Critical success factors in online education

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Critical success factors in online education

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Abstract
The Internet is a major
technological advancement
reshaping not only our society but
also that of universities
worldwide. In light of this,
universities have to capitalise on
the Internet for teaching, and one
progressive development of this is
the use of online delivery methods.
This paper draws upon the results
of a survey conducted amongst
students enrolled in one online
management course at an
Australian university. Three
critical success factors in online
delivery are identified: technology,
the instructor and the previous use
of the technology from a student's
perspective. We also argue that
the lecturer will continue to play a
central role in online education,
albeit his or her role will become
one of a learning catalyst and
knowledge navigator.

Introduction

Online education has generated tremendous excitement both inside and outside higher education. For some, it offers the potential to provide learning to new audiences; for others, it offers the opportunity fundamentally to transform learning delivery and the competitive landscape (Poehlein, 1996). Among those institutions with better-defined reasons for embracing online education the rationales vary, but they often fall into one of four broad categories:

1 *Expanding access.* Most states need to expand access to education in order to meet the education and training needs of state residents and companies and to educate under-served populations. For many people in the past, academic programme calendars have not matched work and family responsibilities, and programme offerings may not have met learner needs.

2 *Alleviating capacity constraints.* There has been a surge of student numbers which current university facilities cannot accommodate any more. Some are hoping to leverage the scalability of online education to avoid overwhelming their bricks-and-mortar capacities (Weill and Broadbent, 1998).

3 *Capitalizing on emerging market opportunities.* The public's growing acceptance of the value of lifelong learning has fuelled an increased demand for higher education services among people outside the traditional 18-24 age range. Emerging student segments, such as executives seeking further education and working adults, may be more lucrative than traditional markets. By capitalizing on emerging market opportunities, many educational institutions hope to generate significant revenue.

4 *Serving as a catalyst for institutional transformation.* Many higher education institutions are being challenged to adapt rapidly to a decrease in public funding and to an increasingly competitive environment (Whitty *et al.,* 1998). Distance education can catalyse institutional transformation.

The rapid expansion of the Internet as a potential course delivery platform, combined with the increasing interest in lifelong learning and budget restrictions, has created a significant incentive for universities to develop online programs. As the technology is now available and relatively user-friendly, those universities which do not embrace it will be left behind in the race for globalisation and technological development. If we want universities to make the utmost use of the Internet, it is essential to identify and understand the critical success factors affecting the online delivery of education. Indeed, if we continue to re-implement conventional models borrowed from classroom-based or distance education focused on passive transmission, we can expect only marginal improvements and may well simply escalate costs.

This paper aims to identify the key success factors of this new paradigm of education based on the case of a business course, which has been offered online for the past few years at an Australian university of technology. The first section will define the concept of online education. In the second section a review of the literature will identify the key factors influencing the effectiveness of online delivery, and the third section will describe the method used to conduct this study. In particular, the features of the course offered online will be detailed. The last section presents the findings and a discussion.

Defining online education

The literature on online delivery in the field of education has flourished since the early 1990s with the rise of the Internet. There has

been a concomitant interest in a variety of issues linked to online delivery and numerous terms have emerged in the literature such as distance learning, computer-based learning, distributed learning, and lifelong learning. It is therefore important to clarify the concept of online delivery and to see how it relates to these other terms.

Distance learning is probably the oldest and best-known concept. It was originally intended to cater particularly for students disadvantaged by their geographical remoteness from university campuses. The UK's Open University and imitators in countries as different as India, Israel, and Australia have demonstrated, even without the benefit of the Internet, that technology makes it possible to deliver a good (and relatively cheap) higher education beyond a physical campus. Course materials and contact with instructors may rely on traditional (such as print and telephone) or newer technologies (such as electronic communication). Hence, distance learning can be defined as any approach to education delivery that replaces the same-time, same-place, face-to-face environment of a traditional classroom.

Computer-based learning was, until fairly recently, limited mainly to technological fields such as mathematics, engineering and design. Now, however, computer laboratories are likely to be frequented by students in linguistics, geography, history or business. Computers provide an unparalleled capacity to manage and access large amounts of information, and present it in a novel and interesting way. Similarly, computer-based education allows students to become active learners rather than mere passive recipients of teaching (Candy *et al.,* 1994). Computers are not necessarily linked to a network: computer learning can be achieved by stand-alone computers using a particular software stored in the hard disk, a floppy disk or CD.

