Facts, Lies and Videoconferencing

A Guide to Video Communication

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About the Ontario Telepresence Project

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The Ontario Telepresence Project (OTP) was a three year, $5 million, pre-competitive research project whose mandate was to design and field trial advanced media space systems in a variety of workplaces in order to gain insights into key sociological and engineering issues. The OTP, which ended December 1994, was part of the *International Telepresence Project*, which linked Ontario researchers to counterparts in four European nations. The Project's major sponsor was the Province of Ontario through two of its Centres of Excellence - The Information Technology Research Centre (ITRC) and the Telecommunications Research Institute of Ontario (TRIO).

The Ontario Telepresence Project was a tight partnership of academic and industry researchers including faculty, students and professional staff from Engineering, Computer Science, Psychology and Sociology at the University of Toronto and Carleton University, as well as staff located at Industry Partner sites. To gain first hand experience with the media spaces being prototyped, all aspects of work were conducted without regard for geographic location of the project participants. Experimental versions of a media space system, employing a variety of communications protocols (including ATM) were used to link collaborators' desktops and conference rooms. Versions of the systems were also deployed at arm's-length sites to study implementation issues from a sociological and psychological perspective.

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The business press and popular media are having a field day reporting on the proliferation of videoconferencing technologies in the workplace. One reporter heaps praise on these new technologies and their potential to make business more efficient; another warns of the dehumanizing aspects of the technology. Who should you believe?

Recent research and new products are drastically changing the notion of what videoconferencing is, how we use it, and its potential value for organisations. A better understanding of the social contexts in which you use videoconferencing and the communication problems it is intended to solve will radically affect the benefits you will reap from videoconferencing.

These new tools can be more than just adaptations of existing videoconferencing systems. When combined with thoughtful planning, installation, training and integration with your present communication tools, you can create an enriched 'environment' to support workplace activities. These environments have been referred to as 'media spaces'.

This paper is intended to help you understand the nature of videoconferencing technologies and their potential social implications in the workplace. It will also provide you with strategies for deciding when, where and how you might use videoconferencing tools in your organisation.

What is traditional videoconferencing?

In its simplest form, videoconferencing is a class of technologies that allow audio and video communication between two or more locations. A typical installation has a camera, monitor, microphone and loudspeaker in each location to allow participants both to see and to hear each other. The video connections can be made by any number of communications technologies, the most frequent today being ISDN or 56K telephone lines. This paper does not discuss the details of these commercial technologies as this information is readily available from your vendor.

The most extensive use of videoconferencing to date has been in the top-of-the-line conference room environment, and until recently the cost and the complications prevented more general use. In recent years, however, videoconferencing has begun to be used in a variety of new ways, each of which has its own strengths and weaknesses.

Conference Room

This is the traditional setting for videoconferencing technologies. A typical conference room designed to accommodate many people will have some or all of the following: one or more large monitors at the front of the room; a camera providing a view of the room; a 'document camera' for showing paper documents or other artifacts to the remote site; and a control seat with lots of buttons and knobs for controlling the environment and the technology. The quality of the audio and video is usually very good, but these features don't come cheaply. These facilities continue to be very expensive.

In general, conference rooms are not flexible and do not readily support different types of meetings (e.g., they are good for formal presentations, but poor for brainstorming sessions). They often require booking in advance, and technical support staff to operate. Participants must leave their offices and 'travel' some distance in the building to attend even the briefest

meeting. This makes it difficult to have impromptu meetings when the videoconferencing systems are in conference rooms.

Meeting Room

Meeting rooms are typically much smaller than conference rooms, and so are better at supporting meetings of small groups. The video quality may be as good as that of the conference room, but there is often less control of the lighting and acoustics, both of which affect the perceived quality of the videoconference. Rollabout units potentially provide flexibility to hold videoconferences from more than one location, but in practice the logistics of moving relegate the units to a single location.

Desktop

In the past few years desktop videoconferencing tools have appeared. In general, they display small video images in a window on a computer workstation, and the image quality is relatively poor. Most desktop systems use inadequately designed cameras, microphones, and loudspeakers. Since the goal is to keep the unit cost down, the quality of the audio and video suffer.

However, there are many important advantages to desktop systems. They make it easy to have impromptu video meetings, are more convenient to use, and usually require less technical support.

How is videoconferencing evolving?

Recent progress in the design of videoconferencing systems is overcoming many of the technical and social limitations of earlier systems. Some companies use hybrid analog/digital systems which provide high quality audio and video throughout a facility: i.e., to desktops, meeting rooms, and conference rooms.

Earlier systems required a codec per desktop, and the engineering required to minimize the cost per desktop meant that the video quality was poor. The new systems make it possible to give desktop users access to a shared pool of higher quality codecs, thus improving the quality of the audio and video, often at lower cost to the organisation.

An additional exciting feature of these new systems is the ability of people within a facility to communicate with each other without any codec or special phone line. These systems use an internal analog network which guarantees the highest quality audio and video possible for all internal communication, the most frequent type in any organisation.

These videoconference systems are evolving toward location independence. Workers can connect as easily with their distant colleagues as they can with those nearby, and they can choose to work from their desktop, a meeting room or a conference room. The near zero cost of distributing additional video signals across the internal network is resulting in new types of services being delivered throughout the workplace. As organisations gain experience with videoconferencing they are themselves beginning to develop their own innovative services. Examples include broadcasting window views to landlocked desks, the use of multiple cameras and monitors in a single office, and broadcasting seminars and guest speakers to the desktop.

How can it help organisations in the 90s ?

Organisations have always been concerned with communication—after all this is how much of the work in organisations is either carried out or coordinated. In fact, if you think for a moment about organisations as giant systems of communication it might help you to realise how much of your work involves communication.

The importance of communication isn't likely to change in organisations in the 90s, except to intensify. There is increasing globalisation of the economy, and not only for large firms. Small firms are often considered to have a competitive advantage in this environment because they are flexible and can make decisions more quickly. In addition, many organisations are becoming more distributed, contracting out a variety of traditional in-house functions, and developing strategic alliances with other organisations. Within the organisation, staff are being encouraged to work as members of teams rather than individually. Consequently, the need for effective communication has never been greater, and the challenges are larger as staff struggle to work across national and organisational cultures while maintaining contact with colleagues in their own organisation.

There are advantages to being in the same location

We get a lot of information just by being together in the same location. Social relationships, both professional and personal, develop when people work in close proximity and get to 'know each other'. This is especially true for people who work together or whose work activities are interdependent. Daily contact fosters the development of group norms, and helps individuals connect with the larger enterprise. In successful teams, individuals are no longer isolated, but part of a larger community which shares particular values and beliefs.

Think of all the different ways you interact with your colleagues. You bump into them at the coffee pot, you telephone, leave a voice mail message, send e-mail, a written memo, or possibly send a fax—perhaps you have a screen sharing feature on your computer. Some contacts are formal (e.g., a scheduled face-to-face meeting) while others are informal, (e.g., lunching with a colleague). Being together in a single workplace you get other 'background' information as well—you hear a person's voice or footsteps nearby and can take the opportunity to resolve an issue, or you can tell by their voice that it's a good time to stay away!

How to get the advantages that the office environment fosters is an important challenge at a time when organisations are increasingly distributed and co-workers physically separated.

The medium is part of the message

Perhaps you've never realised how sophisticated you already are in choosing among a variety of communication media and environments as you carry out your daily activities. For example, if an important visitor is coming to your organisation, you can probably predict the meeting room that will be used for the presentation—in fact you probably know where he or she will sit and the places members of your organisation will take in relation to this guest. You also are constantly making choices about the communication medium you will use— should I send a fax, or phone first and then follow-up with a fax, or perhaps I need to send a formal letter on company stationary?

Each medium carries with it a number of social meanings—e.g., a typed memo is more formal than a post-it note stuck to your door, and all of us who have lived and worked in this culture have learned how to 'decode' these messages and similarly to make choices when we communicate. Meetings are a good example. We all speak generically about attending a meeting—but we also know there are various meeting styles and we adjust our behaviour

accordingly. We might choose a small meeting room with a white board or flip charts if we are brainstorming some new ideas with a few colleagues. On the other hand, if we want to have a confidential discussion about an employee with his or her manager we are likely to hold this meeting in a private office with a door.

Once again, as organisations become increasingly distributed and communication increasingly mediated by technology, it is increasingly important to understand the ways in which various technologies affect social relationships and workplace cooperation.

