A

Seminar report

On

Telepresence

Submitted in partial fulfillment of the requirement for the award of degree of ECE

SUBMITTED TO:
www.studymafia.org

SUBMITTED BY:
www.studymafia.org

Acknowledgement

I would like to thank respected Mr…….. and Mr. ……..for giving me such a wonderful opportunity to expand my knowledge for my own branch and giving me guidelines to present a seminar report. It helped me a lot to realize of what we study for.

Secondly, I would like to thank my parents who patiently helped me as i went through my work and helped to modify and eliminate some of the irrelevant or un-necessary stuffs.

Thirdly, I would like to thank my friends who helped me to make my work more organized and well-stacked till the end.

Next, I would thank Microsoft for developing such a wonderful tool like MS Word. It helped my work a lot to remain error-free.

Last but clearly not the least, I would thank The Almighty for giving me strength to complete my report on time.

Preface

I have made this report file on the topic **Telepresence**; I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to ……..who assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

CONTENTS

1. Introduction
2. History
3. Implementation
    - 3.1. Vision
    - 3.2. Sound
    - 3.3. Audio/Visual Technology
    - 3.4. Network
    - 3.5. Hardware optimized Environment
    - 3.6. Software Applications
4. Manipulation
    - 4.1. Teleoperation
5. Applications
    - 5.1. Teleconferencing
    - 5.2. Connecting communities
    - 5.3. Subsea Network
    - 5.4. Hazardous Environments
    - 5.5. Pipeline inspection
    - 5.6. Remote Surgery
    - 5.7. Education
    - 5.8. Entertainment
    - 5.9. Telepresence Art
    - 5.10. Telepresence and AI
6. Comparison with Virtual Reality
7. Comparison with video conferencing
    - 7.1. Issues in video Conferencing
    - 7.2. Benefits of Telepresence
8. Commercial Telepresence Systems
9. Conclusion
10. References

INTRODUCTION

Telepresence refers to a set of technologies which allow a person to feel as if they were present, to give the appearance that they were present, or to have an effect, at a location other than their true location.Telepresence requires that the senses of the user, or users, are provided with such stimuli as to give the feeling of being in that other location. Additionally, the user(s) may be given the ability to affect the remote location. In this case, the user's position, movements, actions, voice, etc. may be sensed, transmitted and duplicated in the remote location to bring about this effect. Therefore information may be travelling in both directions between the user and the remote location.

TelePresence is a new technology that creates unique, "in-person" experiences between people, places, and events in their work and personal lives. It combines innovative video, audio, and interactive elements (both hardware and software) to create this experience over the network. Telepresence means "feeling like you are somewhere else". Some people have a very technical interpretation of this, where they insist that you must have head-mounted displays in order to have telepresence. Other people have a task-specific meaning, where "presence" requires feeling that you are emotionally and socially connected with the remote world. It's all a little vague at this time.

Telepresence is a matter of degree. Rarely will a telepresence system provide such comprehensive and convincing stimuli that the user perceives no differences from actual presence. But the user may set aside such differences, depending on the application. Watching television, for example, although it stimulates our primary senses of vision and hearing, rarely gives the impression that the watcher is no longer at home. However, television sometimes engages the senses sufficiently to trigger emotional responses from viewers somewhat like those experienced by people who directly witness or experience events. Televised depictions of sports events or disasters such as the infamous September 11 terrorist attacks can elicit strong emotions from viewers.

As the screen size increases, so does the sense of immersion, as well as the range of subjective mental experiences available to viewers. Some viewers have reported a sensation of genuine vertigo or motion sickness while watching IMAX movies of flying or outdoor sequences.

Even the fairly simple telephone achieves a limited form of telepresence, in that users consider themselves to be talking to each other on the telephone rather than talking to the telephone itself. To an observer with no knowledge of telephones, watching a person chatting to an inanimate object might seem curious, but the telephone is readily usable by almost everyone who can speak and listen.

