custom learning ways by deciding when learners can get to content things, conversations, evaluations, assignments or other learning exercises.

- **Grade** Centre: Stores learner execution results, including support for custom reviewing scales, grade weighting, thing examination and grade hub assessments.

b) **Moodle LMS**; a free bundle planned to utilize realized academic standards to assist the instructors in creating viable internet learning networks. Moodle is given uninhibitedly as an Open Source application under the GNU Public License. This implies Moodle is copyrighted, however, you are permitted to duplicate, utilize and change Moodle given that you consent to: give the source to other people; not adjust or

expel the first permit and copyrights, and apply this equivalent permit to any subordinate work.

In the accompanying segment, we will depict the design of Moodle and how the Moodle functions at a specialized level: A Moodle establishment includes the Moodle code executing in a PHP-competent web server; a database oversaw by PostgreSQL, MySQL, Oracle or Microsoft SQL Server; and a record store for transferred and produced documents (the Moodle data folder). Every one of the three sections can run on a solitary server; or they can be isolated with many burden adjusted web-servers, a database bunch, and a document server; or anywhere between those boundaries. Then again, Moodle centre gives the whole framework important to fabricate a Learning Management System. It executes the key concepts that all the different modules should work with.

c) MooKIT LMS is a lightweight MOOC Learning Management System like EdX, which is considered, structured and created at IIT Kanpur to convey and deal with a course on the web. MooKIT Learning Management System has been developed ground at the Computer Science division at IIT Kanpur with best-of-breed highlights and condition of craftsmanship innovation. It has been running since 2012. It gives guidance to students and the engineering is profoundly adjustable and financially perceptive.

As indicated by IIT Kanpur, the basic standards of MooKIT are to guarantee to learn is not a weariness, learning should scale and make online courses ought to be as simple as taking them. Starting at now, the foundation ties up with IIT Ropar to together give understudies who effectively complete the Arch4Cloud course testaments of achievement, while giving students finishing its MOOC on MOOC course with endorsements of cooperation.

d) **Litmos LMS**: It is a cloud-based Learning Management System, and it is arranged in the SaaS layer of the cloud structure. Litmos was essentially structured and is as often as possible used to convey online train courses for associations individuals, giving a stage for some scholarly associations, medicinal services, little venture business and government various divisions. This LMS was first evolved and presented at Silicon Valley in the San Francisco Bay Area of California, United States. At present, there are around 4,000,000 supporters in Litmos.
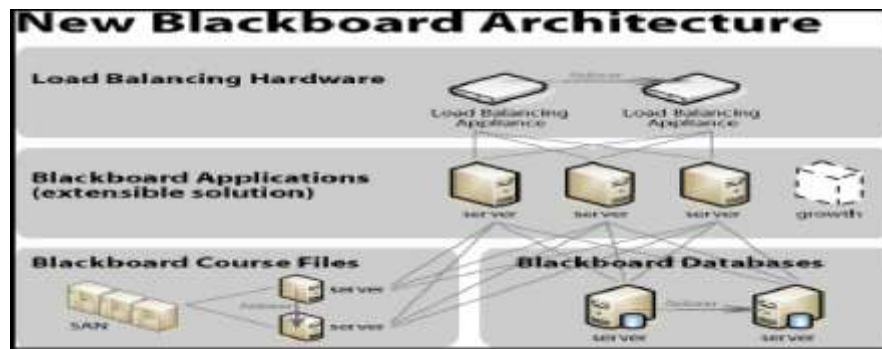
Fig. 3: Blackboard LMS
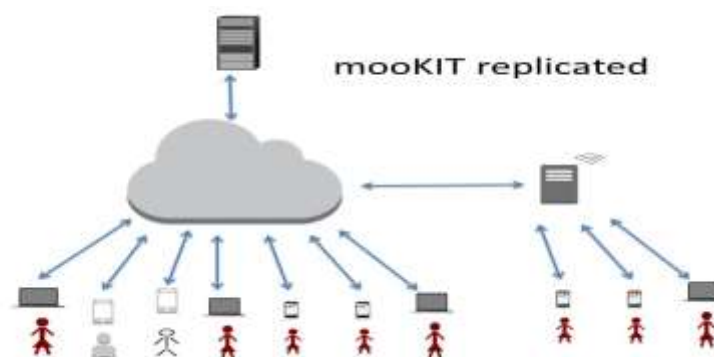*Source: Subramanian, et al (2014)*

