A Re-Structuring of the Critical Success Factors for E-Learning Deployment

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Abstract
E-learning, being an information system, suffers high failure rates due to the complexity of deployment. This paper has 2 objectives: (I) to compile the critical success factors (CSFs) of e-learning from current literature; (II) group CSFs that approximately attain the same objective into roles where the roles together accomplish the main goal of a best e-learning deployment. 17 critical success factors (CSFs) were obtained through an exhaustive search, and were partitioned into 4 natural roles of Student, Instructor, Technology, and Institution. The confinement of the CSF interactions to within roles resulted in a dramatic reduction of pair wise comparisons. Pair wise comparisons are a measure of interactions and concomitantly of complexity.

Key words: E-Learning, Critical Success Factors (CSFs), Roles, Pair-wise Comparisons.

1. Introduction
In its broadest sense E-Learning can be defined as instruction delivered via all electronic media including the Internet, intranets, extranets, satellite broadcasts, audio/videotape, interactive TV and CD-Rom. E-learning for the purposes of this article refers to teaching and learning that is web-enabled (Govindasamy, 2002). E-learning has been viewed as synonymous with web-based learning (WBL), Internet-based training (IBT), advanced distributed learning (ADL), web-based instruction (WBI), online learning (OL) and open/flexible learning (OFL) (Khan, 2001). E-learning is the effective learning process created by combining digitally delivered content with learning support services (Hara & Kling, 1999). Above are the varied definitions and meanings that can be ascribed to the modern pedagogy known as e-learning.

2. Attributes of E-Learning
The profile of a college student is changing. In the new education environment, the traditional 4-year degree has evolved into a 40-year degree to indicate a lifetime relationship between education and human beings (Galloway, 2000). E-learning provides more learning opportunities to adults who are no longer of the formal education age which ranges from 17-25 years (Goi & Ng, 2009). The confluence of technology, demographics, and work/family requirements make life-long learning imperative (Berge, 1998). E-Learning in a way can provide flexibility to those students who possess a full time job and study at the same time, also known as “earner-learner”. Flexibility means that provision should be made to these types of students so that they spend fewer hours on campus or do not come on campus but still have the ability to fast track their education (Stuparich, 2001). E-learning possesses the ability to transform the educational process as never before. As John Chambers, president and CEO of Cisco Systems beautifully put it; “There are two fundamental equalizers in life: the Internet and education. E-Learning eliminates the barriers of time and distance creating universal, learning-on-demand opportunities for people, companies and countries”.

Internet-supported distance education courses do more than bring new students into online classrooms (Hara & Kling, 1999); it is also viewed as a cost-effective tool to address present fiscal realities (Pardue, 2001). Institutions are gradually jumping on the bandwagon as a cost cutter. Governments and organizations do not have to worry about building more concrete campuses to train and equip the working generation (Mat, 2000). Many states in the U.S. are developing virtual schools to support non-traditional or special needs learners as well as to reduce the need for new buildings; many of these virtual schools are utilizing some of these technologies to support hundreds and in some cases thousands of learners (Greenberg, 2009).

E-Learning keeps evolving. Table 1 (appendix) compares and contrasts the subtle differences between current e-learning and its recent past. Of particular interest is the steep change in the technologies. In e-learning lectures, there is no problem of unmanageable class size or insufficient number of students to start the course. As long as there are students taking the course, they can attend the class anytime at any place they want.
Hence, e-learning can be a way to produce a quality and innovative generation (Mat, 2000). In the past, learners had to spend much of their time and money to get to the physical campus for lectures. The learners can now access the campus from their home without much traveling and being away from their families. It cuts the learning time and cost. Thus, it encourages more organizations to support e-learning education for their employees (Mat, 2000).

3. Growth and Momentum

According to U.S. Dept of Ed 1998 survey released Dec.’99, 78% public 4-year and 62% public 2-year universities offered Distance Learning (DL) programs. 87% of all institutions had over 10,000 student enrollments. From 1995 - 98, there has been a 33% increase in institutions offering distance education, while number of DL courses and enrollments doubled. Internet and Web-based courses increased by 32% (Vucetic, J. (2003). Table 2 (appendix) summarizes the exponential growth in U.S. and worldwide Internet users over the many 20 years. It is estimated that the number of unique students enrolled in fully online distance-learning programs in 2002 was approximately 350,000 representing 2% of all students enrolled in postsecondary education in the US. The growth rate was 40% and revenue of $1.75b in tuition was generated for host institutions (Gallagher, 2002).

