Comparison of
Distance Education/Communication Technologies

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Higher education administrators, faculty and staff have a multiplicity
of communication needs in a wide variety of locations and situations.

Some of the older and well-established means for fulfilling these needs are:
> face-to-face meetings
> telephone calls
> email

Similarly, there are well-established ways of teaching and training:
> traditional classroom instruction
> correspondence courses
> computer-based courses
> video-based instruction

But recently there has been an explosion in technologies for basic
communication and for education and training, including (but not limited to)
Internet-based course management systems and videoconferencing.

With the current proliferation of new technologies for both education and
communication at a distance, there is some uncertainty even among
regular practitioners as to which method is best in different situations.

This paper will outline:
1. major existing categories
2. current technologies in each
3. enumerate their strengths and weaknesses
4. identify the uses best suited to each of these technologies

Categories
1. High-end Videoconferencing Systems
2. Mid-range Videoconferencing Systems
3. Desktop Videoconferencing Systems
4. Course Management Systems
5. Collaborative Software Systems
6. Lecture Capture Systems
7. Screencasting Systems

High-end Videoconferencing Systems

These systems separate the camera from the control box, and are capable of accepting multiple video and audio inputs. This would include some or all of the following: instructor camera, student camera, document camera, computer, videotape and/or DVD, and multiple microphones for instructor(s) and students.

Within IFAS, selection of video and audio sources is done most often by a facilitator rather than the instructor, although there are some sites where it is possible for the instructor to control these sources through the use of a remote control or touchpad.

Locations are generally at the Gainesville campus and some of the RECs associated with originating or receiving courses. The Distance Education Center at G001 McCarty Hall has the additional capacity to digitally capture events for streaming on the Web after a presentation.

Another characteristic of these systems is that there is a high-bandwidth connection to each site, at least a T-1 line, and Quality of Service (QOS) is enabled so that the videoconferencing signal takes precedence over data. This means that there should be little or no pixelization, freezing, or dropouts of audio or video. Multiple site videoconferences (i.e. more than two) are usually connected through the Radvision bridge operated by UF Academic Technology.

Examples
- Polycom VSX 7000e, 8400, 8800 or iPower (now discontinued but still in use.)

Best Uses
- course delivery
- seminars
- faculty training
- extension training
- interviews which include presentations and which will be viewed by a large audience

Advantages
- wide range of multimedia sources usable through system
- high quality of the audio and video signal
- closest equivalent to traditional face to face experience

Disadvantages
- high cost
- the need for learners to travel to a videoconferencing site
- the scheduling and coordination of site facilitators

Mid-range Videoconferencing Systems

These systems incorporate the control box and one camera, and generally come with one microphone.

The newer models are capable of adding options such as a second display adapter, second camera, second microphone, stereo speakers, or a device that will transmit a computer signal at XGA resolution (like you would see on your computer monitor, not the degraded video resolution.) Sometimes they may be set up and/or operated by a facilitator, but they can also be operated by videoconference participants with minimal instruction.

Some are on the main Gainesville campus with bandwidths of 100 MB (which is good) but no QOS; some are additional units to the higher-end models at some of the RECs, with T-1 bandwidth but no QOS; and some are at RECs which do not have the higher-end models and at Extension offices, most with DSL bandwidth but no QOS. This means that there may be pixelization, freezing or dropouts depending upon the data traffic at the location.

At some of the county locations, there are also issues with getting through the local firewalls. Some of these systems have internal bridges that can connect a total of four sites, but the majority of multiple site calls go through the Radvision bridge.

Examples
- Polycom 7000S, 7400, 7800, and the older Viewstation EX and FX.

Best Uses
- meetings (e.g. graduate committees, design teams, administrative functions)
- interviews with smaller audiences

Advantages
- They are more widely distributed and available
- the cost is cheaper
- they can save a lot of time and money on travel

Disadvantages
- more limited multimedia source options
- intermittent loss of quality in the audio and video signal

Desktop Videoconferencing Systems

As the name implies, these systems work with desktop or notebook computers.

Some units like the Polycom ViaVideo integrate camera, microphone, processor and software into one package. Others, like the Polycom PVX, simply provide the videoconferencing software to run on your own computer (PC only, with a minimum P4 processor), with a third party camera and microphone.

The PC cameras usually have built-in microphones which work OK with point to point calls, but if you use collaborative software (which we will address later), a headset microphone is preferable to reduce echo.

Video and audio quality vary widely according to computer processor speed and Internet traffic. There are also many problems with firewalls set up by IT administrators to protect computer users from hackers, spyware and the like.

Examples
- Logitech Orbit
- Pro 5000 or Notebook Pro
- Creative Labs Webcam for Notebooks

Mac computers have their own systems, such as iLife software and the iSight camera, but their compatibility with Polycom desktop systems is questionable.