Most often, currently feasible telepresence gear leaves something to be desired; the user must suspend disbelief to some degree, and choose to act in a natural way, appropriate to the remote location, perhaps using some skill to operate the equipment. In contrast, a telephone user does not see herself as "operating" the telephone, but merely talking to another person with it. A goal of telepresence developers might be to similarly have their users lose direct awareness of the equipment they are using.

The first application, the Cisco TelePresence Meeting solution, delivers life size images, ultra-high-definition video (1080p), spatial audio, and a specially-designed environment that create a "room within a room" meeting space. The Cisco TelePresence Meeting solution enables users to have a live, face-to-face meeting experience as if they were all in the same room together, empowering them to interact and collaborate like never before.

HISTORY

The first commercially successful telepresence company, Teleport (which was later changed to TeleSuite), was founded in 1993 by David Allen and Harold Williams. The original intent was to develop a system that could allow families to interact across great distances without the hassle or costliness of flying. The first systems (which they called TeleSuites) looked more like something out of an upper class home rather than a conference room in an office suite (which are what most systems are used for today).

Hilton Hotels had originally made a deal with them to begin installing them in their hotels throughout the United States and other countries, but usage was low. The idea lost momentum and Hilton eventually backed out. They later began to focus on business oriented telepresence systems. Shareholders eventually held enough stock to take over the company, which ultimately led to its collapse. David Allen purchased all of the assets of TeleSuite and then called the new company Destiny Conferencing.

Although they survived, the idea did not truly catch on until other mega-corporations jumped onboard such as Polycom, HP, and Cisco released similar systems around the mid 2000's. Polycom eventually bought out Destiny Conferencing and now carries the TeleSuite telepresence system now known as the Real Presence Experience (RPX).

IMPLEMENTATION

For a user to be given a convincing telepresence experience, sophisticated technologies are required. The Cisco TelePresence Meeting solution consists of the Cisco TelePresence technology, codecs, cameras, lighting arrays, microphones, speakers, and endpoints that consist of one or more 65-inch plasma screens, and in some models, one-half of a "virtual" conference table. Also included is the Cisco TelePresence Manager, which provides event management, help desk and consolidated device status reporting. It enables integration to enterprise groupware for easy scheduling and launching of Cisco TelePresence calls. Integration with Cisco Unified Communications Manager 5.1 and enterprise groupware provides Cisco TelePresence with just one button to push to launch calls directly from the phone.

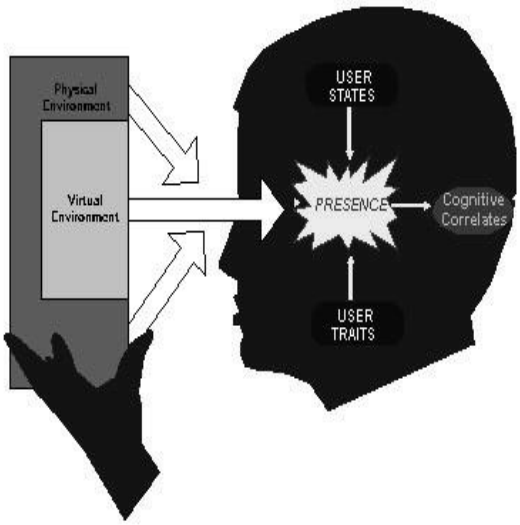
Cisco TelePresence endpoints consist of two models, designed for different numbers of users and different size environments:

• **Cisco TelePresence 3000**-A virtual table with seats for 6 on each side, including three 65-inch plasma screens, speakers, microphones, and lighting

• **Cisco TelePresence 1000**-Designed to be flush-mounted along a wall space for easy use in smaller footprint areas (for example, individual offices, bank branches, lobbies, doctor's offices) includes one 65-inch plasma screen, speakers, a microphone, and lighting.

