

DEFINING
TELEPRESENCE:
HOW CAN IT HELP
YOUR
ORGANIZATION?

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EXECUTIVE SUMMARY

Telepresence is the latest in a long line of visual communications technologies that have promised to revolutionize corporate collaboration. But can the new technology meet the complex and demanding needs of today's organizations for reducing costs, improving productivity, and realizing their environmental responsibilities—or is it just another example of a solution looking for a problem?

The challenges facing organizations are clear, with a growing number of remote and virtual employees; the rising costs and stresses of business travel; the need to make decisions faster than ever before; and the desire to be ecologically responsible putting pressure on managers to find alternatives to in-person collaboration. And while many of today's visual communications solutions are adequate for ordinary collaboration sessions, only telepresence promises a truly life-like experience that mimics an in-person session. For highly critical or strategic meetings, this personal dimension can mean the difference between success and failure.

The fact that companies can see significant value from visual collaboration is well documented, starting with the hard-dollar cost savings and ending with the softer but often more valuable productivity gains. Telepresence ratchets up the ROI equation, because it delivers remarkable usability and convenience. Since telepresence allows participants to meet for many hours at a time without experiencing “meeting fatigue,” it can be used to replace meetings that would otherwise have to happen in person. And because telepresence delivers such a high-quality experience with remarkable ease, companies can expect the systems to see significant usage compared with other visual communications, thereby shortening the time it takes to see a return on investment.

The value of replacing in person meetings with virtual ones cannot be overstated. The so-called “executive wear and tear” induced by business travel is extending to more people within organizations, as knowledge workers find themselves having to travel to collaborate with their colleagues. Furthermore, companies are increasingly under pressure to offset the negative impact they have on the environment. Replacing air and auto travel with network-based visual communications can go a long way toward saving on carbon emissions—a move that has PR and shareholder value, as well as benefits to the corporate bottom line.

In this increasingly complicated business environment, IT leaders are seeking answers. This whitepaper discusses how and why telepresence can play an important role in the new solutions mix.

DEFINING TELEPRESENCE: MYTHS & REALITIES

The term “telepresence” has been seized upon by a number of vendors and service providers, some with a real product to market, others wanting to add sizzle to their

existing offerings without changing the underlying technology. The challenge for the prospective buyer is being able to tell the difference.

Telepresence is quite distinct from other visual collaboration solutions. Telepresence comprises a tightly integrated combination of technologies and services designed to create a truly immersive collaborative environment. To be classified as telepresence, a solution must have **four defining characteristics**, which together create a fully immersive meeting environment in which participants are able to focus exclusively on the meeting content, and not worry about how that content is being delivered. (Please see Figure 1.)