For the first time ever, an impartial stakeholder has asserted that “blended” instruction (using a variety of face-to-face and distance-oriented pedagogical methods) can have a larger advantage relative to purely face to face instruction or instruction conducted wholly online (Greenberg, 2009). Internet use and diffusion is growing at an unprecedented pace, reaching a 25 % market share in only 7 years, compared to 35 years for the telephone and 30 years for the microwave. According to International Data Corporation (IDC), Internet access is forecasted to grow to 320 million users in 2002, up from 14 million in 1995 (Kah et. al., 2000). There is a speeding up of all things related to distance education. The momentum is fueled by technological innovation, perceived value, timing and need, learner expectations and competition. A Sloan Consortium survey shows that concerns about course quality were less of a factor in 2007-2008 than in a previous survey, whereas issues regarding course development and/or purchasing costs, and limited technological infrastructure to support distance education, were moderately or significantly increased in the latest survey (Greenberg, 2009).

3.1 Failure Rates

But the story is not rosy all round. A 2003 Hackett Group study reported that 30% of Information Systems projects fail E-learning, being an information system, suffers even higher failure rates. These high failure rates indicate the existence of misconceptions regarding the implementation process and use of e-learning (Sela, 2009).

And there are roadblocks. Table 3 (appendix) groups together the most cited obstacles to videoconferencing deployments, where videoconferencing is assumed a good metric of distance education in general. Bandwidth unavailability should certainly be a more potent problem in resource-starved environments like Africa. Also, concerns about the ability of online courses to meet quality standards seem to be receding while concerns about the ability to actually deliver online classes (development and infrastructure) are growing (Greenberg, 2009).

3.2 Challenges

In developing fully online programs, it is critical that institutions make sufficient investments in their technology and services infrastructure. The efficient operation of a fully online program rests upon the strength of its technology and services architecture, as the core business of the institution is now being delivered entirely via the web (Gallagher, 2002). And there are barriers. Student barriers to Distance Learning include students’ alienation and isolation, lack of effective advice, costs and motivators, feedback and teacher contact, student support and services, lack of experience, frustration in learning, and training (Hara & Kling, 1999). Distance learners are more likely to have insecurities about e-learning. These insecurities are founded in personal and school related issues such as financial costs of study, disruption of family life, and lack of support from employers. These pressures often result in higher dropout rates than among traditional students (Falowo, 2007). Another source of insecurity is the perceived irrelevance of online studies. It is doubtful if national accreditation boards of African countries will accord online programs the same cognizance as their terrestrial counterparts.

3.3 Reasons for E-learning Failures

Many of the first e-learning programs have failed, resulting in the failure of many e-learning technology companies.
One of the major reasons given is the reluctant adoption of e-learning by learners - not because of the technology, but rather because of the failure of educators and organizations to provide quality content and to create an effective, interactive e-learning experience (Engelbrecht, 2003). The early models emphasized the role of the technology in providing content (information), delivery (access) and electronic services. Owing to the continuous ICT developments, the focus was primarily on the use of technology to create convenient virtual learning environments for learners to access anywhere, any time. Many educators and technology vendors assumed that the delivery of traditional learning content via the Internet constitutes e-learning (Engelbrecht, 2003). Many online courses cannot sufficiently motivate students to participate. In other words, e-learning is apt to isolate trainees and this can lead to high rates of failure (Mehregan, 2011).

Below is a list of reasons why e-learning deployment would fail:

- Being overly ambitious in terms of desired outcomes for the budget and time available.
- Utilizing particular information technologies for their own sake, without sufficient regard for appropriate learning design.
- No change in the assessment of learning to suit the changed learning outcomes.
- Commencing software development without adequate planning.
- Failure to prepare students for participation in learning experiences such as working in groups.
- Failure to obtain copyright clearance (Goi, 2009).

3.3.1 Profile of E-Learning students

E-learning is tailor-made for the non-traditional student. This type of student often works full time, attends classes after work, is married, has children or other familial obligations, and is a degree-seeking or continuing education student. Many are pursuing education in order to gain new skills and advance their careers. These busy, mature students are looking for quality, convenience and flexibility and should comprise a significant constituency of institutions with an e-learning outreach. The confluence of student needs and the potential of fully online distance learning create virtually limitless opportunities for institutions to serve students with educational offerings (Gallagher, 2002).