VISION

A minimum system usually includes visual feedback. Ideally, the entire field of view of the user is filled with a view of the remote location, and the viewpoint corresponds to the movement and orientation of the user's head. In this way, it differs from television or cinema, where the viewpoint is out of the control of the viewer.In order to achieve this, the user may be provided with either a very large (or wraparound) screen, or small displays mounted directly in front of the eyes. The latter provides a particularly convincing 3D sensation. The movements of the user's head must be sensed, and the camera must mimic those movements accurately and in real time. This is important to prevent unintended motion sickness.



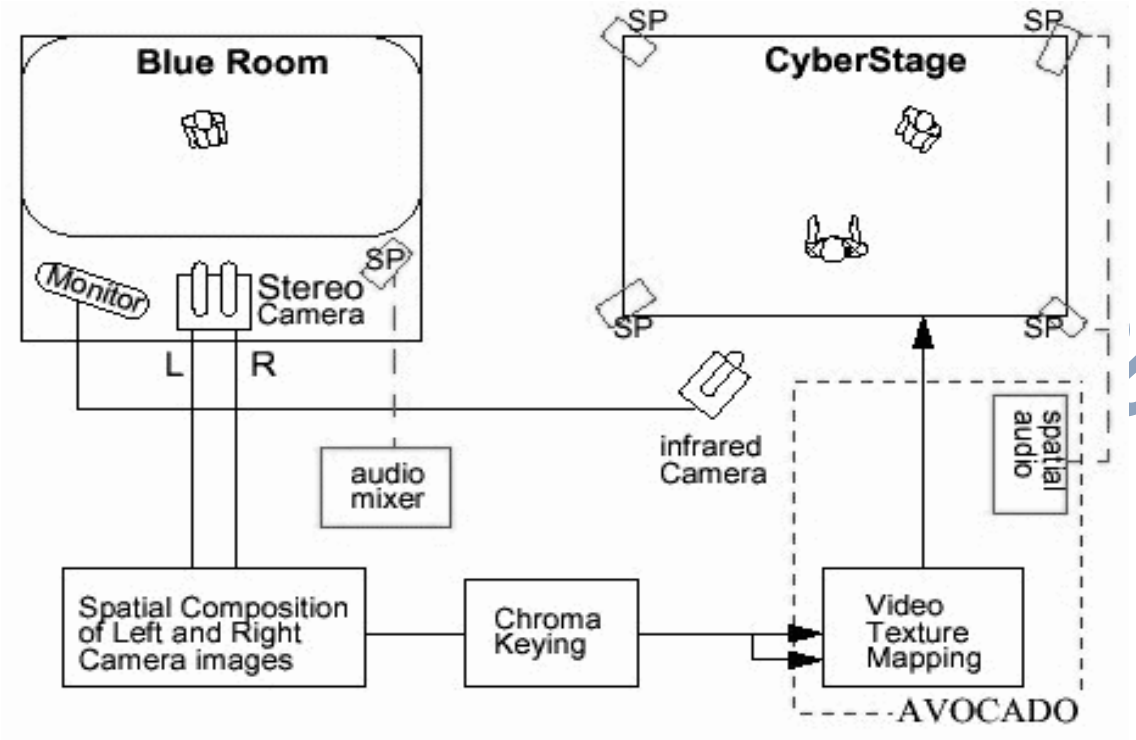
SOUND

Sound is generally the easiest sensation to implement with high fidelity, with the telephone dating back more than 100 years, and very high-fidelity sound equipment readily available as consumer gear. Stereophonic sound is more convincing than monoaural sound, and surround sound is better still.

