

# Exploring the Dimensions of E-Learning Maturity Model

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**Abstract**—Despite the highlighting on e-learning, it was obvious that models for successful deployment have not yet been recognized. Even with the huge quantities of money being spent, it is not clear that any enhancement in student learning outcomes has been recognized. To address this issue, this qualitative research aimed to explore and understand dimensions of E-learning Maturity Model (ELMM). An inductive approach, using qualitative methods, was used in this research. Fifty interviewees suggested five dimensions: Students' Attitudes, University attitudes from students' perspectives, E-learning features, E-learning implementation and Effects of E-learning on students. Students from different majors and levels participated in this study. Findings of this study show that, there are significant five factors which formulate ELMM. Moreover, the study demonstrates that e-learning features have significant effects on student. It also highlights the relevance of using qualitative research in exploring maturity concept in e-learning.

**Index Terms**—Effects of E-learning, E-learning, E-learning features, E-learning implementations, maturity model, students' attitudes, university attitudes.

## I. INTRODUCTION

Information technology has restructured everything in our lives especially our attitudes towards learning. Thus, e-learning has become a strategically element which can be adopted by higher education institutions to improve educational outcomes and to enhance students' skills.

Consequently, e-learning can be defined by different methods for example instructions delivered via all electronic media (Engelbrecht 2003); learning facilitated by internet (Meredith & Newton 2003); and distance education using information technologies (Watanabe 2005), but the most important thing is e-learner, who was ignored in all previous definitions. Since 1990 e-learning has become phenomenon (Rajasingham 1988). Moreover, the extraordinary growth in e-learning deployment has resulted in a number of national guidelines on how to evaluate the e-Learning.

In addition to the benchmarks of e-learning and cross-cultural research, there is no clear framework or model, which can be used for introduction ELMM in the deployment of e-learning applications, though there are attempts at definite steps in the region, notably in New Zealand, to utilize alternative models such as the electronic Maturity model (eMM) (Marshall & Mitchell 2004). However, there are no signs of results in the Middle East yet.

Further reading of the literature identified an array of dimensions that would seem to compose ELMM. These

dimensions can be summarized as the following: (a) Students' attitudes towards e-learning (explore students' attitudes towards e-learning and to enlighten most important factors which affect on students' attitudes), (b) Effects of e-learning on students (enhancing the learning content through the use of simulations, multimedia and interactive content), (c) How e-learning is being implemented? (Constructivism - Behaviorism - Cognitivism), (d) University attitude towards e-learning (what capabilities are required by universities adopting in e-learning for example technology, software, infrastructure and staff development courses?), and (e) Effects of e-learning on students.

There are appears neither ready model nor clearly successful plan for e-learning. For that the exploration research is very important in this case.

## II. LITERATURE REVIEW

Whilst there have been various researches which address the factors affecting the E-Learning, most of them are not based on direct empirical evidence (see Al-Doub et al. 2008; Berteau 2009). There are, of course some empirical researches of the uptake of e-learning at university. However, these tend to focus on the assessment process for certain individual factors, students' attitudes towards e-learning, or address the effects of e-learning on students (Singh et al. 2005). These researches can be classified as the following: students' and academic attitudes towards e-learning, instructional design models for e-learning and e-learning strategies.

Abdel-Wahab (2008) goes on to measure students' attitudes towards e-learning and defined elements that can be used in modeling students' attitudes towards e-learning. Also Mandernach et al. (2006) explored students' attitudes but from perspective of online instructors. Havelka (2003) proved differences in beliefs toward e-learning do exist between different majors.

Moreover, Mandernach et al. (2006) suggest that in order for an e-learner to be successful, he must be comfortable with the basic computer skills required to work within the e-learning. In the same context, Saade et al. (2007) found that students with more IT experiences would have better advantage in managing e-learning courses over those who with little experience. Berteau (2009) agrees and goes on to say that essential abilities needed by a student entering an e-learning system refer to use of writing software, internet browsing, and email. If these are lost, learning effectiveness through e-learning diminishes, the student having to face a stressful feeling, which can turn into disturbance and lack of self-confidence. Keengwe (2007) finds a positive correlation

between students' personal computer skill and instructional computer proficiency. Also Cotterill et al. (2005) pointed to the importance of students' basic information technology skills level before starting e-learning program.