The role of videoconferencing

One of the goals of videoconferencing is to allow those who are physically separated to work together *as if they were together*. The ability to see those at a distance enriches the communication, but, as we now know, working together in the same place brings us more than a visual image. There is some recognition in the videoconferencing industry of this fact, and systems are being designed to accommodate a broader range of communication activities and behaviours.

Here's one example of how a videoconferencing system can support group awareness, that is, awareness of colleagues who are not in the same office, or necessarily even the same country.

This technique uses the videoconferencing camera on your desktop to take a snapshot every five minutes. The snapshot is distributed to those members of the group who you have decided may receive it. The intent is to give a level of awareness about your availability to your colleagues similar to what they would have if you were located on the same corridor. For example, they could 'see' if you were on the phone or had a visitor—information that colleagues nearby 'hear'.

Techniques such as this may not be appropriate in every office environment or for all staff in an organisation. And it is very important that the ethical issues of this are discussed with each employee in advance, and social conventions established. For example, you may insist on reciprocity (i.e., if you can see me I can see you) and provide an easily accessible distribution list from which names can be deleted or added. The essential element here is that each person controls who is permitted to see him or her.

Supporting intra-organisational communication

In a typical organisation, as many as 70% of telephone calls never go beyond the local switchboard. The majority of communication is between people in the organisation. If videoconferencing systems are appropriately designed we can expect similar usage patterns.

But what is an appropriate design? First, making a video call must be at least as easy as using the telephone. Second, the time to set up the call must be very short—at least as fast as the time it takes to place a phone call. Finally, the quality of the audio and video for internal calls should be maximised. You want to be sure you have the best quality for the most frequent type of calls.

Analog vs digital: the social graces of analog audio and video.

Digital transmission of audio and video signals almost always introduces distortion, which affects the quality of the social interaction, and our ability to use the system for effective work. Analog systems do not introduce such distortions, and they provide a smoother, more natural interaction among participants.

The first example, and perhaps the most critical, is latency. Most digital systems introduce at least a half-second delay between the time something is said and when it is heard. While the delay is extremely short it can seriously disrupt many of the social cues that we use in conversation, e.g., interrupting someone to ask a question. Analog signals have no latency and conversation flows naturally. This helps you forget about the technology and concentrate on the topic of your conversation.

A second important aspect is the degradation of the video image. Most digital systems cannot use full video resolution, and introduce blurring, chunking, and jerky motion to the image. Most desktop systems on the market today display the video image in a small window on the computer screen. The images are low resolution, and degrade even further if there is any movement. It is almost impossible to make eye-contact, and facial expressions and gestures are lost. Analog transmissions have none of these distortions, and provide the user with a clear crisp television quality image. It's much closer to the 'being there' that the advertisers promise.

A third benefit of analog is the guaranteed synchronisation of the audio and the video signals. Digital systems suffer from the audio and video getting out of sync—you've seen enough badly dubbed movies to know how hard this makes it to communicate!

The goal of videoconferencing should be to allow interpersonal communication to happen as 'naturally' as possible. Systems can be designed to minimise the distortions the technology itself may introduce. The use of analog audio/video networks is one way to get closer to this goal today.

Using a separate monitor

Several innovative desktop videoconferencing systems take the image and sound 'out of the computer', and put it on a separate monitor. The use of a separate monitor has been found to have several benefits over using the computer screen for personal communication.

First, the electronic visitor occupies a space of his or her own within the room as he or she would if present. The computer screen can be used to share documents, spreadsheets, or other objects. When people arrive 'on' your computer screen they can get lost under documents—after all, they are just another window! If you don't misplace them you will likely have a very small image of them, especially if you are going to look at a document during your meeting.

Second, a separate monitor with a camera mounted on it will help you make eye contact. This monitor can be placed further away from you than your computer monitor. This further improves the illusion of eye contact by reducing the angle between the camera lens, your eye and the eyes of the remote participant on the video monitor.

In addition to eye contact, a separate monitor will let you know where your colleague is looking—at you, the document, or off into space—and you are aware of the shift as he or she moves from the document to you. Preserving these relationships enhances your ability to work together.

A third and more practical reason for using a separate monitor has to do with the limited screen space on a computer monitor. There never seems to be enough space on any computer screen, and videoconferencing windows are another demand in an already crowded environment.

It may be difficult to grasp the real significance of the separate camera and monitor until you have actually tried it. But it is likely that once you have used desktop videoconferencing this

way you'll never want to go back to peeking at a video window on your computer screen. Try it, you'll like it!

Tell me just a bit about how it works.

In mid-1995 the state-of-the-art of videoconferencing technology is changing weekly, so any detailed description of the mechanisms of videoconferencing would be out of date by the time you read this. However, there are some technical limitations that should continue to be true for the next few years and some fundamentally new ideas that will affect how videoconferencing systems can be used in the immediate future.

Why not use existing computer networks?

Many offices already have computer networks, and it seems a natural assumption that you should use that same network to transmit digital audio and video for interpersonal communication. But there are a number of reasons why you may not want to do this.

First, the quality of audio and video transmitted on computer networks cannot rival that of direct analog signals, and the quality is not yet the equal of high-end codecs. Compared to analog signals, the images are usually very small, crude, not well synchronised with the audio, and very jumpy. Computer networks usually introduce a fraction of a second delay between the time one person says something and when the other person hears it. This latency and the small crude video images combine to make video communication through digital networks somewhat socially awkward.

Second, existing computer networks cannot support more than a few audio/video signals at one time. In an organisation with more than one or two dozen people it is likely that there will frequently be more 'video conversations' than your network can support.

Why use an analog network?

Several research projects and some recent commercial products have been designed to support large numbers of very high-quality videoconferences within a facility. These systems use an analog network to transport audio and video within the facility. This provides several benefits over digital transmission of audio/video.

First, and perhaps most important, compared to digital audio/video, analog signals have no delay and are very high quality. By eliminating the delays and quality degradation that result from digitization, you greatly improve the quality of the social interaction, which is, after all, what the technology proposes to support. Certainly digital networks and compression technology will evolve to a point where they can be used to support effective interpersonal communication, but the reality today is that analog audio/video is vastly superior to digital.

A second advantage is the ability of analog networks to support many simultaneous conversations. On an analog network there are not the same 'bandwidth' concerns that there are on digital networks. Adding more conversations will not overload your network.

A third advantage of an analog network within a facility is the low setup time for a video conversation. The audio and video is usually 'switched' immediately upon request. Conference systems which use telephone facilities can take minutes to set up, which can be a great deterrent to use. Additionally, you have the potential for many simultaneous internal calls, without requiring additional telephone lines or enhanced computer networks.

Finally, since it doesn't cost anything to send a signal over an internal analog audio/video network, there are many other interesting things you can do with the system when it isn't being used for inter-personal communication. Some organisations have 'window cameras', to provide a window view for employees in offices without windows. Other organisations transmit promotional videotapes or live news-feeds which employees can choose to view on their monitor when it is not being used for meeting with someone.

Why use a star architecture?

Most analog audio/video networks that are used for videoconferencing are arranged in a star network. Each desktop, meeting room or other device that is connected to the network has wires that lead back to a central equipment room, and they connect to an audio/video switch in a star arrangement. The quantity and type of wires depends on the specific technology, but can range from 4 coaxial cables per desktop to a single category 5 twisted pair.

The star arrangement has some interesting features. It allows anybody on the network to communicate with anybody else on the network without the need for digital telephone services or expensive videoconferencing codecs.

High-end codecs, which allow the highest quality audio/video across telephone lines, can be a shared resource, available to conference rooms and desktop users. This brings higher quality videoconferencing to the desktop than is normally available in totally digital systems.

Finally, the star architecture makes it relatively simple to add new 'services' to the network, such as the 'window camera' or other video services.

Why would I want to share a codec?

Codecs introduce several distortions to the audio and video signals. They blur moving images, create chunky images, and introduce a delay. Many of these problems are reduced, though rarely eliminated, when you use very high quality codecs. Since the goal of videoconferencing is effective interpersonal communication, we should strive to make the technology as transparent as possible, and use the highest quality codecs available. But higher quality does mean higher cost, and since any user doesn't need a codec all the time it makes sense to share this resource.

Desktop videoconferencing systems generally have a codec built-in, one per desktop. Consequently each codec needs to be relatively inexpensive, and the video quality is adversely affected. Most meeting or conference rooms, on the other hand, use much more expensive codecs which are much higher quality, but these are too expensive to be put on every desktop.

