

# Effectiveness of E-learning in Select Ethiopian Universities

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**Abstract:** In past decade the ICT (Information and Communication Technologies) has enormously affected the way education is provided. E-learning is a concept which uses the internet technologies for teaching and learning process. Many educational institutions have developed their own E-learning systems and some outsource it. But most of the universities have invested much and everyone have this E-learning system in their institution. How far this E-learning system is utilized by the teaching and learning community is a question mark. Though technology is in the finger tips of the teaching and learning community use of these tools are seem to be slow in developing countries like Ethiopia. Investing in E-learning is already done by many universities, but their fruits are not yet ripe. This paper discusses the current state of E-learning systems in selective universities of Ethiopia.

**Key Words:** E-learning, cloud computing, effectiveness

## I. INTRODUCTION

E-learning is not a buzz word. It is there for long years from now and even school children knew about it. The technology enabled learning or Electronic learning has become a part of any educational institution without any grade difference. All the Educational institutions and many organizations who want to train their employees have adopted E-learning systems in some way or the other. The industrial organizations are using E-learning system to train their employees on certain technologies. The educational institutions are investing on E-learning technologies to meet the state of art in par with other world class institutions. But usage of E-learning system in Educational institutions of Ethiopia is not to that extent. One of the best universities of Ethiopia is Addis Ababa Science and Technology University. In this institution also the stake holders of E-learning system are less. Main thing is there is no awareness towards the E-learning technologies followed there, among the teaching and learning community.

There can be two types of E-learning solutions used by Educational institutions. They can use commercial products or open source models. Both has its advantages and disadvantages. The commercial E-learning applications are easy to implement since they come as readymade. Technical support and maintenance is not a problem. But the cost of

initial investment and maintenance will be more for commercial products. For open source e-learning applications, the initial cost is less, but training of professionals, developing customized contents and maintenance involves more cost. Most of the universities will have an ICT wing in which some 5 to 10 members will be working on developing the E-learning system. They use the open source model to develop their customized E-learning system.

Irrespective of whether commercial or open source, the cost is more in either in initial investment or in maintaining and hiring professionals for developing. It is necessary to adopt better methods of E-learning system to reduce the cost in countries like Ethiopia where huge investment on an area like Education is very crucial.

Detailed analysis is done in selected Universities of Ethiopia to understand the present scenario of E-learning systems and a new framework will be proposed for the betterment of Universities in future, who have adopted E-Learning systems. The new framework will be based on cloud computing technology.

## II. CLOUD COMPUTING

Cloud computing is a new approach for managing and organizing the ICT resources in an efficient manner. Cloud computing is defined in [1] as a “*model for enabling 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*”. There are three types of cloud service models in general. 1. Software as a Service (SaaS); (2) Platform as a service (PaaS); (3) Infrastructure as a service (IaaS) [2]. Cloud Technology offers many advantages including availability of up to date software , flexible cost, always on availability etc. Using cloud technology in e-learning will drastically reduce the investment cost in infrastructure of E-learning.

## III. CLOUD COMPUTING AND E-LEARNING

Many institutions are not having fund for the management of e-learning infrastructures. Especially in developing countries, the maintenance and management of the ICT resources are very costly. Many institutions have implemented E-learning system but in partial because of lack of resources. The storage capacity of the servers is less. The technical contents are only word or pdf documents. But if the storage capacity is more, then multimedia contents can be uploaded. Some of the institutions are having good storage capacity servers, but they don't maintain it properly. The teaching contents are poor. The problems related to management of infrastructure can be solved by using cloud computing techniques.

In [3] a comparative study of using cloud computing in E-learning is done. They highlight the following points.

### 3.1 Advantages of cloud computing in e-learning

- Cloud computing will allow the stakeholders to use the e-learning materials from anywhere any time.
- 24/7 content support and infrastructure availability is guaranteed.
- Software will be up to date.

### 3.2 Disadvantages of cloud computing in E-learning :

- Security of the contents and sensitive data. The cloud service provider should ensure 100% safety, but remote access through internet is always vulnerable.
- Internet speed may affect the curiosity and interest of students and teachers to use the E-learning system. Best possible internet speed should be provided by the universities.
- Cost for short term use is high. But if we have a full fledged content prepared by experts, then the cost of bringing expatriates from different countries to teach the students of Ethiopia can be reduced.

## IV. RELATED WORK- E-LEARNING MODELS BASED ON CLOUD COMPUTING

There is lot of research going on in using the cloud computing technology in e-learning framework. Some researchers have proposed models with different layers. Phankokkrud [4] proposed e-learning architecture based on cloud computing which consists of three layers: (1) infrastructure layer, (2) platform (middle) layer, and, (3) application layer.

