Open, Flexible and Distributed e-Learning Environments

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Abstract

What generate an effective e-learning environment to course writers may differ to a developer but the major consideration is to the prospects because they are the receiver. An e-learning system is meaningful to learners when it is easily accessible,well-designed, learnercentred, affordable and efficient; flexible and has a facilitated learning environment. When learners display a high level of participation, involvement and tremendous output in meeting a course'sgoals and objectives, this can makee-learningmeaningful to instructors.Therefore, when learners enjoy all availablesupportservices provided in the course without any interruptions, it makes supportservices staff happyas they strive to provide easy-to-use, reliable and accessible services.This paper examines components and features that can make e-learning as competitive as face-to-face learning whereby students derive equal benefits as when undergoing face-to-face learning.

*Keywords:*Components, features, open, flexible, distributed.

1. **Introduction**

Recently, e-learning is one of the most promising and growing applications that are essential to an information age. The growth of the Internet is approaching online education to people in corporations, institutes of higher education, the government, and other sectors [17], and both the growing need of continuous education and the inclusionof new multimedia technologies become crucial factors for the expansion of lifelong learning. Besides pure virtual colleges and universities, more and more traditional educational institutions are adopting the use of Information and Communication Technologies (ICT) to provide learners with a richer environment for their learning process.

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Technologies such Web 2.0, wikis and blogs have generated new possibilities for creating and sharing educationalcontent. This fact, combined with the concept of open educational resources, enables a new environment for learners that view the whole Web as a learning space with many possibilities, with no time or space barriers. Research according to [18], opined that learning process must be created on top of such infrastructure, and there is a real need for managing all those contents available on the Web.

Numerous factors help to create a meaningful learning environment, and many of these factors are systemically interrelated and independent. The comprehensive understanding of these interrelated features would enable us create a flexible learning environments. Designing open, flexible and distributed e-learning systems for diverse learners is a challenge to writers and developers; however, as more and more institutions offer e-learning to learners worldwide, we will become more knowledgeable about what works and what does not work. We should try our best to accommodate the needs of students.

Advances in information technology, coupled with the changes in society, are creating new paradigms for education and training. These massive changes have tremendous impact on our educational and training systems. Participants in this educational and training paradigm, require rich learning environments supportedby well-designed resources [15]. They expect on-demand, ubiquitous, high-quality instruction with good support services. To stay viable in this global competitive market, providers of education and training must develop efficient and effective learning systems to meet the society's needs. Therefore, there is a tremendous demand for affordable, efficient, easily accessible, open, flexible, well-designed, learner-centered, distributed, and facilitated learning environments.

 [17]stated that Internet technologies have fundamentally altered the technological and economic landscapes so radically that it is now possible to make quantum leaps in the use of technology for learning.[4]reports that "e-learning is the fastest-growing and most promising market in the education industry. According to [10], e-learning is poised to explode, and the company anticipates the market to more than double in size each year through 2002."

This statement is not an abstract, a survey captured in 2002 supported this facts which has this to say; the Primary Research Group conducted a survey of distance learning programsin higher education in 2002. The survey results show continued astoundinggrowth in the higher education distance learning market. The mean annualenrolment growth rate for 2002 reported by the 75 college distance learningprograms in the study was 41 percent, and 92 percent of programs sampled saythat their enrolment growth rate has been either "very strong" or "fairly good."Not a single college in the survey experienced a decline in total distance learningcourse enrolment. In 2004 survey, the Primary Research Group found thatcollege distance learning programs increased their revenues by a mean of 9.67percent in 2003 (source: The Survey of Distance & Cyberlearning Programs inHigher Education, 2002 Edition and 2004 Edition) as cited by [13].

The following serves as structure of this paper apart from the general introduction: literature review, traditional instruction and e-learning, learner-focused e-learning system and Components and features of e-learning

2. Literature Review

1.1   *Open, Flexible, And Distributed Learning Environment*

The simple definition of open learning islearning in your own time, pace, and place.[14]notes thatopen and flexible learning allows learners to have some say in how, where, andwhen learning takes place called ubiquitous computing. Most writers used the terms open andflexible interchangeably. [6]noted that distributed learning is not synonymous with distance learning, but theystress its close relationship with the idea of distributed resources:

Distributed learning is an instructional model that allows instructor, students, and content to be located in different, non-centralized locations so that instruction and learning occur independent of time and place [13]

The distributed learning model can be used in combination with traditional classroom-based courses, with traditional distance learning courses, or it can be used to create wholly virtual classrooms.