One of the interesting opportunities with an analog star network for audio and video is the ability to share a high-quality codec among many people. Rather than many inexpensive codecs, which sit unused most of the time, you can now have one or more high quality codecs which can be shared. This gives you the ability to communicate with remote colleagues from your desktop, with the higher quality that is usually restricted to conference rooms. Not only do you increase the effectiveness of the desktop videoconferencing tools, but there is the potential to reduce your capital costs.

2.   Should I believe all the hype?

Videoconferencing, like many other high-technologies, has been heavily hyped in the popular press. It sometimes hard to know just what is fact and what is fiction. Here are a few of the more common misconceptions.

They tell me that it's just like being there

Sometimes it's better than being there, sometimes it's worse. But one thing is for sure, it's not *just* like being there.

First, not all videoconferencing systems are created equal. You want to be sure you get the type of system best suited to your needs. For example, desktop systems support some types of meetings better than conference room systems, and vice versa. There are now systems appearing on the market that are 'location independent'—that is, the desktop systems and the conference room or meeting systems all interconnect. You then simply choose the venue most appropriate for the meeting, just as you do today when scheduling any meeting.

Second, understand the nature of your meeting. Videoconferences with several participants are somewhat more formal than face-to-face meetings, and hence may be shorter and more to the point. Consequently, agendas are prepared ahead of time and the meetings are chaired. Participants tend to be better prepared and bring supporting documents ready for presentation.

Furthermore, the group dynamics that emerge when people meet to work on issues of common interest may be adversely affected in a video-mediated conference. There is usually only one camera showing you the remote screen and, depending on the nature of the meeting, some attention may have to be paid to controlling the camera. Subtle social cues may be missed, and it is difficult to 'read' body language. You can't have a side-conversation with a remote participant while the main meeting is going on. You can't see the blush in the cheek of the person you are negotiating with or the bobbing knee of the person who is impatient.

Does this mean I'll never have to travel again?

When telephones were introduced into the workplace 75 years ago, people thought they would eliminate travel. We know that never happened. Similarly, videoconferencing will not eliminate all your travel. What it will do is change the reasons you travel, improve your communication between trips and make possible 'visits' that would not otherwise have taken place. One firm reported that they replaced some of their regular intercity meetings with meetings by videoconference. The time saved in travel to these regular coordinating meetings was used to visit key customers more often. Over time, you will likely see a shift in your travel destinations and agendas.

Why buy one when there is no one else to talk to?

The consulting firm Personal Technology Research says that the number of desktop video systems will grow to 88,000 units in 1996. And by 1998, that number may rise to as many as half a million as videoconferencing capabilities are integrated into consumer-oriented PCs. Add to that the existing 100,000 conference room systems already in use and the fact that the newest systems accommodate cross-brand communication. ...That's a lot of people to talk to.

Will videoconferencing open new lines of communications in my company?

Videoconferencing tends not to be very good in opening lines of communication where none previously existed. If employees had no reason to communicate with one another before

videoconferencing, they will still have no reason after videoconferencing is introduced. However, videoconferencing is extremely good at reinforcing existing communication. If you have groups of people in two different buildings who are frustrated by all the running back and forth for meetings, then videoconferencing may help. On the other hand, if your sales people in Atlanta rarely talk to your engineering team in Toronto, don't expect videoconferencing, by itself, to bring these groups closer together.

The benefits of videoconferencing will start to flow the moment I install it, right?

Not quite. The methodology for the introduction of technology into the organisation can be every bit as important as the technology itself. Videoconferencing is unlike most other shrink-wrapped desktop tools. Its function is not simply to help *you* do your work better—but to help your ***group*** work better. As such, it must be skillfully integrated into the work practices of your employees.

There have been a number of studies which have shown that how a technology is introduced into the firm is at least as important as what technology is introduced. In one organisation, the executives spent $250,000 on a fancy board room complete with the state-of-the-art conference-room videoconferencing system. They then stood back and waited for their employees to start using the expensive facility. Few did. It turns out that most were intimidated by the lavish furnishings. Those that did want to use it could almost never get the room because it was usually booked for regular face-to-face meetings by the executives. Thus, the whole objective of the initiative was undermined and the equipment rarely used.

Can I use videoconferencing for all my meeting needs?

The technology can certainly support a wide variety of meeting needs. Various accessories such as a document camera, special camera lenses and telecommunications lines, or multi-party connection software can be added as necessary.

However, remember that there are other, more sensitive 'human factors' to consider in planning meetings. The following table illustrates some of the effective uses of videoconferencing and suggests when face-to-face meetings may be more appropriate. But remember, these are only guidelines—you know your organisation best, and the key to successful videoconferencing is in understanding how your organisation works and adapting the system to your needs.

Effective Uses of Videoconferencing

- regular working group meetings
- weekly briefings
- quick problem resolution meeting
- pre-qualify a cold-call
- quick question to a colleague

Bad Uses of Videoconferencing

- major sales pitch
- sensitive client negotiations

• employee performance review

Everyone in my organisation is going to love it!

No. Not everyone in your organisation will love it, not everyone will even like it. Videoconferencing is a tool which fits some people's work practice and personal style more than others. Some will use it for hours a day, others won't go near it. Getting it to the right people at the outset will help create a positive climate and increase use of the system.

Can I use videoconferencing to telecommute from my home office?

Teleworkers are entrepreneurs or salaried employees who work from home offices at least some of the time. Typically, they use ISDN, POTS or cellular phones to connect their personal computers to corporate mainframes or LANs. Many are now using these same communications networks for videoconferencing.

And, the numbers are growing. It is estimated that up to 30 percent of the North American work force will telecommute by the end of the 1990s. Driving this trend is the relentless pursuit of increased profits through perceived worker productivity gains and real-estate cost reductions. But remember, there is a lot more to this issue than the perceived returns to the bottom line. Long term effects on employee loyalty, organisational culture and group dynamics are as yet unknown. The relevance of videoconferencing for teleworkers must be considered in the context of each employee's role in the organisation. It is not *the* solution to getting everyone working at home.

3.   What about these other concerns?

Much of the popular press and academic reports have been on the potential negative implications of video in the workplace. This section discusses some of the common misconceptions about video in the workplace, describes some of the potential real problems, and offers suggestions for how to encourage productive uses of video communication.

Isn't video in the workplace inherently a bad thing?

It is helpful to recognize that technology itself is neither inherently good nor bad, rather it is the way that we use it that creates a value. People, not technology, will determine the outcome. Many of the potential negative uses of video in the workplace can be reduced or eliminated through careful planning, communication, and involving those who will be affected by it. We must remain diligent to make sure that the positive uses are encouraged and the negative uses discouraged.

Won't video compromise my privacy?

Almost every desktop videoconferencing system on the market today gives you the option of deciding if you will take a video call or not. In this way it is similar to the telephone. People can call you, but you can choose not to answer. Images from your office cannot be seen unless you explicitly allow them.

A good desktop video system will always insure 'reciprocity', the idea that if they can see you, then you must also be able to see them. There may also be a display somewhere telling you who is calling you.

Some systems go the extra step and allow you to define exactly how accessible you will be. By setting your electronic door open, ajar, closed, or locked, you can give social cues as to how accessible you want to be at any particular time.

Won't this be used for surveillance?

It is very difficult to covertly adapt desktop videoconferencing systems for surveillance. Most systems have been designed so that video connections must be 'reciprocal', so that both parties can see each other. To adapt these systems covertly is not a simple task, and it is a great deal more expensive than installing old fashioned security cameras for the same purpose.

It is possible that there will be situations where a boss wants to constantly check up on the staff. This indicates an aspect of the organisational culture that is independent of technology. Remember, technology does not solve problems—people do. Socially unacceptable activities are most appropriately dealt with by social means, not by rejecting potentially valuable workplace tools.

What if I'm picking my nose, and other personal habits?

As humourous as this may sound, one of the first things that people ask when they see desktop videoconferencing is "What if I'm picking my nose when somebody calls me?" (Of course we would never do this, but just about everybody asks us the question.) The better desktop videoconferencing systems use a sound to indicate that a video call is about to happen, and require that you take some action to answer a call, e.g., click a button on your computer screen. There is plenty of time to remove the offending digit from the camera view, to wipe the sleep from your eyes, or to hide your romance novel before *you* make the connection.

Won't it be strange to have a camera pointed at me all day?

One of the first reactions that many people have to desktop videoconferencing is the fear of having a camera pointed at them all day long. There is a presumption that the view from your camera is always being sent somewhere. In any reasonable videoconferencing environment the view from your camera is never sent anywhere without your knowledge and approval. A little education and a slight understanding of the technology will help to lessen these concerns.

