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## Technology-Enhanced Learning in Blended Learning Environments: A Report on Standard Practices

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## **TECHNOLOGY-ENHANCED LEARNING IN BLENDED LEARNING ENVIRONMENTS: A REPORT ON STANDARD PRACTICES**

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### **ABSTRACT**

This report summarizes educational adoption instances of computing and communication technologies for blended learning environments. We focus on the technologies of desktop videoconferencing and podcasting as they were adopted in the 2005-07 time period. We also expand and present major issues from a panel discussion on this topic at the 2007 Americas Conference on Information Systems (AMCIS) held at the Keystone Resort in Colorado.

**Keywords:** blended learning, desktop videoconferencing, podcasting, panel report, conference planning

### **I. INTRODUCTION**

Based on a growing body of knowledge, there is little doubt that computer and communication technologies can facilitate and enhance learning, if implemented in a well-structured pedagogical context. Previous research about learning technologies, however, tends to focus on comparing learning that takes place either in a traditional face-to-face environment, or exclusively online [Alavi 1994; Alavi et al. 1995; Alavi et al. 2002; Carswell and Venkatesh 2002; Storck and Sproull 1995]. In fact, what we term “blended learning environments” are probably much more common on university campuses than either of these extremes [Oblinger 2006; Oblinger and Oblinger 2005]. A blended learning environment combines instructional delivery in a traditional face-to-face context with online learning, either synchronously or asynchronously [Albrecht 2006; Kim and Bonk 2006].

This report provides practical lessons learned from deploying several computing and communication tools for instructional delivery in primarily blended learning environments during the 2005-2007 time period. The technologies emphasized in the report are representative of a number of products that are now commercially available at a reasonable cost. We share our experiences using these technologies in support of specific pedagogical goals, as well as practical considerations of their deployment. The specific technologies that are the focus of this report are desktop videoconferencing (e.g., Marratech, Elluminate Live!) and podcasting.

Our report also synthesizes the major issues discussed at a panel presentation on this topic at the 2007 Americas Conference on Information Systems (AMCIS) held at the Keystone Resort in Colorado. The panelists and authors are information systems (IS) faculty members who are actively involved in adopting technologies that support learning goals at their institutions and in shaping academy-wide understanding of such technologies' learning efficacy. The report synthesizes the key points from the panel discussion within the report sections. Section II provides background on the blended learning phenomenon. Section III presents an analysis of common computing and communication technologies used in blended learning situations according to the dimensions of communication medium type, social presence, and time flexibility. Sections IV and V focuses on desktop videoconferencing and podcasting technologies, as well as the standard practices that have emerged through use of these technologies for learning environments. Section VI discusses future issues and research related to the blended learning phenomenon. An appendix presents additional resources about this topic for IS and other educators.

## II. OVERVIEW OF BLENDED LEARNING

Improved quality, affordability, convenience, and more common acceptance of the Internet and the Worldwide Web for course and degree program development and delivery facilitate the offerings of online courses and degree programs in a wide range of subjects and disciplines [Kim and Bonk 2006; Volery and Lord 2000]. This phenomenon has made higher education more easily available and accessible to working individuals with limited available travel time and to those who live in rural areas and away from campuses.

Factors that are cited in the literature as the reasons behind the significant growth of online course and degree program development and delivery include competition for students [Kim and Bonk 2006; Rahm and Reed 1997; Tschritzis 1999], and life-long learning and continuous professional education and growth [Confessore 1990]. Group Decision Support Systems [Alavi 1994], "virtual classrooms" and "hypermedia virtual classrooms" [Hiltz 1994, 1995; Rana et al. 1996], multi-media and hypermedia [Carver et al. 1999; Hadidi 1997] have been cited as means of improving online education in the areas of student performance, access, communication and collaboration, multimedia richness, active and life-long learning, effectiveness, and efficiency.

Developing online content and making it available to face-to-face as well as for online students may also facilitate improving traditional face-to-face instruction. Leidner and Jarvenpaa [1995] analyzed various learning models such as "constructivist," "collaborative," "cognitive," and "sociocultural" and concluded that overall student performance could potentially be improved by replacing or complementing the traditional face-to-face instruction with the use of Web-based tools and technologies for course development, delivery, synchronous, and asynchronous discussions. Leidner and Jarvenpaa [1995], Serwatka [1999], and Tschritzis [1999] underscore that in using technology in teaching and learning, the emphasis should be placed on "transforming" rather than "automating" teaching and learning.

One of the recognized benefits of a blended learning environment is that it allows educators to enhance the in-class pedagogical richness of face-to-face class sessions [Osguthorpe and Graham 2003]. A blended learning environment also gives educators the opportunity to enhance students' learning experience by increasing their access to information and knowledge [Osguthorpe and Graham 2003]. These benefits are realized as educators incorporate

technologies into blended learning environments. This allows them to transition face-to-face class time from a model where information is dispensed to a model that focuses on improving student learning. For example, this can be accomplished by posting discussion questions and providing hands-on training or experiments, or by dispensing information in advance [Osguthorpe and Graham 2003]. It is likely that blended learning will become more popular in particular for subject matter that is not suitable for fully online development and delivery.

### III. BLENDED LEARNING TECHNOLOGIES

Although blended learning is a more recent phenomenon, the same kinds of tools and technologies used in online learning may be used to facilitate blended learning [Albrecht 2006]. During the mid-1990s, there were not many tools and technologies available to support online or blended learning course development and delivery. Most faculty members who had begun teaching online needed to develop their own courseware using Web programming tools available at that time. Online teaching, in particular, grew so rapidly [Hadidi et al. 2005; Koepfel 1999] that numerous commercial course management systems and conferencing tools became available by around the year 2000. Online enrollment growth has continued. In Illinois alone, a total of 8,143 online class sections were offered during spring/winter 2007 semester, a 14 percent increase over the spring/winter 2006 semester [[Illinois Virtual Campus](#)].