On the other hand Thomassian et al. (2008) examined how e-learning will be embedded in introductory courses. Another research conducted by Partridge and Edwards (2004) exploring how e-learning is being implemented in educational institution.

Buss (2001) states that in the United Kingdom, the National Learning Network (NLN) creates accessible a self-assessment equipment to make easy classification of universities according to the extent to which information and learning technologies (ILT) have impacted upon them. In order to measure the level to which ILT has been embedded into teaching and learning, and to recognize priorities for development, institutions review their current state of maturation on 14 indicators, including strategic management, learning resources management, learner IT skills, and record keeping.

Roberts et al. (2000) identified four models of e-learning: (a) Naive model is the most broadly used. It may be characterized as notes on the web. It provides no chance for communication or comment, (b) Standard model which attempts to operate the advantages of the technology to allow a significant degree of communication and interaction between students and staff, (c) Evolutionary model which allows a response mechanism to give beneficial comment on how the subject is succeeding, and (d) radical model which dispenses where students are formed into groups to learn by interacting amongst themselves by using the enormous amount of existing web based resources.

O'Hearn (2000:7) contends that university structures are rigid and unproven, regarding the incorporation of technological advancements. Holley (2000:35) states that e-learning is not easy to employ without the complete cooperation and support of lecturers, as the degree of interaction between lecturers and students is still predominant in e-learning environments (Volery 2000:37). Long-established universities should be able to race with other independent education providers in relation to social demands for 'life long learning' and globalised education services (O'Hearn 2000; 24).

Learning theory includes philosophies that aim at explaining changes in human performance, providing a set of instructional approaches, tactics and techniques from which to select, as well as, the foundation for how and when to select and combine the strategies. Furthermore, it forecasts the results of using the strategies (Yang 2004). In the same context, in the behaviorist learning model, students rely on instructors for knowledge at the beginning of any learning activity. From a behavioral perspective, educators operate and adjust the learning environment depending on the preferred outcome (Skinner 1971). On the other hand Cognitivism model, instructors place the objectives of the learning process, and the students are expected to attain these objectives. During the input process, the instructor breaks the content to smaller pieces, steps, and designs in advance, which is a device used to more efficiently perform each step. In the output process, the instructor assesses the student to see whether they achieved the learning objectives (Vrasidas 2000). But Constructivist learning theory has sought to create learn-

ing environments that come closer to actual life environments. As a result, constructivist educational methods have long been applied particularly in Information Systems (Franck 2005). Many educational researchers argue that the constructivism theory offers a theoretical and practical foundation for E-Learning procedures, especially the online type of E-Learning (Bransford 2000; Weigel 2002).

McMahon et al. (1999) in a study found that enlarged concentration to a student perception may lead to enhanced strategic planning in students' use of computers. Redfern and Naughton (2002) found that Collaborative virtual environments have the prospective to enable innovative and valuable distance teaching techniques and it should be based on the pedagogical requirements of the students' communities. Higgins (2002) agrees and highlights that E-learning will only be successful if it is based on sound educational approaches.

From the preceding literature review we can identify that e-learning distributed between students' and university attitudes, features, effects and models without concentrating on maturity model for e-learning.

In the previous literature, most of the researchers were focusing more on the quantitative research and techniques to be used in the recommendation, without an emphasis upon the ELMM. There was no research carried out to explore the dimensions of the ELMM. Furthermore, none of the researchers have attempted to use good learners' experiences as exploration techniques. This study aims to address the above mentioned issues. In contrast, the work described in this paper focuses solely on the learner's perspective and we have extended the case by using outcomes from Max QDA software. Also the literature on e-learning is dominated by various factors, but there is no ELMM. While the maturity model provides valuable experiment, it is important to balance these factors to create a maturity model.