AUDIO/VISUAL TECHNOLOGY

Cisco TelePresence incorporates the most up-to-date standards and technologies to offer the best audio and visual results:

- H.264 video codecs to offer the highest quality and lowest bit rate
- Session Initiation Protocol
- Native 720p and 1080p high-definition cameras
- Native 720p and 1080p high-definition encoding/decoding
- Low-latency architecture and low bandwidth utilization
- Wideband advanced audio coding with low delay (AAC LD)
- Multichannel spatial audio with echo cancellation and interference filters to eliminate feedback from mobile devices.
- Optimized environmental conditioning to provide the best audio and video and overall user experience



NETWORK

Cisco TelePresence uses the standard IP technology deployed in corporations today and runs on an integrated voice, video, and data network. The system supports high-quality, real-time voice and video communications with branch offices using broadband connections. It offers capabilities for ensuring quality of service (QoS), security, reliability, and high availability for high-bandwidth applications such as video, particularly high-definition video, which can require 1 Mbps to 5 Mbps, depending on the resolution.

HARDWARE-OPTIMIZED ENVIRONMENT

This system includes purpose-built office furniture, which incorporates cameras and displays, lighting, speakers, microphones, and projection capability into a specially designed table for larger rooms, or, in smaller configurations, into existing office furniture.

SOFTWARE APPLICATIONS

Cisco TelePresence applications incorporate a variety of new and existing standards-based software for accommodating converged voice and video transmissions, including:

- **IP telephony** — Cisco TelePresence works with IP-based phones and call-processing systems from the major networking and telecommunications vendors. This can simplify launching calls because it uses a telephone instead of a complicated remote control.
- **Groupware** — Integration with enterprise groupware solutions (such as Microsoft Outlook and Lotus Notes) accommodates easy scheduling of meetings and access to corporate information.
- **Services** — Cisco TelePresence enables easy scheduling, management, reporting, billing, and metrics applications to ensure proper tracking and bill-back of activity on the system, as well as real-time support services.

MANIPULATION

The ability to manipulate a remote object or environment is an important aspect of real telepresence systems, and can be implemented in large number of ways depending on the needs of the user. Typically, the movements of the user's hands (position in space, and posture of the fingers) are sensed by wired gloves, inertial sensors, or absolute spatial position sensors. A robot in the remote location then copies those movements as closely as possible. This ability is also known as Teleoperation.

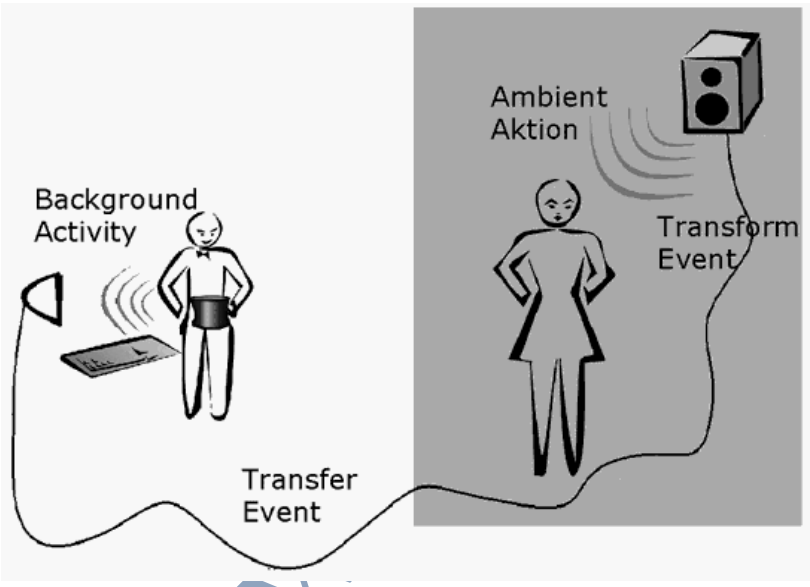
TELEOPERATION:

Teleoperation means "doing work at a distance", although by "work" we mean almost anything. What we mean by "distance" is also vague: it can refer to a physical distance, where the operator is separated from the robot by a large distance, but it can also refer to a change in scale, where for an example a surgeon may use micro-manipulator technology to conduct surgery on a microscopic level.

