

# A CONCEPTUAL FRAMEWORK FOR HYBRID DISTANCE DELIVERY FOR INFORMATION SYSTEM PROGRAMS

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## ABSTRACT

*This paper describes a conceptual framework for learning effectiveness emphasizing hybrid distance delivery for Information Systems (IS) courses. The framework is then applied to the Master of Science in Information Systems (MSIS) program at Dakota State University.*

**Keywords:** Information systems education, Distance education.

## INTRODUCTION

While the existence of distance education utilizing technology can be traced back to 1969, with the advent of the open university in the United Kingdom, it is only during the last decade that distance education in general, and Internet based learning in particular become popular on college campuses across the United States. According to the US Department of Education National Center for Education Statistics, 34% of the institutions surveyed (a total of 1600) offered distance education in 1997-98. Overall, 1.7 million students enrolled in all distance education courses offered by two- and four-year institutions, primarily at the undergraduate level. Another 20% of the surveyed institutions plan to offer distance courses within three years. Recent and dramatic advances in computer and telecommunication technologies in general, and the Internet in particular, have fueled this movement towards distance education.

Moreover, a great deal of research has been done in determining and evaluating learning effectiveness. While research on technology-enhanced learning environments date back to the beginning of the last century (5), research on Internet-based education is still in its infancy (9,2). To address the research needs of the rapidly growing Internet-based education, Picolli et. al. (15) developed an initial conceptualization of the determinant of learning effectiveness in a virtual learning environment. In this paper, we extend the framework proposed by Picolli et al. (15) to explicitly capture the role of the learning environments in learning effectiveness, as well as the inter-dependency among the various determinant of learning effectiveness. Moreover, in addition to effectiveness, the framework highlights the availability of a choice of learning environments, factors affecting the choice of a particular environment, and introduces the notion of a hybrid learning environment. Following the description of the framework, we present an application of the framework to the MSIS program at Dakota State University.