Best Uses
- one to one, video "phone calls" to colleagues

    A poor use of this system is to participate in multipoint videoconferences with high-end or mid-range systems. There are several reasons for this, but the main ones are that these individual desktop connections are a nightmare for the bridge operator, and they often degrade the quality of the videoconference for everybody else.

Advantage
- free, face to face communication at your desk or wherever you have Internet access with your laptop

Disadvantages
- computer security problems and spotty quality

Course Management Systems

These are online systems that offer a full range of features necessary to deliver academic courses or other types of training via the Internet. Some of these features are online testing, a gradebook, student tracking, chatrooms, messageboards, and some means of student authentication. Many of these systems also allow integration with the registrar, financial services and other institutional functions.

Examples
- WebCT Vista (The University of Florida's official CMS)
- Blackboard
- Angel
- Moodle (open source, free and available to install on your own server)

Best Use
- to deliver courses and training in a secure, password-protected environment
- lecture material can be incorporated in a variety of media
- CMS is capable of both synchronous and asynchronous interaction of instructors and students

   (Synchronous means the interaction takes place at a particular time, as in a chatroom; asynchronous means that interaction takes place at different times, as on a messageboard.)

Advantages
- ability to utilize a rich mixture of multimedia including video, computer software, images, sound and music
- the wide range of student testing and management features; the ability to password-protect for authentication and to preserve copyright privileges
- compliance with the ADA (Americans with Disabilities Act)
- ability to reach students at a distance, anywhere in the world
- works well in combination with other methods of distance education delivery.

   For instance, an instructor could present lectures in the CMS and employ its interaction, testing and tracking features while using short videoconferencing sessions for intensive interaction or group projects, and at the same time put video segments and other high-bandwidth material on CDs or DVDs.

Disadvantages
- occasional slow periods or downtime, although these are not common
- difficulties with logging in non-students for Extension training and other non-academic functions, although a process to do this is being worked out
- the sometimes daunting learning curve for instructors, although help is available from UF Academic Technology and from IFAS Communication Services
- lack of any synchronous video or voice capacity

Collaborative Software Systems

Collaborative software systems allow multiple users to interact synchronously with voice and video, see PowerPoint presentations and other computer programs at high resolution, share computer applications, take Web tours, and collaborate with other tools including a whiteboard and text chat.

They combine some features of videoconferencing and of a CMS, but they fill a niche that neither of those other systems can provide on their own. Most of these programs work through common Web browsers with standard plugins such as Java or Flash, although some require their own proprietary software to be installed on users' computers.

Examples
- Adobe Acrobat Connect
- Elluminate
- Horizon Wimba
- Saba Centra

Specifically, the unique capability that these programs provide is to deliver instruction to multiple users (up to hundreds, according to manufacturer claims) at their own computers, with presentations and other computer applications at computer resolution, with simultaneous voice over IP (VOIP) and video if desired, and with the ability to remotely share operation of computer programs.

Best Uses
- to deliver a small (around ten people) graduate class
- to supplement a course taught via a CMS or high-end videoconferencing
- to deliver training in a fairly small setting (perhaps up to fifty people)
- and to brainstorm, collaborate or work on group projects with people at their homes or offices

Advantages
- ability to have synchronous communication with a number of people at any location with a computer and Internet access (although DSL or cable bandwidths are recommended),
- high interaction including voice and video, and high resolution for computer programs and websites.

Disadvantages
- disruptions and degradation of signal with a high number of users and during times of high Internet traffic
- the cost, especially with institutional commitments to a CMS and videoconferencing
  (a ballpark estimate for a perpetual 50 seat license could easily cost $50,000 plus $10,000 in annual maintenance)
- the inability of a recent Distance, Continuing and Executive Education (DCE) committee to agree on one product that meets the expressed needs of all interested departments

Lecture Capture Systems

These systems record a speaker's computer presentation, voice, and optionally video, and combine them into a graphic package that can be uploaded to a server and viewed on an Internet browser.

The format of the interface presents a much larger and higher resolution view of the computer portion than does the digital capture and streaming of a presentation in Real Media or Windows Media files.

Examples
- Sonic Foundry Mediasite
- Anystream Apreso
- Accordent Capture Station

Some require their own proprietary server, and some will run on any Web server. Similarly, some offer all necessary hardware in one package, and some require the user to install software on their own computers with required peripherals.

Best Uses
to capture course lectures, training presentations, seminars or conference speakers. These can then be incorporated into a CMS or website, or burned to CD or DVD.

Advantages
- presentations can be captured from regular classrooms, conferences and so forth without the speaker having to go to a particular studio or mediated classroom
- presentations can be published in a variety of formats with an attractive interface and high resolution

Disadvantages
- cost, which ranges from $10,000-$40,000
- need for personnel to set up and operate these portable systems.

Power Point Conversion Software

Note: There are other programs that could be considered to be a subset of lecture capture systems; those that take narrated PowerPoints and publish them to the Web or CD. These are much more limited in media sources and other features, but nevertheless provide a valuable service.

