

# Adoption of Cloud Computing in Distance Learning



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**Abstract:** The use of distance courses in learning is growing exponentially. To better support faculty and students for teaching and learning, distance learning programs need to constantly innovate and optimize their IT infrastructures. The new IT paradigm called “cloud computing” has the potential to transform the way that IT resources are utilized and consumed in education and is expected to have a large impact on educational computing during the next few years. With its focus on helping distance learning administrators and practitioners to understand cloud computing and to make plans for successful cloud adoption, this paper provides insights into the adoption of cloud computing for distance learning, based on a thorough review of the literature about cloud computing Implications and considerations for additional research are provided as well. This paper describes some of the characteristics, benefits, Risk and limitations that cloud computing can bring to distance learning. It also presents cloud computing options, including its delivery models and deployment methods. Also explains insights for DL administrators and practitioners who are interested in adopting and implementing cloud computing. Finally, presents conclusions and suggestions for future research.

**Key words:** Cloud computing, IaaS, SaaS, PaaS

## INTRODUCTION

Post-independence era has seen India flourish remarkably in the field of providing higher education. Government initiatives along with innovative technology have facilitated the education providers to overcome all the boundaries and impart knowledge in every corner. India can be counted to possess one of the largest higher education systems in the world. Still, there is a lot of untapped opportunity and potential for the development of higher education system in India. Earlier, education was considered to be meant for the elites only, but now education has become compulsory for all, at least till a specific age. Various limitations of attaining regular course of education opened doors to this alternative system, i.e., distance Learning.

According to our statistics, the current gross enrolment ratio in higher education is not at par with the world’s average. To meet this target of world’s average, the country is targeting a high economic growth of over 8% in the coming years. However, to be at par with the economic growth in the global marketplace fuelled by the knowledge economy, the country still needs to increase the number of student enrolment in higher education. This can only be achieved through the development of distance education in the country.

According to our latest research report, “Indian Distance Learning Market Analysis”, the distance education market in India expected to grow at the rate of around 24% during 2011-12 to 2015-16. On the back of technological development, increasing awareness, rising faculty crunch, and increasing penetration of internet in the country, this market is anticipated to reach INR 87 Billion by the end of 2015-16. However, the aim of the government to raise its current GER from around 13% to 30% by 2020 that will also boost the growth of the distance education in India.

As more faculty and students are becoming involved in distance and blended learning, there is increased pressure to build distance learning programs and modules. Instructors of both blended and distance courses are expecting to include more data-intensive and computing-intensive learning resources such as interactive videos, virtual worlds, modelling and simulations, and Web 2.0 tools in their courses [1]-[5]. The current IT infrastructure offered by most distance learning programs is not likely to be able to sufficiently meet the increasing demands and needs of instructors and students in an efficient and effective manner. The act of adding additional servers to the current IT infrastructure owned by each distance learning unit takes time, is expensive, and doesn’t address the gap between demand and supply. Thus, a new IT infrastructure that can provide flexible and on-demand services to instructors and students needs to be explored. To better support instructors and students for teaching and learning, as well as to increase the competitive advantage, distance learning units need to constantly innovate and optimize their IT infrastructure, resources, and business processes.

## What’s in the cloud?

By sharing IT services in the cloud, an education institution can outsource non-core services and better concentrate on offering students, teachers, faculty, and staff the essential tools to help them succeed. Both public and private institutions can use the cloud to deliver better services, even as they work with fewer resources. To fill a significant gap in the distance learning literature and to better help distance learning administrators and practitioners understand and adopt cloud computing, this paper provides some insights for developing cloud computing strategies for distance learning, based on the literature review and on the authors’ years of practical experience in distance learning. These insights are intended to assist distance learning administrators and

practitioners when they are integrating cloud computing as a part of their IT strategy planning.