Distributed learning refers broadly to features of a learner-centred environment, which "integrates a number of technologies to enable opportunities for activities and interaction in both asynchronous and real-time modes. The model is based on blending a choice of technologies with aspects of campus-based delivery and distance education" (Reid, 1999, p. 4). Two essential aspects therefore underpin the concept of distributed learning: first, a heavy reliance on technology, and second, self-learning. The latter implies that the learner (or student) assumes responsibility for specifying individual learning needs, goals and outcomes, planning and organising the learning task, evaluating its worth and constructing meaning from it (Candy *et al.,* 1994, p. 128).

Lifelong learning refers primarily to those forms of learning throughout life that are called for by social and cultural change. The rate of social, technical, economic and other change is so great, at least in industrialised countries, that few people will hold the same job throughout their lifetime. Similarly, recent research on learning across the lifespan has shown that people are not only capable of, but actually engage in, continuing learning over their active life and beyond (Tuijnman and van der Kamp, 1992). Although lifelong learning can be self-directed, a variety of agencies (corporations, professional associations, unions, community groups) also represent an extraordinarily rich and diverse repository of learning opportunities.

Drawing on the concepts previously defined, online delivery is a form of distributed learning enabled by the Internet. Uses may include the provision of student access to learning resources, the facilitation of communication and collaborative working among and between students and academic staff, the assessment of individual students or groups of students, and the provision of administrative and student support. Online delivery goes beyond traditional computer learning as it makes full use of the Internet and other digital technologies. Online delivery can facilitate distance education by making course material accessible anytime anywhere. It provides substantial advantages over traditional technologies, such as:

- Collaborative tools which offer a rich, shared, virtual workspace in which interactions occur not between an individual and technology, but as many-to-many, interpersonal communication, among students. The interaction can be synchronous (i.e. in real time) with, for example, a chat forum or video conferencing, or asynchronous.
- Interactive tools such as simulations or self-administered quizzes which allow the student to progress at his or her own pace through required exercises and self-assessments. These collaborative tools are limited in that they do not provide for interaction with other students or an instructor; the student interacts only with the technology.

Key factors in effective online delivery
Effectiveness
Webster and Hackley (1997) remarked that students' performance, measured by their marks, represents a key aspect of teaching effectiveness. However, several studies have shown that there is little or no difference in student performance between educational television and face-to-face instruction (Wetzel *et al.,* 1994) or between video instruction and face-to-face instruction

(Storck and Sproull, 1995). Webster and Hackley (1997) further suggested that the following dimensions can capture the concept of effectiveness: student involvement and participation, cognitive engagement, technology self-efficacy (i.e. the belief that one has the capability to interact with a given technology), perceived usefulness of the technology employed, and the relative advantage or disadvantage of online delivery.

According to studies conducted by Dillon and Gunawardena (1995) and Leidner and Jarvenpaa (1993), three main variables affect the effectiveness of online delivery:
1 technology;
2 instructor characteristics; and
3 student characteristics.

Technology
The reliability, quality and medium richness are key technological aspects to be considered (Sanders Lopez and Nagelhout, 1995). In particular, the network set up should allow for both synchronous and asynchronous exchange; students should have convenient access (e.g. through a remote access); and the network should require minimal time for document exchange. The quality of the interface also plays a crucial role (Trevitt, 1995). The literature concerning interface design for online delivery ranges from the highly artistic (e.g. Laurel, 1990) to highly technical (e.g. Blattner and Dannenberg, 1992). Reeves and Harmon (1993) presented a synthesis between these two tendencies and identify the following dimensions as being important ones in the user interface: ease of use, navigation, cognitive load, mapping, screen design, information presentation, aesthetics, and overall functionality.

The perceived richness of the technology should also influence the effectiveness of online delivery. In medium richness theory (Daft and Lengel, 1986), a rich medium is one that allows for both synchronous and asynchronous communication and supports a variety of didactical elements (text, graphics, audio and video messages). A central part of the medium richness relates to interactivity. Indeed, McIntyre and Wolff (1998, p. 257) noted that: "One of the powers of interactivity in a Web environment is the capability to engage by providing rapid, compelling interaction and feedback to students." Engagement is also enhanced by problem-based presentation of educational material. An engaged student is a motivated student (Neorman and Spohrer, 1996).