A **telemanipulator (teleoperator)** is a device that is controlled remotely by a human operator. If such a device has the ability to perform autonomous work, it is called a telerobot. If the device is completely autonomous, it is called a robot. In simple cases the controlling operator's command actions correspond directly to actions in the device controlled, as for example in a radio controlled model aircraft or a tethered deep submergence vehicle. Where communications delays make direct control impractical (such as a remote planetary rover), or it is desired to reduce operator workload (as in a remotely controlled spy or attack aircraft) , the device will not be controlled directly, instead being commanded to follow a specified path. At increasing levels of sophistication the device may operate somewhat independently in matters such as obstacle avoidance, also commonly employed in planetary rovers.

Devices designed to allow the operator to control a robot at a distance is sometimes called telecheric robotics.

Two major components of Telerobotics and Telepresence are the visual and control applications. A remote camera provides a visual representation of the view from the robot. Placing the robotic camera in a perspective that allows intuitive control is a recent technique that although based in Science Fiction (Robert Heinleins WALDO AND MAGIC COMPANY 1959) has not been fruitful as the speed, resolution and bandwidth have only recently been adequate to the task of being able to control the robot camera in a meaningful way. Using a head mounted display, the control of the camera can be facilitated by tracking the head as shown in the figure below.



This only works if the user feels comfortable with the latency of the system, the lag in the response to movements, and the visual representation. Any issues such as, inadequate resolution, latency of the video image, lag in the mechanical and computer processing of the movement and response, and optical distortion due to camera lens and head mounted display lenses, can cause the user 'simulator sickness' which is exacerbated by the lack of vestibular stimulation with visual representation of motion.

Mismatch between the users motions such as registration errors, lag in movement response due to overfiltering, inadequate resolution for small movements, and slow speed can contribute to these problems.

The same technology can control the robot, but then the hand eye coordination issues become even more pervasive through the system, and user tension or frustration can make the system difficult to use.

Ironically the tendency to build robots has been to minimize the degrees of freedom because that reduces the control problems. Recent improvements in computers has shifted the emphasis to more degrees of freedom, allowing robotic devices that seem more intelligent and more human in their motions. This also allows more direct teleoperation as the user can control the robot with their own motions.

The more closely the robot re-creates the form factor of the human hand, the greater the sense of telepresence. Complexity of robotic effectors varies greatly, from simple one axis grippers, to fully anthropomorphic robot hands.

Haptic teleoperation refers to a system that provides some sort of tactile force feedback to the user, so the user feels some approximation of the weight, firmness, size, and/or texture of the remote objects manipulated by the robot.

APPLICATIONS

TELECONFERENCING

Rather than traveling great distances, in order to have a face-face meeting, it is now possible to teleconference instead, using a multiway video phone. Each member of the meeting, or each party, can see every other member on a screen or screens, and can talk to them as if they were in the same room. This brings enormous time and cost benefits, as well as a reduced impact on the environment by lessening the need for travel - a damaging source of carbon emissions.

A good telepresence strategy puts the human factors first, focusing on visual collaboration solutions that closely replicate the brain's innate preferences for interpersonal communications, separating from the unnatural "talking heads" experience of traditional videoconferencing. These cues include life–size participants, fluid motion, accurate flesh tones and the appearance of true eye contact. This is already a well-established technology, used by many businesses today. The chief executive officer of Cisco Systems, John Chambers in June 2006 at the Networkers Conference compared telepresence to teleporting from Star Trek, and said that he saw the technology as a potential billion dollar market for Cisco.

Michael Venditte,Vice President of Engineering of Telanetix defines Telepresence as a human experience of being fully present at a live real world location remote from one's own physical location. Someone experiencing video Telepresence would therefore

be able to behave, and receive stimuli, as though part of a meeting at the remote site. The fore mentioned would result in interactive participation of group activities that will bring benefits to a wide range of users. Application examples could be sited within emergency management and security services, B&I, entertainment and education industries.