**Using cloud computing in Distance Learning:**

**Benefits:**

- Significant Cost Reduction
- Access to applications from anywhere
- Support for teaching and learning
- Software free or pay per use
- 24 hours access to infrastructure and content
- Opening to business environment and advanced research
- Protection of the environment by using green technologies
- Increased openness of students to new technologies
- Increasing functional capabilities
- Offline usage with further synchronization opportunities

**The Risk and Limitations:**

- Not all applications run in cloud
- Risks related to data protection and security
- Organizational support
- Dissemination politics, intellectual property
- Security and protection of sensitive data
- Maturity of solutions
- Lack of confidence
- Standards adherence
- Speed/lack of Internets can affect work methods

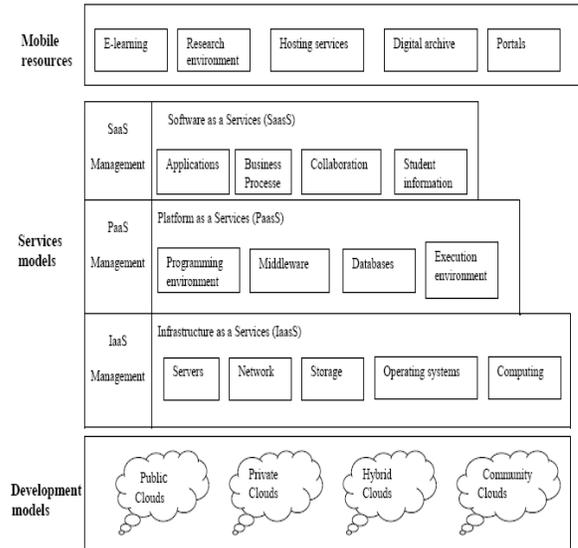
There is no doubt that these cloud computing limitations have a significant impact on migration decisions or that more research needs to be done to address these Limitations [6]. Many technology solutions (e.g., security, monitoring, cost-estimating technologies) and non-technology solutions (policies, regulations) are being developed to help mitigate the challenges of and the concerns about cloud computing risks.

To successfully adopt cloud computing in distance learning, cooperation among DL administrators and practitioners, other campus personnel, cloud users (instructors and students), and cloud service providers is needed. It is also important to note that the migration of IT applications and systems to the cloud takes time.

**CLOUD COMPUTING ARCHITECTURE FOR DISTANCE EDUCATION**

Thinking, planning, and working in the cloud requires institutes/universities to cope with specific challenges of cloud environment [7] such as uncertain definitions, privacy, contractual and jurisdictional issues, risk and non performance, interoperability, network capacity, re-architecting, staff and perceptions. Also, the adoption of cloud architecture involves overcoming barriers, such as: policy and control issues, new services that will move

above campus before older self-operated services, using an “accidental strategy” formed around consumer choice [8], organizational culture and regulatory considerations [9].



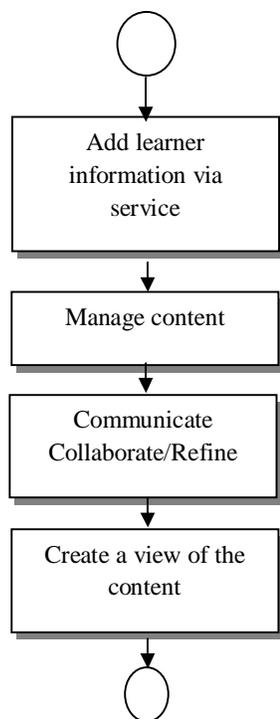
**Fig1:** Shows service model for cloud architecture for Distance education

With respect to cloud models, the main differences between public and private in the educational environment are presented in Table 1. Hybrid models are also used (for example Panasas private cloud combined with Amazon public cloud storage) as well as community ones (for example Virginia Virtual Computing Lab).

**Table1:**Main differences between Public and Private Cloud

Model Feature	Public	Private
Owned and managed	Service Provider	Distance Learning
Access	By subscription	Limited to students faculty, staff of the university
Customization and control	None	Yes

The community models appeared due to the increase of pressure in the educational environment (necessity of drawing up reports, monitoring educational, demographic and financial information starting from the moment of registering students and until the end of the educational stage) and also due to the advantages offered by collaboration (evaluating success on the labour market, emphasizing the educational quality, innovation).



**Fig 2:** Shows Student Adds Information about Their Learning in the Community Cloud

The next process illustrates the method in which a service consumer (the student) may access and modify information in a community cloud (Fig 2).

The successful use of Cloud Computing in Distance learning presupposes the existence of three key elements, namely virtualization, the intelligence from the network and a robust ecosystem. These offer the basis for obtaining operational efficiency, security, activity continuance, scalability, interoperability leading in the end to innovation. In addition, a government involvement in organizing a centralized cloud at the level of Distance learning may stabilize the academic field [18] and lead to fast results in research and innovation.