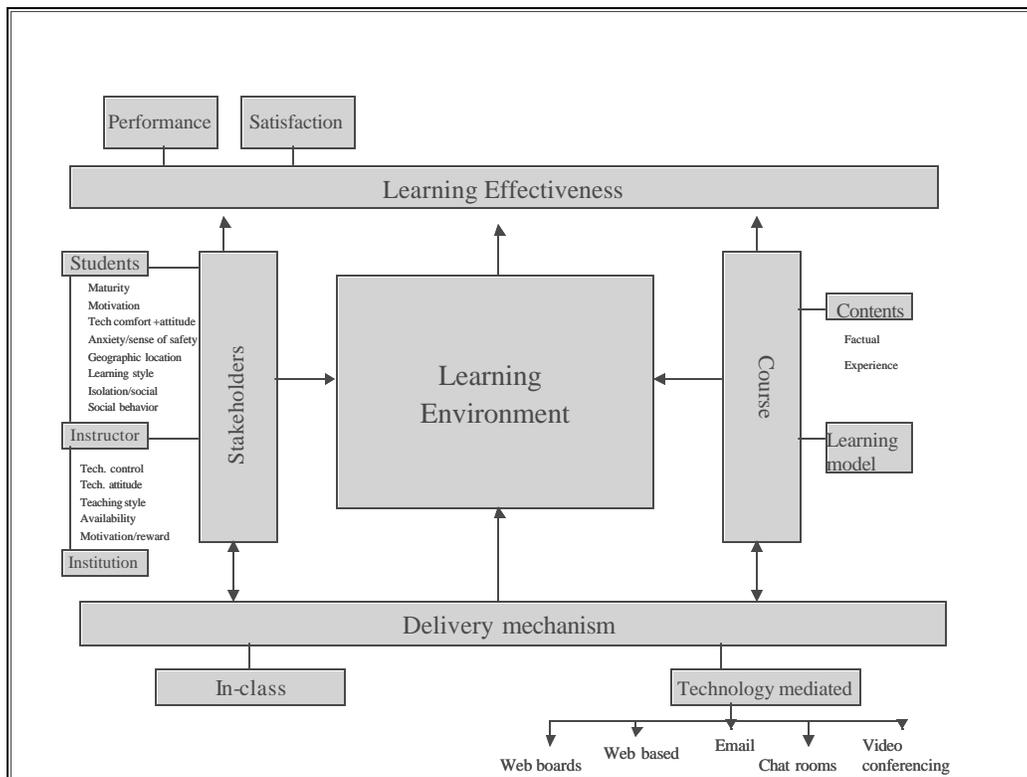
## THE FRAMEWORK

Figure 1 depicts a framework for the determination of learning effectiveness and the inter-dependence among these determinants. Following Piccoli, et. al. (15), we have two classes of determinants: the human dimension (which we extend to a stakeholder dimension) and the course dimension. We expand their framework to include the learning environment, the choice of which is dependant on the human and design dimensions in addition to the delivery mechanism.

In turn, the choice of the delivery mechanism affects and is affected by the human and design dimensions. The following sub-section discusses each component in further detail.

**Learning environment**

Learning environments refer to the particular setting in which learning takes place. Examples of learning environments include the traditional classroom-based environment, computer assisted instruction, and the virtual learning environment (VLE). In computer aided instruction, students individually enter a self-contained computer-based learning environment with little if any communication among students or between students and the instructor (15). In contrast, Wilson (25) defines VLE as “computer-based environments that are relatively open systems, allowing interactions with the participant”. With the advent of the Internet, VLEs usually refer to Internet-based environments that allow for either synchronous and asynchronous communication.



**Figure 1. The Framework**

In addition to the aforementioned environments, we add what we will refer to as a hybrid learning environment (HLE). In that regard, we define HLE as a classroom- and computer-based environment that is a relatively open system, allowing synchronous interactions and encounters with other participants.

Following Picolli, et. al. (15), we can define learning environment with respect to the timing of instruction, physical location of instruction, collection of materials available to the learner, technology, degree of contact, and extent of learner control. Table 1 contrasts the traditional classroom based environment versus the HLE and VLE.

**The Delivery Mechanism**

The delivery mechanism can be broadly classified as the traditional in-class delivery or technology mediated delivery. Technology mediated delivery includes video-conferencing and Internet-based technologies, including email, web site, discussion boards, chat rooms, and desktop video conferencing.

As noted in Picolli, et. al. (15), technology itself does not determine learning nature. However, technologies differ significantly with respect to the learning environment they foster. Moreover, some technologies are more suited than others in supporting specific theoretical models of learning (12).

**Stakeholders Dimension**

The main stakeholders in an educational setting are the students/learners (the ultimate beneficiaries of the educational process), the instructors, and the institution. The following sub-sections explore the determinants and factors affecting learning effectiveness as they pertain to each of the stakeholders.

**Table 1: Learning Environment.**

	<b>Classroom-based</b>	<b>Hybrid</b>	<b>Virtual</b>
<b>Timing</b>	Synchronous	Synchronous	Asynchronous/ Synchronous
<b>Place</b>	Limited to in-class & DDN	In class, DDN and Internet only	Internet only
<b>Space</b>	Many resources (if supported by a website)	Provide wide access to resources.	Provide wide access to resources.
<b>Technology</b>	In-class DDN	In-class + DDN (optional), Video streaming, phone, live chat	Synchronous: Video streaming, live chat, phone Asynchronous: Web site, Web-Board, email
<b>Interaction</b>	Live and technology mediated (for DDN)	Live and technology mediated	Technology mediated
<b>Control</b>	Low	Low	Greatest depends on synchronous vs. asynchronous

**Students**

The research on learning effectiveness in general, and as it relates to technology mediated learning in particular, has identified a number of determinants as shown in Figure 1. Schellans and Valeke (18) indicate the dependency of learning styles and learning environment. Students who have learning styles that are not favored by the learning environment will experience learning difficulties, and will have lower levels of appreciation for the learning environment.