Won't hackers crack our system and spy on us?

In most videoconferencing environments the audio/video communication is not a part of your normal computer network. It is similar to the telephone. While your telephone is on the cradle, there is no way for anyone to listen into your office. Similarly, in a well designed videoconferencing environment there is no way for anybody to see or hear you without your consent. At least one company has a system whereby sliding a lens cover over the camera turns both the camera and microphone off, thus providing complete confidence that nobody can see or hear you without your permission.

With some systems it is theoretically possible for someone inside your organisation to look at you without your consent, but this is a very difficult thing to do. It requires a high degree of technical knowledge of a very specific kind. It is much more difficult than tapping telephones, reading someone's electronic mail, eavesdropping on private conversations or snooping around desks. Any workplace that has a justifiable fear of this kind of video surveillance has much bigger problems than can be solved by the absence of videoconferencing.

What can I do to lessen some of these concerns?

The are several things that can be done to eliminate any unnecessary concerns, and to reduce the chances of socially unacceptable uses of the technology. Video in the workplace can be a very sensitive issue and will raise all kinds of concerns for people. And rightfully so.

There are several steps you should take *before* the decision is made to install the equipment. These can help to defuse any misunderstandings before they occur. Some of these steps are social solutions, others are technical solutions.

Education

The most important step that must be taken is education. Recognize that these tools have implications throughout an organisation, not just for the individuals who use it; so the whole organisation must be educated about the systems. Important topics to cover include:

- the strengths and weaknesses of videoconferencing,

- when it is appropriate to use videoconferencing, and when it is not,

- understanding just a bit about the technology, and

- etiquette with videoconferencing (videoquette).

User Groups

Setting up a user group is a very important part of the education process. It is also a way for people to raise their concerns and have them addressed before the systems are installed. User groups should be listened to very carefully. If people are unhappy with the idea of videoconferencing before it is installed, it is unlikely that they will adopt the technology as an important part of their work practice. Listen to them, learn from them, and make their

concerns yours. This will help you to decide if, when, where and how to deploy videoconferencing in your workplace.

Establish social conventions in advance

Although every effort is being made on the part of the system designers to insure that the technology supports our normal social conventions, it will never replace the richness of face-to-face communication. Before people use the system they must be made aware of the potential social inadequacies of their particular videoconferencing technologies. They should adapt mutually agreed upon techniques for avoiding social faux pas through video.

For example, it is rare that a video camera can see everything in an office, and it is often the case that there is someone at the distant office that cannot be seen by the camera. Imagine the possible repercussions if your distant colleague has a visitor in the office, who is not visible through the camera, and you begin talking about confidential information. The lesson here is to always announce who is in the room, whether they can be seen or not. See the section on videoquette for more suggestions.

The point of establishing these social conventions in advance is so that everybody can take steps to avoid these socially awkward and potentially serious situations. Besides, discussing social conventions and other issues in a user group situation helps everybody to understand these tools better, hopefully leading to more and richer uses of the system.

Earcons and security lights.

Most desktop videoconferencing systems present 'earcons', or tones, before video calls are established. They are like icons for your ear, in this case serving much the same purpose as the ringing of the telephone. A few systems also have small lights in the cameras which turn on when a video connection is established. At least one company has a system whereby sliding a lens cover over the desktop videoconferencing camera turns both the camera and microphone off, thus providing complete confidence that nobody can see or hear you without your permission.

4. How do I make a business case for videoconferencing?

If you are serious about introducing videoconferencing technologies into your workplace, you will probably have to create a business case to justify the expense. Building a good business case requires both hard number crunching and some skillful strategising. Depending on your situation, you may have to do more of one than the other. As in all business analyses, you need a clear understanding of the business and financial objectives of each major stake holder involved in the decision before you start.

What are the Strategic Benefits of Videoconferencing?

Most of the time, videoconferencing purchases cannot be justified based on the benefits to any one project or contract. It is an element of organisational infrastructure, touching many products and processes—and infrastructure can be hard to cost-justify. But, by the same token, it can significantly affect the entire organisation.

Some firms can cost-justify videoconferencing based on a key problem in one of their **primary activities.** Others treat videoconferencing as yet one more kind of communications medium provided as infrastructure to the entire firm. To build a business case which properly reflects the full organisational impact of the acquisition of videoconferencing, you should consider where it can be effectively applied in *your* organisation's value chain.

If you can show its utility and value in a number of different primary activities, then you will have a much stronger case than if only one group could be shown to need it.

What are the Financial Benefits of Videoconferencing?

If you are going to cost-justify videoconferencing, you need some measures which will tell you if the benefits outweigh the costs. Depending on which metrics you use, you can get different answers to the buy/don't buy decision. The most basic measure is Profit, defined as Revenues—Expenses. This measure is often used initially as a simple check to see if it is anticipated that videoconferencing will reduce current costs or increase current revenues in your organisation.

Another commonly employed measure is Productivity. If it is improved productivity you are after, there is only one way to get more for less, and that is more outputs for fewer inputs.

$$\text{Productivity} = \frac{\text{Outputs}}{\text{Inputs}}$$

But making money tomorrow may not be a good enough argument if money is tight today. Thus you might have to anticipate the timing of the cash savings or revenue improvements. Some firms have procedures to ensure that their cash flow is carefully managed. You may have to include a financing strategy in your cost-benefit analysis that will show how you will offset the monthly payments on the videoconferencing system with cash savings on meeting expenses or improved revenues.

Then there is the issue of the cost of capital in your organisation. You may need to develop a model which accounts for the net present value of all the increased revenues and decreased costs you anticipate. It's very nice if you can show improved profits from the

videoconferencing initiative, but what if someone else in your organisation could use that money to make even more money for the firm?

As you can see, it's important to choose the right measures on which to gauge the anticipated quantitative benefits of videoconferencing. Once these are chosen, you can go about gathering data and building your case.

Basing your Decision on the 'Travel Costs' Argument

Traditionally, people seek to justify the purchase of videoconferencing systems on the basis of anticipated travel cost savings. Their operative assumption is that if the organisation has an in-house videoconferencing system, they will need to travel less.

Setting up a spreadsheet to check this is fairly straight forward. On one side are the costs for airfare, ground travel, hotel, food and entertainment boosted up with some figures accounting for the costs of all the unproductive hours spent preparing for an extended absence from the office and the time in transit. On the other side are the capital costs of the videoconferencing system, installation, maintenance, training and telecommunications charges. This cost justification method is simple to compute and gives an immediate indication of value. But, this does not tell the whole story.

First, studies show that while videoconferencing can reduce travel and its associated costs, it tends to do so only early on in its use. Once videoconferencing becomes integrated into your organisational processes, you will find that it will change the reasons for, and the destinations of, your travel. For instance, you may find yourself making fewer problem resolution trips to clients (because communication between you has improved) but now you have time to make sales calls to establish relationships with new clients. This is a good result—but difficult to account for in financial models.

Remember, Numbers Do Not Tell the Whole Story...

Just because financial objectives can be quantified and analysed, doesn't necessarily make them paramount. Many of the benefits of videoconferencing are unquantifiable—but nonetheless valuable. Here are a few:

- intangible process and productivity improvements in the primary activities of the firm (including marketing and sales),

- information brokering among employees (lead tracking, rapid response to problems, in-house mentoring opportunities, etc.),

- internal networking which propagates corporate values, cohesion of objectives, and better job satisfaction,

- external networking which can lead to strategic alliances, targets for acquisition or recruitment of personnel with skills key to the success of the firm.

In the end, diligent analysis must be tempered by good judgment.

5.   Now I'm really listening—what do I do next?

It may come as a bit of a surprise but the first steps you should take have little to do with the technical aspects of videoconferencing. Now that your interest has been sparked you need to step back and to think about *your* organisation, how you accomplish your objectives today and how videoconferencing can help you to be more efficient and effective.

The introduction of any new technology, or set of procedures in your organisation involves you in the exciting process of innovation. But innovation frequently fails for social, and not technical reasons. Bringing videoconferencing into your organisation is about managing and planning change—not about new hardware or software. This should be obvious, but is often forgotten. Success depends on getting the right application to the right people at the right time, in conjunction with leadership, support and commitment of senior staff *and* the actual users.

Now that you are excited about the potential of videoconferencing, here are a couple of things to think about before you start:

- Think about this as an opportunity for organisational innovation, not simply the purchase of new equipment,

- Think hard about your organisation. You are excited, but how do you get others in your organisation interested in exploring this, and who do you need to get onboard?