The Internet supports open learning because it is device, platform, time, and place independent. It is designers who take advantage of the openness of the Internet to create learning environments that are flexible for learners. Therefore, openness is a technical matter; flexibility is a design matter. The Internet, by its very nature, distributes resources and information, making it the tool of choice for those interested in delivering instruction using the distributed learning model [7]. Thus, the Internet supported by various digital technologies is well-suited for open, flexible, and distributed learning as seen in fig 1.
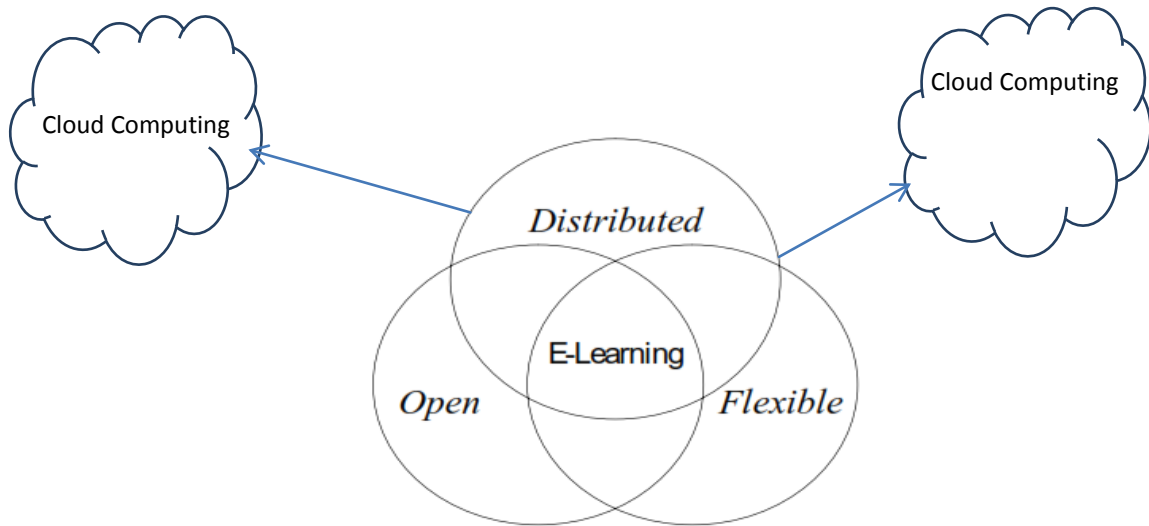
Figure 1.Open, flexible, distributed & e-learning integrated with Cloud computing

Source (OFDLE research, [1])

2.2   *Cloud Computing Versus Distributed E-Learning*

The definition given by [13] makes it clear that cloud computing is an infrastructure that housed the distributed learning. The following are the advantages of cloud computing as related to distributed computing with respect to infrastructure acquisition as structured by [1]:

2.2.1   *Reduction of Capital Expenditure*

Customers can avoid spending large amounts of capital on purchasing and installing their IT infrastructure or applications by moving to the cloud model. Capital expenditure on IT reduces available working capital for other critical operations and business investments.

2.2.2   *Reduced Administration Costs*

IT solutions can be deployed extremely quickly and managed, maintained, patched and upgraded remotely by your service provider. Technical support is provided round the clock by reputable providers no extra charge, reducing the burden on IT staff. This means that they are free to focus on business-critical tasks, and businesses can avoid incurring additional manpower and training costs.

2.2.3   *Improved Resource Utilisation*

Combining resources into large clouds reduces costs and maximises utilisation by delivering resources only when they are needed. Businesses needn't worry about over-provisioning for a service whose use does not meet their predictions, or under-provisioning for one that becomes unexpectedly popular. Moving more and more applications, infrastructure, and even support into the cloud can free up precious time, effort and budgets to concentrate on the real job of exploiting technology to improve the mission of the company. Sharing computing power among multiple tenants can improve utilisation rates, as servers are not left idle, which can reduce costs significantly while increasing the speed of application development.

2.2.4   *Scalability on Demand*

Scalability and flexibility are highly valuable advantages offered by cloud computing, allowing customers to react quickly to changing IT needs, adding or subtracting capacity and users as and when required and responding to real rather than projected requirements. Even better, because cloud-computing follows a utility model in which service costs are based on actual consumption, you only pay for what you use.