Research also indicates that students need to feel safe and comfortable in their learning environment (13). This need is easier accomplished in a traditional classroom-based environment than in an online environment (16). The anxiety created by unfamiliar learning environments can adversely affect students learning experience (10).

It has also been determined that the choice of a learning environment affects students' sense of belonging and social setting. In a classroom-based environment, the students in the class and the instructor become a student's learning community. However, in an Internet-based

environment, a student's first sensation is one of isolation (7,3). Accordingly, conversion of traditional practices to electronic practices should be conducted in a manner that reduces the sense of isolation through increased interaction (16).

Another factor that must be taken into account is the student's own behavior in a social setting. Learning is more effective when there is interaction between the instructor and students (14). While new teaching strategies are proposed to promote instructor-student interaction, e.g., cooperative projects (16), the learning environment and interaction are interdependent. For example, Arbough (1) compares learning in a classroom-based environment and VLE with respect to interaction and participation and concludes that while the findings extend support for "no significant difference" (17), gender-based differences did exist. Other research includes the work of Chidambaram (4), Strauss (19), Warkentin, et. al. (22), Dumont (7), and Taylor (20).

Other factors affecting learning effectiveness and the choice of a learning environment include the relationship between maturity and motivation for academic success in VLE (12), the comfort level and attitude towards technology (15), and geographic location.

### **Instructor**

An instructor's attitude both affects and is affected by the choice of a learning environment. For example, in the context of video conferencing use in distance education, Webster and Hockley (23) indicate the relationship between an instructor's: positive attitude toward the technology, teaching style and control over technology, with learning effectiveness.

An instructor's motivation also plays an important role. HLE and VLE are particularly demanding in terms of faculty time and effort. According to Fergusson and Wijeykumar (8), on average, it took 25 hours to transfer each 6-hour module to an acceptable distance education format. Hlitz (11), also indicates that instructors in a VLE environment feel as if they are "on duty" 24/7. Instructors are further burdened by the lengthy nature of communication and interaction in VLE (21). Accordingly, although arguable, the availability of an instructor to meet the demands imposed by a learning environment may affect the learning effectiveness (15). A reward and support structure in terms of tenure and promotion (6) and the institution of support for course preparation, technical support, release time, and so forth can help instructors adjust to a particular learning environment.

### **Course Dimensions**

Attributes specific to a particular course, as well as the design, the choice of delivery mechanism, and learning environment are interdependent. For example, if the course content focus primarily on the transfer of factual knowledge, the CAI environment may be appropriate (15). However, for contents or designs that emphasize discussion (typical in managerial courses), an environment that promotes communication is required (24).

Moreover, in the information systems area (as well as others), there are courses that emphasize hands-on experiences which involve access to labs and specialized software. Such specific needs have to be addressed by the learning environment as well as the delivery mechanism. Other factors for consideration include the degree of discretion that students can exert over the pace, sequence, and contents of instruction, the type of interaction (synchronous vs. asynchronous), and the learning model (objectivist vs. constructivist) (15).

### **Evaluation of Learning Effectiveness**

The evaluation of learning effectiveness can be conducted in multiple dimensions. Ricketts, et. al (16) suggest the need for formative evaluation (feedback on the effectiveness of the material presented) and summative evaluation (evaluation of the knowledge and skills required). Other dimensions include self-actualization, self-effectiveness, and student satisfaction with the learning experience.

### **THE MSIS PROGRAM AT DAKOTA STATE UNIVERSITY**

This particular case study involves the introduction of Dakota State University's first graduate program, a Master of Science degree in Information Systems. The program requires 30 credit-hours of work, with up to an additional six hours of prerequisite courses and six hours of foundation courses required for those students with neither business or technical backgrounds. It was assumed that prerequisite courses could be satisfied by enrollment in existing undergraduate courses offered by the College of Business and Information Systems. The thirty hours of required courses were divided into fifteen hours of core courses, nine hours of courses in a selected concentration, and a six hour project. The program offered a choice of three possible concentrations. The capstone IS project required the planning and implementation of an actual IS project.