Infrastructure layer is a hardware layer that supplies the computing and storage capacity for the higher level and this layer, which is used as e-learning and software virtualization technologies, ensures the stability and reliability of the infrastructure. The second layer is Platform layer, this layer is a middle layer consisting middleware that is Web service. It is used for providing the learning resources as a service. This layer consists of two modules: item classification module (ICM) and course selection module (CSM). They are used for accessing the items from the item bank and selecting suitable

learning content from the content database. The third layer is Application layer which is responsible for interface provision for the students. Not much difference can be inferred from the comparison of the architecture delivered by Phankokkrud [4] and Wang, Pai, & Yen [2]. They proposed an architecture of e-learning-based cloud computing consists of three layers, namely: (1) infrastructure layer, (2) middleware layer, and, (3) application layer. The first layer is infrastructure layer. It is employed as the e-learning resource pool that consists of hardware and software virtualization technologies to ensure the stability and reliability of the infrastructure. This layer also supplies the computing and storage capacity for the higher level. The second layer is middleware layer. It focuses in providing a sharable platform consisting of two modules: CNRI's (Corporation for National Research Initiatives) Handler System Module and Metadata Transformation System Module. The final layer is application layer. At this layer, cloud computing provides convenient access to the e-learning resources.

The next architecture proposed by Masud & Huang [5] consists of five layers. The First layer is infrastructure layer. It is composed of information infrastructure and teaching resources. Information infrastructure contains internet/intranet, system software, information management system and some common hardware. Teaching resources stored up mainly in traditional teaching model and distributed in different departments and domain. The second layer is software resource layer. This layer is composed by operating system and middleware. A variety of software resources are integrated through middleware technology to provide a unified interface for software developers to develop applications and embed them in the cloud. The third layer is resource management layer. In order to effectuate on demand free flow and distribution of software over various hardware resources, this layer utilizes integration of virtualization and cloud computing scheduling strategy. The fourth layer is service layer. This layer has three levels of services namely, SaaS, PaaS, and IaaS. In SaaS, cloud computing service is provided to customers, contrasting to traditional software, cloud customers use software via the internet without any need to purchase, maintain, and upgrade. They simply to pay a monthly fee. The last layer is application layer.

This layer is a specific layer consisting of applications of integrated teaching resources, including interactive courses and the teaching resources sharing. The teaching resources include teaching material, teaching information, as well as the full sharing human resources. The above text is given in [6].

## V. RESULTS AND DISCUSSIONS

In Ethiopia there are more than 31 universities. In many of the universities E-Learning system is available. But the percentage usage of e-learning system among the teaching-learning community is very less. Many are not aware of

existence of such system in their universities. This paper studied the effectiveness of e-learning system in selected universities of Ethiopia. The results are given below. The survey is conducted in 4 dimensions.

Dimension 2: Learner –Content –interaction in e-learning  
 Dimension 3: Learner –instructor interaction in e-learning  
 Dimension 4: Learner-instructor-interaction in e-learning

Dimension 1: The ability to learn autonomously using e-learning

Table 1: Dimension 1: The ability to learn autonomously through e-learning

Items	SA	A	N	DA	SD	Mean	Std.Dev
In e-learning my learning is personalized. Frequency	71	107	96	12	12	3.64	1.11
Frequency percentage	23.27	35.08	31.48	3.93	3.93		
In e-learning I can learn anytime, anywhere. Frequency	102	112	42	18	30	3.78	1.25
Frequency percentage	33.44	36.72	13.77	5.9	9.84		
In e-learning I can learn based on my pace. Frequency	66	119	53	36	12	3.45	1.37
Frequency percentage	21.63	39.01	17.37	11.8	3.93		
E learning presents what is suitable for my learning style Frequency	53	144	66	23	12	3.61	1.1
Frequency percentage	17.33	47.21	21.64	7.54	3.93		
E-learning enables me to review the foregoing any Time Frequency	77	125	72	6	18	<b>3.8</b>	1.04
Frequency percentage	25.24	40.98	23.61	1.97	5.9		
E-learning presents immediate feedback. Frequency	42	155	65	18	18	3.55	1.12
Frequency percentage	13.77	50.81	21.32	5.9	5.9		
In e-learning I am able to self-evaluate. Frequency	54	112	78	42	12	3.45	1.16
Frequency percentage	17.7	36.72	25.57	13.77	3.93		
E-learning presents suitable technical support Frequency	66	83	84	47	18	<b>3.38</b>	1.26
Frequency percentage	21.63	27.21	27.54	15.41	5.9		

The ability to learn autonomously through e-learning is the most important dimension because the learners ability to self-learn is a necessary factor for e-learning to take place. This section of the report shows that overall, the learners perceptions of their ability to learn autonomously showed that they could use the flexibility of e-learning (time, place and pace).The items fall in the mean score of 3.8 and 3.38 which make all the responses in the range of agree and

neutral. The average mean for this dimension was 3.8 (neutral), the highest placed, in terms of dimension order, was the item regarding E-learning enables me to review the foregoing any time . The next item with the highest value was- In e-learning I can learn anytime, anywhere with 3.78 mean values. They felt they were able to access suitable materials for their own learning style. Technical support and evaluation features were rated on a lower scale by the respondents.