2.2.5   Quick and Easy Implementation

Without the need to purchase hardware, software licenses or implementation services, a company can get its cloud computing arrangement only with a click.

2.2.6   Helps Smaller Businesses Compete

There has been a huge disparity between the IT resources available to small businesses and to enterprises. Cloud computing has made it possible for smaller companies to compete on an even playing field with much bigger competitors. 'Renting' IT services instead of investing in hardware and software makes them much more affordable, and means that capital can instead be used for other vital projects.

2.2.7   Quality of Service

Your selected service provider's offer 24/7 customer support and an immediate response to emergency situations.

2.2.8   Global Access

Internet would make assessment of cloud based services available anywhere and anytime.

It's easier to collaborate with both the application and the data stored in the cloud, multiple users can work together on the same project, share calendars and contacts etc.

2.2.9   Technical Support

A good cloud computing provider will offer after sales service such as technical support. This type of support model allows a provider to build a better understanding of your business requirements, effectively becoming an extension of your team.

2.2.10   Disaster Recovery

Recent research has indicated that around 90% of businesses do not have adequate disaster recovery or business continuity plans, leaving them vulnerable to any disruptions that might occur [9] Experienced providers can provide an array of disaster recovery services, from cloud backup to having ready-to-go desktops and services in case your business is hit by problems. Files are stored twice at different remote locations to ensure that there's always a copy available 24 hours a day, 7 days per week.

2.3   TRADITIONAL INSTRUCTION AND E-LEARNING

Table 1 displays the advantages and disadvantages of e-learning

ADVANTAGES/DISADVANTAGES OF E-LEARNING

	Advantages of E-learning	Disadvantages of E-learning
1.	E-learning has made possible the rescheduling of class work around personal and professional work.	Unmotivated learners may fall out
2.	It has reduced travelling cost and time to and from school	Students may feel isolated or miss social interaction.
3.	It helps learners to select learning materials that meet their knowledge and interest.	Instructors may not always be available on demand.
4.	It helps learners to study anywhere provided there are computer and internet access.	Slow or unreliable internet connections can be discouraging.
5.	It allows learners to work at their pace.	Managing learner's software can involve a learning curve.
6.	It provides users the flexibility to join discussions in the bulletin board at any hour or chat with classmates.	Some curses such as surgery, public speaking which requires face to face contact with teacher are difficult to simulate.
7.	Different learning styles are addressed and facilitation of learning occurs through varied activities.	Lack of familiar structure and routine may take time getting used to.

Table 2 shows the advantages and disadvantages of traditional learning (face-to-face) learning

ADVANTAGES/DISADVANTAGES OF TRADITIONAL LEARNING

	Advantages	**Disadvantages**
1.	Responses in face to face discussions are more prompt than in online discussions	Students who could not attempt questions immediately are considered slow learners.
2.	Face to face discussions seem to be more efficient than online discussions in terms of time and ease to make conclusions.	Learners could access assignment anywhere and anytime provided there is computer and internet which is quite difficult in traditional learning.
3	Face to face discussions are more likely to involve more interaction than online (social interactions) discussions which are multidirectional.	Interactions are immediate and cannot be postponed or done at convenience compared to online learning which can accommodate assignment and discussion forum in as much as you meet up the deadlines.
4.	Communication in face to face discussions is easier and more natural than online discussions.	Traditional learning is more expensive because it involves tuition fees, accommodation, feeding etc.
5.	Visual clues are mostly lost in online discussions. Although a number of emoticons can be used to enhance body image.	Learners lack the ability to work at their pace.

2.4 *Learner-Focused E-Learning System*

A leading theorist of educational systems by [2] makes a strongcase for learning-focused educational and training systems where the learneris the key entity and occupies the nucleus of the systems as displayed in figure 1 where the e-learning is standing as the nucleus of the three systems.[2] further explained that when learning is in focus, arrangements are made in theenvironment of the learner that communicate the learning task, and learningresources are made available to learners so that they can explore and masterlearning tasks. A distributed learning environment that can effectivelysupport learning-on-demand must be designed by placing the learners at thecentre [14].

