

# Effectiveness and security of cloud computing applications over traditional ERP system in educational sector: A Comparative study

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**Abstract** – In today's IT world technology is moving very fast and students have become more technologically savvy as teaching and learning uses more advance technology day in, day out. Education is a key factor in ensuring economic growth, especially for countries with growing economies. Cloud computing is a new emerging technology that is expected to significantly change in the next few years. Today, leading enterprise companies Amazon, Microsoft, and Google provides numerous cloud services like hardware, software, storage and infrastructure over the internet in the form of customized, reliable and cost-effective web applications and its greatest impact on the IT ecosystem. In Educational sector, this cloud technology has been used by students and faculties for accessing and assigning some educational work over internet. Students and administrative personnel have the opportunity to quickly and economically access various application platforms and resources through the web pages on-demand. Hence this research paper is mainly focuses on effectiveness and security of cloud computing applications over traditional ERP system in educational sector with respect to various services models like Infrastructure as a service (IAAS), Software as a service (SAAS) and Platform as a service (PAAS) as per users requirement.

**Index Terms** - Cloud computing, Cloud deployment models, Educational Sector, Implementation etc.

## 1. Introduction

Cloud computing is latest trend in IT world. It is Internet-based computing, whereby shared resources, software and information, are provided to computers and other devices on-demand, like the electric grid. This technology has the capacity to admittance a common collection of resources on request. It is proving extremely striking to cash-strapped IT departments that are wanted to deliver better services under pressure. In recent years cloud computing has become a growing interest for organizations looking to reduce their IT costs by offloading infrastructure and software costs onto 3rd party organizations who offer software-as-a-service (SaaS) (e.g. Google Apps), platform-as-a-service (PaaS) (e.g. Google App Engine), and infrastructure-as-a-service (IaaS) (e.g. Amazon EC2).

## 2. Cloud Services Models and Deployment Models

### 2.1 Service Models

- Software-as-a-Service (SaaS): It is a software distribution model where a third-party provider hosts applications and makes them available to customers over the high-speed internet connection.
- Platform-as-a-Service (PaaS): It is a middle layer which gives the organizations, institutions or companies a freedom and framework for developers to develop their own applications and deploy them and make customers within their company to access the resources.
- Infrastructure-as-a-Service (IaaS): Infrastructure is most vital among the three service models because it is the basic need to launch the organization's services over the internet in a cloud platform, to make their services available to clients and applications to run them smoothly.

## 2.2 Deployment Models

- **Public Cloud:** The cloud services are easier to install and less expensive or even charge free, the applications, hardware and bandwidth are provided by the service provider, and are scalable, the user avail can only those services that they are interested.
- **Private Cloud:** As the name suggests, its services, infrastructure is solely operated and maintained by an organization. The services are made available on proper authentication, priority is being given towards the client's data security.
- **Community Cloud:** Here the cloud resources are shared by an organization which is of common interest for every participant which is being part of a community, whose needs are similar.
- **Hybrid Cloud:** It is a combination of two or more cloud deployment models like (public, private, community) it enables cloud application portability, multi-tenant, resource sharing.

## 3. Research Methodology

Research design is the conceptual structure within research is conducted; it constitutes the blue print for the collection, measurement and analysis of data. This research is restricted to very small sample size and has mainly focused on usage of ERP Vs. cloud computing in Educational sector. Overall research will be done with a sample size of 33 respondents from different education institutes from Pune University by using Snowball & convenience sampling method. Primary data has collected through online questionnaire (Google Docs) and offline questionnaire from Educational Institutes. /whereas Secondary data has collected from the past research-work done by various people in the field of cloud computing Research articles, Magazines, T.V News and Newspaper articles, Environment based books, Periodicals, and Internet , etc

### 3.1 Objectives of the study are as-

- To study about the awareness of cloud computing in Educational Sector.
- To do the comparative study of cloud computing vs. traditional ERP systems.
- To do the comparisons of cloud computing vs. Traditional ERP and measure the effectiveness of cloud computing in educational sector.
- To study the role of cloud computing model selection with respect to educational institutes.

### 3.2 Hypothesis of the study

- H<sub>1</sub>: Cloud computing services are cheaper than the existing ERP system.
- H<sub>2</sub>: Use of Cloud computing increase the resource flexibility level in educational sector.

## 4. Data Presentation, Analysis and Interpretation

This research aims to prove the effectiveness of cloud computing in Educational sector, as these sectors form the backbone of our economic sector. This research also aims at providing comparison between different services provided by cloud computing. Also the features of cloud computing that are favored by individuals and organizations alike Security, Per user cost, Overall Cost, Effectiveness and Time and cost saving.

### 4.1 Objective 1: To study about the awareness of cloud computing in Educational Sector.

**Table No 1: Awareness of cloud computing in Education Sector**

Awareness	No. of Respondents (In Percent)
Yes	31 (93.9)
No	2 (6.10)
Total	33 (100)

Figures in bracket indicates Percentages

From above Table No.1, it clears that about 93 percent educational institutes are aware about cloud computing. Ratio for awareness of cloud computing in educational sector is very high as compared to the unawareness.