Instructor characteristics
Collis (1995, p. 146) remarked that the instructor plays a central role in the effectiveness of online delivery: "It is not the technology but the instructional implementation of the technology that determines the effects on learning." Webster and Hackley (1997) suggested that three instructor characteristics influence learning outcomes:
1 attitude towards technology;
2 teaching style; and
3 control of the technology.

Students attending a class with an instructor who has a positive attitude towards distributed learning and who promotes the technology are likely to experience more positive learning outcomes. In a distributed learning environment, students often feel isolated since they do not have the classroom environment in which to interact with the instructor (Serwatka, 1999). To overcome this feeling, instructors can provide various forms of office hours and methods of contacts for the students. Most importantly, the instructor should exhibit interactive teaching styles, encouraging interaction between the students and with the instructor. Students in Internet distance learning courses often face technical problems. It is therefore crucial that the instructor has a good control of the technology and is able to perform basic troubleshooting tasks (e.g. adding a student at the last minute, modifying students' passwords, changing the course settings). Organisation skills go hand in hand with control of technology. Haynes *et al.* (1997) remarked that a designed instructor is essential for overall coordination and that, as the development of an online course is labour intensive, both faculty and technical resources must be identified and committed to the schedule at an early stage.

Student characteristics
A variety of characteristics with potential influence on online delivery can be identified in the literature. As maintained by Colley *et al.* (1994), such variables as prior experience, having a computer at home, and personality produce gender difference towards computers. Reinen and Plomp (1993) found that computer usage at school was dominated by males in most of the 21 countries they surveyed. Computer experience is another variable which can have an interaction with gender (Kay, 1992).

In addition to gender, other demographic characteristics are likely to impact on the effectiveness of online delivery. It is anticipated that the programme in which the students are enrolled (e.g. Master of Business Administration, Master of International Business, Master of Electronic Commerce) will play a role. The enrolment interacts with computer experience: students enrolled in Curtin University's Master of Electronic Commerce take all their courses online and are familiar with the technology. Another demographic variable to be considered relates to the country of origin of the student.

Leidner and Jarvenpaa (1995) also suggested that students lacking the necessary basic skills and self-discipline may do better in a traditionally delivered mode. Similarly, the brightest and most motivated students may prefer to learn in an individual competitive environment rather than sharing their knowledge with less motivated, less bright students in a traditional classroom setting.

WebCT: a Web publishing software to develop online courses

WebCT is an integrated Web publishing environment specifically tailored for the design and development of teaching and learning materials. WebCT is a tool that facilitates the creation of sophisticated World Wide Web-based educational environments. It can be used to create entire online courses, or to simply publish materials that supplement existing courses. WebCT requires minimal technical expertise on the part of the developer of the educational material, and on the part of the student. All content is accessible via a standard Web browser.

WebCT was developed in the Department of Computer Science at the University of British Columbia, in Canada. Curtin University of Technology has purchased an unlimited licence for the software so that it can be used locally to produce Curtin courses. During 1998, the number of online courses being implemented by Curtin schools using WebCT grew from under 50 to over 300.

The Global Business 650 course was one of the first courses offered online at Curtin Business School. One of the main drivers for online delivery was due to the fact that this course was also offered in Singapore within the Master of International Business, a challenging and flexible programme specifically designed for busy executives. This programme features guided-independent study, student-centred learning and maximum use of information and communication technology. Although the course content is available online, a series of four intensive one-day seminars is conducted throughout the semester. During these seminars, the instructor gives an overview of the different topics and students can interact in a classroom setting on case studies or students' presentations.

Global Business 650 is structured around 11 topics, which each have the following features:
- *Summary.* The summary covers the essential concepts for each topic.
- *Slides.* The slides used by the instructor during the intensive seminars can be either viewed or downloaded.
- *Readings.* A series of articles relating to the topic is available online or through a link with another URL.
- *Quiz.* Ten multiple-choice questions have been designed to check the understanding of the topic. Clicking on that button presents the questions. WebCT automatically marks student responses correct or incorrect.