### III. RESEARCH METHODOGY

The study unfolded in one phase. The purpose of this phase was to answer the research question defining the dimensions of ELMM. This was accomplished by asking students to describe their e-learning experience.

To ensure that the investigate would be appropriate for discovering dimensions of ELMM, regardless of major or educational level, students of several different majors at various levels within institution took part in the study. Fifty girls and boys who presented a wide range of majors within their institution and ages participated in in-depth interviews. The educational institutions located in six cities in the Oman (Sur, Sohar, Nizwa, Salalah, Ibri and Al-Rustaq).

The student in-depth interview questions were designed to elicit information related to students' technological background, the setting and course website experience, the course website content and the student/instructor interaction regarding the site. The questions were designed in such a way as to help the interviewees think about how e-learning could be mature model.

First, the behavior question dealt with the students' behavior through using computers, the Internet, and prior usage of websites. After the behavior question, questions #2 to #5 were asked about the student's opinion to extract information regarding the physical interaction with the

site, providing details on particulars such as site access and site navigation. Question #6 explored student's feeling. The next set of questions #7 to #11 involved interaction between the students and instructor regarding the website, extracting information about student involvement in course website design and content. Questions #12 and #13 explore if students in web-enabled learning environments become more active and self directed learners. Question #14 explores if students feel that technology can facilitate communication with faculty and classmates. Questions #15 and #16 explore if there are positive effects on student learning, problem-solving skills, and critical thinking skills. Questions #17 to #19 explore faculty members' behaviors from students' perspectives. Questions #20 to #23 explore effects of Constructivist learning environments. Questions #24 and #25 explore effects of Behaviorism. Questions #26 to #28 explore effects of Cognitivism theory.

Each of these areas of inquiry provided student responses that in many ways support the constructivist categories and site taxonomy discussed in the literature review and used for initial course website evaluation and thematic coding. Specifics are discussed within the analysis area.

In-depth Interviews progressed in a question-by-question manner, with opportunities for respondents to add information they felt was important. The in-depth interview questions were broad (see Appendix 1) and the semi-structured format allowed different aspects to be brought to the fore, depending on the role and experience of the person being interviewed. In-depth Interviews lasted an hour and were more in the style of a conversation between colleagues than a formal interview.

#### IV. DATA ANALYSIS

There are software tools available to assist the researcher with the task of qualitative data management. In this study Max QDA was used to assist with both management and analysis of qualitative data. As stated on the Max QDA website, 'Max QDA is designed for researchers who need to combine subtle coding with qualitative linking, shaping, searching and modeling'. We found the software useful for textual data such as transcripts from interviews and it supported our qualitative methodology.

Moreover, to allow effective data management and remove the laborious task of cutting and pasting pages of narrative material manually, the in-depth interview transcripts were imported into a computer software package called 'Max QDA™' for coding and sorting.

We saved electronic versions of the transcripts as rich text format (RTF) documents (the format required by MAX QDA) and imported them into the software program for the purposes of computer-assisted coding. We began with first-level coding. Each transcript was read and coded in its entirety before we moved on to the next. This strategy preserved (as far as possible) the integrity of each transcript as it prevented respondents' voices 'flowing into each other' in the researcher's mind. Following Miles and Huberman (1994, p. 58), codes were developed from the central research questions and by paying attention to codes emerging from the data. Multiple codes were developed for single segments of text.

In addition to electronic coding MaxQDA facilitated systematic organization and analysis of data. For example,

this program allows one to group transcripts into document sets. We grouped boy and girl students' transcripts into separate document sets. Initially this practice helped us organize and classify data. Later in the analysis, however, this organization of data facilitated text searches for the purposes of verification. For example, we used the facilities offered by the software to search for codes within a document set in order to verify whether all or most students were saying similar things. We also searched different document sets for the same codes in order to verify whether boy and girl students were sometimes saying similar things.

For example, most of both the boy and girl students in the sample repeatedly mentioned that they and their classmates 'don't use communication tools in e-learning' in and outside the classroom.