### 4.2 Objective 2: To study the implementation cost of cloud computing and their various service models.

To do the comparative study of cloud computing vs. traditional ERP system, various factors are considered like cost of implementation, cost of implementation with various service models and understand opinions of educational sectors that ERP is cheaper than cloud computing or not.

Based upon the survey carried out and through Table No. 2, it is seen that out of 33 educational institutes 25 institutes' implemented cloud computing whereas only 8 institutes are using traditional ERP system. And as per the educational institute's opinion, the cost to implement cloud computing lies mainly between the range of Rs.30, 000-40,000 of educational institutes.

**Table No: 2: Cost incurred for implementing cloud computing**

<b>Implementation Cost (In Thousands)</b>	<b>No. of Respondents (In Percent)</b>
Not implemented	8 (24.2)
Below 30	6 (18.2)
30-40	9 (27.3)
40-50	3 (9.1)
50-60	4 (12.1)
60 and more	3 (9.1)
Total	33 (100.0)
<b>Mean</b>	<b>1.94</b>
<b>Standard Deviation</b>	<b>1.619</b>

Figures in bracket indicates Percentages

Further study has been carried out to compare implementation of cost of various cloud computing service model as per IT industry point of view. Following Table. No. 3 shows various service models of cloud computing and their implementation cost. It is seen that the percentage of PaaS & SaaS requires high implementation cost (Rs. 90000/-) as compared to IaaS.

**Table No: 3 Cost for implementing cloud computing with respect to Service Model**

<b>Model</b>	<b>IaaS</b>	<b>PaaS</b>	<b>SaaS</b>
<b>Cost in Thousand</b>	<b>Number of Respondents (In Percent)</b>	<b>Number of Respondents (In Percent)</b>	<b>Number of Respondents (In Percent)</b>
Not implemented	8(24.24)	8(24.24)	8(24.24)
below 30	10(30.31)	7(21.22)	11(33.34)
30-60	15(45.45)	12(36.36)	12(36.36)
60-90	0(0)	4(12.12)	1(03.03)
90 above	0(0)	2(06.06)	1(03.03)
Total	33 (100)	33 (100)	33 (100)

Figures in bracket indicates Percentages

#### **4.3 Objective 4: To study the role of cloud computing model selection with respect to educational sector.**

For studying this objective, various deployment models like private, public, hybrid and community etc are considered from educational institute point of view. Following Table no. 4 shows deployment models in educational sectors.

**Table No.4: Deployment models in educational sector**

Deployment Models	Number of Respondents
None	19 (57.6)
Private	4 (12.10)
Public	2 (6.10)
Hybrid	6 (18.20)
Community	2 (6.10)
Total	33 (100.0)

Figures in bracket indicates Percentages

As per Table no.4, it reveals that most of the educational institutes used Hybrid Deployment model as compared other models.

#### 4.4 Objective 3: To do the comparisons of cloud computing vs. Traditional ERP and measure the effectiveness of cloud computing in educational sector.

This objective mainly focuses on effectiveness of cloud computing with respect to education sector. For measuring effectiveness, various factors like availability of resources, security, accessibility, reliability, resource flexibility etc factors are considered

For study, researchers have also considered opinion of educational institutes regarding comparison between cloud computing and traditional ERP system.

Table No. 5: Cloud computing cheaper than ERP

Cloud computing cheaper than ERP	No. of Respondent (In Percent)
Yes	30 (90.90)
No	3 (9.10)
Total	33 (100)

Figures in bracket indicates Percentages

From above Table no. 5, it clears that 90 percent educational institutes agreed that cloud computing is cheaper than traditional ERP system and they are satisfied with cloud computing. For measuring the effectiveness of cloud computing various factors are used along with five point scale and their average value has been calculated. Following Table No.5 shows the effectiveness of cloud computing.

Table No.6: Effectiveness of cloud computing in educational sector

Effectiveness Factors	Very Dissatisfactory	Dissatisfactory	Average	Satisfactory	Highly Satisfactory	Average
Resource Availability	3 (9.10)	1 (3.00)	6 (18.20)	17 (51.50)	6 (18.18)	3.66
Security	1 (3.00)	2 (6.10)	12 (36.40)	6 (18.20)	12 (36.36)	3.78
Accessibility	1 (3.00)	2 (6.10)	6 (18.20)	14 (42.20)	10 (30.30)	3.90
Reliability	1 (3.00)	2 (6.10)	5 (15.20)	13 (39.40)	12 (36.36)	4.00
Resource Flexibility	2 (6.10)	2 (6.10)	10 (30.40)	9 (27.30)	10 (30.30)	3.69

Figures in bracket indicates Percentages

From Table No.6, it clears that effectiveness of cloud computing services is very high because average value of each factor is more than 3.5. Study reveals that cloud computing services are more reliable with average value 4.0 followed by accessibility with average value 3.90, security is high with average value 3.78. Further resources flexibility with average value is 3.69 and resource availability with average value is 3.68.