As the use of innovative technologies increases, the distinction between traditional face-to-face courses and online learning environments blurs [Osguthorpe and Graham 2003]. In this section, we identify three attributes (communication medium type, social presence, and time flexibility) that can be used to differentiate the technologies used in blended learning. We also discuss the influence that these attributes may have on how the technology supports or facilitates and enhances the learning process.

#### COMMUNICATION MEDIUM TYPE

*How does the technology represent or distribute content to students (e.g., as written text, as audio, as video, or as still images)?* A certain media type is often chosen based on its specific representation characteristics [Guttormsen Schar and Helmut 2000]. For example, written text is often considered to invoke trust, confidence, and stability.

Different media types contribute their own advantages and bring their own sets of limitations, as they are processed via separate information processing channels (e.g., visual vs. auditory channels) [Mayer 2001]. Guttormsen Schar and Helmut [2000] suggest that the understanding of text requires more attention than the understanding of visual content, such as pictures or movies. Learners often prefer voice over text or prefer voice in addition to text as “intonation, speech flow, and articulation help in understanding content” [Guttormsen Schar and Helmut 2000]. Likewise, Daft and Lengel [1984] found that written media is better used for communication where messages are unequivocal, while face-to-face media is better for communication of equivocal messages. A multimedia approach, one that combines both visual and auditory modalities, can be beneficial to the learning process as an over-reliance on any one information processing channel causes fatigue and reduces attention [Guttormsen Schar and Helmut 2000].

#### SOCIAL PRESENCE

*What level of interaction and spontaneity does the technology provide students and the instructor?* Research suggests that students value the social interaction that they have with classmates and the instructor in traditional classrooms [Osguthorpe and Graham 2003]. Traditional online learning environments tend to have limited human interaction and tend to be less spontaneous than face-to-face classes [Molinari 2003]. Encouraging social involvement among students in blended and online learning environments is a challenge getting the attention of both educators and researchers [Guttormsen Schar and Helmut 2000].

Short et al. [1976] define social presence as the degree to which a medium supports the psychological presence of users during an interaction. Face-to-face communication has the highest level of social presence, followed by synchronous communication that combines audio and video (videoconferencing), audio, and then text.

Adopters of online and blended instruction have to compensate for the lack of face-to-face communication. In particular, this compensation may be possible with students' interaction with the course instructor, peers, and course content [Moore 1989] combined with social presence available through the employed technology [Short et al. 1976; Swan 2002] that may increase the quality of online instruction.

Studies of learning style preferences and technology adoption decisions indicate that males and females differ in preferred style [Dwyer 1998; Lundeberg et al. 1994; Mann 1994; Pettigrew and Zakrajsek 1984; Venkatesh et al. 2000]. In general, females tend to show more interest in collaborative and group learning. They also prefer to learn in a more social setting. Males, on the other hand, exhibit more tendency to prefer independent learning situations rather than collaborative. Mann [1994] investigated the learning conditions confronting women and girls in several subjects. Mann [1994] found that women and girls often face learning conditions that include instructor bias, and when institutions promote a competitive or assertive style of learning, they damage the friendship networks that females are more likely to favor than men are. Mann [1994], therefore, suggests using teaching techniques that place more emphasis on collaboration.

Incorporating course management systems and desktop video conferencing technologies may facilitate collaboration among learners in blended or online learning environments, while increasing social presence. One downside to increased social presence, however, is that as the number of social participants increases, students can become more attentive to the presence of other social participants and become less attentive to the information exchange. If the information to exchange is relatively simple and straightforward, media with less social presence may be sufficient [Baker 2002].

## TIME FLEXIBILITY

*Does the technology give students some control over the timing of the learning process?* Technologies supporting blended or online learning can vary based on time-related factors, such as *when* the students can learn, the *speed* at which they can learn, and the *frequency* with which they can access content. These attributes affect whether the student is allowed the opportunity to direct or control their own learning [Osguthorpe and Graham 2003]. For example, synchronous technologies offer an increased spontaneity and social presence, but they limit when the students can learn. Media representations such as voice and video limit the learner's control over the presentation's duration and speed, whereas written text gives students more freedom to absorb content at their own pace [Guttormsen Schar and Helmut 2000]. Further, some technologies support the archiving and revisiting/replaying of content, while others do not.

Educators in a blended learning environment should aim to balance face-to-face human interaction and online content access [Osguthorpe and Graham 2003]. While some educators may emphasize asynchronous student-to-student contact, others may find that an emphasis on synchronous interaction is a better approach [Osguthorpe and Graham 2003]. A standard practice is to provide both alternatives. Regardless of the approach, education-based research suggests that it is better to have a match between the characteristics of the learning content and attributes of the technology used [Guttormsen Schar and Helmut 2000]. This recommendation parallels information systems literature that suggests there should be a fit between task requirements and the intrinsic properties of media (technology) [Daft and Lengel 1986; Dishaw and Strong 1999; Goodhue and Thompson 1995].

The remainder of this report will discuss our experiences using two different types of technologies supporting blended/online learning: desktop videoconferencing and podcasting. Each of these

technologies offers distinct advantages and brings its own challenges to the learning process. A summary of the technologies according to the differentiating attributes can be found in Table 1.