#### V. RESULTS

Fifty in-depth interviews were conducted with students in College for applied science in Oman to find out situation and students' views on e-learning and their view for pedagogical model usage for e-learning.

##### A. Features of e-learning and its implications in the learning process

In-depth Interviews show that students use e-learning for getting content and assignments. All students use e-learning in the downloading and uploading process for materials and assignments. For the question Describe what sort of features do you use in e-learning? And why? Students said that they use E-learning in the downloading materials, assignments, PowerPoint presentations, tests. Student 1 and Student 5 said that they try to use discussion forums but Lecturers weren't responding for that. Student 7 and Student 9 tried also e-board, e-calendar, forum and chat but all these tools were not activated with all lecturers.

Student 10 found out that it is not clear for him how better use and for what purposes to use these tools. Student 11 admitted that sometimes students are active in private email, but there are not active in other emails. The findings show that the calendar, e-board and chat components were perceived as the least valuable, and a significant number of students never used these tools.

This suggests that these components are being under-used by students. Perhaps these components would have received more positive evaluation if these had hyperlinks and were deployed more productively in reminding students of key deadlines and weekly lecture topics and activities that need to be carried out in preparation for weekly lecture and seminar sessions.

##### B. University attitudes towards e-learning from students' prospective

On question about Does your instructor use a course management system?, one of the students admits that not all lecturers. He sees that if lecturer uses technology for all courses that will be better. Student 7 talked about another issue.

About the different resources or ideas, he wishes to find different resources relating to same subject. Student 2 mentioned videoconference, recording of lecture that afterwards is available in archive. Student 3 could not say

how he can use technology for self-assessment; assign feedback and step by step learning because he doesn't find these tools through the blackboard. Also Student 6 and Student 8 mentioned the purpose from e-learning not clear they use it just as a file storage server.

Student 6: I like to chat with my lecturer but not responses.

Student 4: Uses Black board just for getting materials.

From previous analysis we should take in our account the previous points to avoid using e-learning just for sake of using e-learning.

### C. *E-learning models*

On question about how e-learning could be implemented to manage collaboration between students and students and teacher, one of the students (Student 1) admits that he does not see such possibility.

Student 2 mentioned that if the assignment was group based or if group based tasks were built into the module there would have been a relatively high usage of interactive components.

Student 6: I like to add my feedback on some issues but there isn't tool to let me do that.

Student 4: there isn't self-assessment or step by step tool in Black board.

Thus, students haven't different resources, collaborative learning, self-assessment and step by step description which mean no learning theories embedded in e-learning. This dimension supports the preceding dimension. If University hasn't model for e-learning then it hasn't clear attitudes towards e-learning.

### D. *Students' attitudes towards e-learning*

All students' admit that they use e-learning in downloading courses materials, submitting assignments and tracking grades (behaviors). One student (Student 4) says that he isn't using forums because lecturers don't use it. Interesting that Student 8 said that he likes e-calendar but he doesn't use it because lecturers don't use it.

Student 8: I like chat, forums, e-calendar and e-board. I am the person who likes to work collaboratively and that is why I don't like to work independently. And there are students who like to work independently. But also, there are very little assignments which require students to work collaboratively (opinion). Other activities like online exams were very difficult (feeling).

Depending on previous analysis we find that students' attitudes consist of three elements: behavior, opinion and feeling. For that reason when we implement the e-learning we should take in our account these elements.

## VI. CONCLUSIONS

*E-learning features* were the first dimension of ELMM. Interviewees described the features of e-learning and how it done within their respective educational institutions. Throughout the in-depth interview, students were encouraged to think about ELMM. Students claimed that this 'changes the way of learning'. They said that it had encouraged them to 'think about features of e-learning, in greater depth'; 'e-learning as a communication tool rather than just storage tool; 'look at things differently'; and '(listen) to instructor a lot more closely'. The students had spent their previous two or three undergraduate years

using just the preliminary tools of e-learning. In these In-depth interviews, they are recognizing the e-learning in educational life and discovering the extent of its efficacy. It was evident that e-learning features were enhanced through the combination of several factors. These factors involved: e-calendar; communication tools; dialogue within small groups (forum); chatting and speed feedback. A valuable insight was highlighted by a student who said that 'communication tools are very important to let me arrange my time for quizzes and exams but not all teachers use them'. This highlights the holistic dimensions of the e-learning. To gain a clearer understanding of how the e-learning deployed successfully, it is useful to examine the key features of the e-learning.