The achievement in an e-learning system involves a systematic process of planning,designing, evaluating, and implementing online learning environments where learning is actively fostered and supported. An e-learning system should not onlybe meaningful to learners, but it should also be meaningful to all stakeholdergroups including instructors, support services staff, and the institution. Forexample, an e-learning system is more likely to be meaningful to learners whenit is easily accessible, clearly organized, well written, authoritatively presented,learner-centered, affordable, efficient, flexible, and has a facilitated learningenvironment[13]. When learners display a high level of participation and success inmeeting a course's goals and objectives, this can make e-learning meaningful toinstructors. In turn, when learners enjoy all available support services providedin the course without any interruptions, it makes support services staff happy asthey strive to provide easy-to-use, reliable services. Also, an e-learning systemis meaningful to institutions when it has a sound return-on-investment, amoderate to high level of learners' satisfaction with both the quality of instructionand all support services, and a low drop-out rate [15].

3.0 METHODOLOGY

3.1 *Components and Features of E-Learning*

An e-learning program is discussed here in terms of various components andfeatures that can be conducive to learning.Components are integral parts of ane-learning system as identified earlier. Features are characteristics of an e-learning program contributedby those components. Components, individually and jointly, can contributeto one or more features [[9].

For example,e-mail is anasynchronous communication tool or component that can be used by both studentsand instructors to interact on learning activities. Therefore, with appropriateinstructional design strategies, e-mail can be integrated in an e-learning programto create an interactive feature between students and the instructors. Thinkabout it this way. While traveling in a Car, the passengers can communicate with others around their coverage using the mobile phones. In this case, mobile phone is a component ofthe Car system that allows passengers to establish a synchronous communication(feature). In the same manner e-mail, mailing lists, newsgroups and conferencingtools(components), along with appropriate instructional design principles andstrategiescan contribute to a collaborative feature for students working on agroup project.

Table 3 Components of e-learning

Source: Khan, 2005

s/no	Components	Examples of Components
1	Instructional Design	(a) Learning and Instructional Theories (b) Instructional Strategies and Techniques
2	Multimedia Components	(a) Text and graphics (b) Audio Streaming e.g Real Audio (c) Video Streaming e.g Quick Time (d) Links e.g hyperlinks, Hypermedia lnks, 3-D links, image-maps
3	Internet tools	(a) Communications Tools (i) Asynchronous: E-mail, Listserve, Newsgroups (ii) Synchronous: Text-based e.g Chat, IRC, MUDs, messaging (audio/video conferencing tools) (b) Remote Access Tools (i) Telnet, File Transfer Protocol (FTP) (c) Internet Navigation Tools (Access to databases and Web documents.) (i) Text-based browser, Graphic browser, VRML browser (ii) Plug-ins (d) Search Tools (i) Search Engines (e) Other Tools (i) Counter Tools
4	Computers and Storage Devices	(a) Computer platforms running Graphical User Interface (GUI) based operating systems such as Unix, Windows, Macintosh, Linux, and nonGUIbased operating systems such as DOS. Mobile devices such ashandheldpersonal digital assistants (PDAs) running Palm operatingsystem,Pocket PC Windows, and other platforms. (b) Hard drives, CD ROMs, DVDs
5	Connections and Service Providers	(a) Modems (b) Dial-in (e.g., standard telephone line, ISDN, etc.) and dedicated(e.g., 56kbps, DSL, digital cable modem, T1, E1 lines, etc.) services (http://whatis.com/dsl.htm) (c) Mobile technology (e.g., connected wireless, wireless LAN, wireless WAN, wireless PAN or personal area network) (d) Application Service Providers (ASPs), Hosting Services Providers (HSPs), Gateway Service Providers, Internet Service Providers (ISPs),
6	Authoring/Management Programs, Enterprise Resource Planning (ERP) Software, and Standards	(a) Scripting Languages (e.g., HTML - Hypertext Markup Language, VRML - Virtual Reality Modeling Language, XML – Extensible Markup Language, RSS - Rich Site Summary, is a text-based format, a type of XML http://www.faganfinder.com/search/rss.shtml#what, XSL - Extensible Style Sheet language, XHTML – Extensible Hypertext Markup Language, CSS - Cascading Style Sheets, WML-Wireless Markup language, Java, Java scripting, etc.). (b) Learning Management System (LMS) and Learning Content Management