3.3.2 Universities In A Business Context

Corporate and academic institutions have invested in e-learning as it seems to offer possible solutions for three immediate business goals, namely: 1) increasing or sustaining the quality of educational or training programs and consequently the quality of employees/graduates 2) improving access to learning opportunities 3) reducing the total cost of education (Engelbrecht, 2003). A well run e-learning system can thus contribute revenues to an institutions’ coffers.

3.4 E-Learning Design

Transforming "learning" into "e-learning" is not just about developing online courses. More factors should be taken into account. There should be useful and easy to use e-learning tools. Complexity decreases usage. Therefore, "over-abilities" should be avoided (Sela et al., 2009). E-learning tools should be learner focused (simple, easy to use, not overwhelming, and familiar to users) and developed by experienced professionals (Sela, 2009). An organizational culture that supports and encourages learning, and especially e-learning is important. Training, once an interpersonal process, has become a one person (and one computer) process. This radical change requires adjustments to the organizational culture and a new thinking about the role of computers as part of organization life (Sela, 2009).

3.4.1 E-Learning Alternatives

There are different variations of distance learning. Eduventures research indicates 3 core models, each with its own characteristics and requirements.

**E-course/face-to-face:** Students attending class on campus complete some amount of coursework online. It employs extensive web-supported resources as a required component of the course; enriches the learning experience and improves students’ technology literacy and skills.

**M-course/mixed mode:** Hybrid or Mixed Mode combines face-to-face courses with a fully online course component to reduce classroom seat time; reduces instructional costs and improves student performance and retention.
W-\textit{course / fully online}: Students complete their courses entirely at a distance with no on-campus component. Learning delivered as part of an online certificate or degree-granting program; aims to provide education access to students for whom distance, convenience, and flexibility are paramount considerations (Newman, 2003). The availability of free web services online provided mostly by GOOGLE and Microsoft makes the first alternative easier to implement by faculty with some level of computer competency. The second and third alternatives however require more resources and permissions, and can be deployed only as part of the strategy and mission of the institution.

4. \textit{Critical Success Factors of E-Learning}

A complex technological initiative like an e-learning deployment is an undertaking involving a multiplicity of factors that impact the implementation to varying degrees. A factor that is critical to the success of the project is intuitively referred to as a Critical Success factor (CSF). Therefore, critical success factors (CSFs) are variables that are fundamental to the success of the implementation, and an organization must handle these CSFs well in order to have a successful implementation (Frimpon, 2011).

The CSFs approach has been used by managers as a framework for strategic planning to direct them in determining those elements that must go right to succeed in achieving goals and objectives (Jafari et al, 2006). About 81.5\% of the variation in the ERP systems implementation can be explained by the CSFs (Colmenares, 2009). Therefore, it is critical to focus on the critical success factors for a successful deployment exercise. The core alternatives of distance learning have very similar modes of implementation. They thus have similar challenges and success factors.

Table 4 (appendix) is a listing of critical success factors compiled from various academic papers. Due to the many competing elements and factors of an e-learning process, it is necessarily a complex one. Beyond the complexity are the nuanced meanings in the CSFs which may make it unclear as to whether they are in tandem or in conflict with each other. A task of this paper is to map the CSFs onto natural groupings such that complementary ones end up in the same group where they together achieve a sub-objective of the main objective of a successful e-learning deployment.

4.1 \textit{Compilation and Sifting of CSFs}

A compilation of the success factors from 14 papers resulted in a count of 74 non-unique CSFs as seen from Table 4 (appendix). A compare and contrast exercise to eliminate duplications result in 17 unique CSFs. Table 5 shows the much shorter list of reviewed CSFs, their definitions and sources. A process with this many variables is necessarily a complex one. This complexity is further magnified by the number of interactions and relationships between the variables. To be able to have a successful implementation this complexity has to be managed.

Figure 1 (appendix) is a graphic of the 17 unique CSFs from Table 5 placed in their respective roles. 17 attributes is pretty large for any software process. With such a large number there is the likelihood that some may have differing objectives. Therefore, it is helpful to bring some structure into the process by placing similar and consistent CSFs into same groups where they may together help achieve a sub-objective of the main e-learning objective of a successful implementation. Grouping criteria can help the process of checking whether the set of criteria selected is appropriate to the problem, can ease the process of calculating criteria weights in some methods, and can facilitate the emergence of higher level views of the issues (UK DTLR, 2001).