### 5. Testing of Hypotheses

Various statistical tools used to test the hypotheses. If the replies of a majority of the respondents support a hypothesis then that hypothesis will be considered as confirmed. Otherwise it will be considered as rejected. The data connected with the hypothesis and obtained from respondents has been used for this purpose

**5.1 Hypothesis 1:** The first hypothesis of the study is “Cloud computing services are cheaper than the existing ERP system.”

For testing this hypothesis, null and alternative hypothesis are set and which are as follows-

H<sub>0</sub>: There is no difference between cost of Cloud computing services and ERP system.

H<sub>1</sub>: Cloud computing services are cheaper than the existing ERP system.

**Table No.7: Z Statistics**

One-Sample Test				
T	df	Sig. (2-tailed)	95% Confidence Interval of the Difference	
			Lower	Upper
12.990	21	.000	1.15	1.58

As per Table No. 7, P value is **0.00** is **< 0.05** hence reject H<sub>0</sub> (Null hypothesis) and accept H<sub>1</sub> that is hypothesis of the study. Hence it proves that “Cloud computing services are cheaper than the existing ERP system”

**5.2 Hypothesis 2:** Use of Cloud computing increases the resource flexibility level in educational sector.

According to data collected from 33 people, 17 people agree upon the cloud computing increases resource flexibility. For testing this hypothesis, null and alternative hypothesis are set and which are as follows-

H<sub>0</sub>: Cloud computing doesn't affect the resource flexibility level in educational sector.

H<sub>1</sub>: Use of Cloud computing increase the resource flexibility level in educational sector.

**Table No. 8: ANOVA for Resource Flexibility for cloud computing**

Groups	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	24.524	1	24.524	19.318	.000
Within Groups	39.355	31	1.270		
Total	63.879	32			

As per above Table No. 8, P value is 0.000 which is less than  $\alpha=0.05$ , the level of significance. Therefore, it is enough evidence to reject the Null hypothesis and accept H<sub>1</sub> that is hypothesis of the study. Hence it proves that “Use of Cloud computing increases the resource flexibility level in educational sector”

### 6. Findings, Conclusions & Suggestions

#### 6.1 Findings of the Study:

- 93 percent educational institutes are aware about cloud computing.
- As per the educational institute's opinion, the cost to implement cloud computing lies mainly between Rs.30, 000-40,000 only.
- It is seen that the percentage of PaaS & SaaS requires high implementation cost (Rs. 90000/-) as compared to IaaS.
- 90 percent educational institutes agreed that cloud computing is cheaper than traditional ERP system and they are satisfied with cloud computing
- Study reveals that cloud computing services are more reliable with average value 4.0 followed by accessibility with average value 3.90, security is high with average value 3.78. Further resources flexibility with average value is 3.69 and resource availability with average value is 3.68.
- Most of the educational institutes used Hybrid Deployment model as compared other models.

#### 6.2 Conclusion of the study



In today's fast moving life people want all the facilities at their maximum convenience which is provided by the cloud computing over the internet, this is one of the reasons for the growing popularity of cloud computing. Still a large proportions of people today refrain themselves from using these facilities due to the security reasons or reliability with cloud computing.

- Ratio for awareness of cloud computing in educational sector is very high.
- Effectiveness of cloud computing services is very high in educational sectors.
- From the research the researchers can also conclude that the organizations using cloud computing services uses the same for all their connectivity issues. Also a few other products such as Drop Box, Google Drive have increased the awareness in the people. The research also shows that most of the people using these facilities view it as time saving and cost saving.
- Educational sector decrease the paper work by implementing the cloud computing services. The cost incurred for the software licensing can be reduced by sharing software with the help of SaaS.

### 6.3 Suggestions & Recommendations of the study

The respondents have put forward certain suggestions and recommendations which have been summarized into a more organized form by the researcher

#### 6.3.1 Suggestions of the study:

- The use of cloud computing should be promoted by organizations.
- Services charges for cloud computing should be minimized and all the different cloud computing models should be available at low implementation cost.
- The technology should be made simpler, user- friendly and easily accessible.
- The cloud computing should not only be available to faculties or management in institutions but also should be available for students.
- The platform requirement for accessing the cloud computing should be minimized such as
- Efforts should be made to decrease the technical problems and security issues regarding the cloud computing. Different security measures should be applied in order to provide security for data and services provided by cloud computing.

#### 6.3.2 Recommendations of the study:

The following are the recommendations for increasing the use and popularity of cloud computing facilities:

- Proper training is given to employees by the implementing organization to access the applications, resources or software's over the internet, then the time and cost incurred can be minimized.
- Create a trust in organizations towards security of the services and data.
- Cloud services implementation and access should be available at lower cost.

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