Planning for the Present and Future of Videoconferencing

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INTRODUCTION

For over a decade, videoconferencing has been developing as a key component of distance learning in a variety of subject areas (Wang, 2006; MacLaughlin et. al., 2004; Kidd & Stamatakis, 2006; Sebrects et. al., 1995, Smyth, R., 2005). Although not a perfect replacement for face-to-face communication, videoconferencing can bring educators and students together although they may be separated by vast distances. Using videoconferencing technology, a lecturer in San Francisco can address students and colleagues in New York and Australia, students in Qatar and Pittsburgh can collaborate on a graduate research project and a doctoral candidate in Houston can defend his dissertation to a review board of faculty from a number of cities.

Videoconferencing requires a substantial investment in equipment, expertise and support resources. Any institution considering such an investment must make a significant effort to evaluate the technical and usage requirements for a videoconferencing implementation to ensure the supportability and expandability of the system.

BACKGROUND

Videoconferencing is real-time two-way audio and video communication over a network. Envision a meeting between students in Pittsburgh and Qatar. The Pittsburgh students sit into a meeting room where, on the other side of the conference table, a large monitor displays the students in a similar meeting room in Qatar. In Qatar, the students see a similar monitor that displays the students in Pittsburgh. After some introductions, the students begin to discuss how they will collaborate on a research project.

As the students discuss their project, they are unaware of the technology that makes their conversation possible. As a student in Pittsburgh speaks, a camera captures the image of the conference room and a microphone captures the sound. Software then compresses the audio and video into packets that are transmitted over the internet to similar equipment in Qatar. Equipment in Qatar receives the packets and decompresses them and displays video on a monitor and audio through speakers. At the same time, the same equipment is transmitting audio and video from Qatar to Pittsburgh, so that the student speaking in Pittsburgh can see the reactions of the students in Qatar.

Videoconferencing has been available in one form or another for decades, originally through costly dedicated cable or satellite systems. However, the availability of ISDN (Integrated Services Digital Network) in the 1980s enabled videoconferencing over existing telephony systems and IP (Internet Protocol) solutions became available in the 1990s. As network infrastructure continues to be developed in response to larger consumers of bandwidth such as email, file-sharing and television broadcast, videoconferencing will benefit greatly from that growth. By 2015, video communication, including videoconferencing, will be the primary driver of network growth (Exabyte, 2008).

Users' expectations have a significant impact on how the assess the usability of technology (Szajna & Scamell, 1993). As unified communications – the convergence of voice, video and message as well as other collaboration technologies – gains popularity and acceptance, users will expect high quality, seamlessly integrated audio and video communication as the norm (Passmore, 2008). As it develops as a key component of distance education and collaboration, users' will increasingly perceive videoconferencing as they do email – that is, it is a utility that should simply work.

PLANNING FOR THE PRESENT AND FUTURE OF VIDEOCONFERENCING

While the quality of audio in videoconferencing is essential to students' learning performance, the quality of video has a significant effect on their perception of the tool and their desire to participate in this form of distance learning (Kies, et. al., 1997). Providing a rich video experience for the user is neither a simple nor inexpensive proposition and requires a deep understanding of the expectations users do and will have for the service. Building an infrastructure and support system that will be scalable in terms of both volume and breadth of use requires careful planning and constant reevaluation.

As videoconferencing technology matures, customers will increasingly perceive it as a utility. Although they understand that there are complex technologies involved in the service – just as there are with utilities such as electricity or telephone service – they will come to expect that their role as a user is little more than flipping a switch to turn it on. Regardless of how complex the systems between them and their distant counterparts, videoconferencing should simply work.

Network Infrastructure

The key to successful videoconferencing is a reliable communication network. In traditional point-to-point videoconferencing systems, if the signal between the two endpoints needs to be maintained at some minimum, usually 128 kb/s (kilobits per second), of the audio and video signal will be lost and the receiving endpoint will experience low quality, dropped audio, video or other problems. If these problems are frequent, the videoconference can become a distraction rather than an improvement over a simple teleconference.

Emerging room-based videoconferencing systems with high definition video and multiple cameras require significantly higher rates of 8 to 24Mbps. Video communication at these rates require significant increases in available bandwidth as well as quality of service controls.

Typically, universities are on a high bandwidth network such as Internet2's Abilene network, which provides a high quality, cost-effective connection between endpoints. However, if international videoconferences will be common, it may be necessary to research what options will provide the reliable network connection at a reasonable cost. ISDN also needs to be considered as an option as many governments, corporate, and international sites have security standards or bandwidth limitations which require ISDN to be used for videoconferencing. Implementation of a gateway to provide an ISDN/IP bridge will allow any endpoint connected via IP to videoconference with any endpoint connected via ISDN.

An IT organization has the most control over the network infrastructure surrounding the endpoints. Adequate cabling and network bandwidth needs to be available to any location that may host a videoconferencing site.

Service Simplicity

Second only to reliability, users expect that they won't have to invest a great deal of time in learning how to use the videoconferencing system (Morikawa, Maesako, 1998). Whether in a classroom or meeting situation, the facilitator does not have the luxury of time to negotiate a long, complex set of steps that, if not followed precisely, will require more time to correct. While users won't necessarily expect that the system works as easily as a light switch, they most likely will expect that it won't be much more complicated than making a telephone call or setting up a simple slide presentation.

Some things that will improve the user experience with the service include:

- Define pedagogical objectives & strategic goals of this technology to avoid any usage confusion or scheduling conflicts.
- Choose similar equipment and software for all locations so that users will be familiar with the interface regardless of their location.
- Implement centralized services such as a "gatekeeper" server to provide common address books or directories of endpoints.
- Provide an integrated scheduling system to allow users reserve the videoconferencing service with the classroom or meeting space instead of having to schedule both independently.
- Understand & inform users of any security related exposure.
- Develop plans for assessing user experience & feedback. Implement continuous improvement feedback loop.
- Develop a solid service support model.