Fig.4: Mookit LMS
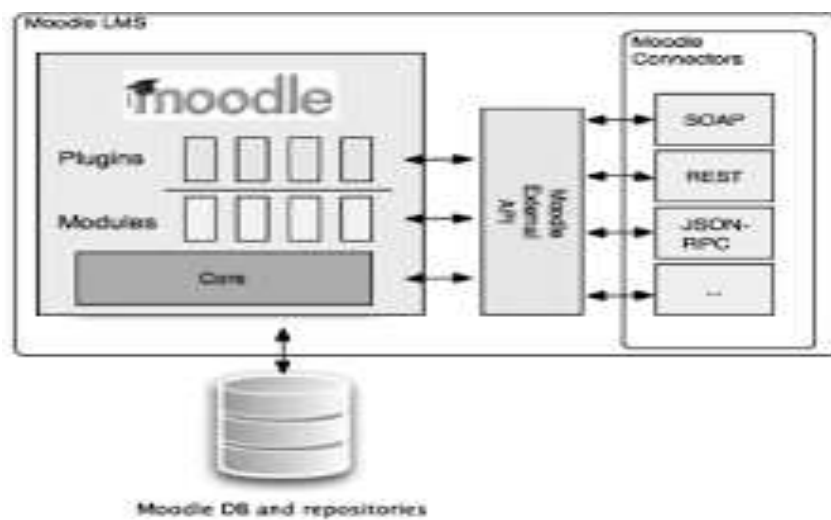*Source: Subramanian, et al (2014)*

Fig. 5: Moodle LMS (Source: Strobbe et al (2014)).

7.3 Advantages of Cloud-Technology in Education

Cloud technology through its capacity of scaling and elasticity has several benefits in the education sector.

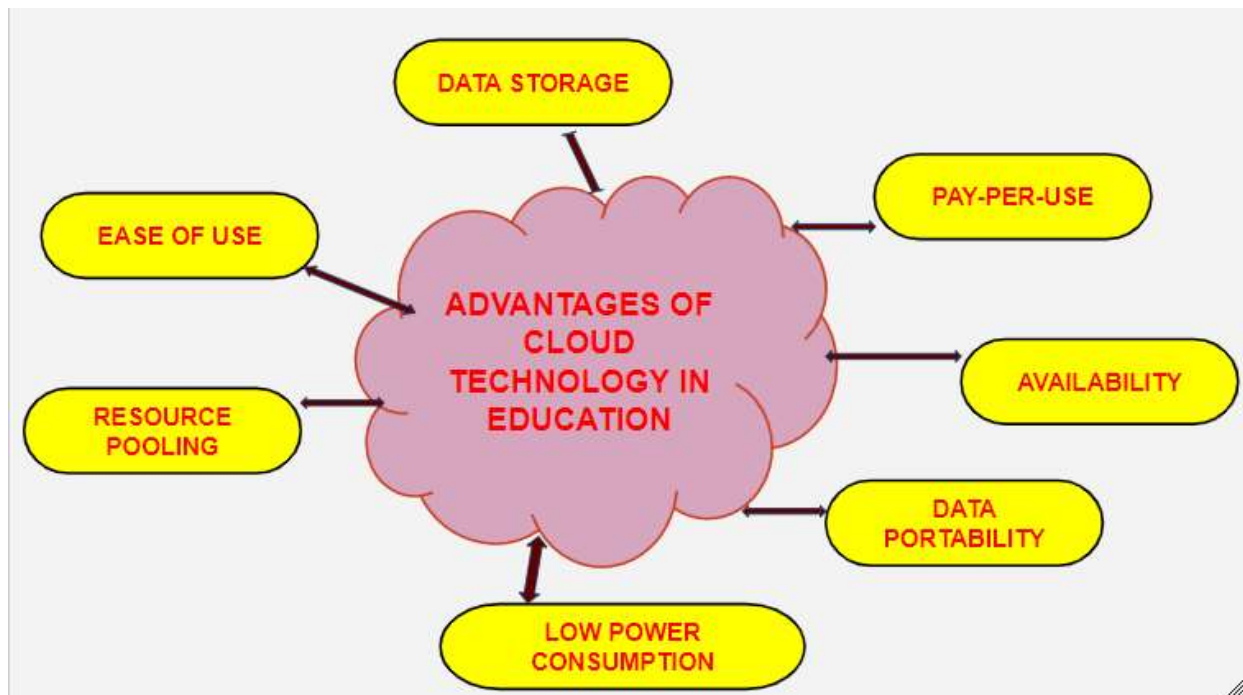This figure shows the advantages of the technologies as;