4.2 \textit{Roles and their rationale}

A good way to mitigate this complexity is to aggregate the attributes in groups, and furthermore restrict interactions to “within groups”. We shall define a role as a group of CSFs identified and put together for the purpose of achieving a sub-objective of the main objective. In simple terms, a role is a container for holding specific CSFs. As an example, the Student Role contains the attributes that are best needed or required by the student for the attainment of a successful e-learning experience. Table 4 which gives the definitions of these attributes help to group the CSFs. This paper uses as groups the 4 accepted e-learning categories of (1) Instructor; (2) student; (3) information technology; and (4) university support (Selim, 2005). There is good supposition that the above categories are the main actors of an e-learning initiative.

These 4 roles then help in the attainment of the main objective of a successful e-learning implementation and deployment.
4.3 Structuring CSFs
In this structuring exercise, the CSFs are placed in roles according to the following criteria: (Bullen et al., 1995)

1. Function: Identify the CSFs necessary to achieve the goals and objectives.
2. Best measure: Many other CSFs can be measures of the role but this CSF is the best or among the best.

In addition, we make the simplifying assumption that the CSFs in different roles have no interactions. Using simple set theory notation; for any pair of CSFs,

$$\bigcap_{i \in \text{role } I, \ j \in \text{role } J, I \neq J} \text{CSF}_i \cap \text{CSF}_j = \emptyset$$

4.4 Pair wise Comparisons
In any software deployment process, as the number of attributes grows so does the complexity of the implementation process. Pairwise comparisons are a measure of the number of interactions, and number of interactions is a measure of complexity, which implies that pairwise comparisons are a measure of complexity.

The grid in Table 6 (appendix) shows the extent to which a mere grouping of attributes cuts down on complexity. The COMBIN function in Excel (COMBIN(X, Y=2) allows us to deal with the Combinatorics problem of comparing attributes two at a time.

As can be inferred from Table 6:
- Total pairwise comparisons in the grouped process is (28 + 6) = 34:
  - Number of pairwise comparisons between the CSFs within the roles = 28.
  - Number of pairwise comparisons between the 4 roles themselves = 6.
- Total pairwise comparisons between the 17 CSFs in an ungrouped process = 136.

The dramatic reduction of 102 pairwise comparisons is due to the fact that there are no interactions between CSFs in different roles.

5. A Structured E-Learning Implementation
The roles are the pillars that shoulder the burden of the implementation of the e-learning process. Figure 3 (appendix) depicts the configuration of the e-learning process. The structural integrity of the entire e-learning process is hinged on the strength of the pillars. A weakness in any of the pillars can result in a failure. On the other hand, all the pillars have to be managed well to result in a successful implementation. That is why there should be focused treatment of the roles to ensure each CSF receives consideration until it drops out if it has to. Taking out a CSF without analytic due diligence can weaken the pillars and result in the crumbling of the edifice, so to speak.

5.1 Conclusion
The evolution of distance education has been very fast. The speed of change is proportional to the speed of the internet, so that the astronomical growth of the web is the rocket fuel for distance education. As a result of the speed, technologies get moribund quickly and institutions have to be very alert not to deploy systems that will be ‘dead on arrival’. It is proverbial that generals always prepare for the last war. Institutions, may unwittingly invest considerable resources in purchasing systems because they are already in use in sister institutions. Unfortunately, these existing systems may have been designed for the challenges of a past era, plus the fact that the newer technologies are cheaper and superior. With e-learning, the cost of infrastructure can be reduced tremendously from the millions required to build a campus to thousands to have a complete network infrastructure (Mat 2000).

This study defines a re-structured CSFs “role” model for ERP implementations. The model was developed through a multidisciplinary approach of Combinatorics, Decision theory and simple Set theory applied on a set of previously identified Critical Success Factors.

The compiled number of CSFs is large and could even be larger but their partition into the four groups of Student, Faculty, Technology, and Institution makes the model computationally less intensive and thus more easily manageable.
5.2 Limitations
The list in this research (Table 4) contains CSFs from 14 authors and papers. Perhaps increasing this sample and broadening the scope can result in more pertinent CSFs, especially since the model can handle any number of CSFs. The sample size although small is good enough for this early part of the project (Hubbard, 2009).

