Critical Success Factors for eLearning Delivery

Patrick G. Coman
Department of Electronic Engineering
Institute of Technology Tallaght, Dublin 24, Ireland
Tel: 353-1-4042502
Email: pat.coman@it-tallaght.ie

Abstract

This paper will focus on issues relating to the delivery of eLearning, using the delivery of a technology based college course to students in the workplace. The issues addressed include on-line learner skills and support, the effective and appropriate use of multimedia, the use of simulation, ICT requirements and tutor skills and training. On-line learning’s opportunities for more personalised learning using simple testing and feedback tools and student use of sophisticated specialist software will be explored along with more mundane factors such as scheduling, student tracking and assessment.

1. Introduction

The determination of Critical Success Factors for eLearning Delivery is influenced by a number of distinct dimensions. The design of any delivery environment must be pedagogically rooted, reflecting the transposition of an abstract pedagogic model to a tangible system design. The learning dynamics of the subject domain provide the data points needed to define the specifics of system design and implementation. The final dimension that must be considered relates to the learning environment and its associated interactions.

This paper addresses each in turn in the context of the e-delivery of a third year telecommunications module to part-time, industry based students completing a National Diploma in Electronic Engineering. Critical Success Factors are identified for each dimension. The treatment is presented independent of any specific learning management system and does not address Critical Success Factors in that regard.

2. Pedagogy of System Design

The pedagogic model adopted for system design is derived from Cognitive Flexibility theory. Cognitive Flexibility theory is a conceptual model for designing learning environments that is based upon cognitive learning theory. Its intention is to facilitate the advanced acquisition of knowledge to serve as the basis for expertise in complex and ill-structured knowledge domains [1]. Cognitive flexibility represents an evolution of classical constructivism. Very closely allied to the model of constructivism is the notion of cognitive apprenticeship [2]. The apprentice-master model of traditional crafts inspires the model but it is adapted to "cognitive" or intellectual domains.

2.1 Design Realisation and CSF derivation.

The fusion of these concepts enables the definition of the following Critical Success Factors:

1. The design should enable deep learning - all aspects of content should closely interrelate as a whole. Module content is implemented as a hierarchy of units, lessons, and topics.
2. The learning process should be student centered - the implementation is open and allows the student total flexibility as to how they access or sequence any of the courseware materials or utilities.
3. The learning process should be student directed. A learning plan is provided to allow the student map out their schedule of activities. Data from module delivery suggests that while students may want to be able to asynchronously access module units, synchronisation is preferred within units, each unit typically requiring eight to ten hours of effort.

3. The Subject Domain

The subject domain in this context presents the particular dynamic that many of the concepts require practical demonstration in order to be fully understood by the students. The student is expected to develop certain practical capabilities, with circuits and also with instrumentation. The student is also expected to develop analytical and problem solving capabilities. Influenced by cognitive apprenticeship these cannot be fully developed by simply accessing courseware and tutorials, without actual interaction with circuits and systems. The deterministic behaviour of such associated circuits can be presented with simulation tools, in this case Orcad PSpice, using Citrix [3] as a bandwidth effective on-line access tool. Analytical capability can be developed by providing simulations that present unexpected outcomes, such as circuit behaviour as a result of using modified device timing models.

Real laboratory behaviour and instrumentation form such an integral part of mastering the subject domain that eLearning provision without them is incomplete. A hybrid can be created using tools such as LabView [4] to build virtual instruments, and present those instruments with
simulation output data cases, presenting the opportunity for significant asynchronous student access to such cases. Additionally LabView can be used to provide complete remote IP based access to and control of both instruments and hardware, enabling the remote student the full spectrum of activity and experience that a "hands-on" regular student would have.

Extrapolating concepts presented in previous research [5] regarding student-active science education is useful in identifying a set of critical success factors here:
1. Laboratories should be fundamentally investigative, encouraging active learning by actually doing it.
2. Formats used should include active collaboration among students, and between students and lecturers.
3. Laboratories and problem assignments should be based on complex, real-world problems.
4. Exercises and laboratories should inculcate higher order thinking skills, and intellectual maturity.

4. The Learning Environment

The learning environment in this case refers to the interactive dynamics that exist, and how they are enabled in this learning context. One of the most critical factors is the sense of disconnection and isolation that net users may experience. The development of a "knowledge family" is an important element in addressing this. Asynchronous communications are supported using a Spinnaker based bulletin board and MSN Messenger messaging. Synchronous communications such as tutorial sessions are supported with Messenger and MS NetMeeting. The "knowledge family" must be actively promoted and stimulated by tutors and lecturers, through bulletin boards and discussion groups.

MSN Messenger is Microsoft's answer to ICQ for instant messaging. Once Messenger is open on a desktop it will let the user know what members of their contact list are on-line, and which ones are not. Using Messenger alone, a far more community based communications environment can be created for distant learners, addressing some of the concerns regarding sense of place, and isolation in distance learning. Using MS NetMeeting any desktop application can be opened and shared between selected members of the MSN Messenger contact list. This makes it an ideal platform for providing support to students, addressing issues that arise with interactive course elements such as laboratory exercises. It also provides the capability to remotely deliver tutorial sessions, to individuals or groups, with the voice conferencing capability enhancing the communications process.

Streaming media, in this case Real, can be used to provide bandwidth efficient tutorial support that can be accessed in a completely asynchronous manner by students. Video is not required, with a combination of Real Audio and image animation using tools such as RealPix or Flash providing a more effective support environment.

The student must also be able to benchmark their own progress and level of understanding as they progress through the course. The test strategy is to provide individual formative tests for each lesson, and a single summative test for each unit. Formative assessment is used primarily to help the student and the tutor to monitor progress in the development of skills and understanding in each lesson. The student can take a lesson test at any time, and may retake that test as many times as they wish. Each lesson test will comprise of, typically, ten to twelve questions, selected at random from a question bank. The Unit Test is used both in a formative, but primarily summative manner. The performance from the Unit test can be used as part of the formal assessment process for the student. The Unit test is randomly generated from the same question bank, but can be taken only once, however feedback and support can be provided if specific weaknesses are identified.

5. Conclusions

It is seen that the subject domain heavily influences the determination of Critical Success Factors in eLearning. However the desired pedagogy, and learning environment define the dimensions, and success factors, of the general infrastructure that must be created to support the domain specific presentation. Further work is required to develop and model these processes so that they are better defined, and can become more repeatable, and transportable from application to application cases.

References

[3] CITRIX, Application Serving White Paper,
[4] National Instruments, Distance Learning
http://www.ni.com/academic/distance_learning.htm