Table 2 : Dimension 2: Learner –Content –interaction in e-learning

Items	SA	A	N	DA	SD	Mean	Std.Dev
E-learning eases the process of learning. Frequency	123	148	20	5	7	4.24	0.83
Frequency percentage	40.38	48.52	6.56	1.64	2.30		
E-learning encourages me to learn more. Frequency	72	154	64	6	7	3.92	0.86
Frequency percentage	23.61	50.49	20.98	1.97	2.30		

E-learning increases my capacity.	Frequency	100	138	42	16	7	4.02	0.94
Frequency percentage		32.79	45.25	13.77	5.25	2.30		
E-learning increases the motivation to learn.	Frequency	83	131	56	21	12	3.83	1.03
Frequency percentage		27.21	42.95	18.36	6.89	3.93		
E-learning increased my productivity.	Frequency	84	130	59	17	5	3.82	1.11
Frequency percentage		27.54	42.62	19.34	5.57	1.64		
E-learning helped me to manage my time and self discipline	Frequency	49	131	72	22	29	3.49	1.14
Frequency percentage		16.07	42.95	23.61	7.21	9.51		
My specific learning time in e-learning was spent fully in Learning	Frequency	59	94	95	38	17	3.46	1.11
Frequency percentage		19.34	30.82	31.15	12.45	5.57		
I prefer to do the tasks and tests through e-learning tools	Frequency	22	129	101	39	12	3.36	0.94
Frequency percentage		7.21	42.30	33.11	12.79	3.93		
I prefer to obtain my score through e-learning tools.	Frequency	87	94	47	48	7	3.48	1.44
Frequency percentage		28.52	30.82	15.41	15.73	2.29		
My results in e-learning were better Compared to those I received in traditional learning	Frequency	50	96	106	23	19	3.36	1.20
Frequency percentage		16.39	31.48	34.75	7.54	6.22		
E-learning met my needs.	Frequency	58	132	56	26	14	3.47	1.33
Frequency percentage		19.016	43.28	18.36	8.52	4.60		
E-learning met my expectations.	Frequency	84	106	69	32	12	3.72	1.10
Frequency percentage		27.54	34.75	22.62	10.49	3.93		
I enjoyed learning by e-learning.	Frequency	78	155	21	39	10	3.83	1.06
Frequency percentage		25.57	50.82	6.89	12.79	3.28		
I felt more freedom learning by e-learning.	Frequency	93	92	83	28	7	3.78	1.05
Frequency percentage		30.49	30.16	27.21	9.18	2.30		
E-learning has increased my confidence.	Frequency	67	130	64	35	7	3.71	1.01
Frequency percentage		21.97	42.62	20.98	11.48	2.30		
I want to take other courses by e-learning	Frequency	70	166	48	5	14	3.90	0.93
Frequency percentage		22.95	54.42	15.74	1.64	4.59		

In this dimension, as in the one previously reported, the respective items means came between neutral and agree where the highest item got 4.24 and the lowest got 3.36. From above , we can say that two items were rated as agree and remaining 14 items rated as neutral. The results showed a neutral response to e-learning. Learners rated their experience Neutral

in terms of the amount and quality of the work they had undertaken through e-learning. They reported that motivation resulted from the ease of learning and were only slightly more reserved in their enthusiasm when comparing their results with those of traditional learning.

Table 3 : Dimension 3- Learner –instructor interaction in e-learning

	SA	A	N	DA	SD	Mean	Std.Dev
I enjoy contacting my instructor via e-learning Frequency	54.00	107.00	60.00	47.00	36.00	3.32	1.26
Frequency percentage	17.70	35.08	19.67	15.41	11.80		
I built a productive relationship with my instructor via e-learning Frequency	18.00	84.00	89.00	66.00	47.00	2.87	1.16
Frequency percentage	5.90	27.54	29.18	21.64	15.41		
E-learning encourages me to discuss with my instructor Frequency	24.00	48.00	125.00	59.00	48.00	2.81	1.13
Frequency percentage	7.87	15.74	40.98	19.34	15.74		
I prefer to communicate with the instructor by e- learning compared to face to face Frequency	18.00	83.00	90.00	72.00	41.00	2.88	1.13
Frequency percentage	5.90	27.21	29.51	23.61	13.44		
E-learning increases communication with the instructor Frequency	24.00	77.00	84.00	65.00	54.00	2.84	1.21
Frequency percentage	7.87	25.25	27.54	21.31	17.70		
E-learning eases discussion with my instructor Frequency	42.00	54.00	101.00	71.00	36.00	2.98	1.20
Frequency percentage	13.77	17.70	33.11	23.28	11.80		
In e-learning I receive more attention from my instructor Frequency	42.00	66.00	90.00	53.00	53.00	2.97	1.28
Frequency percentage	13.77	21.64	29.51	17.38	17.38		