Table 1. Technology Differentiation

Technology Attributes Technologies	Type of Communication Media Supported	Level of Social Presence	Time Flexibility		
			Access Speed	Timing of Access	Access Frequency
<b>Desktop Videoconferencing</b> (Marratech, Elluminate Live!)	video, audio, text	High interaction	<i>Live:</i> Session-controlled  <i>Archive:</i> Student-controlled	<i>Live:</i> Session-driven (synchronous)  <i>Archive:</i> Student-driven (asynchronous)	<i>Live:</i> One-time access  <i>Archive:</i> Multiple access
<b>Podcasting</b>	audio, video	No interaction	Student-controlled	Student-driven (asynchronous)	Multiple access

#### IV. TECHNOLOGY: DESKTOP VIDEOCONFERENCING

Prior research of videoconferencing has focused on technologies that require substantial investments of time and money on the part of institutions and users in order to utilize the videoconferencing facilities [Alavi et al. 1995, 2002]. Researchers raise concerns about user apprehension [Campbell 2006], impression management and information use [Storck and Sproull 1995], development of team/group member affinity [Walther et al. 2001], and the level of support needed to ensure learning in such environments [Ertl et al. 2006]. Despite the validity of these concerns, educational institutions continue to deploy such technologies to support collaborative learning experiences in online and blended-learning environments [Kim and Bonk 2006].

A variety of easy-to-use course management systems and collaborative conferencing tools for synchronous and asynchronous presentations, discussions, and collaborations are available for online and blended learning at a reasonable cost. Among them are Elluminate Live! (<http://www.illuminate.com>) and Marratech (<http://www.marratech.com>). Individuals may participate in either of these commercial software applications with the addition of a simple web-camera and headset/microphone combination to their computer setup, costing approximately \$50-60 in the United States.

#### ELLUMINATE LIVE!

Elluminate Live! (Hereinafter referred to as Elluminate) is a desktop videoconferencing tool with a significant number of features suitable for online and blended instruction. These features include audio, video, graphics, and text presentation capabilities, application sharing, breakout room facilities, direct messaging and file transfer capabilities, Elluminate Sensory Perception (ESP) indicators, polling, remote desktop sharing, session recording option, and whiteboard capability.

Figure 1 shows the main Elluminate client interface consisting of three main windows. The whiteboard on the right is used for presentations and application sharing. The top window on the left shows the session participants and their real-time participation status. The bottom window on the left shows text messages.

Elluminate has a very useful full duplex audio capability that allows up to four people to talk simultaneously in a given session. This feature facilitates small group cooperation and collaboration. A standard practice is to use a headset and turn your microphone off when you are not talking to prevent creating an echo. Another standard practice is to inform the class participants to use the “raise hand feature” of Elluminate so that the moderator can give the microphone to a participant who wants to speak. For most online and blended courses, the video feature is not as useful as many other Elluminate features. The only exception is for courses such as a capstone class using student presentations as a major part of the course assessment.

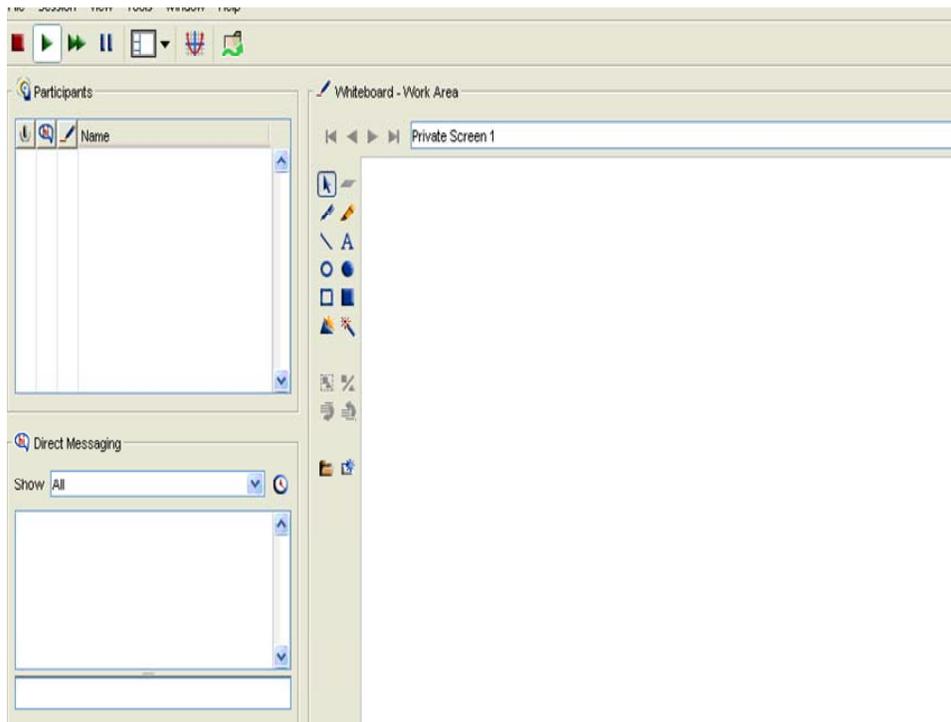


Figure 1: Elluminate Client Screenshot  
Source: [www.illuminate.com](http://www.illuminate.com)

Application sharing makes it possible for the instructor or a course participant to share any application with the rest of the class in an online or a blended course. This feature in particular is useful for courses which require hands-on instruction and demonstrations. When using application sharing, a standard practice is for all participants to set their connection speed to the Internet from the Elluminate session menu. Another standard practice for an Elluminate session moderator is to monitor the activity indicator light which uses the ESP capability to determine which attendees are using slower connections and/or are facing Internet delays so that appropriate adjustments may be made to the pace of the instruction.