5.3 Future Research
Distance education is over 100 years old, and there is considerable literature to support deployment. However the web, which fuels the modern process, is barely 25 years old. Therefore, there is still on-going research especially on the interplay of student, instructor, technology and institutions and their roles in distance education.

The E-Learning solution selection is a multiple criteria decision-making problem that needs to be addressed objectively taking into consideration the relative weights of the criteria for any organization (Colace, 2008). Metrics should be developed to measure the roles and their associated CSFs in order to be better able to quantify the implementation process. As management consultant Peter Drucker once said: “If you can’t measure it, you can’t manage it.” A good methodology like Analytic Hierarchy Process (AHP) by Saaty can be used to determine the weights of the attributes in order to compare and rank alternatives for implementing the process. Figure 4 (appendix) is a graphic of a possible hierarchy of an e-learning deployment process that can be used to determine the weights. CSFs that are redundant or have no bearing on the implementation can drop out during the modeling process. If there are dependencies between the Critical Success Factors, as is most likely, then a modeling approach like Analytical Network Process (ANP) also by Saaty should be used to determine and calibrate the weights to further enhance the accuracy of the model.

Cloud computing technologies enable institutions that do not have the technical expertise to support their own infrastructure to get access to computing on demand. For many institutions, cloud computing offers a cost-effective solution to the problem of how to provide services, data storage, and computing power to a growing number of Internet users without investing capital in physical machines that need to be maintained and upgraded on-site (Al-Zoube, 2009). Educational institutions are beginning to take advantage of existing applications hosted on a cloud that enable end users to perform tasks that have usually required site licensing, installation, and maintenance of individual software packages. The Cloud works on the principle of economies of scale at application, software and hardware level. It results in many benefits like service provisioning, reduced costs, optimum resource utilization (Goel et al, 2011). Providers such as Amazon, Google, IBM, Microsoft, and Sun Microsystems have begun to establish new data centers for hosting Cloud computing applications in various locations around the world to provide redundancy and ensure reliability in case of site failures (Al-Zoube, 2009). Cloud applications can be leveraged to help resource-starved institutions like those in Africa.
References


Gallagher, S. (2002). Distance Learning at the tipping point. CSFs to Growing Fully Online Distance Learning Programs. Edventures, Inc.


TABLE 1: Evolution of Distance Learning

<table>
<thead>
<tr>
<th>Definition</th>
<th>Past Distance Learning</th>
<th>Present e-Learning</th>
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<tbody>
<tr>
<td>Definition</td>
<td>Any approaches to education delivery that replace the same-time, same-place, and face to-face environment of a traditional classroom (i.e., correspondence teaching; multimedia distance teaching)</td>
<td>The most recent evolution of distance learning that creates, fosters, delivers, and facilitates learning, anytime and anywhere, with the use of interactive network technologies (i.e., E-learning)</td>
</tr>
<tr>
<td>Paradigm in education</td>
<td>• Focus on teaching: lesson based Objectivist model of learning in which learners are passive</td>
<td>• Focus on learning: learner based</td>
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<tr>
<td></td>
<td>• A series of lectures for efficient transfer of knowledge from instructor to learner</td>
<td>• Constructive, collaborative, and cognitive information processing of learning</td>
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<td></td>
<td></td>
<td>• Individual differences in the learning process; learning as a social process</td>
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<tr>
<td>Interaction</td>
<td>• Lack of direct interaction between the teacher and the learner</td>
<td>• Interactions between instructor and learner, and among learners</td>
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<tr>
<td></td>
<td>• Asynchronous interaction</td>
<td>• Asynchronous/synchronous or real-time (e.g., chat forum, instant messaging, video conferencing) interaction</td>
</tr>
<tr>
<td>Technology</td>
<td>Written or printed materials, broadcast media, audio/ videotapes, telephone, and CAI/ CBT with stand-alone computers</td>
<td>All electronic media, especially, network technologies such as the Internet, intranets, and extranets</td>
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Table 2: U.S. & Worldwide Internet User Growth

