

# Education in the New Millennium – The Potential of Cloud Computing with Special Reference to Developing Economies

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**Abstract:** Technological advancements and their exponential growth rates have revolutionized modern society and impacted all sectors across the globe in a very pronounced manner over the last few decades. Over the past few years the IT world is buzzing with various new and revolutionary tools and techniques of computing with Cloud Computing being among the most talked about and widely discussed topic among all stake holders who are interested in leveraging IT services and tools to enhance the effectiveness of their respective businesses.

Education, which is a very crucial determinant of the progress of any society, has also been enormously influenced by IT especially after the advent of Internet and related technologies. Cloud Computing which derives its roots from Internet, Distributed Computing, Virtualization and other related techniques has caught the attention of policy makers and users as a potent tool to ensure more effective sharing and collaboration of resources among users to revolutionize the existing traditional system of education and transform it to a newer, more exciting and fruitful experience for all concerned at very affordable costs.

The present working paper seeks to explore the potential of cloud computing in the field of education with special reference to developing economies which are often plagued by issues like lack of funds to avail the possible and available benefits that IT has to offer owing to heavy infrastructural costs of hardware and software requirements, huge licensing fees and other factors.

The paper also seeks to address issues related to the prospects and challenges facing this new technology and thereby paves the way for future research in the area.

**Keywords:** Information Technology; Cloud Computing; Education; Developing Economies; Resource Sharing; Internet.

## 1. INTRODUCTION

Governments in developing countries have realized that the growth and development aims for any nation

cannot be realized unless and until the education and literacy levels of the citizens are given due consideration. This realization has prompted the government to ensure formulation and administration of various schemes and plans for promoting education across various levels of the society [1].

An important step in this direction is inspiring the guardians about the importance of education by generating awareness and encouraging them to send their wards to schools and colleges to receive education.

The most recent initiative in this regard has been the well-publicized “Beti Bachao Beti Padhao” flagship program initiated by our honourable Prime Minister Shri Narendra Modi to educate and empower daughters of the country.

However, despite the fact that such schemes have been launched on numerous occasions and measures have been taken to plan and coordinate them to ensure that those in need of education reach schools and colleges but various local level contextual factors like unavailability of required infrastructure, dearth of educational materials and high costs of softwares and their licensing etc lead to unsatisfactory services and consequently high percentage of drop-outs[5].

Given this dismal scenario, cloud computing, which in layman terms refers to a global network of shareable computational resources (like hardware, software, data etc) has emerged as a viable option for addressing the shortcomings associated with educational quality, delivery and output of contents in context of developing economies.

## 2. CLOUD COMPUTING: THE BASICS

Though hogging limelight more over the last few years than in the past, the concept of cloud computing can be traced back to 1960, when it was very famously declared by John McCarthy that at some point of time in the future, computation could well emerge as a service for public utility[3].

Conceptually, for the novice cloud computing may be interpreted as a type of Internet. It wouldn't be an overstatement to mention that many of us are availing cloud services through Internet though we may not be formally aware of the same. Facebook, Gmail, Google Drive etc are all applications employing cloud computing concept.

Therefore, we may interpret cloud computing as a very modern and sophisticated style of computing which enables the users to access resources through internet without the pre-requisite of any prior knowledge or awareness about the infrastructural requirements that are functional in the background and hidden from the user through a level of abstraction. Cloud computing ensures the availability of resources to the user 24X7 at his own convenience. The most important characteristic of cloud computing is the high level of abstraction which ensures that the user does not have to bother at all about the internal mechanisms of its functioning. The network of computing resources is conveniently made available to the user as per his customized requirements in a most user friendly manner.

### 2.1 An Overview of Services offered through Cloud Computing

The services offered by cloud computing are briefly outlined below:

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

SaaS in the current times is offered by several companies with the most notable ones being Google and Microsoft among many others. In this model of cloud service delivery, as per the demand of a given customer, a complete application is provided to him. It should be clearly understood that only a single instance of the said service is executed on the cloud and the service is availed by multiple end users [7].

The benefit of this model from the user's point of view is that, he is entitled to availing customized services without any heavy initial investment in servers or software licenses which were associated with traditional computing paradigms while the provider is benefited on account of costs being lowered due to the need of hosting only a single application.

#### (ii) *Platform as a Service (PaaS)*

PaaS which is another model of cloud services works upon the concept of making available application platforms to the customers and thereby enabling them to develop their own applications which may run using the infrastructure provided by the service provider [6].