We labeled the second dimension *university attitudes*. According to the participants, being recognized as valuable and feeling that their opinions was important to the educational institution. The students were asked to indicate their outlook about the kinds of e-learning services provided to them. The services offered by the College of Applied Science include the Online Library facilities and Free Software, Audio/Video equipment, Black Board and the use of the computer laboratory. According to both the literature review and in-depth interviews that are conducted with the students at College of Applied Science University, the results showed that the main factor that affects the students' perception of e-learning is role of instructor. This study demonstrated that many respondents perceived that technical appliance was important and essential in the successful implementation of the E-Learning Portal. The biggest technical issue arose when doing the online exam through the Portal was very hard. This could lead to the students' feeling frustrated and for that reason, half of them declared that the usage of this tool was quite challenging. Therefore, attention should be given to the successful online exam in E-learning Portal. More investigation needs to be carried out of how we could improve the Portal to include social networks. Besides that, research is also needed into how mobile learning might support those forms of e-learning to provide high quality collaborative and active learning.

We labeled the third dimension *e-learning model*. The students were asked to indicate their opinions about the kinds of instructional design model for e-learning provided to them. These models offered by the College of Applied Science include the cognitivism, behaviorism and constructivism model. According to both the literature review and in-depth interviews that are conducted with the students, the results showed that the main model that affects the students' interaction with e-learning is constructivism model. This study demonstrated that many respondents perceived that different resources were important and essential in the successful implementation of the E-Learning Portal. Based on the data collected through in-depth interview, constructivism is used mainly in the context of conducting, managing and encouraging personalized learning activities when doing collaborative learning. This could lead to the students' feeling communion and for that reason; all of them declared that the usage of this model was better than others. Therefore, attention should be given to the successful model in E-learning Portal. More investigation needs to be carried out of how we could improve the Portal to include feedback response. Besides that, research is also needed into how materials

might support instructional model of e-learning to provide high quality collaborative and active learning.

The fourth dimension emerging from the in-depth interviews was *Students' attitudes towards e-learning*. The aim of this dimension was to explore students' opinions and engagement with a typical e-learning system, namely, Blackboard (BB). The findings of this study propose that the majority of the students had a positive view of the e-learning system. The frequency of usage of Blackboard was also very high among the students, with the huge majority using it frequently in downloading materials. In terms of the perception of the variety of components of Blackboard, the findings demonstrate that almost all the students selected the course content component as very important. The course content component contained items such as lecture slides, notes, a course outlines and related articles.

A reasonable explanation of the highest using for this element is that it aids students' preparation for lectures, frees up their time for note taking and participation in lectures, and provides them with catch-up material. The second most highly used element was the assignment component, suggesting that the students may have been assignment driven. Perhaps this component received high optimistic evaluation because the students used it to know the coursework requirement, submission of their coursework, checking of grades and feedback from module lecturers.

On the other hand, the findings show that the e-calendar component was perceived as the least valuable, and a large number of students never used it. This suggests that this component is being underused by students. Maybe this element would have received more positive assessment if it was organized more effectively in reminding students weekly lecture topics and activities that need to be carried out in preparation for weekly lecture.

Converse to expectations, limited evidence in support of the use of the chat component was found in the current study. Specifically, findings suggest that the chat component was rarely used by students and was classified by a significant number of students as not valuable. This is amazing, known that the chat component appears to be one of the elements of e-learning that students are most likely to use in order to maximize the possible benefit of e-learning.