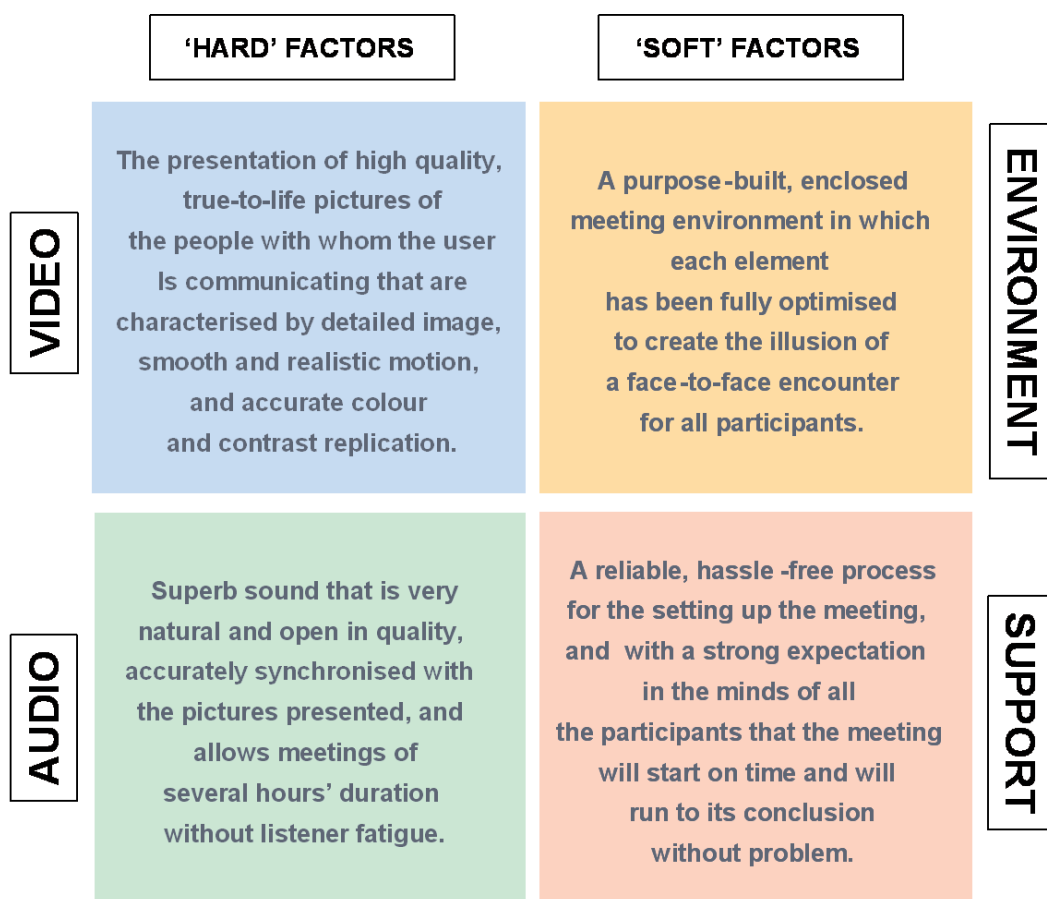


Figure 1: Four defining characteristics of telepresence

A true telepresence experience cannot be achieved by a single technology element; rather, the technology and services work together to create a rich, immersive solution. Applying this simple yet effective definition helps buyers clarify their investment goals and justify the benefits of telepresence over other kinds of visual communication.

THE HEART OF THE SOLUTION

The essence of a telepresence solution is its immersive nature: the ability to allow participants to focus on their meeting objectives, rather than the technology that's driving the meeting. Indeed, participants shouldn't even be aware of the technology that surrounds them, let alone distracted by any shortcomings, such as blurry pictures, echoing sound, or patchy connectivity.

In practice, the more immersive the solution, the more effective it will be at allowing people to communicate across any distance. And in general, the greater the ability of a solution to support effective communications, the better it is at generating a return on investment.

While an optimized telepresence solution will always be more than the sum of its parts, the individual elements are critical for success. Let's look at them one by one.

Planning for the Solution

Companies deploying telepresence should plan on a "kick-off" session to begin the pre-installation process, during which time they and their vendor should gain a deeper understanding of their overall communications needs and applications and draft an appropriate installation plan.

Next comes an on-site pre-installation survey to determine what, if any, additional site modifications or infrastructure changes need to be made, such as whether that network circuit(s) have been installed successfully. CAD drawings will give everyone a visual sense of what the room will look like.

Room Design & Furniture

The telepresence room is the first thing participants will see, touch and, quite literally, feel - and it goes to the heart of how telepresence is different from other visual communications.

Choosing an appropriate room is the first step in any telepresence deployment. This can be a general-purpose meeting room given over partially for visual communications, but more likely it will be a dedicated location. Most telepresence vendors look for rooms of an appropriate size for the planned seating arrangement, from four people to a galleried, theatre-style layout suitable for up to 28 participants.

How closely a prospective room is surveyed varies widely from vendor to vendor, but a more thorough survey generally will lead to better results. The electrical installation, heating, air conditioning, sound proofing and existing lighting should be analyzed, and the appropriate changes made, to ensure that the resulting configuration is optimized for the telepresence environment.