Breakout room facilities allow a moderator to create on-the-fly breakout rooms for one or more participants. Each breakout room has its own access to most features of Elluminate, such as application sharing, audio/video conferencing, whiteboard, and communication capabilities. A standard practice is to use the breakout room option for brainstorming among course participants in blended and online learning. The content of each breakout room may be moved to the main room for all participants to review and discuss.

The direct messaging capability of Elluminate allows sending text messages to one or more participants in online or blended learning courses. Direct messages are color coded to indicate if the message was sent to all of the participants (black), or a private message was sent or received by the moderator (blue), or a participant has sent a private message to another participant (red). A standard practice is to filter direct messaging to better manage communication after a

brainstorming session is completed. This can be done by using the direct messaging filter of Elluminate.

The whiteboard feature of Elluminate serves as the main presentation window for online and blended instruction. This window is used to download presentations in a format such as PowerPoint. Other options are available to write text and/or draw objects using icons that are available next to the whiteboard window. A common standard practice is to prepare presentations in PowerPoint or other formats and download to the whiteboard area during a live presentation.

The Elluminate polling option allows users to select from a number of polling options. The polling statistics can be published on the whiteboard in a number of different text and graphical formats. Additionally, Elluminate also permits recording of the session so that it may be archived and retrieved for later use.

What we have presented here is a brief summary of features and capabilities of Elluminate. For a complete list and description of additional features and capabilities of Elluminate, see <http://www.illuminate.com>.

## **MARRATECH**

Marratech AB, a Swedish company, provides server and client software that permits interactive video communication among session participants. Marratech operates with client software running on an individual's computer and connects to a server to provide the collaboration environment for the session. The server allows for both a "Public" room and a number of "Private" rooms to be configured at any one site (university or Marratech corporate). The client software is available for Windows, Macintosh, and Linux operating systems as a free download from the Marratech Web site. The Marratech solution has substantial collaboration features above simple audio and video transmission, including shared whiteboard space for group collaboration, text/image/PowerPoint presentation features, public/private chat, shared simple Web browser, application sharing, and session recording/playback capabilities. In 2005, a university's initial investment for one Marratech server and a 20-seat license was approximately \$25,000 [Vician and Lins 2006].

Figure 2 displays the Marratech client interface that provides multimodal interaction capabilities for participants. Each session participant sees the same whiteboard display at the same time, thus enhancing group memory and coordination. Each session participant has equal control over what is being displayed on the whiteboard as Marratech permits any session participant to be in charge of "leading" the shared display of the whiteboard page contents. A standard practice is to permit the individual who initiated the session to take control of the shared presentation area, but this can be changed quickly as needs dictate within a single session through mutual agreement among participants.

The top left area of the interface contains the two toolbars accessible to each participant. The first three icons permit starting a new whiteboard page, opening documents to share with others in the presentation area (Windows users may bring in Word and PowerPoint directly; Macintosh users may bring in Adobe Portable Document Format directly), and saving the whiteboard "document" (all pages) for later retrieval from within a Marratech client session. The topmost toolbar also has a drop-down menu for other whiteboard pages, as well as more navigation aids for the whiteboard area. The secondary toolbar contains tools permitting participant pointing and notation of the whiteboard area. In Figure 2, a set of images has been placed on a PowerPoint slide that has been brought into the Marratech whiteboard presentation area for viewing by all session participants. The current speaker (the person shown in the larger window on the right hand side of the interface) is using his pointer tool to elaborate on a discussion point he is making (the red arrow with a name attached to it).