Thus, PaaS ensures that the user is spared of the expenses involved and technical know-how's of acquiring and managing the associated hardware and software layers for the applications he wishes to develop. Common examples of PaaS are Google's App Engine, Force.com etc.

#### (iii) *Infrastructure as a Service (IaaS)*

IaaS can be conceptually viewed as an on-demand data centre where the provider pools a variety of infrastructural resources like servers, storage systems, network equipments etc which the customer may use paying for only what he uses and he is responsible for his on-demand infrastructure management, monitoring and administration [4].

Most common contemporary examples of IaaS are GoGrid, 3 Tera etc.

### 3. CLOUD COMPUTING IN EDUCATION

Conventional education offered by schools and colleges have been trying to leverage the potential of IT to enhance the quality and reach of education delivery to the intended audience. However, in the traditional approach of utilizing IT, the costs associated with maintaining an IT department, skilled staff force, purchasing softwares and licenses have often cropped up as limiting factors which are addressed very effectively through the use of cloud computing and availing its various services.

A typical model for an education cloud is depicted in the below figure:

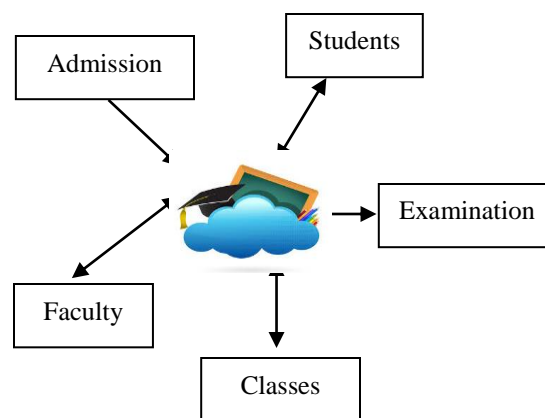


Fig 1: Education cloud and associated services

#### 3.1 Advantages of Cloud Computing Services in Education

The cloud paradigm once implemented in educational institutions offer several advantages the most notable ones being a drastic reduction in costs incurred for

hardware, software, & licensing which were a part and parcel of the traditional computing paradigm[8].

Further, this arrangement enables access to educational content 24X7 from the user's point of view and further cost cutting can be realized if the servers and learning materials are shared with other educational institutions.

From the trainer's point of view, cloud services offer various options for preparing lectures and other materials online and store them in cloud without the need to save and carry it in their hard drives.

### 3.2 The Limiting Factors In Context Of Developing Economies

Despite the enormous advantages that cloud services offer to the users and institutions it has been found that the degree to which cloud computing is being utilized is more in case of developed economies like USA than the same in case of developing economies like India and Bangladesh[2].

Some local level contextual issues like lesser levels of IT literacy, lack of adequate internet speeds, resistance to change the existing order, undue and enlarged apprehensions of perceived risks related to security etc have acted as a barrier and this needs to be resolved in order to ensure that cloud computing is utilized to the fullest possible extent in context of developing economies.

## IV. CONCLUSION

In conclusion it can be said that it is high time the developing economies realize that acclimatizing and coping up with change is a vital requirement to ensure that the prevailing system of education is made an active beneficiary of the revolution that has been brought about by cloud computing.

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If the grass-root level contextual issues are paid due attention to and concerted efforts of generating awareness and embracing technology are initiated in the right earnest, cloud computing has the undoubted potential of revolutionizing and changing the face of education in developing economies.

## REFERENCES

- [1]. Blomstrom, M., Lipsey, R. E., &Zejan, M. (1992). *What explains developing country growth?*(No. w4132). National bureau of economic research.
- [2]. Kshetri, N. (2010). Cloud computing indeveloping economies. *IEEE Computer*,43(10), 47-55.
- [3]. Mathew, S. (2012). Implementation of cloud computing in education-A Revolution.*Education*,1(5), 6.
- [4]. Mell, P., &Grance, T. (2011). The NIST definition of cloud computing.
- [5]. Psacharopoulos, G. (1994). Returns to investment in education: A global update.*World development*,22(9), 1325-1343.
- [6]. Velte, T., Velte, A., &Elsenpeter, R. (2009). *Cloud computing, a practical approach*. McGraw-Hill, Inc...
- [7]. Wang, C., Wang, Q., Ren, K., Cao, N., & Lou, W. (2012). Toward secure and dependable storage services in cloud computing.*Services Computing, IEEE Transactions on*,5(2), 220-232.
- [8]. Zhang, Q., Cheng, L., &Boutaba, R. (2010). Cloud computing: state-of-the-art and research challenges.*Journal of internet services and applications*,1(1), 7-18.



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