



## DEVELOPING ARCHITECTURE OF AN E-LEARNING SYSTEM – A CASE STUDY

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**Abstract-** E-Learning is a form of learning through new technologies like e-mail and the internet. In e-Learning the role of a teacher is mainly that of a facilitator, who have less direct interaction with students. In e-Learning, learning is mainly self motivated and student taking responsibility to manage time and complete the tasks within given time frame. In this paper we propose a functional architecture of an e-Learning system, the architecture also supports the cross browser and is fully integrated with different databases: Oracle, MS SQL Server, and MS Access. The functional architecture identify components that construct an e-Learning system and the objects be moved among these components.

This paper also demonstrates an innovative idea of personalizing an e-Learning system by Knowledge Flow. The research study intends to emphasize the development of a new scale on e-learning and teaching process based on new technologies. Further to this, the research study resulted in acceptable scale which embraces social interaction role, interaction behaviour, barriers, capacity for interaction, group interaction as sub-categories to evaluate online learning and teaching process.

**Keywords-** e-Learning, traditional learning, Information and Communication Technologies (ICT), internet.

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### Introduction

Online instructions focus on the theoretical stand of socio-constructivism, collaborative mode of learning is taken place in order to create desirable learning outcomes in online context [1]. In this respect, online interaction plays a great role to maximize learning opportunities in online context as a social context [2, 3]. Some researchers describe the theoretical framework for online instruction as the combination of social information processing and group structure theories [4]. The roles of tutor as pedagogical, social, managerial and technical actions, making a general evaluation for social interaction based on these roles provided insights to realize the online learning, teaching process [5]. Further to this, considering both advantages and disadvantages of online teaching and learning process.

E-Learning is a form of teaching or training over the internet or intranet. E-Learning can be divided into two categories: synchronous and asynchronous. Synchronous e-Learning is like traditional

classroom learning, where trainer and students meet at a particular time through audio, video or a chat room. Asynchronous e-Learning allows learner to work on their own time and communicate with trainer through e-mail when need for communication. E-Learning requires patience, motivation, self-confidence, dedication, and a general knowledge of using a computer and internet. Furthermore, the effectiveness of e-Learning varies based on individual's learning style and behaviour type [6]. In online pedagogy, we believe that social interaction, learning, teaching in online and hurdle in online framework is crucial.

For this study, two sections of a certificate course were offered during the same semester by one lecturer using identical syllabi and assessment instruments. In this paper we analyse the effects of e-Learning on various students. It gives statistical information on students who had faced one class from the traditional classroom and other from e-Learning. The success of the class using e-Learning depends on various factors which will be discussed in this

paper. The main objective of this paper is to proposal for a functional architecture to build standard-driven distributed and interoperable learning system. The functional architecture defines components that contribute an e-Learning system and the objects that must be moved among these components. In addition, a detailed comparison between e-learning and the traditional classroom will be discussed, the result showing how the traditional classroom is more preferable than e-Learning by these students. Although e-Learning has several advantages, this paper suggests that e-Learning can not be replaced traditional classroom but act as tool for enhancing the teaching and learning process.

**A. Comparison of traditional learning and e-Learning**

Table 1 summarizes several opinions regarding the comparison between traditional learning and e-Learning.

Table -1- Comparison between traditional learning and e-Learning

	Traditional Learning	e-Learning
Learning Process	The learning is conducted with the whole class, no group or no individual study	Most of the learning process takes place in group or by individuals
Classroom Discussions	The teacher talks more than students	The students talk more than teacher
Subject Matter	The teacher conducts the lesson according to the study program	The students take part in determining the course contents and also study is based on various source of information
Motivation	The students' motivation is low	The students' motivation is high due to the participation in matters that are closer to them
Teacher's Role	The teacher is the authority	The teacher directs the student to the information
Lesson Structure	The teacher dictates the structure of the lesson	The structure of the lesson is affected by the group or individual dynamics
Location of Learning	The learning takes place within the classroom and the college	The learning takes place with no fixed location
Time of Learning	The learning takes place within the given time-frame	The learning takes place with no fixed time