CONNECTING COMMUNITIES:

Telepresence can be used to establish a sense of shared presence or shared space among geographically separated members of a group.

SUBSEA WORK

The cost of deep water diving operations is extremely high due to safety regulations, hyperbaric equipment, time spent in decompression, and support vessel costs. Telepresence systems for inspection and teleoperation for repair and maintenance would realise significant cost benefits and also remove divers from hazardous environments.

HAZARDOUS ENVIRONMENTS:

Many other applications in situations where humans are exposed to hazardous situations are readily recognised as suitable candidates for telepresence. Mining, bomb disposal, military operations, rescue of victims from fire, toxic atmospheres, or even hostage situations, are some examples.

PIPELINE INSPECTION

Small diameter pipes, otherwise inaccessible for examination, can now be viewed using pipeline video inspection.

REMOTE SURGERY

The possibility of being able to project the knowledge and the physical skill of a surgeon over long distances has many attractions. Thus, again there is considerable research underway in the subject. (Locally controlled robots are currently being used for joint replacement surgery as they are more precise in milling bone to receive the joints.) The armed forces have an obvious interest since the combination of telepresence, teleoperation, and telerobotics can potentially save the

lives of battle casualties by allowing them prompt attention in mobile operating theatres by remote surgeons.

Recently, teleconferencing has been used in medicine (telemedicine or telematics), mainly employing audio-visual exchange, for the performance of real time remote surgical operations - as demonstrated in Regensburg, Germany in 2002. In addition

to audio-visual data, the transfer of haptic (tactile) information has also been demonstrated in telemedicine .

EDUCATION

The benefits of enabling schoolchildren to take an active part in exploration have been shown by the JASON and the NASA Ames Research Center programs. The ability of a pupil, student, or researcher to explore an otherwise inaccessible location is a very attractive proposition; For example, locations where the passage of too many people is harming the immediate environment or the artifacts themselves, e.g. undersea exploration of coral reefs, ancient Egyptian tombs, and more recent works of art.

Research is also being conducted to investigate the use of telepresence to provide professional development to teachers. Research has shown that one of the most effective forms of teacher professional development is coaching, or cognitive apprenticeship. The application of telepresence shows promise for making this approach to teacher professional development practical.

ADVERTISING AND SALES:

Tour operators and property agents could use telepresence to allow potential customers to sample holiday locations and view properties remotely making commitments.

ENTERTAINMENT

Telepresence systems could be incorporated into theme or nature parks to allow observers to travel through coral reefs or explore underground caves. In amusement parks, the elderly or infirm could experience the thrill of live roller coaster rides without risk.

In the games, users can interact using telepresence, sharing robots to interact one human with another (paired objects as remote surrogate actors). In other words, if one partner shakes the object, the remote object also shakes.

TELEPRESENCE ART

In 1998, Diller and Scofidio created the "Refresh", an Internet-based art installation that juxtaposed a live web camera with recorded videos staged by professional actors. Each image was accompanied with a fictional narrative which made it difficult to distinguish which was the live web camera.

In 1993, Eduardo Kac and Ed Bennett created a telepresence installation "Ornitorrinco on the Moon", for the international telecommunication arts festival "Blurred Boundaries" (Entgrenzte Grenzen II).

It was coordinated by Kulturdata, in Graz, Austria, and was connected around the world.

TELEPRESENCE AND AI

Marvin Minsky was one of the pioneers of intelligence-based mechanical robotics and telepresence. He designed and built some of the first mechanical hands with tactile sensors, visual scanners, and their software and computer interfaces. He also influenced many robotic projects outside of MIT, and designed and built the first LOGO "turtle."