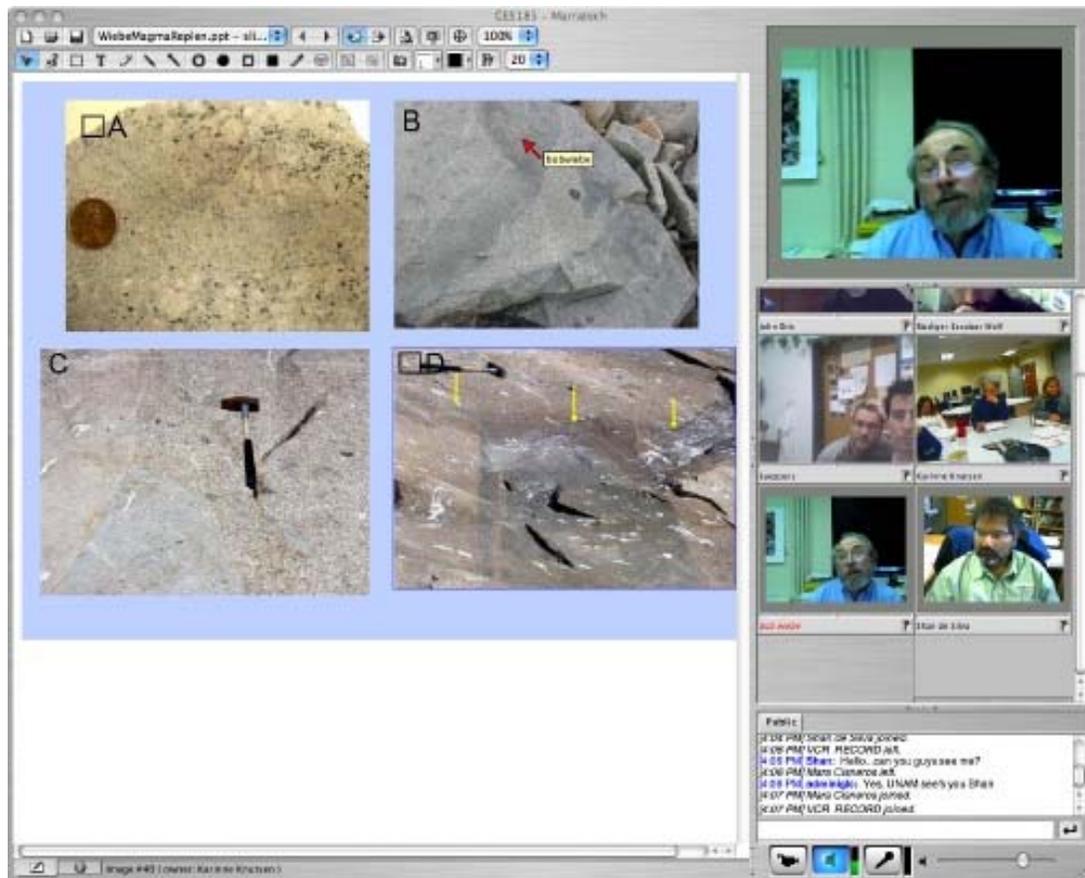


Figure 2: Sample Marratech Client Interface

All session participants are displayed in the smaller windows on the right hand side of the interface under the current speaker's window. Each session participant controls whether or not his/her video image is transmitted via the Marratech session by use of the video and microphone icons at the bottom right hand side of the interface. If session participants have turned on their desktop cameras within Marratech, a video image will be shown. If the camera is not turned on, only the participant name is shown in this area. When a person has turned on his/her microphone within Marratech, the person's name will display in red type. As many computers use speakers, it is common practice to use a headset and microphone to avoid the echo effect when speaking within the Marratech session; alternatively, a participant could use the option of only turning on his/her microphone when speaking to avoid the echo effect (Marratech terms this the "walkie-talkie" mode for audio connections). The audio/video and whiteboard features of Marratech serve to support a high level of social presence among session participants.

The area beneath the video images is the public/private chat area. Participants can quickly type in a message to everyone in the session or can initiate person-to-person private chat sessions. Common uses of the public chat function have included: asking other participants a question without interrupting the flow of the audio discussion; providing a URL to a Web site; and checking on a participant's connection if the video image seems to freeze.

Marratech further offers an application sharing feature as part of the videoconferencing software. The application sharing feature permits an individual participant to run a software application (such as MS Excel) on his/her computer and to share the view of this software application with others in the Marratech session. Additional discussion of this feature can be found at the Marratech Web site, <http://www.marratech.com>.

A Marratech session recording can be initiated by any session participant. When a session is being recorded, a separate VCR window will be seen in the participants' section of the Marratech interface. The session recording can include full video/audio or can be set to record audio-only. The session recording can then be made available to participants after the session for reference purposes. The availability of an archived session recording permits students flexibility in accessing course content and control over pace of instruction, two key elements of successful blended learning environments [Albrecht 2006; Kim and Bonk 2006].

Marratech has been used successfully to connect individual, geographically-dispersed learners with one another as well as groups of learners with other groups of learners in the U.S. and across the world [Vician and Lins 2006]. Further, the availability of videoconferencing in a desktop application has enabled flexibility in faculty and student work locations as individuals can participate via university or home offices [Vician et al. 2007; Vician and Power 2006]. Details on a recent experiment using Marratech to enable virtual guest speakers for an MBA class are provided in the accompanying video-enhanced podcast (vodcast) and RealMedia presentation of the AMCIS 2007 panel session (see Section VI, Future Issues/Research for the link to these audiovisual materials). Interestingly, 69.2 percent of the learners indicated that the use of desktop videoconferencing to connect with virtual guest speakers was a positive addition to their learning experience. The guest speakers also indicated high satisfaction with learning and using the Marratech technology to provide the guest speaking event. Future research should address why learners perceive the addition of the video channel is significant to their learning experience.

In the spring of 2007, Google Inc. acquired the Marratech videoconferencing software and hired the software engineers working on this Marratech product as Google employees [Sayer and Perez 2007]. The client software remains a free download from the Marratech AB site (<http://www.marratech.com>), and Marratech continues to operate as an independent company. It is unknown at this time whether or not Google Inc. will seek to integrate the Marratech videoconferencing product into a Google collaborative work tool offering in the future.

## **OTHER PRODUCTS**

In addition to Elluminate Live! and Marratech, there are other commercial software products that can be used for desktop videoconferencing applications within educational settings. Skype is a cross-platform (Windows, Linux, Mac) software application that permits voice-over-IP communication between computers and also has instant messaging and video call/videophone features. The Skype software remains a free download from the Skype Web site (<http://www.skype.com>), though the company was purchased by eBay in 2005. Individuals can use Skype to connect with up to nine other individuals in an audio/video conference, but there is no shared collaboration space for participants. Another product entry into the web conferencing market that bears watching is Adobe Acrobat Connect Professional (<http://www.adobe.com>).

Course management systems such as WebCT and Blackboard offer simple same-time chat/instant messaging options within these educational tools, but at the present time do not support richer interaction such as audio or video communication among session participants.

## **V. TECHNOLOGY: PODCASTING**

One of the challenges of a blended learning environment is increasing the sense of community and commitment to the class. Online learning (OL) may appear to use a leaner medium as defined by Daft and Lengel [1986] than face-to-face (F2F) learning. Yet one of the attractions of OL to many students is that it allows learning to happen in the different-time, different-place mode, which is of course not the same-time, same-place that F2F learning requires. Therefore, asynchronous communication is essential for classes with online components.

