

# THINGS YOU SHOULD KNOW ABOUT...

# TELEPRESENCE

## Scenario

Landon recently began a graduate program in botany and also works as one of several research assistants to Hilary Jamison, a professor working to develop a new red *vinifera* grape cultivar that will mature several weeks early (to escape the risk of frost damage). Because Dr. Jamison's work is part of a larger project dedicated to organic agriculture, the new grape cultivar also needs to be disease resistant, and she and her research team regularly consult with plant breeders working to develop disease-resistant grape cultivars at the Agriculture Experiment Station in another state. After reading in the campus newspaper about the university's new telepresence system, Landon suggests that the research team use the system in their interactions with other scientists and experts who have access to a telepresence facility. At an initial telepresence meeting with staff from the USDA National Clonal Germplasm Repository, Landon discovers how quickly he is able to develop a rapport with the USDA officials. The system provides such a lifelike experience that for Landon, the line soon blurs between who is physically in the room with him and who is remote.

When Landon learns that clonal tissue is available from a recently rediscovered disease-resistant variety, the research team sets up a telepresence meeting with the researchers working on disease resistance. They bring a cutting from the most promising of their experiments for discussion, and while explaining their successes and failures, one of the researchers plucks a leaf from the cutting to illustrate a point. Dr. Jamison and her group can see the specimen clearly enough that very fine details are visible. A lively discussion erupts about which cultivars the respective teams had worked with. The telepresence systems allows a level of interaction—between individuals and with physical objects—that in many ways rivals an in-person meeting. As a result, the telepresence sessions are extremely productive. As an added bonus, Dr. Jamison's team obtains contact information for the research director of a similar program in Japan, which is successfully developing *vinifera* stock of exceptional vigor. The following week, Landon and the rest of Dr. Jamison's team hold a telepresence meeting with three researchers from the Japanese program with similar success.

## 1 What is it?

Telepresence refers to the application of complex video technologies to give geographically separated participants a sense of being together in the same location. These systems use high-definition cameras feeding to life-size HD displays with high-fidelity acoustics that, in many cases, localize sound to image, simulating the effect of each voice coming from the video display for each participant. The technologies are integrated into a high-bandwidth system to support real-time, seamless presentation in a dedicated telepresence space. In sophisticated telepresence rooms, the furniture and displays are arranged in ways that further enhance the simulation—participants sit at a conference table and see high-resolution video of participants in remote locations at similar tables, allowing participants to imagine sharing a single table. Many vendors also offer lower-bandwidth options, which may allow people to participate using desktop clients, albeit at lower fidelity, resulting in a less compelling experience. Telepresence systems have become popular for scientists and researchers who work in different cities or even countries because—more than with web conferencing—the feeling of shared presence is striking, allowing users to forget about differences in location.

## 2 Who is doing it?

While most telepresence systems developed by major vendors are costly, they are becoming increasingly popular in both business and academe, and a number of schools have implemented such systems over the past few years. The California Community Colleges (CCC) Confer project, for example, headquartered at Palomar College in San Marcos, California, allows those within the CCC system to meet and collaborate remotely. The University of Melbourne recently announced the installation of a telepresence system for research with a demonstration and lecture on epilepsy. It was presented simultaneously to an audience at the University of California, San Diego via a one-gigabit-per-second Internet linkup. In a program called the Cisco TelePresence University Connection, Cisco has provided its telepresence suite to a number of research institutions, including Cornell University, MIT, and several University of California campuses. Not all campuses can afford a dedicated telepresence setup, but some vendors and a few hotel chains like the Marriott and Starwood Hotels (including Sheraton and Westin hotels) are moving to offer complete on-site telepresence setups that can be rented for individual projects.

## 3 How does it work?

A telepresence system requires at least two locations with dedicated server hardware and software, bandwidth to support the HD throughput, and equipment that can deliver high-quality audio and HD video. People appear life-size, frequently seated, with torso and hands visible—an arrangement especially effective

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with smaller groups. High-fidelity sound transmits tone of voice, and participants can readily discern body language and facial expressions. The result is more lifelike communication, as participants lean forward in sudden interest, drop their voices to a confidential register, or telegraph humor with their eyes. Once the attendees are all in place in their respective telepresence rooms, the meeting can proceed like any other, with participants responding as if they were in the same room.