The other features and tools also available to students from the Global Business 650 Web page include:
- *Course conferencing system (bulletin board).* This allows communication among all course participants. WebCT keeps track of which articles are read by each student and, by default, initially presents only unread articles. The conferencing system can be searched (new and old articles) for content, sender, date of sending, and more.
- *Electronic mail.* An electronic mail facility can be added to a course allowing one-to-one message transfer among course participants. Like the bulletin-board, messages can be searched for based on the sender, content and the date of sending.
- *Virtual library.* Several links to the Curtin library, online journals and magazines, and international organisations are provided. These online resources provide readily up-to-date information when students complete their assignments.

Method

Data were collected through an anonymous questionnaire administered to the 47 students enrolled in Global Business 650 during the first semester 1999. The measurement of the variables was drawn from Reeves and Harmon (1992) and Webster and Hackley (1997):
- *Teaching effectiveness.* The grades of each individual student were not available at the time the questionnaire was administered, so this dimension was not included in effectiveness. The following dimensions were used to capture the concept of effectiveness: student involvement and participation, cognitive engagement, technology self-efficacy (i.e. the belief that one has the capability to interact with a given technology), perceived usefulness of the technology employed, and the relative advantage of online delivery. Seven items were developed using a five-point Likert scale where the respondent had to indicate the extent of his or her agreement/disagreement. A teaching effectiveness index was subsequently built by adding the value of the seven items.

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- *Technology.* A set of 11 items was developed using a five-point Likert scale to capture the reliability, quality, and medium richness of the technology. A technology index was subsequently built by adding the value of the 11 items.
- *Instructor characteristics.* A set of 12 items was developed using a five-point Likert scale to capture the attitude towards technology, teaching style, and control of the technology displayed by the instructor. An instructor index was subsequently built by adding the value of the 12 items.
- *Student characteristics.* In addition to a question relating to previous computer experience, the following demographic variables were included in the analysis: access to the Internet at home, programme of study followed by the student, country of origin, and gender.

Findings

To determine the frequency of use of the various features of the course available to students through WebCT, each feature was listed and students indicated their usage on a five-point Likert scale. Responses ranged from 1 = "not at all" to 5 = "very often". The least frequently used feature of the course was the video. A reason for the low usage of this feature may have been that students were able to attend face-to-face lectures that covered all topics, which eliminated the necessity to view the videos through the Internet. The next two features which students rated as having medium usage were the readings and the virtual library. The last four features of the course all rated as often being used. These were the summaries, slides, quizzes and the bulletin board. Of these four, the quizzes rated the highest, and were also the most interactive, with students being able to submit the quiz for immediate grading. The findings are illustrated in Figure 1.

The relationship between teaching effectiveness and technology was tested by a Pearson correlation (two-tailed). The Pearson correlation coefficient is 0.563 with a *p*-value of 0.001. Thus, there is a significant relationship between teaching effectiveness and technology.

A factor analysis was further conducted to identify the underlying factors in technology. The factors were extracted with a principal component analysis and the factor matrix was rotated using the varimax method. Three factors emerged from the factor analysis. Each factor displays a high level of reliability with Cronbach alpha > 0.7. Overall, the three factors explain 70 per cent of the variance. The results of the factor analysis are summarised in Table I.

Factor 1: ease of access and navigation
This factor comprises the first five variables of technology. These variables all relate to the ease with which the students can access the site and the usability of the software in general. The instructor noticed through the student tracking facility that students took full advantage of the access flexibility offered by WebCT. For example, they logged in at any time during day and night. There was no frustration experienced with access and navigation.

Factor 2: interface
This factor comprises four variables of technology. These all relate to the visual structure and design of the Internet course. The Web page design was perceived to be appealing and well structured. This ergonomic dimension was particularly important since it was discovered that some students could spend up to two hours at a time on the Web site.

Factor 3: interaction
This factor comprises the final three variables of technology. These relate to the interactive abilities of the WebCT course between all students and the instructor. The technology made it possible to have a truly virtual classroom, as there was no need to sit in a classroom to experience interaction with classmates and the instructor. The interaction dimension indicates that universities must not attempt to come to terms with the Internet in a fetish way, i.e. to require their lecturers to merely put their lecture notes on the Web. The result of that approach is unfortunately too well-known: lectures become even more rigid and boring.