Podcasting is a tool that can be used to assist the instructor and the student in asynchronous material delivery in blended learning environments. The term podcast is a mashup of the terms "iPod" and "broadcast." Podcasting is a three-step process that begins with the creation and

editing of an audio or video file, such as an MP3 file, followed by the distribution of the file, and then the accessing of the file [Gribbins and Bapat 2007]. Users subscribe to a Really Simple Syndication (RSS) feed for the program of interest, and as new episodes are available, they are downloaded automatically to the subscriber's computer, where they may or may not be transferred to the listener's personal music player, such as an iPod. Classroom material and leisure-time entertainment come through the same medium and desktop utility, thus, intertwining a student's educational experience with other aspects of his/her life [Campbell 2005].

It should be noted that the term *podcasting* may lead one to believe that it is necessary for students to own an iPod to consume podcasts, and one may believe that they are necessary to create podcasts. Neither of these two assumptions is correct. Podcasts can be created and disseminated using software and hardware from many vendors on many operating systems (OS) platforms, and they can be consumed while sitting at the computer or on the go. A simple computer microphone and basic sound recording and playback software, which can be downloaded for free, is all that is needed for an educator to create and manipulate digital audio [Chan and Lee 2005]. The ease of publication, ease of subscription via RSS enclosures, and ease of use across multiple environments has contributed to the rapid growth of podcasting [Campbell 2005].

In the blended learning environment, it is easy for the instructor to "record" his or her lectures as they are happening and then make them available to students for download after class and playback later. Only a digital audio recorder or a microphone attachment for an iPod is needed. With a computer and additional software like Humble Daisy's Profcast, ([www.profcast.com](http://www.profcast.com)) or Lecture123.com's SnapKast, ([www.snapkast.com](http://www.snapkast.com)), recorded lectures can be automatically synchronized with a PowerPoint or Keynote slide presentation, so that the podcast consumer not only hears the audio, but in the window of his/her iPod or computer, also can see the relevant slide. This format is called an enhanced podcast, which can be compared to a filmstrip from classrooms of the 20th century.

Moreover, digital content can be added to the course at the whim of the instructor. A "thought for the day," news update, reminder, or just about anything else can be recorded quickly and easily for inclusion with the rest of the course materials. It is sufficient to speak into the same recording devices that are used to record class, and the materials are published in the same manner.

Podcasts can be edited during or after production. An example of a simple edit during production might be to stop recording while the class is working on an in-class independent or small-group assignment. The bulk of editing, however, occurs outside of the class room at the instructor's desk. Simple, free programs like Audacity ([audacity.sourceforge.net/](http://audacity.sourceforge.net/)) allow the user to edit an audio stream much like a word-processing document, where it is possible to cut, copy, paste, insert, delete, reorder, and modify content after the raw material has been captured. Other programs, like Apple's Garage Band, part of the iLife suite of applications ([apple.com/ilife](http://apple.com/ilife)), allow all of the above plus the ability to create enhanced podcasts with graphics and notes.

The anytime/anyplace nature of podcasting, along with its low barriers to entry, allows even students to submit their work via a podcast. An example of this might be a current events report for students to inform the class about a topic in the area. A podcast submission allows those students who have some presentation anxiety the chance to edit their speech multiple times before submitting the work for all to hear. It allows some interaction in classes where the sheer class size might make that impossible during the limited number of contact hours per week. It allows a greater connection for primarily distance-based students or primarily distance-based classes in the blended learning environment. Guthrie and Soe [2007] provide additional examples of student podcasting assignments, including university product commercials, reports on service learning experiences, and skill projects (e.g., speaking Chinese). Most laptop computers today have all the technology needed to produce the podcasts – a microphone and some free software.

Podcasting provides several educational advantages over printed media, including the ability to add clarity and meaning, motivation, emotion, intimacy, and personalization [Chan and Lee 2005]. Educational materials can be offered independently of time and place [Walton et al. 2005], as it frees learning from physical constraints like the classroom. Podcasts allow for flexible listening at times convenient to the user, such as when commuting or exercising [Chan and Lee 2005]. They can be listened to offline, as opposed to streaming files that require the user to be connected to the Internet, and they can be archived and accessed as often as the student desires. Preliminary anecdotal evidence indicates that the use of podcasting in educational settings does not negatively affect attendance numbers at class sessions, but it does appear to affect the *type* of questions asked in class sessions.

Before podcasting is attempted, university technical support in the form of server space, bandwidth, and maintenance is recommended. Faculty wanting to limit the access of the podcast to enrolled students, as opposed to the population-at-large, would also need to establish a permission-based distribution architecture [Meng 2005]. Podcasting also has limited usefulness for the hearing impaired, and it is not designed for two-way interaction or audience participation [EDUCAUSE 2005], though it can certainly be used as a discussion starter.

Figure 3 displays an educational podcast accessed through iTunes. Each episode of the podcast is automatically downloaded to iTunes and remains until the file is deleted by the student.