These responses showed that the learners perceived the extent to which e-learning did not increase their motivation to contact their instructors. They expressed a negative preference for interaction the instructors by electronic

means but agreed that they enjoy the opportunities of contacting the instructor through e-learning. These results showed a negative response to the facilities for learner instructor interaction provided by e-learning.

Table 4 : dimension 4 : Learner-instructor-interaction in e-learning

	SA	A	N	DA	SD	Mean	Std.Dev
E-learning increases cooperation among learners. Frequency	48.00	84.00	47.00	77.00	47.00	3.03	1.34
Frequency percentage	15.74	27.54	15.41	25.25	15.41		
I prefer to communicate with my classmates by e-learning compared to face-to-face. Frequency	12.00	149.00	53.00	59.00	30.00	3.18	1.10
Frequency percentage	3.93	48.85	17.38	19.34	9.84		
I enjoy contacting my classmates via e-learning. Frequency	42.00	101.00	82.00	42.00	36.00	3.23	1.20
Frequency percentage	13.77	33.11	26.89	13.77	11.80		
I built a productive relationship with other learners via elearning. Frequency	30.00	108.00	58.00	77.00	30.00	3.10	1.18
Frequency percentage	9.84	35.41	19.02	25.25	9.84		

E-learning encourages me to participate in discussion with my classmates. Frequency	30.00	66.00	95.00	58.00	54.00	2.87	1.23
Frequency percentage	9.84	21.64	31.15	19.02	17.70		
E-learning eases discussion with my classmates Frequency	24.00	102.00	71.00	58.00	15.74	2.99	1.22
Frequency percentage	7.87	33.44	23.28	19.02	15.74		
E-learning has increased my communication with other learners. Frequency	30.00	107.00	76.00	24.00	66.00	3.04	1.31
Frequency percentage	9.84	35.08	24.92	7.84	21.64		

Learners perceptions of the extent of e-learning's effectiveness, as shown by their communication with each other, were neutral. They did not appreciate the speed and frequency of contact. They reported their satisfaction with the quality of learner-learner relationships and with their outcomes.

The first four dimensions ordered by means

	Dimension	Mean	Dimension
01	Learner- content-interaction in e-learning	3.71	2
02	The ability to learn autonomously through e-learning	3.58	1
03	Learner-learner-interaction in e-learning	3.06	4
04	Learner-instructor-interaction in e-learning	2.95	3
05	All dimensions	3.43	

From the analysis, it is understood that the awareness among students is very less. The interaction among learner to learner and learner to teacher is also very less. Most of the students have accepted that they use the moodle e-learning system and it helps them to study at their own pace. Many students have written that though they use e-learning system for some subjects, they feel that the traditional learning system cannot be replaced by e-learning techniques. Some students feel that the online contents are more interesting and they like it so much. Many students have complained that the availability of infrastructure is very poor and there is no proper maintenance of the infrastructure too. The availability and maintenance of infrastructure is more costly.

## VI. SUGGESTIONS AND RECOMMENDATIONS

In countries like Ethiopia, where more developments are expected in near future, education plays a major role. Many students want to register for their post graduation, but the seats and number of universities is limited. The instructors who are working in Universities are

having just a basic degree and they depend on other countries for their post graduation. Many students are working in banking and insurance sectors are registering for their post graduation in universities. Many want to study while they work. They are not able to do so, because of limited seats, or the need for physical presence in university campus. A good solution for these students is to use e-learning in cloud platform.

In every year, approximately 30 expatriates are appointed in every universities. Government is spending approximately \$2000 every month as salary for every expatriate. When calculated, it comes to a good amount spent on expatriates for providing quality education to students. But whether the mission is completed or not is a question mark. This problem of spending unnecessary money and bringing expatriates can be stopped, if enough resources are made available in Ethiopian universities. A good cloud based e-learning system with best contents can solve most of the problems.

## VII. CONCLUSION AND FUTURE WORK

The current e-learning systems followed in many of the universities are just used as a fancy material and it is not utilized properly by the students as well as by the teachers. Interactive e-learning contents with more graphics and multimedia will improve the interest of students to learn using e-learning techniques. This can be achieved by using cloud technology in e-learning. A framework for E-learning using cloud computing will be proposed in the future. It will be cost effective and reliable.

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