		System (LCMS) (c) HTML Converters and Editors, and so on. (d) Authoring Tools and Systems (easier to use than programming lan-guages) (e) Enterprise Application or Enterprise Resource Planning (ERP) Soft-ware in which e-learning solutions are integrated. (An article entitled "Integrating your Learning Management System with your Enterprise Resource Planning System" provides valuable information: http://www.thinq.com/pages/white_papers_pdf/ERP_%20Integration _0901.pdf) (f) Interoperability, Accessibility, and Reusability Standards (http://www.adlnet.org/)
7	Server and Related Applications	(a) HTTP servers, HTTPD software, and so on. (b) Server Side Scripting Languages — JavaServer Pages (JSP), Active Server Pages (ASP), ColdFusion, Hypertext Preprocessor (PHP), Common Gateway Interface (CGI) — a way of interacting with the http or Web servers. CGI enables such things as image maps and fillout forms to be run. (c) Wireless Application Protocol (WAP) gateway — changes the binarycoded request into an HTTP request and sends it to the Web server.

3.2   *E-Learning Features*

A well-designed and structured e-learning program can provide numerous features conduciveto learning and learners as seen in table 4.

Table 4 E-learning features

Source: [13]

E-Learning Features	E-Learning Components	Relationship to Open, Flexible, and Distributed Learning Environment
Ease of Use	A standard point and click navigationsystem. Common User Interface, SearchEngines, Browsers, and Hyperlinks.	A well-designed e-learning course with intuitive interfaces cananticipate learners' needs and satisfy the learners' natural curiosity toexplore the unknown. This capability can greatly reduce students'frustration levels and facilitate a user-friendly learning environment. However, delays between a learner's mouse click and the response ofthe system can contribute to the frustration level of users. The hypermedia environment in an e-learning course allows learners toexplore and discover resources which best suit their individual needs.While this type of environment facilitates learning, it should be noted that learners may lose focus on a topic due to the wide variety

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		ofsources that may be available on an e-learning course. Also, information may not always be accessed because of commonproblems related to servers such as connection refusal, no DNS entry,and so on [9].
Interactivity	Internet tools, hyperlinks, browsers, servers, authoring programs, instructionaldesign.	Interactivity in e-learning is one of the most important instructionalactivities. Engagement theory based on online learning emphasizes that students must be meaningfully engaged in learning activitiesthrough interaction with others and worthwhile tasks [6]. E-learning students can interact with each other,with instructors, and online resources. Instructors and experts may actas facilitators. They can provide support, feedback, and guidance viaboth synchronous and asynchronous communications. Asynchronouscommunication (i.e., e-mail. listservs, etc.) allows for timeindependent interaction whereas synchronous communication (i.e., conferencing tools) allows for live interaction [9].
Multiple Expertise	Internet and WWW	E-learning courses can use outside experts to guest lecturers fromvarious fields from all over the world.
Collaborative **Learning**	Internet tools, instructional design.	E-learning creates a medium of collaboration, conversation,discussions, exchange, and communication of ideas [16]. Collaborationallows learners to work and learn together toaccomplish a common learning goal. In a collaborative environment, learners develop social, communication, critical thinking, leadership,negotiation, interpersonal, and cooperative skills by experiencingmultiple perspectives of members of collaborative groups on anyproblems or issues.
Authenticity	Internet and WWW,instructionaldesign.	The conferencing and collaboration technologies of the Web bringlearners into contact with authentic learning and apprenticingsituations [3]. E-learning courses can bedesigned to promote authentic learning environments by addressingreal world problems and issues relevant to the learner. The mostsignificant aspect of the Web for education at all levels is that it dissolves the artificial wall between the classroom and the 'realworld' [5].
Learner Control	Internet tools, authoring programs,hyperlinks, instructional design.	The filtered environment of the Web allows students the choice toactively participate in discussion or simply observe in thebackground. E-learning puts students in control so they have a choiceof content, time, feedback, and a wide range of media for expressing their understandings [16].

4.   CONCLUSION

The research shows that e-learning can be open to all in respective of locations; flexible to time, space among others.

E-learning can also compete favourably with tradition (face-to-face) learning if all the aforementioned components and features which are meant to enhance, stimulate, attract and motivate learners are incorporated in the right place and time as mentioned. The research also stressed the need to expand learning outside the shores of classrooms to meet voracious readers. Amongst such benefits are rescheduling of classes around personal and professional work and it has reduced travelling cost and time to and from school.

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