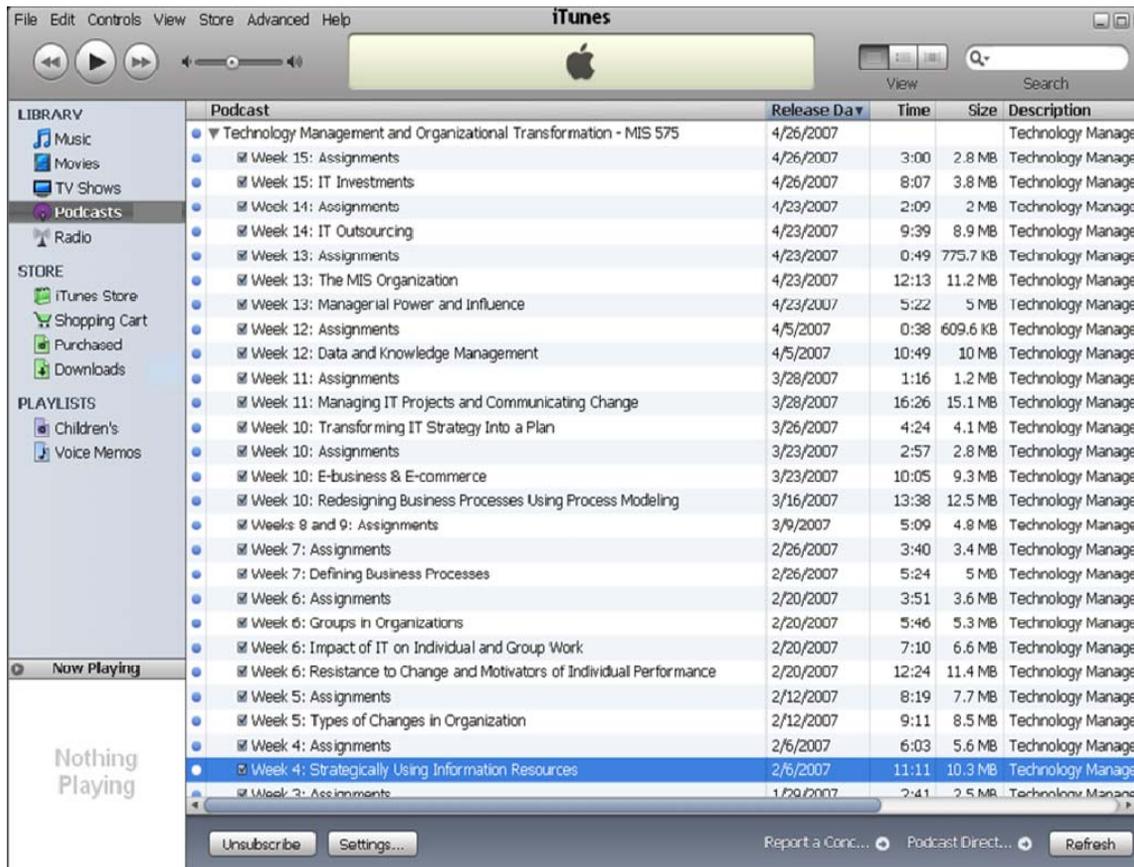


Figure 3: Sample Podcast Using iTunes

## VI. FUTURE ISSUES/RESEARCH

### BLENDING LEARNING EFFECTIVENESS

The benefits of blended learning are well documented in the literature. A few preliminary studies have been completed which have found results supporting the use of blended learning [Albrecht 2006; Houle et al. 2007] while supporting findings about the consumption of podcast material [Gribbins and Bapat 2007]. Work needs to be done on an overall theory of blended learning to be able to quantitatively measure the benefits of technology in the blended learning environment. This theory needs to be device and company independent, and it needs to draw from both the MIS literature and the research done in education and psychology. As theory development is tedious and arduous, but yet rigorous in order to maintain its testability, it may be that small steps can be taken to build the theory through a set of simpler tests. For example, a comprehensive study might look at just the adoption of asynchronous two-way audio delivery or videoconferencing, or the factors surrounding the adoption of one of those learning methods.

Further complicating this matter is the fact that these technologies are constantly changing. For a general theory of blended learning to be effective and useful, it should be as technology-neutral as possible. For example, the term *podcasting* did not exist five years ago, and it may not exist five years from now. If the theories that are developed are to stand the test of time, they should concentrate on the business problem of mixing face-to-face learning with education delivery online, and perhaps draw on other theories such as media richness theory to differentiate between the correspondence courses from recent history and the online degree programs offered today. Additionally, as some of the technologies that are novel today become more mainstream and ubiquitous in everyday life, the theoretical development needs to transcend specific technology offerings.

At the same time that we work to develop theory related to successful blended learning environments, we must heed past research that questions the impact of delivery mode on the performance of students as measured by grades [Russell 2001]. Hirschheim [2005] argues that courses being delivered in modes other than face-to-face require substantial redevelopment to meet learner expectations and to take advantage of online or blended learning technology features. Any future theory development in this area should attempt to address these concerns, as well.

### TECHNOLOGY ADOPTION AND DIFFUSION

Future research should continue to focus on the adoption and diffusion of desktop videoconferencing and podcasting technologies in educational settings. Individuals, groups/teams, and organizations will continue to grapple with decisions about integrating these technologies into work processes. We need to understand more about the factors which influence technology adoption and diffusion in order to provide practitioners with sound guidelines for deployment and training. More rigorous research regarding the effects of technology deployment decisions [Urbaczewski 2006] is clearly necessary as are further inquiries regarding the effects of individual factors, such as gender [Beckwith et al. 2006], age [Morris et al. 2005], emotional response [Zhang and Li 2005], and anxiety/apprehension [Brown et al. 2004; Fuller et al. 2006], upon technology choices.

### CONFERENCE ARCHIVAL PODCASTS

An interesting issue for future AMCIS conference planners to consider was raised during the panel discussion: Why are conference panels, tutorials, workshops, and keynote presentations not recorded for later retrieval? A primary rationale for this request is that it is difficult to decide what sessions to attend among the various options provided by the conference program. If a session recording were made and then archived, a conference attendee could review the activities that transpired at those sessions that were of interest but could not be attended.

We chose to provide a simple recorded archive of our panel session mainly for our own reference in developing this report. However, since we have created the artifact as a video-enhanced podcast (vodcast), it is now available for others to view and consume, either as a vodcast or a RealMedia stream (capable of being played with RealPlayer). To access and download the vodcast file of the panel presentation, iTunes should be used to view the content. Once iTunes is launched, the following steps are needed to access and download the vodcast:

1. Choose Advanced > Subscribe to Podcast.
2. Paste the file's URL (<http://media.uis.edu/podcasting/hadidi/podcast.xml>) in the dialog-box and click OK.
3. The podcast will begin to download and will appear under the "Podcast" section of your iTunes LIBRARY.
4. Double-click on the downloaded file to view.