Fig. 6: Advantages of Cloud Computing Technology In Education

a) **Ease to Use**: Students can use desktop application with unawareness of the installation of the operating system, software. They have just to do their work without any tension of resources from where they manage. Everything will be available on their demand.

b) **Data Storage**: Where keeping data on a large scale becomes an issue, cloud service provides a solution to this. Students can keep their data on a cloud machine without worrying about the backup, damage to the hard disk. They can use their data from anywhere via the Internet. There is no need for extra expenditure on hard disks for storage purpose.

c) **Data Portability**: Data portability plays an important role in the education system. Students have to research their higher education in various fields where they need more data, videos, and slides from here and

there. However, just because of a virus or some power failure their data can be destroyed. At that time they have to approach admin for recovery and sometimes did not get anything in revert. Cloud computing saves them from all this.

d) **Availability**: Software has always been providing with user demand. Rapid demands also fulfilled by the cloud services which the users can use anytime anywhere. Reliability: Students can relieve the tension of data security, power failure, hard-disk damage, loss of data. Cloud computing also act as World where they can avoid keeping textbooks and use mobility to access.

e) **Low Power Consumption**: Cloud computing facilities provided to colleges, universities, schools via the internet irrespective of large data centres location and power consumption. Servers in data centre require cooling system, maintenance and

service optimization techniques, which are a big hurdle for education institutes.

f) **Resource Pooling**: Cloud offers unlimited resources in terms of memory, storage, network, processing to achieve the requirements of the end-users on their demand. Students can take the benefit of these unlimited resources in an educational environment and researchers can do their research work freely.

g) **Pay-Per-Use**: Cloud also offers a Pay-Per-Use policy. To take the benefit of large data

or resource usage institutes have to pay only for that what they use. There is no need to buy a physical machine for some time usage or testing purpose.

7.4   Drawbacks of Cloud Technology in Education

Numerous limitations come with cloud computing technology in an education setting. Some of the burdens to the implementation of cloud services in educational institutions are as follows:
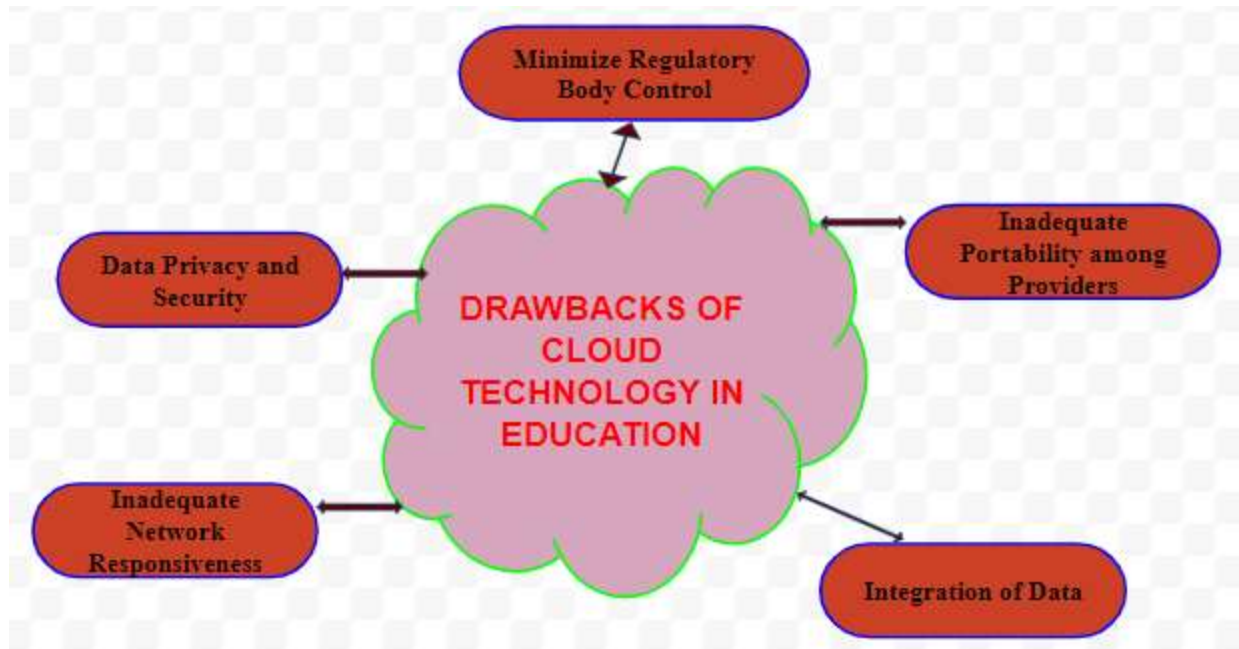