- **Always remember that successful innovation requires leadership, planning, support and commitment from both senior management *and* the actual users.**

The following is a model to guide organisational innovation which has been modified to take into account some of the unique features of videoconferencing. Every organisation is unique in many ways, so you need to take your own organisation into account in applying this model.

The model has two major parts; what to do *before* you get your videoconferencing system and what to do *after* the system arrives.

What should I do BEFORE the technology arrives?

Planning and preparation

There is a high cost to an organisation, both financial and in terms of morale, of a failure to adopt and use any new technology. It is crucial to evaluate organisational readiness and to determine the most appropriate lead users of videoconferencing in your organisation. At this stage you need to look at your organisation and its workplace(s) from a variety of perspectives.

Think about the present condition of your organisation in terms of its structure, culture and climate.

Organisations vary in terms of their structure and culture. You know best how your organisation works. Time spent at the outset in creating a positive climate for innovation, communicating the vision and exploring the potential of videoconferencing with those affected will help build consensus and commitment for the next stages.

Begin by reviewing your past experiences with technological innovation to help you identify things that have lead to successes or disappointments in the past. Perhaps you recently added a voice mail service, or are using a new application such as electronic mail. Try to understand why problems occurred (e.g., was the change not supported by senior management, were there technical problems, were employees not informed of impending changes or was the training inadequate?). And also try to understand what contributed to your successes (e.g., the innovation improved the quality of work life, those whose work was directly affected were involved at an early stage, there was a respected early user, clients with whom your employees worked appreciated the change, etc.?).

Think about your organisation in terms of the nature of the work employees do, who they work with and the ways they currently communicate.

If you stop and think you'll realize that you already use a number of communication technologies today and you unconsciously choose among them. At times you simply want to leave a voice message, other times a written record is required—e-mail may be sufficient, or a paper copy may be necessary. Videoconferencing offers new opportunities and allows for a richness of interaction and support for the work of teams, especially over distance—work that cannot be accomplished with other media.

Distance does not only mean distance across town or between countries. People often work as part of a group, and often are members of several work groups. Videoconferencing will help bring together co-workers located on different floors of a building, or in different cities. However, the nature of the work and the work practices of the users must be taken into account at the outset. Don't repeat the unfortunate experience of one organisation that gave a desktop videoconferencing system to a number of staff who spent the major part of their work day away from the office!

How well you understand your organisation and the ways in which people actually accomplish their work will clearly affect the future outcome. You may feel comfortable undertaking this task yourself, but if you feel you need help there are consultants who specialize in this area.

Who should I equip with videoconferencing tools?

Once you've thought carefully about your organisation, you will probably have some ideas about how and where videoconferencing might help you. The next step is bringing together representatives from the areas you've identified for a meeting or series of meetings. Your goal is to identify a lead group of users, or early adopters, and to create a positive climate for innovation.

At these meetings you might:

- introduce the concept of videoconferencing,

- host a demonstration by prospective vendors,

- answer questions and discuss any concerns about videoconferencing, such as the effects of video on privacy, surveillance and accessibility,

- hear how videoconferencing has been used in other organisations, and

- most important, get feedback on how videoconferencing might help this group. Remember, we all know how we carry out our own work, but we seldom understand how others *actually* complete their tasks. Let your potential future users tell their stories. You will learn a lot by *listening to them.*

You may decide to start with one group of lead users, or choose several groups. In either case you need to work closely with the early adopters, as their experiences will affect subsequent diffusion of videoconferencing in the organisation.

Just in case you are feeling that this is a lot of work before you even get the system, you should be aware that the time required to carry out these steps will vary widely and depend on the nature of your organisation and your staff. For example, in a small organisation with a relatively homogenous staff used to working in groups the process may be short and very informal. In a more complex organisation (e.g., with a deep structure and multiple cultures) the process may need to be more formal. You know your organisation; the goal is more than just innovation, it is successful innovation. You decide on the time to allocate.

Establish a User Group

The establishment of a User Group made up of the lead users who will get videoconferencing is an important first step. In a large organisation you might start with representatives from each group. This provides a forum for supporting the innovation process and soliciting feedback.

Before the technology arrives the group may want to do several things. For example they may wish to have a more detailed demonstration of the videoconferencing system that has been purchased.

They may also want to arrange further opportunities to discuss concerns about video in the workplace (e.g., privacy, ethical issues, how they will look, etc.). As the group becomes comfortable with each other these issues will emerge naturally and should be addressed directly. For example, they might ask how (and whether) the designers of the system have dealt with the ethical issues that concern them. These are important questions and your vendor should be prepared to address these concerns.

They should also be consulted on their individual preferences and requirements—for example, do they require a headset? what is the best placement of the equipment in the workspace? and so on.

What should I do AFTER the technology arrives?

Now is the time for the vendor and the installers to get the system up and running. Because you've done such careful planning and worked closely with the staff before the equipment arrived, you should have few organisational concerns at this stage.

Once the technology is operational the focus should return to the users, both as individuals and as members of a group. This is essentially a continuation of the work you were doing before, but now you'll have real experiences with the system on which to base your discussions. Here are some of the things you should do after the technology arrives.

User Group

This group will continue to play an important role in how the system is used in your organisation. By providing feedback on both the successful uses of the system and on problems they encounter, the users have the opportunity to fine tune the system to meet their needs. This participation not only empowers the users and involves them in the process of innovation, but also stimulates the integration of the technology into the organisational culture.

Training

The users should be trained in the use of the system, but they should not be 'overtrained'—i.e., trained to the point that they no longer explore and experiment with the technology. It will be the early users who 'discover' innovative ways to use the technology in *your* organisation. These are often very different than the ways you anticipated.

Documentation

Documentation will be provided by your vendor, but you might encourage the User Group to develop their own documentation process and to produce brief commentaries based on their personal experiences with videoconferencing in the organisation. Remember, some members of the group of lead users may be your best trainers when you extend the services in your organisation.

Communicating the change within the organisation

You should keep the rest of your organisation informed of your experiences with videoconferencing. You might do this through the company newsletter or regular staff meetings.

Expanding the use of videoconferencing in the organisation

Finally, if you've found the right application, the right lead users, and supported them through the process you probably have by now strong in-house support for videoconferencing. Demand for the service will grow through *social pull* rather than *technological push*—and, just maybe, the spirit of innovation will be catching.

6.   Do you have any tips for success?

As much as we might want it, videoconferencing never has been and never will be the same as face-to-face communication. There are many opportunities for videoconferencing to be misused and to have serious negative effects on a conversation or a meeting. These guidelines are a starting point for you to understand more about what you should and shouldn't do to insure a positive experience for all parties.

Video Surrogates

It is often helpful to imagine the camera, monitor, microphone and loudspeaker as being a 'video surrogate' for your distant colleague. The monitor is their face (or body), the loudspeaker their mouth, the camera their eye, and the microphone their ear. By treating these physical components as a representation of your distant colleague, you may begin to better understand how to communicate effectively through these new tools.

Understanding the view from your camera.

There are many things which affect what your camera can see, and you should take these into account when deciding where to put your camera. Try different placement and lighting conditions before you commit to the arrangement of the camera and monitor in your office. You might even want flexibility for different types of meetings, so think about this in terms of how you set up your equipment.

What you see is not necessarily what you expect

In a face-to-face meeting, you are always aware what your colleague can see and what they are looking at. With videoconferencing your colleague has very little control over what he or she sees. This is, socially speaking, a new and highly unusual arrangement. Some systems have a 'mirror' which lets you see how you look through your camera to preview how your colleagues will see you. You should always check this view before you have a video meeting. Verifying what they can see before you begin will prevent unexpected surprises.

To think about this another way, anything you do with your camera in your office will have very little effect for you, but can have major effects on what your remote colleagues can see. Apparently small changes on your side can have huge consequences on theirs.

Eye contact and gaze awareness

We use eye contact as an important part of our communication. Often, when we want to stress a point, or when are looking for feedback on a new idea, we look directly into the eyes of our colleague.

A second way we use our eyes is something called 'gaze awareness.' This is that familiar sense of awareness that someone is looking at you, or perhaps looking at the object or document you are discussing. This is an important aspect of communication that is often disrupted by videoconferencing. One way to help support gaze awareness is to locate the video image of the person on a monitor separate from the computer screen. This permits us to know when our colleague is looking at the computer screen and when they are looking at us.