Perhaps for the rather unexpected findings from the current study could be that students used personal email to communicate with their colleagues and the teaching team, rather than the integrated chat component of Blackboard. Another reason is that the module was designed with limited scope for group work activities. It could perhaps be argued that if the assignment was group based or if group based tasks were built into the module, there would have been a relatively high usage of interactive components (for example, chat, discussion, mail) and students would have had greater positive evaluation of these tools. Against the context of the current move from one-way knowledge transmission from lecturer to students towards significant interaction among students, between students and lecturer, and between students and course content, the findings of the current study provides important insight on the important tools that students depend on for their learning. Findings propose that usage of e-learning components is still distorted towards the traditional mode of learning

which highlights limited involvement of students in the learning process (that is, high usage of course content as opposed to chat and discussion). This elevates most important questions for syllabus creators and faculty members to consider, among them how to ensure that e-learning platforms are used constructivism theory in enhancing e-learning.

The fifth dimension emerging from the in-depth interviews was Effects of e-learning on student. E-learning technology provides opportunities for improved communication through the deletion of communicational barriers. But both students and instructors may have little experience with these tools. E-learning technology can provide an organizing environment. This study has shown that there are clear benefits in using the e-learning system. However, in order to maximize the benefits, more research is needed, through which the effectiveness of the learning theory can be further determined.

## VII. FURTHER WORK

The primary consideration for implementing E-learning should be focused on the requirements of the students. For instance: What are the students' attitudes towards E-learning? How to increase and explore the effects of e-learning on students? How to help the student turn E-learning into a communication tool that supports communication between students and instructor? How to test the results of embedding traditional learning theories into E-learning? How to improve universities attitudes towards e-learning? These are the dimensions which are needed to build a true and practical ELMM. This research has made the suggestion according to the qualitative data analysis building on students' views, and hope that it would provide a help for people who are committed to the ELMM. For that in the future we need more and more researches depend on qualitative research to explore what are the main dimensions for e-learning?

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APPENDIX I

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PAPER  
EXPLORING THE DIMENSIONS OF E-LEARNING MATURITY MODEL

Domain	Potential Elements	Interview Questions
Students' Attitudes	Behavior	Describe what sort of features do you use in e-learning? And why?
	Cognitive	Describe your opinion about e-learning? Is it easy to access Black Board? Have you had problems getting to the site? What type of problems?  Does site usage require any special technical skills?  What do you like and dislike? Why?  Do you have a preference for information delivery, one over the other? Is one better than the other?
	Feeling	Does using the course website make you more motivated regarding class?
Effects of e-learning on students	Explore e-learning Features	What type of content is provided by the site? Instructor info? Course info? Course documents? Schedules? Assignments? Resources? (Discuss each item)  What is the most important content provided? (Can't live without.) Why?  What is the least important content provided? (Never used...doesn't matter if it's there.) And why?  Does the site utilize any audio or video technology? Do you watch the videos or listen to the recordings?  What content is missing? What should be there that currently is not?
	Education gains	Does the provided content contribute to your learning? Why? Why not?  Would you say that your learning experience is enhanced by the course website? If so, why? If not, why?
	Communications gains	Would you say that you feel more connected to the class by having access to the course website?
	Organization gains	Would you say that the online submission of assignments was simple? If so, why? If not, why? Would you say that the calendar section be a valuable resource. ? If so, why? If not, why?

University attitudes from students' prospective	Behavior	Did you attend other courses where instructors had course websites? What was experience with these sites?  Does your instructor use a course management system? If so, what information is provided via this focus?  How does this differ from the information that is provided in the faculty website?
	Constructivism	Do you ever learn from different resources through the web site?  Does the website ever guide learners and instructors in conducting, managing and encouraging personalized learning activities through collaborative learning?  Do you ever give feedback on site design, information provided, organization, navigation, etc? What do the instructors say?  Does the usage of this technology enable interactions that were not possible without course websites?
e-learning implementation	Behaviorism	Do you have self-assessment questions as interactive activities in the learning materials?  Do you have Step-by-step description of learning materials in small chunks?
	Cognitivism	Does the educator set the objectives of the learning process?  Do you found Instructions for learning to learn?  Do you found the annotation and notes in course website?