

# Rearranging the Rooms: A case study in video-based collaboration

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## **ABSTRACT**

A observational study of repeated distance meetings has been carried out within a large computer corporation, observing well-established video-based practices. The study not only carried out observations, but also collaborated in intervening to explore, evaluate and improve these meetings. Key to success in this design extension was the co-development of a new conception of the virtual arrangement of the physical rooms and new technological arrangements that implemented it.

## **Keywords**

Distance meeting places, virtual arrangements.

## **INTRODUCTION**

As part of a research program on "Distance Collaboration" at Sun Microsystems, we carried out an observational study with a number of groups at Sun. Our focus has been on series of "distance" meetings: meetings (e.g., staff meetings) that are similar and take place regularly with participation at both locations. Our interest has been in the use of various technologies (audio, video, and data sharing) used to make these meetings possible. The goal of this work has been to observe well-established practices, learn from them what works and doesn't work, and where appropriate, intervene with new technology and ways of using it that improve the collaboration.

This case study concerns our study and intervention in the video-based working practices of a product development group distributed across two sites. The problem was the support of large meetings ("all hands" and "tech talks"). The resolution was achieved collaboratively by us (the "consultants") and the group members through an iterative exploration of technical and physical arrangements. Integral to this, and critical to the success of the effort, appears to have been the co-development of stories (understandings, mental models) of what was happening.

## **DESIGN SETTING**

The Workplace Effectiveness Group (WEG) of Workplace Resources at Sun Microsystems is an in-house consultancy that conducts research and development on new processes and technologies (physical and electronic) in support of better workplaces for Sun employees. One of the authors

(Bergman) as a WEG member contracted the other authors (Henderson and Henderson) of Rivendel Consulting & Design to help in studying and improving distance collaboration (DC) at Sun.

The study focussed on repeated meetings, meetings that happened again and again. The intent was to study well-established, effective practice, understand what worked and why. Further, if possible improvements were proposed, the study would engage in interventions to design and implement corresponding changes and evaluate the resulting changed practices for improvement.

The study took place over 9 months during 1999, with a number of groups at Sun. Intervention in the practices of one group took place over the final 3 months of this period.

This paper discusses the DC practices of only the single group within which interventions were carried out. Further, it focuses mostly on those practices that were effected by the intervention.

## **ORGANIZATIONAL SETTING**

The group of this case was developing a large technical product, with design held as computer-based files. Much of the work was done by looking at documents in hardcopy form. (The exact nature of this product is not important for presenting this case. It would appear that the results would be applicable for projects of many kinds.)

The group had roughly 100 members at the time of the study. The group was located at two sites: the "east coast group" was smaller (around 30) in Massachusetts, and a "west coast group" was larger (around 70) in California.

Management of the groups was spread across the sites, with many cross-site reporting relationships. Senior management was at the west coast site.

## **MEETINGS**

### **Structure**

The group conducted two different sorts of repeated meetings:

- small meetings: for particular subgroups; e.g., staff meetings, team meetings.

- large meetings: for everyone in the group; e.g., "All Hands" for presenting status, and "Tech Talks" for promulgating technical information to everyone in the group.

Meetings of both sorts were repeated on a regular schedule; e.g., monthly, weekly, Tuesday and Thursday. There were many meeting series of each of these kinds. We studied only four of these: 2 small and 2 large. This case focuses on the large meetings.

### Rooms

The large meetings were held in large rooms. The small meetings were held in either large or small rooms, according to what was available. All meetings were between two rooms, one in the east and one in the west. Meetings were often held back-to-back, so that one meeting would lead directly into the next, with limited time for reconfiguration.

Each conference room had a long rectangular conference-room table. In small rooms, the table ran lengthwise in the room. In large conference rooms, the table was moved around to suit the need: sometimes pushed against the walls to permit chairs to be set up theater style, joined by other tables to create a U-shaped or square-shaped table.

All conference rooms had a presentation wall: whiteboard, pull-down projection screens. In rectangular (non-square) rooms (particularly the small rooms), the presentation wall was an end wall.

### Communications

The group used video technology for its meetings. They used standard video conferencing technology. However, in contrast to elaborate "teleconferencing rooms", the group used video technology in their standard conference rooms. The only modification that had been made to otherwise standard conference rooms were to provide the connections for the necessary telephone and network circuits.

### Practices

The video equipment was regarded as connecting the two rooms. In small meetings, the connection was made at the ends of the rooms, with the video equipment set up near the end of the conference room tables; full-duplex audio was a feature of the videoconference technology, and was achieved in these spaces by spreading microphones along tables in both rooms. In each room, the presentation wall was at the other end of the table from the video.

The effect was that the video equipment was connecting the tables. In fact, of course, connecting the tables also meant connecting the space around the tables, including the presentation areas.

This configuration was described as follows:

- the tables were connected by the video at their ends into one long virtual table;
- chairs were set up around this virtual table, by being set up around the two physical tables;
- access to people was uniformly gained by look across the virtual table, turning head left and right to see people on your side; when people were in the remote room,

access was provided through the same practiced action of turning the head and looking on through the video;

- presentations were given from the presentation areas at both end of the virtual table; people would turn in their chairs to see the presentation, those in the remote room seeing it through the video.