To access the RealMedia stream file of the panel presentation, place the RealMedia URL (<http://webcast.uis.edu/impatica/meptest/panel.ram>) in your web browser's address bar. This will permit viewing of the content if RealPlayer is already installed on your computer.

## VII. CONCLUSION

Blended learning creates opportunities for educators, institutions, and individuals to expand the educational process beyond the walls of the classroom. It takes the anytime/anyplace nature of the Internet and creates teachable moments anywhere in the world. Technologies such as desktop videoconferencing and audio broadcasting are available to the masses, for both production and consumption, and the educational links to them are becoming well-explored.

To maximize the potential successes for blended learning classrooms, educators and students must become comfortable with and trained in the newer technologies. Without the training, students will likely not do much more than read-and-regurgitate, missing out on the excitement of continuous learning. Similarly, without the training, educators will likely just do what they have always done, just in a different format. When the training has been offered and completed, blended learning classes make it possible to have a richer environment than a traditional class. The stigma associated with 20<sup>th</sup>-century correspondence classes is now replaced with the benefits of real-time interactive access to thoughts, experiences, and materials of both educators and students, not to mention outside professionals.

Our panel session discussed issues related to developing blended learning environments for information systems courses. We highlighted the use of desktop videoconferencing and podcasting technologies to provide alternative communication media, social presence levels, and time flexibility for students. As the technologies continue to evolve, educators and students will continue experimentation to determine the usefulness of these technologies in the support of learning goals. We hope that our panel session and this report will assist other educators beginning their experimentation journeys.

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EDITOR'S NOTE: The following reference list contains the address of World Wide Web pages. Readers, who have the ability to access the Web directly from their computer or are reading the paper on the Web, can gain direct access to these references. Readers are warned, however, that:

1. These links existed as of the date of publication but are not guaranteed to be working thereafter.

2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. The authors of the Web pages, not CAIS, are responsible for the accuracy of their content.
4. The author of this article, not CAIS, is responsible for the accuracy of the URL and version information.

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## APPENDIX: ADDITIONAL RESOURCES

**AIS:SIGED IAIM:** This organization is the official Special Interest Group (SIG) on Education within the Association for Information Systems. As a SIG, it sponsors an annual international conference, an honor society, a peer-reviewed journal, and provides resources related to the research and teaching of information systems. The organization Web site is: <http://www.sig-ed.org>.

**Adobe Acrobat Connect Professional:** This resource is a link to the Web site within Adobe that provides information on a web conferencing and collaboration tool that works with FlashPlayer. According to the Web site, participants in the Acrobat Connect session do not need to download any additional software if FlashPlayer is already installed in the Web browser. The site provides

a link to a demonstration video as well as a free trial. The Web site is: <http://www.adobe.com/products/acrobatconnectpro/>.

**American Distance Education Consortium (ADEC):** This organization provides a wealth of resources related to distance education, including links to possible grants, conferences, and learning resources. The Web site is: <http://www.adec.edu>.

**Apple iTunesU:** This resource is a link to Apple's materials related to the iTunesU initiative. The main page provides an overview of this initiative, and there are additional links to the iTunesU section of the iTunes Store as well as materials for administrators, faculty, and students. Podcasts that are not behind a university authentication scheme can be viewed on the iTunesU section of the iTunes Store. Links are also provided for downloading the free iTunes software for Macintosh and Windows platforms. The Web site is: <http://www.apple.com/education/itunesu/>.

**Audacity:** This resource is a link to the Web site for a free, open source software application used to record and edit sound in Windows, Linux, Mac and other operating systems. This software tool is regularly used in creating podcasts. The Web site is: <http://audacity.sourceforge.net>.

**EDUCAUSE Learning Initiative:** This resource provides materials and links to other Web-based resources related to the innovative application of information technology to higher education learning. "EDUCAUSE is a nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology." [EDUCAUSE Web site]. The main EDUCAUSE site also has resources for blended learning. The site and association focuses on the needs of information technology practitioners in higher education, but more recently it has included materials addressing the needs of educators and researchers as well.

The main Web site is <http://www.educause.edu>.

The specific Learning Initiative site is: <http://www.educause.edu/eli>.

**Multimedia Educational Resource for Learning and Online Teaching (MERLOT):** This site provides a repository of peer reviewed online teaching and learning materials for many university disciplines. Access is restricted to members though membership is free. The Web site is: <http://www.merlot.org/merlot/index.html>.

**ProfCast:** This resource is a Macintosh OSX software application that enables recording a video-enhanced podcast from a PowerPoint supported lecture. The software is available at reduced cost for educational users. The software is authored and supported by Humble Daisy, Inc. The Web site is: <http://www.profcast.com/public/>.

**SnapKast:** This resource is a Windows software application that enables simple MP3 audio and MPEG-4 video content creation for podcasts. The software supports simple recording of a video-enhanced podcast from a PowerPoint supported lecture. The software Web site provides a free demonstration download as well as support and examples of its use for business and academic users. The Web site is: <http://www.snapkast.com>.

**United States Distance Learning Association (USDLA):** This site provides materials and links related to Distance Learning in the U.S. The association addresses K-12, higher education, continuing education, military and professional education. Many useful resources and announcements of conferences related to various forms of online, blended, distance, and e-learning situations. The Web site is: <http://www.usdla.org>.

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