Camera angle

Consider where you will be working when you have your video meeting, and try to put your camera at eye level or slightly higher. This will not only improve eye contact, but also will make the camera as 'neutral' as possible. Remember, film and television directors intentionally put the camera above or below eye-level to give the illusion that the subject is somehow either inferior or superior. They understand the powerful effect that camera angles can have.

Camera placement

When your camera is facing you, it can see not only you but who and what is behind you. Be sure that you understand what is behind you when you decide where to put your camera, so that you are aware of what else your electronic colleague can see when talking with you. You might want interesting bookshelves or pictures behind you. You might want your open door behind you so your colleagues can see who is coming and going around your office. This can provide important social cues about who is around your office, an important component in helping your distant colleague feel 'at home' in your office.

Field of view

The 'field of view' of a camera is the range of things the camera can see. If you connect your camera to your monitor (or use the 'mirror' feature of most videoconference systems) everything that the camera can see is in its field of view. This is controlled by the placement and position of the camera, and by the lens in the camera. Be aware of the boundaries of what your camera can see, to the left, the right, the top, and the bottom.

How close are you?

A videoconferencing system is intended to allow someone remote from you to communicate with you, so you should insure that most of what the camera sends to your remote colleague is your image. You want your colleague to focus on their communication with you, so you should try to position yourself so that you (or your head) fill most of the field of view of the camera. If you are too small in the image, you will not have 'presence' and may not have the impact you expect.

Lighting

The lighting in your work environment can significantly affect the impression you give to your colleague. Film and television directors use lighting to affect your perception of a scene. You might have experience with the effect that light has on the quality of your photographs. You should also be aware of the lighting in your videoconferencing environment. The most important part of the image you are sending to your colleague will usually be your face, so be sure to take steps to insure your face is well lit. Here are some things to be attentive to:

back lighting

• if the light in your office is predominantly from behind you (with respect to the camera) you may appear as a silhouette to the camera, and your facial features may not be seen. Try to avoid being backlit.

bright background

• if the background behind you (with respect to the camera) is bright, you may appear as a silhouette to the camera, and your facial features may not be seen. Try to place the

camera so you have a relatively dark background. It is not a good idea to have a window behind you, as the bright light from the sun can affect how you are seen by the camera.

front lighting

• this is the ideal lighting for videoconferencing, and it has the potential to make your picture more flattering. Sometimes a small incandescent or halogen light somewhere in front of you, perhaps lighting a corner of your office, is all that it takes to have effective front-lighting. If you have a window in your office, try to place the camera between you and the window, so natural light can brighten your face.

top-lighting

• if the light in your office is predominantly from above, your eyebrows and nose will cast shadows, and your facial features may not be seen. If this is the situation in your office, try to supplement the overhead light with some front lighting or with natural light.

Sound quality is at least as important as image quality.

It will come as a surprise to many that in a videoconference the sound quality is at least as important as the image quality, in some cases much more important. Several experiments have shown that when you improve sound quality in a videoconference people perceive the image as improving, without noticing the improved sound.

Avoid audio feedback

Audio echo and audio feedback occur in videoconferencing when a loudspeaker projects a person's voice, which is picked up by a microphone, which then sends the person's voice back to them. Some videoconferencing equipment introduces a delay in the transmission. In this case the feedback is perceived as an echo. Some videoconferencing equipment has no delay, and in this case the feedback is perceived as a very loud electronic whining. Proper placement and use of audio equipment can reduce or eliminate audio feedback.

Loudspeaker and microphone quality.

Make sure the microphone and loudspeaker you use for videoconferencing are of the highest quality you can afford.

- • the cheaper the equipment, the more 'noise' it creates,
- • the more 'noise' in the system, the louder the loudspeaker must be played for intelligible speech,
- • the louder the loudspeaker, the greater the potential for feedback or echo.

Our experience has shown that PZM microphones are excellent inexpensive microphones. Also recommended are single, shielded, self-powered loudspeakers, with cabinets that direct the sound in a particular direction. Loudspeakers which radiate the sound all around them, such as cheap multimedia loudspeakers, and loudspeakers built into monitors, are a primary cause of audio feedback.

Loudspeaker and microphone placement

The goal of loudspeaker and microphone placement is to reduce the amount of loudspeaker output that reaches the microphone (thus avoiding audio feedback and echo), while at the same time maximizing the amount of your voice that reaches the microphone (thus improving the

intelligibility of your conversation). One solution is to place your microphone and loudspeaker so that they meet the following requirements:

- the microphone is directly in front of you when you talk to (or look at) the monitor you use for videoconferencing,

- the loudspeaker is a 'directional' speaker (one that projects sound primarily to the front),

- the loudspeaker is located between the microphone and you,

- the loudspeaker is located immediately beside or under the monitor you use for videoconferencing, pointing towards you (and away from the microphone).

A directional loudspeaker is very important. Omni-directional loudspeakers may project the loudspeaker sounds towards the microphone, increasing the chance of audio feedback and echo. Omni-directional loudspeakers are frequently found in inexpensive video monitors, televisions, and multimedia loudspeakers.

Don't strain your voice

A definite indicator of poor sound quality in a videoconference is the need to 'raise your voice' above normal conversation level. If you have to strain your voice above normal conversation levels, your sound equipment needs attention. You should adjust the positioning of the equipment and/or get higher quality equipment.

Noisy environments

When you are using a microphone/loudspeaker arrangement for your videoconferencing, you in fact have a fancy speaker phone. As with all speaker phones you may encounter difficulty using them in certain work environments. If your office is in an open environment, such as a cubicle, any sound from a loudspeaker may be disruptive to nearby co-workers. Try to be sensitive to the volume of your loudspeaker, and your own voice.

Headsets and handsets

In open office or noisy environments headphones and headset microphones such as those worn by receptionists and rock stars may be desirable. The ear piece has the benefit of directing the 'speaker' directly into your ear, with no chance that the microphone will pick it up. The headset microphone has the advantage of always being perfectly located in front of your mouth, no matter where you turn your head. A normal telephone handset could also be used, but it is not hands free.

Two heads are better than one (using a separate monitor)

Some desktop videoconferencing systems allow you to use a separate video monitor to display the video image, while others require the video to be displayed on your computer screen. We strongly recommend that you use a separate video monitor for a videoconferencing.

First, using a separate monitor allows a clear separation of 'person space' and 'task space.' Having a separate space for your electronic colleague and your computer workspace allows you to treat the second monitor as a video surrogate, and use the first monitor for your document. This is especially important when you are working together on a shared document. You don't want to 'bury' your colleague under a document!

You also have the potential to have a better illusion of eye contact and gaze awareness, if you arrange your equipment appropriately.

Some offices have a small meeting table for three or four people. Using a monitor separate from your computer screen makes it relatively easy to move the location of the electronic visitor within the office.

Using a separate monitor is similar to the arrangement in a videoconference room. It allows you to use similar tools and techniques from you desktop and from meeting or conference rooms.

Try it, you'll like it. You may never look back.

A bit about 'videoquette'.

As much as we might want videoconferencing to be exactly like 'being there', it is unlikely that it will ever be as rich or intuitive as face-to-face communication. There are plenty of opportunities to make social faux pas, so here are a few tips to help you get started.

- Always check your camera before you make a video call. Be sure it is adjusted correctly. Use the 'mirror' function if your system provides one.

- Always announce if any other people are in your office at the very beginning of your videoconference. Your camera might not see everybody.

- Remember that there might be people at the remote site that you cannot see. If your caller doesn't tell you, ask if anyone else is there. You wouldn't want to accidentally embarrass someone.

- Remember that slight adjustments of equipment in your office may have few effects on you but huge effects on the other side.

- Try not to have more than three people in your office for a videoconference.

- When your videoconference is using a codec, don't move around too much. Codecs work best if only your lips and hands move.

- Take time to arrange the lighting and camera placement in your office.

- Codecs introduce about a half-second delay in the transmission of audio and video. Experience with the system will help you become comfortable with this.

7.   What are other organisations doing?

The following are realistic and representative tales of how videoconferencing may be used by organisations. These are composites and do not refer to any individual company practice.

Scenario 1: The Office High-Rise

ABC Corp is a large management consulting firm whose head office is located in a high-rise office tower in the downtown core of a metropolitan centre. The firm occupies several floors in the tower, and recently opened a branch office in the nation's capital in order to accommodate its increasingly distributed client organisations.

The opening of the new office got ABC interested in videoconferencing. For the first time its consultants would be *permanently* away from head office, and the senior partners were concerned that the organisation might suffer as a consequence. The partners understood that virtually all ABC's projects require input from a variety of experts over the life cycle of the project, and that partners in the branches would need to work with colleagues at head office on an irregular but ongoing basis. The initial motivation was to improve the quality of communications between the two locations and to defray the high cost of travel between the two offices that they felt would otherwise be required.