Fig. 7: Drawbacks of Cloud Computing Technology In Education

a) **Data Privacy and Security:** This is the main concern amongst many colleges and universities. Cloud technology mostly is the third party who is the provider henceforth the privacy and safety of information is hard to save cloud computing augmented security susceptibilities to the college's resources.

b) **Inadequate network responsiveness:** Cloud technology largely relies on the accessibility of high-speed bandwidth access and reliability of the services. With the failure of it, stakeholders cannot be able to access the intended resources and services.

c) **Integration of data:** Many different applications might need complex integration to link to the existing on-premise resources, as well as cloud computing applications. These requests for the incorporation of existing

university data structures and systems with cloud computing applications.

d) **Minimize Regulatory Body Control**: Cloud computing users have frequently selected a level of government control that is lower than that over on-premises Information Technology resources. This can introduce risks associated with how the cloud provider manages its cloud, as well as the external connections that are required for communication between the cloud customer and the cloud.

e) **Inadequate Portability among Providers**: Because of the insufficiency of established industry morals within the cloud computing industry, public clouds are common ownership to various extents. For cloud customers that have custom-built solutions with dependencies on these ownership environments, it can be challenging to move

from one cloud provider to another. "Barriers to Adoption" for cloud pointed out by Software Engineering Institute of Carnegie Mellon University. If these challenges can be resolved with the service provider, then using the cloud service will be beneficial.

8. Conclusion

Conclusively, cloud computing provisions the uses of various methods of electronic, blended learning, distance education that are enormously popular due to the perception of ICT and have noteworthy returns over old-style forms of the educational system. Cloud computing ensures inclusive access to current ICT for a varied choice of users at any location and time through different platforms, which is a prerequisite for the execution of the ideas of lasting learning.

Cloud computing is tremendously beneficial and necessary for the current education system. It transforms the impact of new technology in supports, training and accelerates the methods of making and providing a collaborating learning setting where all members have incessant access to varied, first-class instructive resources and activities and effort collaboratively.

9. Recommendations

a) There are various fundamental information wellbeing rules and approved system understandings underneath which limitation of perusing information to the outsider marked between the specialist co-op and the end-clients. Legislators likewise began to check the legitimate issues that indicate the protection and information security assurance.

b) The encryption of data ought to be actualized to maintain a strategic distance from the illegal utilization of cloud assets. Information may be encoded previously and a short time later the sending the solicitation to the cloud systems.

c) Governments should enforce the implementation and all necessary security majors should be provided from their sides. Any individual or group found malicious for an institution's cloud resources should be taken serious action against them.

d) Implementation of an isolated cloud by the institute is an excessive foundation of information privacy and security. Crucial information should be set up within the college and controlled by the trust staff.

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