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<tbody>
<tr>
<td>U.S. Internet Users (#Millions)</td>
<td>0.019</td>
<td>1.8</td>
<td>28.1</td>
<td>135</td>
<td>198</td>
<td>245</td>
<td>254</td>
<td>288</td>
</tr>
<tr>
<td>U.S. Internet User share (%)</td>
<td>89.6</td>
<td>84.5</td>
<td>62.3</td>
<td>31.3</td>
<td>18.1</td>
<td>13.4</td>
<td>12.5</td>
<td>10</td>
</tr>
<tr>
<td>U.S. Internet Users/1,000 People (#)</td>
<td>0.08</td>
<td>7.2</td>
<td>105</td>
<td>477</td>
<td>668</td>
<td>797</td>
<td>820</td>
<td>885</td>
</tr>
<tr>
<td>Worldwide Internet Users (#Millions)</td>
<td>0.021</td>
<td>2.13</td>
<td>45.1</td>
<td>430</td>
<td>1094</td>
<td>1825</td>
<td>2030</td>
<td>2890</td>
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<tr>
<td>WW Internet Users/1,000 People (#)</td>
<td>0.004</td>
<td>0.4</td>
<td>7.94</td>
<td>70.8</td>
<td>170</td>
<td>270</td>
<td>297</td>
<td>399</td>
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http://www.etforecasts.com/products/ES_intusersv2.htm

Table 3: Rank Order of Obstacles to Successful Deployments

<table>
<thead>
<tr>
<th>Obstacle</th>
<th>Ranking</th>
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<tbody>
<tr>
<td>Lack of bandwidth and technology infrastructure, or old equipment</td>
<td>1</td>
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<tr>
<td>Staffing (inability to afford support personnel)</td>
<td>2</td>
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<tr>
<td>Lack of interest on the part of sufficient educators and administrators</td>
<td>2</td>
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<tr>
<td>Funding challenges</td>
<td>2</td>
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<tr>
<td>No statewide or district-wide policy / standards / champions</td>
<td>5</td>
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<td>Firewalls</td>
<td>6</td>
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<tr>
<td>Resistance to change</td>
<td>7</td>
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<tr>
<td>Bell schedules / calendars</td>
<td>8</td>
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<tr>
<td>Costs</td>
<td>8</td>
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<tr>
<td>Learning curve</td>
<td>8</td>
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<tr>
<td>The need to create awareness of availability / value</td>
<td>8</td>
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<tr>
<td>Lack of dedicated rooms or not enough equipment</td>
<td>12</td>
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<tr>
<td>Focus on testing / (No Child Left Behind) NCLB</td>
<td>12</td>
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<tr>
<td>The technology was not perceived as high enough quality initially</td>
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<tr>
<td>The state is in the early stages of deployment</td>
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<tr>
<td>1</td>
<td>Program Content</td>
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<td>2</td>
<td>Web Page Accessibility</td>
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<tr>
<td>3</td>
<td>Learners’ Participation and Involvement</td>
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<td>4</td>
<td>Web Site Security and Support</td>
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<tr>
<td>5</td>
<td>Institution Commitment</td>
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<td>6</td>
<td>Interactive Learning Environment</td>
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<td>7</td>
<td>Instructor Competency</td>
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<tr>
<td>8</td>
<td>Presentation and Design</td>
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**Mehregan & Benigno (from Selim)**

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<tr>
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<td>Instructor Characteristics</td>
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<td>Educational Institutes Support</td>
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<td>7</td>
<td>Knowledge Management</td>
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**Leidner & Elliott**

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<td>Technology</td>
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**Volery & Kaulpa**

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<tr>
<td>1</td>
<td>Technology</td>
<td>Subject Matter Experts</td>
</tr>
<tr>
<td>2</td>
<td>Instructor</td>
<td>Documentation</td>
</tr>
<tr>
<td>3</td>
<td>Previous use of technology</td>
<td>Finances</td>
</tr>
</tbody>
</table>
Students need to have time management, discipline and computer skills in order to be successful in the e-learning era. Student prior IT experience such as having a computer at home and attitude towards e-learning is critical to e-learning success (Selim, 2007).

Technical competency of both instructor and student (Soong et al, 2001). Previous student experience with personal computers (Selim, 2007).

Problems of Web-Based Distance Learning include the attitudes of instructors, students, and administrators. (Falowo, 2007)

As reported by MacDonald et al. (2000), effective group discussion is very important in e-learning (GOI, 2009).