When comparing learning an identical course in a traditional framework to e-Learning framework, students have expressed higher fulfilment from e-Learning, but on performance based on final exam result, we found that traditional method superior than e-Learning. E-Learning includes many components from traditional learning as: presentation of ideas by the students, group discussions, arguments, accumulating knowledge, etc. E-Learning includes many advantages over traditional learning as: time for grasp the information and responding, improved communication among the learners, knowledge being acquired and transferred among the learners themselves, and the capability to conduct an open debate [7]. The rest of the paper has been organized as follows: next section discusses the role of information and communication technologies (ICT) and also proposed functional architecture model of e-Learning system. Followed by the methodology used in this paper and result of the experiment based on the statistical tools for comparing the results of the two experiments. Finally the conclusion of this paper discussed.

**Role of ICT**

Information and communication technologies (ICTs) are a various set of hi-tech tools and resources used to communicate and to

create, distribute, store, and manage information. These course of action broadly used at the heart of education. In recent years, educational institutions are increasing access to ICT tools, applications, and networks. Instructions based on ICT increase the performance of students, as instruction delivered through a technological channel such as television, radio, or a computer network more interactive and attractive. There are five aspects of the educational use of ICTs as: supporting new teaching methods, accessing remote resources, enabling collaboration, extending educational programmes and information literacy.

**The Functional Model**

It is useful to have a simple functional model of an e-Learning system to comprehend its working. The functional model can provide a visual representation of the contents that contribute e-Learning environment and the objects that must be moved among these components. In general, the purpose of e-Learning interoperability standards is to provide standardized data structures and communication protocols for e-Learning objects. The functional model and its components are shown in "Fig. (1)".

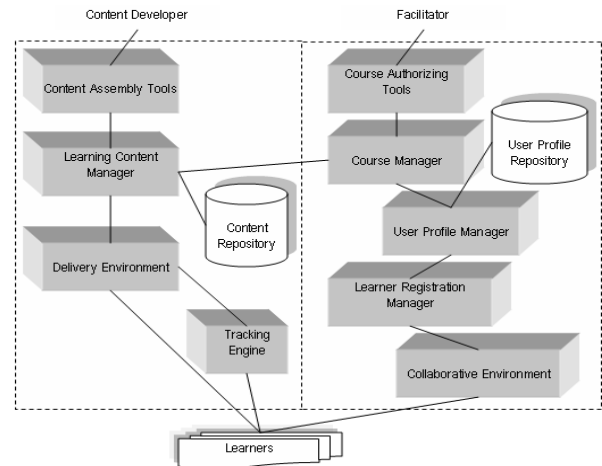
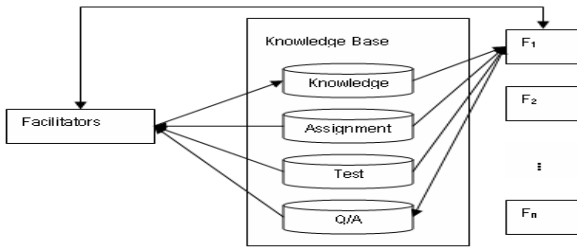


Fig. 1- Architecture of a e-Learning system

For this learning content and catalogs must be labelled in a consistent way to support the indexing, storage, search and retrieval of learning objects. Content packaging specifications and standards allow courses to be transported from one learning system to other. Learner profile information can be included personal data, learning plans, learning history, accessibility requirements, certifications and degrees. Learner registration information allows learning delivery and administration components to know what offerings should be made available to learner, and provides information about learning participants to the delivery environment [8, 9].

**Function of the Knowledge Flow in e-Learning system**

In this research, we describe an e-Learning model driven by Knowledge Flow, which is a form of all entities of information flow between participants, all sorts of knowledge bases, trainers. It includes content of knowledge, its direction and its density. We divide Knowledge Flow into a structure of three tools: facilitators, Knowledge bases and learners [10]. The Interacting structure of e-Learning system and the Knowledge Flow are shown in "Fig. (2)", where L<sub>1</sub> and L<sub>2</sub> represent learners.