The program was approved by the Board of Regents in August of 1999 and began with no formal advertising or promotion. But it did fill a void within the geographic region. It began in the fall semester of 1999 with 34 degree-seeking students enrolled, including two international students. Students came from varied backgrounds. Some were currently working in the IS/IT field, while others were attempting to change careers from non-technical areas. The program began with three courses, two of them foundation courses. The initial assumption was that students would be non-traditional working students, so all courses were offered as four-hour courses that met on alternating Saturdays (mornings and afternoons). An additional 10 students were admitted during the fall for the spring semester. The number of courses offered in the spring was expanded to five courses. Two courses were offered during the summer – one foundation course and one core course.

By the fall semester, 2000, the program was up to 60 degree-seeking students, including nine international students, and was offering ten courses during the semester. Course schedules had been expanded to include evenings as well as Saturdays (still on a four hour basis, every other week). In addition, the prerequisite courses had proved difficult for students, since they were only offered on campus during daytime hours. To address this issue, two new dual-level courses were created that could be used to satisfy the prerequisites. Both of these courses were offered twice a year, once as an in-class course and once as an Internet course. The foundation courses were scheduled on the same basis. Some of the courses also began to be offered via the Dakota Digital Network (DDN) to remote sites around the state. South Dakota's DDN has sites in all of the state universities and every school district in the state, which increased the opportunities for students across the state to take courses. DDN supports two-way audio and video among several sites simultaneously with the state. A plan was also implemented to offer all courses except concentration course through the DDN by the end of the academic year.

By the fall of 2001, the program had 79 degree-seeking students enrolled, despite the fact that it had graduated a total of 22 students. The success of the program was beginning to place some pressures on the College of Business and Information Systems, especially since its undergraduate Computer Information Systems and Computer Science programs were the fastest

growing undergraduate programs. Fortunately, the number of faculty in those areas was also growing rapidly (by approximately 50% during this period).

### **Development of the Hybrid Delivery Model**

MSIS courses are now taught as in-class courses using the on-campus DDN classroom/studio, as remote sites using remote DDN classrooms, and live via the Internet to several other states through live video streaming (HLE). In addition, students may enroll in the courses as Internet-only students, taking the courses asynchronously over the Internet. These students can still watch the classes, which are recorded digitally, via Real Player. Thus, although they are considered to be in the same course simultaneously, they are considered VLE students.

### **Multiple Format Delivery System**

This combination of students has fostered a multiple format delivery system, which will be illustrated through the description of INFS 601: IT Hardware and Software Concepts, a course taught by one of the authors. This class has several delivery methods in use. First is the in-class presentation and discussion segment, which takes place between and among the instructor and students. Students in the classroom or on the DDN interact as they normally would in a class, while the Internet students watch the live video streamed class can call in with questions (there is a telephone available in the studio). But unlike traditional classes, all MSIS classes supplement in-class material with additional material and coverage using both synchronous and asynchronous methods. The 601 course has a course web site that provides students with access to supplemental explanations on various topics, details graded assignments, and gives access to videos of all of the classes.

In addition to the web page, there is a course WebBoard, which is like a course bulletin board. The instructor can post messages to students and students can exchange ideas or ask (or answer) questions by posting messages in labeled conferences. The instructor also communicates with students via email, the telephone, typed or audio chats using NetMeeting, etc. And currently, the program is exploring the use of desktop audio/video systems. Thus, the course truly uses multiple delivery formats.

## **DISCUSSION AND CONCLUSIONS**

This paper describes the relationship between various factors and the effectiveness of the learning experience for students. It also describes the movement of the MSIS courses to the HLE and VLE format. The next step for the MSIS program will be the development of assessment instruments and an attempt to measure both the overall learning effectiveness of the HLE and VLE model and the contribution of the various delivery formats to that effectiveness. The MSIS faculty also intend to begin a series of faculty development seminars during the spring semester that will explore the most effective ways to utilize the different delivery formats.

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