Meetings were held with the consultants from both offices, and a small committee was set up to review the various videoconferencing systems currently on the market. At the end of the day, a decision was made to purchase a desktop videoconferencing system which used a hybrid analog/digital network. In this way, all the consultants could be provided with desktop units at a very low cost per unit, and the branch office staff would have access to whatever expertise they required. This system was installed, the staff trained, and both the branch office and head office consultants reported satisfaction with the videoconferencing system. However, this was not the end of the story, but only the beginning. Something unexpected happened at head office.

Traditionally, each consultant worked on a number of projects at any one time and regular meetings of each project team were scheduled to communicate changes, assure deadlines were being met, etc. In between these meetings team members met as required, one on one or in small groups. This was relatively easy to achieve, given that they were all in the same physical location.

But the availability of desktop videoconferencing meant that some of these meetings could now be held without leaving personal offices or cubicles—in fact there was an advantage to meeting from the office, as there was immediate access to documents and client files. This saved time, improved effectiveness and reduced the 'travel' between floors of the building. In addition, consultants could attend to important phone calls as necessary. By combining the in-house use of videoconferencing with the document sharing software they were already using, they 'discovered' a powerful new way of accomplishing some of their work. Solutions could be checked and shared with key members of the team in advance of the regular face-to-face meetings, so that the quality and efficiency of these meeting also improved. The short, timely, impromptu meetings the system facilitated made them realize that the distribution of their work groups over a number of floors in a high-rise actually meant that they were not in the same location. The effect of distance on communication was not something they should have thought about only in terms of distance over the ground.

But more discoveries lay ahead. The videoconferencing system the firm had chosen provided a feature that let them 'broadcast' a small grainy image of their office to other members in the organisation whom they selected. Similarly, they could receive an image of these colleagues.

Since many of the consultants were out of the office on a regular basis they appreciated the fact that they could 'see' at a glance who was in the office that day, eliminating the never-ending game of telephone tag and elevator rides to empty offices. Consultants had been skeptical of this feature at first, but once they understood that each person was able to determine *who* could see them, and that these permissions could be altered with the click of the mouse if they needed privacy, they found that this improved the quality of their work environment. In fact, it was as if the people they needed to be in touch with at any point in time were sharing a common space—whether it was their colleagues hundreds of kilometers away, or those just upstairs; you didn't hear John's keyboard clicks, or Mary's characteristic footsteps, but you knew when they were in.

Videoconferencing had initially been seen by ABC as a technical solution to a communication problem between two offices separated by several hundred kilometers. However, improvements in the quality of work life, in efficiency, and in effectiveness in this highly dynamic and fast moving business were an unexpected bonus. The technology was *integrated* into the work practices of members of the organisation, and was not just another appliance taking up valuable desk space. It was also integrated with existing communication tools, such as screen sharing, to provide even more powerful applications.

A final note. With ABC's success with in-house videoconferencing and the insights they gained in the usefulness of videoconferencing for firms in a single location or with offices within a small geographical area, they have decided to develop a new area in their consulting practice, tentatively called "An ecological approach to technological innovation".

Scenario 2: The Distributed Organisation

XYZ is a retail organisation with corporate headquarters and several stores in one metropolitan area. It is expanding rapidly and plans to open several new stores outside this geographical area within the coming year. The success of the organisation has been built on maintaining close communication with managers in the stores; there are monthly visits to each location, purchasing is handled centrally; and marketing handled by a local agency which meets regularly with one of the corporate executives. Senior executives are already beginning to experience difficulties in maintaining close communication with their managers, a special concern in an organisation where centralised control is a feature of both the structure and the culture, and is felt to be a major reason for the company's success. The corporate staff, including the executives, are already away from the office more than they should be and this problem is expected to get worse as geographical distance between stores increases. In addition, the building of new stores in distant locations, the hiring and training of new staff for these stores, will require close contact, at least initially; and the cost of travel, both financial and in terms of executive stress, is a serious concern.

The traditional motivator of reducing travel was a major reason the organisation executives first considered videoconferencing. But they also understood that videoconferencing adds a richness to social interactions that will help communication, build group awareness and maintain the organisational culture. While videoconferencing will not replace face-to-face communication and they expect to continue to travel extensively they will use videoconferencing to stay in close contact as face-to-face meetings become less frequent.

It was also clear that XYZ needed flexibility in the way in which the videoconferencing system was deployed if it was to meet the diverse needs and work practices of its various departments—e.g., purchasing, marketing, operations and personnel. At corporate headquarters there was a need for access to videoconferencing from private offices, as well as a need to equip a conference room and small meeting rooms that could be booked for specific uses by various staff—for example, where buyers could 'meet' with sales representatives. Traditional videoconferencing systems do not generally provide this flexibility; the

conference room systems provide access only from one location; and standalone desktop systems are dedicated to a single location. Recent developments in desktop videoconferencing, however, provided them with an exciting opportunity to achieve their multiple objectives. They purchased a system that permitted them to integrate desktops, meeting rooms and their conference room. A single codec could be used from any of these locations, while still allowing local users to make in-house use of the system.

The decision to proceed with videoconferencing was made only after consultation with the staff. Representatives from each department affected were involved in planning the deployment and in keeping other members of their group informed. Orientation and training sessions were also scheduled. The result was that when the system arrived the staff were prepared. The videoconferencing system was found to be a useful addition to the existing communication media, such as the phone and electronic mail. However, the users soon began to find innovative ways to use the system and to integrate it with other technologies already in the office environment.

For example, the executive in charge of overseeing the building of the new stores already received videotapes of the construction site. With videoconferencing he could now hold 'on site' meetings with the construction manager. Videoconferencing provided a rich medium for discussing problems and negotiating changes to the work orders. In the past many of these problems had required a site visit, but with the ability to meet easily when real problems arose, and not only in response to a fixed schedule, the relationship between the site manager and the executive improved.

In the personnel department the system was used in more traditional ways, but the effects were similar. This department faced enormous problems in recruiting and training staff, especially for the remote stores. Junior personnel officers in remote locations could pick up the phone and call headquarters for advice, but informal relationships with the corporate headquarters staff had not developed. These relations were now fostered by the availability of video and resulted in increased reports of job satisfaction from both the field staff and headquarters.

The purchasing department made still another use of the system. Traditionally sales representatives arrived at headquarters with samples of merchandise for the buyers to review. Using the camera associated with the videoconferencing system in the small meeting rooms, the buyers could meet suppliers unable to travel to them and actually 'see' the merchandise being offered by the remote vendor. While everyone agreed that this was not a replacement for being able to handle the product and make deals face-to-face, it did help screen potential new suppliers and also improved relations with those already selling to the organisation.

Finally, videoconferencing, combined with screen sharing, provided a powerful new tool for the marketing department whose work involved numerous deadlines. The marketing firm that headquarters relied on was located in the centre of the city, while headquarters was on the periphery. At busy times of the day this could involve an hour of driving time each way (to say nothing of the parking problems in the downtown core). Given the intense and creative nature of this work, videoconferencing did not eliminate the need for regular meetings, but it did provide the opportunity to hold brief meetings on short notice when decisions had to be made against fast approaching deadlines — meetings in which the participants could both see and hear each other *as well as* share and mark up a copy of the ad or flyer in question.

XYZ is currently placing videoconferencing systems in all its stores and exploring ways in which these systems can be used in orientation and training. A serious concern for distributed organisations is keeping everyone in the organisation up to date with corporate policy and building staff loyalty. XYZ sees video communication as one way to build community within this highly distributed and diverse organisation.

8.   Frequently Asked Questions

What is Videoconferencing?

> Videoconferencing is a technology that lets people see and hear each other even through they are physically separated. Using video cameras, monitors, microphones, and loudspeakers at each site, the participants communicate with each other over telephone lines or satellite links.

What is desktop videoconferencing?

> Desktop video conferencing is a fast growing segment of the videoconferencing market. It provides videoconferencing utilities through the ubiquitous personal computers populating the desks of most modern organisations. It is usually intended for single users to connect to other single users. This differs from conference room systems which are intended to let groups of individuals connect to other groups. They are usually much less expensive than the room systems, but often with significantly lower quality. Some new desktop systems use a hybrid analog/digital network to drastically increase the quality of communication from the desktop. Many of these systems present the video image on the computer workstation, but some of the more innovative allow you to use a separate video monitor.