Even the carpeting and wall coverings may need to be changed to work better with the video technologies to be deployed. Additional sound proofing may be required, to eliminate extraneous noise, and materials may be installed to improve both the local and remote acoustic performance. For some all-inclusive telepresence solutions, acoustical treatments, carpeting and walls are included.

Securing the Meeting

While telepresence can and should be used by people at all levels of an organization for many types of collaboration, there will inevitably be a significant number of executive-level, business critical meetings that are highly confidential in nature. Securing such meetings is vital, and a viable telepresence solution must offer multiple levels of security to enforce the confidentiality of these discussions.

Security must cover all aspects of a virtual meeting, including the physical locations and the networks between them. Robust 128-bit advanced encryption standard (AES) should be used to encode the video, audio and content signals. Other routes into a company's most sensitive discussions can be exposed when conference calls use a video multipoint control unit (MCU) or audio conferencing bridge to connect to other telepresence rooms, video conferencing systems, or even standard telephone lines. Additional participants and locations increase the overall vulnerability of the meeting to unwanted intrusions or malicious attacks, and therefore must be considered in the design.

Internal Marketing and Education

Although telepresence solutions are designed to be easy to set up and use, companies should market the systems internally for maximum return on investment. If employees don't know the systems are available to them, they certainly won't use them.

What's more, most end users need at least some training on the system to feel comfortable initiating a telepresence session on their own. Although these training sessions probably won't need to last more than 15 minutes, they are critical to ensuring success. All employees who may want or need to use telepresence should be given the opportunity for training and receive ongoing support as needed.

THE PARTICIPANTS' EXPERIENCE

Endpoint Technology

What can collectively be referred to as the 'endpoint' is in fact a complex solution comprising a number of discrete technology components. Chief among these are the video, audio and network elements – collectively, the means to transmit and reproduce the images and sounds between the remote locations in a telepresence meeting.

There need not be any technical difference between standard or high definition video conferencing and telepresence endpoints. The value and sophistication of telepresence lies in the specification of each component of the solution, and in the manner in which these parts are united as a whole.

Audio

What is commonly referred to as ‘wideband’ audio of 7 kilohertz (kHz) and generally used as the standard for video conferencing is in fact about only twice the frequency bandwidth of the ordinary telephone. Wideband audio is able to convey from one location to another sound of a frequency range typically covering low bass tones around 50 Hz and higher tones up to 7 kHz. But since the average human adult can directly or indirectly detect frequencies between 20 Hz and 16 kHz, even wideband audio loses important parts of the speech sound spectrum, as low-end (50-60 Hz range) and upper-end (7 kHz to 16 kHz) frequencies are filtered out.

Telepresence solutions aim to overcome this shortfall by implementing audio technologies that support bandwidths up to 22 kHz. Presented with the full range of perceivable frequencies and associated harmonics, the human ear is better able to extract the maximum information from the spoken voice (and other audible gestures).

This capability of telepresence systems to accurately capture, transmit and reproduce sounds across a much broader audio spectrum than the telephone is important to the overall quality of the meeting experience. It is well understood that the human ear - or, more precisely, the human brain – can tire quickly when required to listen to speech reproduced by a poor quality sound system. Fatigue translates directly into reduced productivity. Implementing technologies that can support meetings without fatigue or discomfort is more likely to lead to strong ROI.

Well-designed, multi-channel audio can support the immersive experience by giving local participants a sense of the position of each of the remote users. This is done through the intelligent placement of microphones and loudspeakers, and digital processing of the audio signals to identify the location of an individual speaker. The net result is that a blindfolded listener will be able to distinguish from which seat position a voice is coming.

The crystal-clear audio and sound localization together reinforce the immersive experience and help participants work more productively over longer periods of time.

Maximize Sound Effects

In order to deliver the best sound possible, a telepresence system should have expertly placed speakers, designed to maximize the quality of the speakers’ voices and minimize any external noise or feedback from the room. Microphones should also be strategically placed to capture the right sound at the right time—and nothing else. There’s nothing

worse than having to move microphones in order to hear what participants are saying—with telepresence, that never happens – indeed, participants probably won't even know where the microphones or speakers are, they'll just know that they and their co-workers are being heard.