COMPARISON WITH VIRTUAL REALITY

Telepresence refers to a user interacting with another live, real place, and is distinct from virtual presence, where the user is given the impression of being in a simulated environment. Telepresence and virtual presence rely on similar user-interface equipment, and they share the common feature that the relevant portions of the user's experience at some point in the process will be transmitted in an abstract (usually digital) representation. The main functional difference is the entity on the other end: a real environment in the case of telepresence, vs. a computer in the case of virtual reality.

COMPARISON WITH VIDEO CONFERENCING

The TelePresence Meeting solution is based on an entirely new technology, one that goes far beyond videoconferencing in many important ways:

Quality and environmental factors:

The TelePresence Meeting solution combines life-size video images, ultra-high-definition clarity, and CD-like spatial audio, as well as environmental conditions, to create a unique, "in person" experience. Users will actually feel as if they are in the room with the parties they are conversing with, sitting at the same "virtual table", making direct eye contact, talking to and even talking over other participants, as naturally as if they were together.

Simplicity:

The TelePresence Meeting solution is also designed to be very simple and user-friendly to set up and launch calls. In fact, there are no handheld remotes, menus or manuals with the system. Instead, it uses your enterprise calendar (for example, Microsoft Outlook) to schedule meetings, and one button on the phone to launch a call. Because it uses the tools you use every day, minimal user training is needed and minimal support from IT is required. This "self-service" model makes it scalable across your entire enterprise.

Architected for Reliability

The TelePresence Meeting solution is built to take advantage of a highly available network and the Unified Communications infrastructure to offer users "dial tone" reliability.

ISSUES IN VIDEOCONFERENCING

Some observers argue that two outstanding issues are preventing videoconferencing from becoming a standard form of communication, despite the ubiquity of videoconferencing-capable systems.

These issues are:

Eye Contact:

It is known that eye contact plays a large role in conversational turn-taking, perceived attention and intent, and other aspects of group communication. While traditional telephone conversations give no eye contact cues, videoconferencing systems are arguably worse in that they provide an incorrect impression that the remote interlocutor is avoiding eye contact. This issue is being addressed through research that generates a synthetic image with eye contact using stereo reconstruction.

Appearance Consciousness:

A second problem with videoconferencing is that one is literally on camera, with the video stream possibly even being recorded. The burden of presenting an acceptable on-screen appearance is not present in audio-only communication. Early studies by Alphonse Chapanis found that the addition of video actually impaired communication, possibly because of the consciousness of being on camera.

Complexity of systems:

Most users are not technical and want a simple interface. In hardware systems an unplugged cord or a flat battery in a remote control is seen as failure, contributing to perceived unreliability which drives users back to traditional meetings. Successful systems are backed by support teams who can pro-actively support and provide fast assistance when required.

1. **Perceived lack of interoperability:**

Not all systems can readily interconnect, for example ISDN and IP systems require a bridge. Popular software solutions cannot easily connect to hardware systems. Some systems use different standards, features and qualities which can require additional configuration when connecting to dis-similar systems.

Bandwidth and quality of service:

In some countries it is difficult or expensive to get a high quality connection that is fast enough for good-quality video conferencing. Technologies such as ADSL have limited upload speeds and cannot upload and download simultaneously at full speed. As Internet speeds increase higher quality and high definition video conferencing will become more readily available.

Expense of commercial systems:

A well designed system requires a specially designed room and can cost hundreds of thousands of dollars to fit out the room with codecs, integration equipment and furniture.