**Fig. 2-** The structure of Interacting E-Learning system driven by Knowledge Flow.

**Methodology**

This study is conducted at a College of Technology- Oman for teaching the Physics-2 course [PHYS - 1211]. This course is for the certificate students. The target population for this study was defined as students enrolled for the summer 2010 semester. For this study, two sections of a certificate course were offered during the same semester by one lecturer using identical syllabi and assessment instruments. The two courses differed only in the presentation format: one was a traditional classroom with limited online exercises and other was entirely online. The course used in this study was “Physics-2,” an introductory class designed to familiarize students with various aspects of the course.

In Section S<sub>1</sub> there were 24 students enrolled in the traditional course 3 female and 21 male mostly traditional, residential undergraduate college students. In other section S<sub>2</sub> there were 22 students enrolled in the online course 13 female and 9 male were geographically distant so never met the lecturer face-to-face, contact was limited to e-mail, online discussions, and occasional phone calls from students to the lecturer. These students were mostly non-traditional, with many of them working full-time and taking the course due to its time flexibility. Table 2 below details the gender and age of the participants.

*Table 2- Gender and age of research participants*

Profile of the participants	Frequency	Percent (%)
<b>Gender</b>		
Female	16	34.78
Male	30	65.22
<b>Total</b>	46	100
<b>Age</b>		
16 - 20	30	65.22
21 - 25	11	23.91
26 - 30	5	10.87
<b>Total</b>	46	100

The choice of enrolment between the two sections S<sub>1</sub> & S<sub>2</sub> was made by the students with out prior knowledge of the differences between the teaching-learning systems. However, the students were allowed to switch between sections for the first three weeks (although no students elected to make a change from one section to another). The research study stresses the validity and reliability of 46 certificate students as research participants.

**Grading Methodology**

Learning performance of the student is measured by the grades obtained by them. The grading methodology is same for both the section S<sub>1</sub> and S<sub>2</sub>. Students were assessed continuously throughout the semester. The continuous assessment was done by giving

assignments and quizzes which were given 25% weightage each. Final assessment was done by conducting the final examination which was given 50 % weightage. Finally, the weighted average method was used for calculating the marks and grading the students. The weighted final score is calculated as below  
 Weighted final score = 0.25(Assignment) + 0.25(Class Test) + 0.50 (Final Exam)

**Result of Experiment**

After the final examination, the weighted final scores of all the students of both the sections were calculated. Various statistical values like mean, standard deviation, maximum and minimum marks for both the sections are calculated and shown in the table 3.

*Table 3- Descriptive statistics of weighted final scores*

Section	Teaching Methodology adopted	Maximum marks	Minimum marks	Average	Standard deviation
S <sub>1</sub>	Traditional Classroom	92	70	82.82	5.69
S <sub>2</sub>	E-Learning	86	67	74.76	5.81

Further, the number of students got different grades in each section are compared and shown in the table 4. It is observed from the statistical analysis that mean, minimum and maximum marks for the students of traditional classroom environment (section S<sub>1</sub>) are higher than the students of e-Learning environment of section (S<sub>2</sub>).

*Table- 4- Descriptive statistics of weighted final grades*

Grades	Number of students in section S <sub>1</sub>	Number of students in section S <sub>2</sub>
A (90-100)	2	Nil
A- (85-89)	5	2
B+ (80-84)	10	4
B (76-79)	5	6
B- (73-75)	1	3
C+ (70-72)	1	2
C (67-69)	Nil	5
C- (60-66)	Nil	Nil
D (53-59)	Nil	Nil

**Conclusion**

In this paper, we analysed the current state of the e-Learning standards. Then we proposed a functional model of an e-Learning environment. We also proposed a personalized e-Learning system driven by Knowledge Flow with the support of computer technologies. From the results of the experimentation, it appears that students of section S<sub>2</sub> did not seem to gain the same amount of knowledge using e-Learning as that of section S<sub>1</sub> by using traditional classroom. The majority of students of section S<sub>2</sub> were uncomfortable either due to their understanding or their changed study habits. Hence, the new technologies and old systems should be used together for improving the teaching –learning process.

India has a great potential market of e-Learning projects. Only few universities and industries has been started it. E-Learning projects have brighter industrial prospects, but it has been developed as a subject rather than an industry. This idea can be taken to promote the industrialization of e-Learning system.

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