### 4 Why is it significant?

Telepresence and web conferencing present attractive alternatives to face-to-face meetings for those who need to reduce travel or who don't have time for all of the meetings that they want to attend. While the costs of telepresence prevent it from being a cost-cutting measure for all situations, the advantages of seeing and hearing remote colleagues as if they shared the same space have encouraged many to adopt these systems. As sophisticated systems get better and less expensive, the movement of high-quality telepresence into the mainstream of education could have social, economic, and pedagogical impact on students, faculty, and administrators. It promises to open new kinds of shared instruction, as niche courses can be offered at associated institutions or at main and satellite campuses simultaneously. Decreased costs and increased access to facilities by various academic disciplines and campus groups have the potential to open up new uses and new audiences.

### 5 What are the downsides?

Costs, particularly for high-end systems, can be an obstacle. In addition to the equipment costs, institutions must typically equip a dedicated room for telepresence, provide staffing support, and ensure that adequate bandwidth is available. Although the price of high-end systems may be prohibitive for many, less expensive configurations frequently lack features and often provide experiences that are not as fluid. It takes only a moment of lag time, for instance, to disrupt the illusion and remind users that remote partners are, in fact, remote. Such circumstances result in telepresence conferences that don't provide a legitimate substitute for face-to-face meetings and may account for skepticism that telepresence will work for one's needs. Where telepresence is implemented, users often employ it simply as a two-way video telephone, and while the fidelity is compelling, some feel that the telepresence experience doesn't justify the added cost and complexity over lower-bandwidth communications. Most high-end systems support a minimum of three-way communication links, but while communication among a few small groups can be effective, linking one individual to an audience of 300 in a large lecture class, for example, might offer little advantage over a video presentation of the speaker. Finally, telepresence can never fully replace face-to-face meetings because it has no facility to replicate the informal interactions that are often the most valuable elements of in-person meetings—a quick chat in the hallway after a scheduled session, impromptu brainstorming over lunch, a shared cab ride.

### 6 Where is it going?

As telepresence technology improves and people become more comfortable with the medium, new avenues of sharing will emerge. Improvements in network transfer rates might encourage telepresence to merge with virtual worlds, resulting in a robust hybrid system that can support avatars, mobile media, simulated environments, and other augmented reality. Broader course offerings will be enabled as mobile telepresence comes online. Students in criminology could join detectives at crime scenes, for example, without the risk of contaminating the area. Botany students might join curators at botanical gardens in distant cities. Artists-in-virtual-residence might demonstrate their craft for students in their fields. The technology could see increased use in research, perhaps incorporating teleoperation so that researchers at remote locations can manipulate items in live-lab scenarios. In an effort to help defray the up-front costs, some colleges and universities might offer use of these facilities for a fee, in the same way that some vendors and hotel chains currently do.

### 7 What are the implications for teaching and learning?

A number of high-profile, research-intensive institutions are spending large sums of money to implement sophisticated telepresence systems. The rooms so equipped might offer new avenues for distance education, particularly for seminars and other small classes. If only a few students in a department want to study an obscure language or uncommon dialect, they might be able to join classes at partner colleges or universities via telepresence or, where feasible, join native speakers. Similarly, the technology holds promise for demonstrations in areas such as dance, drawing, and design, as well as presentations in laboratories and kitchens. Mobile options could extend the audiences for field studies, allowing those on-site in remote rainforests, botanical gardens, or archeological digs to examine specimens and artifacts. Telepresence can be blended with virtual or augmented reality in building and architecture courses where demonstrations of techniques or explanations of the tensile strength of materials might take place in high-definition virtual construction labs that accommodate both on-campus and remote viewers. When lower-cost, high-performance suites emerge that put telepresence systems in the hands of new types of users, experimentation should yield novel uses and reveal even more vivid and compelling learning engagements.

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