The relationship between teaching effectiveness and instructor characteristics was tested by a Pearson correlation (two-tailed). The Pearson correlation coefficient is 0.594 with a *p*-value of 0.001. Thus, there is a significant relationship between teaching effectiveness and the instructor. Similar to technology, a factor analysis was conducted to detect the underlying factors relating to the instructor. The results of the factor analysis are summarised in Table II.

Factor 4: attitudes towards students
This factor comprises the first five variables of instructor characteristics. These variables all relate to the instructor's personal approach and teaching manner, and their ability to motivate the students in a classroom setting during the intensive seminars. In other words, the instructor must show some empathy towards students both in a face-to-face setting and in cyberspace. This implies, among other things, handling e-mail queries rapidly and solving emerging problems efficiently in a remote fashion.
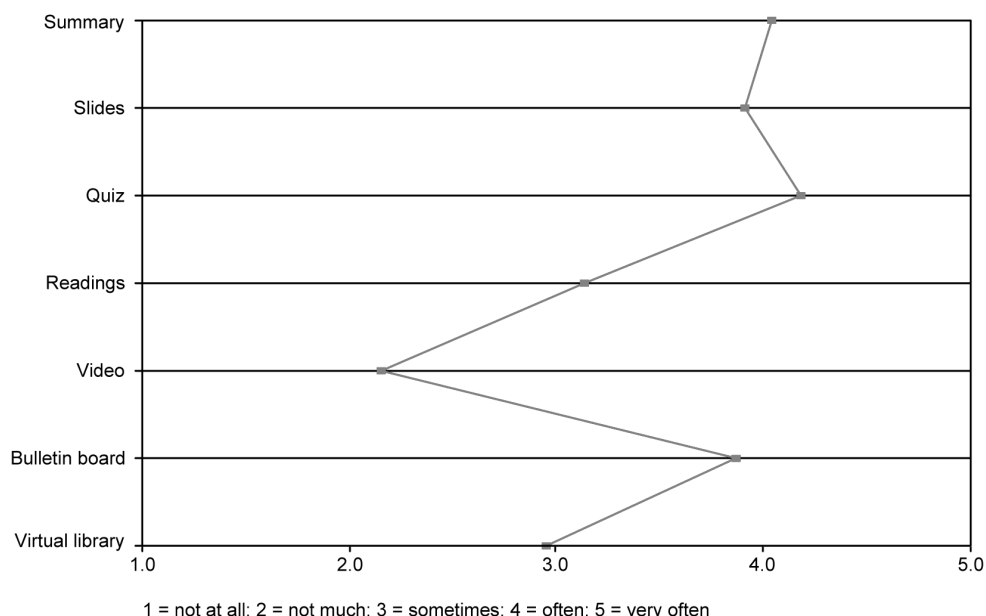
Figure 1
Student usage of WebCT features (mean)

1 = not at all; 2 = not much; 3 = sometimes; 4 = often; 5 = very often

Table I
Factor analysis of technology

Items	Factor 1	Factor 2	Factor 3
Easy access to Web site	0.640		
Did not experience problems while browsing	0.809		
Browsing speed was satisfactory	0.837		
Overall, the Web site was easy to use	0.743		
Web site was easy to navigate	0.586	0.677	
Information was well structured/presented		0.838	
I found the screen design pleasant		0.750	
Web site contained useful features		0.797	
Web site gave me direct/timely feedback			0.792
I could interact with classmates through Web			0.796
I could easily contact the instructor			0.690
Percentage of variance explained	44.420	16.619	9.287
Cumulative percentage of variance explained	44.420	61.039	70.326
Cronbach alpha	0.863	0.879	0.713

Note: Only loadings > 0.5 are shown

Factor 5: instructor technical competence

This factor comprises four variables of
instructor characteristics. These variables
relate to the instructor's ability to use and
promote the Internet technology effectively.
The instructor vigorously encouraged the
use of the technology and a lab session was
organised at the first intensive seminar to
familiarise students with the technology. In
addition, the instructor was clearly able to
handle the technology and believed in it.