Effectiveness of distance learning is based on preparation, the instructor’s understanding of the needs of the students, and an understanding of the target population (Omoregie, 1997) Falowo, R.O. (2007).

Instructor openness to change (Baylor and Ritchie, 2002),

Finally, instructors delivering course content must be able to effectively use the technologies. This might require them to modify or shift their pedagogical paradigm and behavior (Kah et. al., 2000).

The program’s educational effectiveness and teaching/learning process is assessed through an evaluation process that uses several methods and applies specific standards. Data on enrollment, costs, and innovative uses of technology are used to evaluate program effectiveness. Intended learning outcomes are reviewed regularly to ensure clarity, utility, and appropriateness (Smith, 2005)

By advancing information and communication technology (ICT), e-learning is emerged as a modern educational paradigm. This online learning environment improves the delivery of teaching content, knowledge sharing among trainees, social interaction and so forth. (Mehregan, 2011)

In such well-facilitated learning environments, through technology, students become excited about what they are learning and aware they are members of a global community (Berge, 1998).

Virtual Learning Environments (VLEs) are electronic platforms that can be used to provide and track e-learning courses and enhance face-to-face instruction with online components. Primarily they automate the administration of learning by facilitating and then recording learner activity.

If the technical support is lacking, the e-learning will not succeed. University administration support to e-learning is essential for its success. (Selim, 2007).

It is our view in this paper that the success of distributed learning courses and programs depends greatly on the quality and effectiveness of its design, content and mode of delivery (Kah et. al., 2000).

When building the original eLearning course, it helps ensure you’re considering future maintenance issues in your current design. Once built, it provides a historical perspective of original design decisions to help you make more efficient and effective maintenance decisions throughout the course life cycle (O’Brien, 2005)

The top priority of any eLearning course is the SMEs. With their extensive knowledge and documentation, they provide the best picture regarding what type of training needs to occur, but that also means that you need to put their schedule into consideration for your project (Kaupla, 2001).

Therefore, the first critical success factor is to provide faculty with a certain level of security with respect to their intellectual capital (Kah et. al., 2000).

University administration support to e-learning is essential for its success.

Number one in Khan’s 8 dimensions (Focused on aspects and issues affecting the organization such as administrative affairs, academic affairs and student services) (Chin, 2004).

After the initial e-learning activities have been delivered post-e-learning support is provided to embed e-learning in normal training practices, for example in induction, employee reviews and organizational procedures (Elliott, 2009).
Table 6: Results of Pair-wise Comparisons Calculations between the CSFs in their respective roles

<table>
<thead>
<tr>
<th>ROLE</th>
<th>n</th>
<th>COMBIN(n, 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Faculty</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Technology</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Institution</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>17</td>
<td>28</td>
</tr>
</tbody>
</table>

Pairwise Comparisons between the Roles

<table>
<thead>
<tr>
<th>n</th>
<th>COMBIN(n, 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

Total Comparisons \((28 + 6) = 34\)

Pairwise Comparisons between the CSFs altogether

<table>
<thead>
<tr>
<th>n</th>
<th>COMBIN(n, 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>136</td>
</tr>
</tbody>
</table>

Figure 1: The Critical Success Factors (CSFs) of E-learning
Figure 2: The Roles and their Relationship to E-Learning

- Faculty Role
- Technology Role
- Student Role
- Institution Role

eLEARNING DEPLOYMENT

Figure 3: Pillars of E-Learning

E-Learning

- Student
- Faculty
- Technology
- Institution
Figure 4: A Decision Analytic Hierarchy of an E-Learning Implementation Process

BEST E-LEARNING DEPLOYMENT

STUDENT ROLE

Computer Competency

Computer Skills

Previous Use of Technology

Collaboration

Participation

Student-Student Interaction

Student Characteristics

Discipline

Time Management

e-Attitude

INSTRUCTOR ROLE

Competency

Course Development

Evaluation & Assessment

Presentation and Design

e-Learning Environment

Instructor Characteristics

Openness to Change

e-Student

e-Mindset

Technical Competency

Computer use outside school

Instructor Previous Computer Use

Technology Role

Technology Quality

Tech Support

Website Accessibility

Website Security

e-Course Maintenance

e-Learning Platform

INSTITUTION ROLE

Institutional Support

Faculty Support

Financial Support

Student Support

Intellectual Property

SMEs

Sustainability