BENEFITS OF TELEPRESENCE

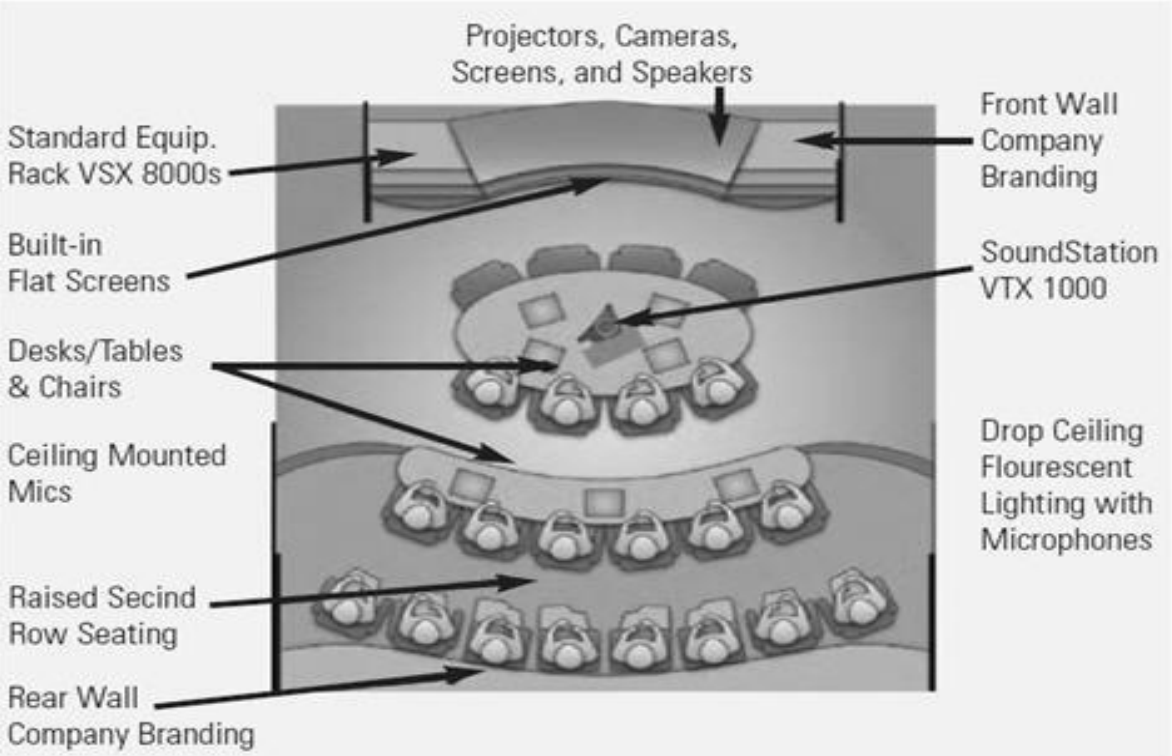
With the TelePresence Meeting solution, users will be able to:

1. Reduce distance as a constraint to deploying expertise
2. Build trust, understanding, and relationships across distances
3. Develop new business models for sales, support and supply chain
4. Speed time to market and enable faster decision making
5. Ensure business continuity options
6. Help their organizations to become "green"
7. Remote interviewing and HR benefits support
8. Face to face customer service and support

COMMERCIAL TELEPRESENCE SYSTEMS

Telepresence systems aimed at corporate customers are commercialized by Cisco, Telanetix, Tandberg, and Polycom . Prices range from tens to hundreds of thousand dollars. These systems include multiple microphones, speakers, high-definition monitors, cameras, and often dedicated networks and custom-made studios. They strive to be as transparent to users as possible by providing life-size videos, imperceptible transmission delays, and user-friendly interfaces.

Polycom RPX 418M - In Profile Above



Polycom RPX 218M - Top Down Thumbnail

The Polycom RealPresence Experience (RPX™)

CONCLUSION

The Telepresence Technology overcomes almost all the disadvantages or drawbacks that the videoconferencing systems have. The broad vision for TelePresence is to provide "virtual experiences" in many environments, from business into the home, with applications that would not have otherwise been possible with traditional video technologies. Imagine a face-to-face doctor's appointment, a shopping trip, or a visit between the kids and grandparents without leaving the office or even your home. telepresence brings such an amazing technology ,that would be a revolution in “face-to-face” conferencing.

References

- www.google.com
- www.wikipedia.org
- www.studymafia.org