Why should I use a separate monitor?

> Using a separate monitor for displaying the person you are meeting with has several advantages over using the computer screen. The computer screen has limited space, and the video image often obscures windows with information you may need for your meeting. The use of separate monitors enhances the illusion of eye contact and gaze awareness.

Why should I care about videoconferencing?

> If your organisation is committed to continuous process improvement, you should be looking at videoconferencing as an enabling technology. Many organisations around the world are integrating group collaboration tools, like videoconferencing, into their work practice. The installed base of videoconferencing systems is more than doubling every year — by 1996 nearly 90,000 desktop systems will be in use. Users report that it improves the effectiveness of their firms' internal processes and extends their business reach to new customers and markets.

How does it work?

> Each site in a videoconference has a camera, video monitor, microphone, loudspeaker and a video 'codec'. The remote person is then 'dialed-up' and can then be seen on a television monitor (or in a window on a computer screen) and heard over loudspeakers. Similarly, the remote person sees and hears the caller.

How do I deploy it in my organisation?

How you deploy is at least as important has **what** you deploy. You should have an incremental strategy whereby you equip a small team of initial users and then, over time, deploy it more widely in your organisation. The groups you equip should already have a need to communicate with each other. The technology by itself will not stimulate interaction among individuals who have no reason to communicate. It may be a good idea to bring in some outside experts to help you determine *where* your communication needs are greatest, *which* of your staff are likely to be 'early adopters', and *how* you can maximize the potential of the early installation for your corporate context.

What are the tangible benefits?

Reduced travel costs are the most often cited benefit of videoconferencing. With reduced travel also comes increased staff availability, reduced stress, and reduced personal risk. However the benefits of the secondary effects should not be overlooked. Successful use of videoconferencing can lead to more frequent customer contact, better internal communications, early problem detection and resolution, more flexible work groups, and strategic advantage over competitors. These are less quantifiable, but no less valuable benefits.

What is a 'codec'?

At the heart of many videoconferencing systems is a device called a 'codec', which is short for COder-DECoder. Using special hardware and software, the codec converts and compresses video images to make them suitable for transmission over long telephone lines. Some videoconferencing systems require one codec per user, others have schemes to share a codec among several users.

Can all codecs communicate with on another?

No. There is a global communications standard (called 'ITU H.360') which is increasingly being adopted; however, many vendors still promote their own proprietary solutions. These proprietary approaches often have better performance but are incompatible with the international standards. Many mid to high-level systems now offer the ability to switch between the standard and their own proprietary techniques.

Who else can I connect to?

Nearly 90,000 desktop videoconferencing systems will be installed by 1996. While there is no 'directory' of people you can call, neither was there a directory of fax numbers in the early days of that technology. More and more people with videoconferencing systems are putting their video numbers on their business cards; yet one more way that they can be reached.

What is a teleworker? What is telecommuting?

Teleworkers are entrepreneurs or salaried employees who work from home offices at least some of the time. Typically, they use the telephone system to connect their personal computers to corporate mainframes or LANs. Many are now using these same communications networks for videoconferencing. People who are 'teleworkers' are said to 'telecommute'.

Can I use this to telecommute?

Videoconferencing is one of the enabling technologies which make telecommuting possible. Many firms are now using videoconferencing together with other groupware tools in telework programs. However, care must be taken in the selection and design of the work processes that link the teleworker to his/her colleagues. Videoconferencing by itself does not make a telework initiative effective.

Will this reduce travel costs?

Generally, yes. If an organisation has an in-house videoconferencing system, employees will likely travel less to places which also have one. Costs saved include airfare, ground travel, hotel, food, and entertainment. There are also savings in the cost of the unproductive hours spent preparing for an extended absence from the office and the actual time in transit. Over time staff will tend to re-target their travel destinations to locations where face-to-face meetings are important. Travel costs themselves are not the issue, it's the profit generated as a result of the contact that is important.

Is this multi-media?

If you go to a 'multi-media' trade-show, you won't see a lot of videoconferencing systems. In a literal sense, videoconferencing technology certainly supports the many media necessary to affect visual, aural and graphical communication between people. However, popular usage of the term multi-media tends to refer to a class of consumer goods involving interactive sound, graphics and moving images—like CD-ROM.

Isn't this like Big Brother?

Certainly not. Videoconferencing is reciprocal—I see you and you see me. It is not surveillance where only one party does the looking. As well, just about every desktop system has built-in features which allow users to set various privacy modes restricting others access to you.

Is it easy to use for a very short meeting?

Desktop systems are particularly well suited to quick, spontaneous meetings. Many have user-interfaces which allow for the creation of 'speed-dial' directories. No rooms need to be booked. You don't even have to pre-book the time—if the remote party answers your call, you meet; if not, you try again later.

How might I use it?

Most kinds of business meetings can be held by videoconferences. You can use the systems for staff training, remote delivery of presentations or other talks, telework from home, and many other uses. One group even used their conference room systems to hold a corporate Halloween party between cities.

What kind of computer resources does this require?

Conference room systems do not usually require a personal computer to operate. Classroom systems often do need a central personal computer to control the various cameras, monitors and other peripherals. Desktop systems all require a personal computer to perform various tasks. Each manufacturer has different PC and/or LAN requirements.

How do I compare competing systems?

If you are considering a major purchase of videoconferencing equipment, or if the deployment is strategic to your organisation, then get some advice from a respected consultant who is expert in this area. There are now nearly 100 competing videoconferencing systems on the market, each with their own unique features, constraints and quirks. What must be paramount in the decision is the fit between your organisations' culture and work practices (both current and planned) and the systems offered by the various vendors. Without this context, no one system can be said to be better or worse than any other system.

What kind of equipment do I need?

Generally, three kinds of equipment are required: peripherals; codec; and transmission lines. Peripherals may include: a video camera to capture your image for display to others; a video monitor to view the images of others; a microphone and a loudspeaker to hear and speak to others; and a device called a 'codec', which contains the hardware and software to compress and translate these signals for transmission. The transmission lines are the conduit that carries the images and sounds between participants.

Different manufacturers package their offerings in different ways. Some will provide you with an 'out-of-the-box' solution which provides you with everything you need. Others build on a personal computer and LAN base and thus require certain kinds of base hardware and software.

We're moving from LAN to WAN—where does this fit in?

The ability to more effectively communicate data from one part of your organisation to another provides you with an efficient telecommunications infrastructure for the implementation of corporate-wide videoconferencing. Some videoconferencing systems can tae advantage of your WAN. Check with your videoconferencing vendor for details.

What does it cost?

Systems range in price from a few thousand dollars per desktop to hundreds of thousands of dollars for fully configured distance training classrooms. The videoconferencing landscape is changing rapidly and with it prices are dropping.

Can I share documents as well as see the person I'm talking to?

Major conference room systems have an optional 'document camera' feature. This allow the transmission of the image of a document or object in addition to the video image of the people. Many desktop videoconferencing vendors create group collaboration 'solutions' which bundle their videoconferencing equipment with data-conferencing software. These allow for the sharing of computer screens (what-you-see-is-what-I-see) while the main videoconference is underway.

What does it cost to operate?

The main recurring charges are telecommunications fees; both line rental and long-distance. Like most things in life, you get what you pay for. If you are content with a basic, low-quality video image in a tiny window on your computer screen, a simple business telephone line will do (plus long-distance charges). On the other hand, if you require television quality images, then you will need to lease some special data circuits, which could cost thousands of dollars per month.

Where can I try this out?

Most manufacturers and their agents will be pleased to set up a demonstration for you at their site. You can also see these system at various industry trade-shows and in many places where it is offered as a pay-per-use service. Unfortunately, not many computer software and hardware retailers have these systems set up for demonstration.

How do these systems 'grow'?

Some systems are designed for easy upgrade and expansion as the number of users increase. Others are meant only for restricted numbers of users and will 'top-out' when the maximum is reached. Care is needed when choosing systems to ensure that it can grow in a cost-effective/performance-effective way with your organisation.

Will this work in my organisation?

Each firm's situation is different and there is no one 'check-list' which you can refer to get the answer. There are some underlying characteristics which make for good candidates, but these need to be tempered with the peculiarities of your organisation.

What is a Media Space?

A media space is an electronic setting in which groups of people can work together, even when they may be separated by space or by time. In a media space, people have a variety of new audio and video mechanisms for communicating with their peers, in addition to their existing communication tools. Media spaces attempt to reduce the effects of geographic separation on the work practices of a group.

9.   Recommended Readings

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