Examples
Impatica
Articulate
Adobe Presenter

Best Uses
- converting powerpoint lectures used in live classes to web only format, without losing the auditory lecture component of the class
- recorded lectures can either expand upon original powerpoint content, or parallel it for special needs students, including those for whom english is a second language

Advantages
- they package the narrated PowerPoints in user friendly interface
- allows lectures to be easily presented in both auditory and text versions together to suit varying learning styles, or special needs requirements
- allow both page by page navigation, and searches
- limited quiz functions
- files sizes compressed tremendously to take much less bandwidth (generally $1/10^{th}$ original size)
- Impatica with Java and Articulate and Presenter with Flash

- original narrated powerpoint remains editable for future updates
- do not require any special hardware beyond desktop computer and headset microphone to create
- much cheaper (less than $500 per license.)
- can be viewed on any computer with proper free plugin installed in browser

Disadvantages
- sound quality can often be of mediocre quality, depending upon equipment and recording location available to lecturerer
- limitations to degree and ease with which one can integrate more advanced multimedia elements into presentation
- time needed to record lectures (can easily recovered through multiple uses of lecture over time)

Screencasting Systems

Screencasting is a term for computer training systems that can be used to create computer software tutorials and interactive simulations. Basically, they record movements of the mouse and keyboard input, combine them with narration, video and annotations, and output them to various file formats including Flash, AVI, WMF, Quicktime and even EXE.

This method can work excellently for short lecture blocks where it is especially important to be able to demonstrate onscreen actions while providing verbal or text instruction, such as training viewers in the use of software.

This method is not suited to long, unbroken lectures, especially those where the instructor wishes to provide sound recording and video capture of the speaker in addition to the screen capture. These can overwelm the processing power of the software, resulting in unsyncronized sound and visuals, and severe dropping of frames from video capture, thereby cancelling the sought advantages.

Examples
- Techsmith Camtasia Studio 2
- Macromedia Captivate
- Qarbon Viewlet Cam and Viewlet Builder
- Ambrosia Snapz Pro X2

Some of these, like Camtasia, are PC only, and the Snapz Pro X2 is Mac only. Most of them are moderately priced, averaging $100-$200 per license.

Best Uses
- to provide self-paced software training
- demonstrate computer simulations, websites and other programs on the Web, CD or DVD

Advantages
- ability of learner to see action or principle being demonstrated onscreen
- representation of the computer screen is larger and sharper than live or through videoconferencing
- trainer can add buttons, hot spots and other forms of annotation
- learner can move through the materials at their own pace

Disadvantages
- are the time it takes to develop the screencasting presentations (but this time can be well justified by the number of people reached by the subsequent training)
- cost (but only if funds are especially tight)
- limitation in platforms for most of the programs (PC only or Mac only.)
- limitations of actual software performance when recording long lectures, or using multiple sources together (screen capture, sound recording, and video cam)
- limitations of recording quality of sound and video dependent upon equipment and location used

Summary

All these methods of communication and e-learning have advantages and disadvantages. They also have ways in which they are best used so that the advantages are maximized, and uses which are not as appropriate and which emphasize their disadvantages. The Excel worksheet reproduced below should give a useful summation of the main points of this report.

System	Examples	Best Uses	Advantages	Disadvantages
High-end Videoconferencing	Polycom 7000e, 8400,8800, iPower	Course delivery, seminars, training, large interviews	Multimedia sources, high quality audio and video	High cost, travel to sites, facilitator issues
Mid-range Videoconferencing	Polycom 7000s, 7400, 7800, Viewstation EX, FX	Meetings, small interviews	Widely available, cheaper cost, saves travel expense	Limited A/V sources, intermittent quality
Desktop Videoconferencing	Polycom ViaVideo, PVX, Mac iLife	One to one meetings, video "phone calls"	Video communication from desk or home, at no cost	Doesn't work well with higher systems, low quality
Course Management	WebCT Vista, Blackboard, Angel, Moodle	Course delivery, Extension training, certification	Full features, authentication, rich multimedia, global reach	High cost, learning curve no live voice and video
Collaborative Software	Acrobat Connect, Elluminate, Wimba, Centra	Graduate course, supplement to course, group projects	Live voice and video to desktops, high resolution for computer presentations	Cost, bandwidth problems
Lecture Capture	Apreso, Mediasite, Accordent	Record lectures, interviews, conference speakers	Mobility, easy to publish to Web and archive	Cost, operation time and expense
Narrated PowerPoint	Articulate, Impatica, Adobe Presenter	Supplement online courses	Simulates lecture for online courses, low bandwidth and cost	Instructor time to repeat lectures
Screencasting	Camtasia, Captivate, Snapz, Viewlet Cam and Builder	Computer software tutorials, simulations	Self-paced for learners, higher resolution and more annotation	Platform limitations (PC or Mac only)