   This dimension also suggests that the
lecturer is not only the repository of
knowledge but he or she can play an
important role alongside the Internet as a
knowledge navigator.

Factor 6: classroom interaction

This variable relates to the instructor's
ability to encourage students to interact and
participate in class and through the Internet.
Students were encouraged to participate and
interact during the Saturday seminars. In
fact, the instructor gave a participation mark
for the interaction on the Web site and in the
classroom. The Internet, however, allows a
new level of interactivity as it eliminates the
temporal and spatial rigidity of office hours
or class meeting times. It will virtualise the
walls of the university, creating "elsewhere"
learning.

   The relationships between the various
demographic variables relating to students
and teaching effectiveness were tested with a

Table II
Factor analysis of instructor characteristics

Items	Factor 4	Factor 5	Factor 6
Instructor was enthusiastic about teaching the class	0.694		
Instructor's style of presentation held my interest	0.846		
Instructor was friendly towards individual students	0.897		
Instructor had a genuine interest in students	0.845		
Students felt welcome in seeking advice/help	0.683		
Instructor encouraged student interaction		0.621	
Instructor handled the Web technology effectively		0.828	
Instructor explained how to use the Web site		0.827	
I feel the instructor was keen that we use the Web site		0.809	
We were invited to ask questions/receive answers			0.647
We were encouraged to participate in class			0.818
I found the intensive seminars were useful			0.660
Percentage of variance explained	29.547	23.703	17.075
Cumulative percentage of variance explained	29.547	53.250	70.326
Cronbach alpha	0.889	0.837	0.684

Note: Only loadings > 0.5 are shown

one-way analysis of variance (ANOVA). The results are presented in Table III.

As can be seen in Table III, the previous use of the WebCT is the only student characteristic influencing teaching effectiveness. Demographic student characteristics such as country of origin and gender were not influencing factors, nor were the type of programme being undertaken or access to the Internet at home.

Conclusion

The Internet is a major technological advancement reshaping not only our society but also that of universities worldwide. In the light of this, universities have to capitalise on the Internet for teaching, and one progressive development of this is the use of online delivery methods. This paper identifies three critical success factors in online delivery: technology (ease of access and navigation, interface design and level of interaction); the instructor (attitudes towards students, instructor technical competence and classroom interaction); and the previous use of the technology from a student's perspective.

Table III
Student characteristics

Items	*F* value	Sig.
Programme of study	0.298	0.827
Internet access at home	0.009	0.924
Previous use of WebCT	5.612	0.001
Gender	1.755	0.192
Electronic commerce students vs. others	0.313	0.579
Country of origin	0.070	0.976

In undertaking this research, the authors encountered only two limitations to the study. The first was the small sample size of 47 students, and the second that student grades were not available at the time of the data collection, to be included in the students performance measurement. In considering the reliability of the results to the evaluation of online education it must be noted that there was no control group to detect whether the pedagogy and technology used significantly enhanced teaching effectiveness compared with more traditional methods. There is also a need to replicate the study to gain further insight from different teaching disciplines across the world. It should also be noted that the course assessment was not testing the acquisition of transferable skills in communication and information technology which are often developed through the use of computer-aided learning in related courses.

Findings from this study indicate the Internet can be a powerful tool in education. This tool has the potential both to support effective education programmes and to expose students to the implications of computer networks. It is evident, though, that lecturers need to upgrade their technical skills in order to keep in touch with the technological developments that are undoubtedly taking place. As this study has illustrated, the Internet and traditional classroom teaching methods are not mutually exclusive, but should be seen as an extra dimension in education which can facilitate the lecturer's task while benefiting the students as well.

More importantly, the level of interaction between the students and the lecturer appears predominant in online delivery. This calls for a shift in the academic role from the intellect-on-stage and mentor towards a

learning catalyst. It is therefore the ability to catalyse students so they can discover their own learning that is crucial. The Internet helps in this process by taking over the information demands on lecturers. As Inayatullah (1999) suggested, the lecturer can then play the more important role of asking questions, engaging the student at many different levels – not only deconstructing his or her worldview but also reconstructing it and relating daily problems to the grand questions facing humanity.

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