Video

Needless to say, the ability of a telepresence system to capture, compress, send and display images of the meeting participants has an important effect on the quality of the overall meeting.



Telepresence delivers an immersive experience by creating conditions under which participants can suspend disbelief and trust the manufactured reality they are being shown. Higher image resolutions can assist in this effort by helping to trick the participants' brains into 'believing' they are seeing a real, physical object, rather than a transmitted image.

Image Quality

The key components of video quality are definition - described in terms of the number of vertical and horizontal pixels displayed on the screen - and the ability to convey to the viewer the motion of the transmitted image.

Definition is usually described by the number of pixels that make up the vertical dimension of an image. For example, high definition (HD) screens (the norm for telepresence systems) will support a minimum of 720 vertical pixels and up to 1080 vertical pixels. In telepresence, video pictures are created on a display monitor using a technique called progressive scan. In this display mode every horizontal line of pixels is displayed onto the screen, one after another, from top to bottom. This contrasts with

interlaced mode, in which alternate horizontal lines of pixels are displayed: odd numbered lines first, top to bottom, then the even numbered lines, also top-to-bottom; a full image effectively takes twice as long to display compared with progressive scan mode. The use of the progressive scan technique is registered in the specification of video equipment by appending a 'p' to the vertical resolution, for example '720p'.

A second important aspect of the quality of a viewed image is the presentation of any motion inherent in the picture: the nod of a head or the flick of an eyebrow, or any other body language, all of which can impart vital communications clues to the viewers. Picture motion is created by the rapid display of successive images captured by the cameras at the each location. The more individual images sent per second, the greater the motion resolution, which is described in terms of frames per second (fps). Telepresence systems generally offer frame rates of 30 frames per second. As a benchmark, television frame rates are typically between 25 and 30 frames per second.

Camera Placement & Video Screens

The presentation of the images of the participants in a telepresence meeting is a key element in creating and maintaining the immersive experience. In order to reinforce the sense that there are no technical or physical barriers to clear communication, the images on screen must make it appear as though participants are physically in the same room, staring across the table at one another.

Participants' bodies should appear roughly the same size as they would when separated by only six or eight feet of table, rather than hundreds or thousands of miles. This requires the use of a large display screen; telepresence solutions typically deploy plasma, LCD or rear projection screens of 42 inches or larger.

Two or three large screens are usually required to emulate the typical boardroom meeting table, seating at least four people on either side. Larger rooms may require more screens or even a rear-projection set up.

Finally, participants must feel as though they are looking directly into the eyes of the person to whom they are speaking. Telepresence systems seek to achieve this in a variety of ways, including locating the camera as close to the top of the video display as possible, placing the camera in front of the screen, and in the case of some rear-projection display systems, locating the camera behind the screen.

INTEGRATING TELEPRESENCE WITH OTHER VIDEO CONFERENCING SOLUTIONS

Interoperability

Most companies investing in telepresence today already have standard definition and high definition video conferencing endpoints – groups systems and desktop products – located

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throughout their organizations. To maximize the value of their existing systems and any new ones they deploy, these organizations should expect any telepresence system to be fully compatible and interoperable with their communications and collaboration network. In practice, this need for interoperability requires standards-based technology, including H.323, H.264, H.239 and SIP, to future-proof their investments.

Infrastructure

With telepresence more than any other form of visual communications, the design and construction of the network is critical. Because of the high-quality images and sound, and the large number of screens and cameras deployed, telepresence has high-end bandwidth requirements, with 4 Mbps regarded as a baseline and 14 Mbps or more being the norm for large, theatre style installations. Bandwidth between 8 Mbps and 12 Mbps is generally stated as the requirements for the majority of multi-screen systems on the market today. In addition, telepresence planning should include gateways to communicate with other types of visual communications. For multi-point meetings, some form of multi-point control unit may be required although, increasingly, companies may outsource this component to a service provider.