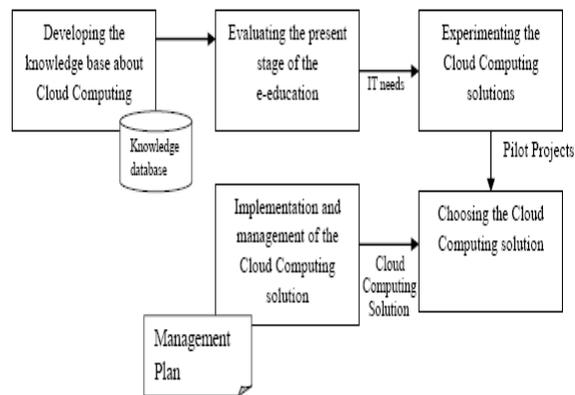
### INSIGHTS FOR DEVELOPING CLOUD COMPUTING STRATEGIES FOR DISTANCE LEARNING

Based on the literature review and on years of practical experience in distance learning, this paper provides some insights for developing cloud computing strategies for distance learning. Since every distance learning unit has its own considerations and

accompanying goals, the insights that are offered in this paper are general in nature and do not comprise a set of specific instructions about what to do or how to do it in terms of the adoption of cloud computing. It is unlikely that cloud computing can address all of the IT problems, but it could be the answer to some very specific ones [10]. Every distance learning unit will need to use its own due diligence to determine whether the benefits of cloud computing outweigh the risks, based on its unique institutional environment and circumstances. Researchers at Infosys Corporation suggest that a series of steps are needed for cloud adoption. Among these are assessment, validation, preparation, and execution.

Furthermore, those distance learning units that have determined to adopt cloud computing need to take the time and effort to design a cloud computing strategy along with a plan that will work best for their own needs. Distance learning administrators and practitioners must be diligent about protecting institutional data and must sharpen their contract writing skills with cloud service providers. Starting from the recent researches related to the transition to Cloud Computing, Author suggest a migrating strategy towards cloud, formed of the following stages(Fig 3):

- a) developing the knowledge base about Cloud computing;
- b) evaluating the present stage of the university from the point of view of the IT needs, structure and usage;
- c) experimenting the Cloud Computing solutions;
- d) choosing the Cloud Computing solution;
- e) implementation and management of the Cloud Computing solution.



**Fig 3:** Cloud Strategy in Distance Learning

- a) Developing the knowledge base about Cloud Computing.

The first step consists in developing the knowledge base by participating at seminars, conferences, discussions with the suppliers and consulting the most recent researches in the field. The success of the phase depends on the allocation of sufficient resources for research, for understanding how Cloud Computing functions in different organizational structures from universities and between institutions [11], the benefits and risks, policies and the best usage practices of Cloud Computing. The research is conducted by a team formed mainly of IT staff who permanently communicates with the users of the solution regarding the objectives, the progress, costs and benefits of the Cloud Computing solution.

- b) Evaluating the present stage of the Distance learning from the point of view of the IT needs, structure and usage. The first step consists in understanding the Distance Learning IT infrastructure. The service oriented architecture represents the base for understanding the data, services, processes and applications that may be migrated or need to be maintained within the Institute/university, so as to observe the security policy. With respect to the IT needs, their structure and usage, the analysis may start from the categories of users who interact with the present IT infrastructure and their necessities.

## CONCLUSIONS AND FUTURE RESEARCH

Cloud computing provides a good solution which should address some of the IT challenges and bring new opportunities to distance learning. Institutes/Universities have begun to adhere to this initiative and there are proofs that indicate significant decreasing of expenses due to the implementation of cloud solutions. The aim of this research to identify the particularities of adoption of Cloud Computing towards Indian education Distance Learning. Mainly, Researcher have considered the risks and benefits of cloud architecture and proposed a cloud adoption strategy proper for Distance Learning. An analysis of the data and the main activities that exist within a Institute/university will be the starting point for choosing a cloud model that should take into account the special security requirements of Distance Learning and the available cloud solutions as well. It is our belief that this paper will help DL administrators to reduce their confusion about cloud computing, to think proactively about cloud computing, and thus to engage in more productive discussions about the best practices of cloud adoption and its potential implementation in distance learning.

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