Benefits of Managed Services

Telepresence managed services act as the glue that binds the disparate video, audio and network components into a single integrated system, harnessing their full potential.

Service starts with the design of the telepresence room, with most vendors offering a comprehensive survey of prospective locations. The design process comes next, and is critical in ensuring that each element of the room is laid out carefully to maximize both the quality of the experience and the usability of the facility. After all the components have been installed, the service provider will test and commission the room to the customer's satisfaction.

But the service component doesn't end there.

To achieve maximum value, a telepresence facility must work flawlessly each and every time it is used. To achieve this end, service providers monitor and manage every aspect of equipment configuration and network connection. As part of this managed services approach, most vendors and their partners offer an 'a la carte' menu of possible options, including on-site parts replacement, room reservation, network set-up, trouble shooting, extensive call reporting, system maintenance and software upgrades and updates.

Choosing a Services Partner

As discussed, services are a key component of any telepresence implementation. The service begins with the initial survey of a prospective telepresence room, and can

potentially cover every aspect of the systems operation, from room reservations through to network diagnostics and capacity planning for future usage growth. This vital service component is generally either provided directly by the telepresence vendor or in partnership with a managed service provider that is better able to create a package of services to meet the precise needs of the customer.

Since most telepresence systems will be used to support global communications, choosing the right service partner will help ensure continuing operation. The complexity of the product needs a support organization capable of resolving problems regardless of where they originate. Network operators themselves are becoming involved in the design, installation and ongoing support of telepresence solutions, and operators with a broad network of international partners should be better able to ensure 24/7 availability for an organization's entire telepresence system.

MAKING THE RIGHT CHOICE FOR YOUR ORGANIZATION

Telepresence can solve many of today's critical business problems, including the need to support global collaboration, cut travel time and expenses, and drive better and faster decisions in an increasingly competitive world. But the systems aren't cheap—so how can you know whether the technology is right for your organization?

Return on Investment

To assure that a telepresence system delivers maximum value, companies should start with a careful assessment of their organization's needs, and the nature of internal and external communications and collaboration performed by people at all levels of the business. Those firms that are already seeing benefits from visual collaboration will generally find it easier to identify the benefits and the return on investment offered by telepresence. Factors that play in the equation include the number of office locations, and the amount of ongoing collaboration among personnel at these sites; the number of team members that need to collaborate on a regular basis; the tools required for productive collaboration; the need for interoperability among a variety of video endpoints; the amount of interaction with external organizations, such as suppliers, partners, and customers; the volume and cost of travel among company sites, or with supply chain partners; and the strategic nature of all these interactions.

Long-Term Strategy

Due to its large bandwidth and managed service requirements, any telepresence implementation requires careful planning around facilities, network and infrastructure. And to be truly successful, a telepresence solution must fit seamlessly with a company's existing communications and collaboration tools.

Services can play a key role in supporting a company's long-term telepresence strategy and ensuring it is a success. An ongoing services agreement can and should include

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unlimited 24x7 telephone technical support, on-site support with next-business-day response, escalation support, quick parts replacement, and software updates and upgrades.

CONCLUSION

Telepresence delivers a tight combination of technology, environmental design and services that immerses participants in the experience, literally tricking their brains into thinking they are actually in the same room, able to see every wrinkled brow, hear every breath, and detect every nuanced pause. Better yet, telepresence offers a realistic solution to many of the challenges posed by today's increasingly global and complex business environment.

Telepresence can help companies realize productivity gains and cost savings by improving the quality of collaboration between distant teams and individuals, and reducing reliance on travel. Telepresence can rejuvenate and restore the reputation of visual communications, and in doing so help companies leverage under-utilized video conferencing systems. And telepresence can help organizations reduce their environmental impact, cutting carbon emissions and enhancing their image at the same time.

That's been the vision, at least. Now, thanks to the availability of high definition, high fidelity video and audio technologies, integrated services, and accessible, affordable bandwidth, the vision is a reality.

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