The interactional techniques of talking around a table worked fine around this extended virtual table. The only exception was that people needed to learn to speak loudly enough for their voices to be picked up by the microphones, which were slightly less responsive than people listening in the same room.

### LARGE MEETINGS

The design challenge was to extend this easy understanding of connected rooms to the large meetings. The large conference rooms could be arranged into a long virtual table just as if it were a small meeting. In fact, that is the way that the large rooms were used to support small meetings.

The problem was that the resulting virtual table in the big conference rooms would not hold everyone that needed to be in the large meetings. The tables did not have enough sides for 100 people.

#### First attempt: extend the table

When the study began, the large meetings did not have a single well-established practice. When the meeting was not too big, people would use the small meeting configuration, and add more chairs in a second row. Those in the second row of chairs were somewhat disadvantaged in being heard, resulting in quite unequal access.

#### *First story: discussion around a virtual table*

The story that was told about the configuration and which drove the practice was the same story as was told in small meetings: discussion around a virtual table. The story worked well in supporting the practice.

The difficulty with this story was that it did not fit easily with the central focus on presentation. While everyone was arranged for a discussion, the presentation was stretching the configuration, as was made clear by the unequal access.

#### Second attempt: face the presentation area

Another arrangement that was in place when the study began gave up on the virtual table. When it was discovered, as the meeting room was filling up, that there were too many people, chairs would be added to the side of the table, facing the presentation area. When the overflow was anticipated, the table would be pushed back against the wall, and chairs set up theater style, facing the presentation area.

In this configuration, people were facing the presentation area. This followed the practice for presentations in small meetings, and was therefore familiar.

However, the disadvantage of turning and facing the presentation area was that discussion was much more difficult. At the presenter's site, local discussion flowed freely in the room. However, interaction with those at the site remote from the speaker required that those at the presenter's end turn around in their chairs to see those

speaking from the other end. Because the video was at the back of the larger room, it was hidden by other audience members from those turning around in their chairs. Discussion was difficult.

*Second story: one room behind the other*

Those at the site remote from the presenter were looking through the video at the presenter, but also at the back of the heads of those at the presenter's site.

The story that this suggested was that one room was behind the other. People at the presenter's site did turn around in their chairs, to discuss with folk at the remote site. The story drove practice: to have inter-audience discussion in large halls, people have to stand up, and turn around, and speak loudly. This is exactly what we saw happen.

**Third attempt: make the remote folk more visible**

After observing the existing practice, we decided to intervene by improving the access to the remote site for everyone at the presenter's end. We projected the image coming from the remote site onto the back wall (the same wall as the video equipment was on; the wall opposite the presentation wall) of the room at the presenter's end.

*Third story: one room behind the other, but closer*

People at the presenter's end could see the remote end much better. The feeling was that the remote room had gotten much closer. From the presenter's perspective, those at the remote end were equally accessible as those at the local end. However, for the audience, local folk had to turn, and remote folk were looking at the back of heads.

**Fourth attempt: symmetry**

Although this third attempt worked reasonably well for "Tech Talk" presentations, it did not work well for the discussion that sometimes emerged as part of them. Our observations showed the symmetry of access provided to those in the two rooms.

However, an "All Hands" meeting showed the real cost of this asymmetry: Although the meeting was being lead from one end, the presentations were being made from both ends; people were introduced, awards were given out, and status presentations made by managers at both ends.

That the rooms could be thought of as behind one another was not acceptable. Clearly what was needed was the rooms on a more equal footing: possibly they should be beside one another.

*Fourth story: rooms beside each other*

This configuration was not explored in practice, but only in thought. To achieve this configuration, a second video channel would have been required; the video would have been set up at the sides of the two rooms so that participants could view each other by looking to the side.

Further to view the presentations, the camera for the presentation would remain at the rear of the room. However, the image of remote presentations would be moved from the back to the front of the room.

It was clear that this configuration was not one that could be our final solution because it doubled the cost of equipment and communications.

However, this story about the virtual arrangement of the rooms provided an important bridge in carrying our thinking forward. It focused our attention on the importance of symmetry, and also on the possibility of moving images to different walls than the ones where the video equipment was located.

**Fifth attempt: twisted space**

After some rethinking, the idea of moving images around in the room suggested that we could make the participants at the "other end" more accessible in a different way: instead of putting big image of them up on the back wall, we would put that same big image up on the *front* wall, beside the images that the presenter was putting up. That is, we would use the presentation area symmetrically for both live and video presentations.

However, the camera still needed to remain at the back of the room, and the image transmitted would be the view from the back of the room, showing the presenter, but also the backs of heads.

*Fifth story: rooms both behind and in front of each other*

From the presenter's view, they are speaking to an audience composed of a local room with a remote room beyond it. From the participant's view, they are behind the other room (as seen in the image of the other room in front of them), but they are also in front of it having more immediate access to the local presenter. Each sees the back of the other's heads, sees local presenters up close, and remote presenters over the audience heads.

The resulting configuration, a ring of rooms each behind the other, is one which has no corresponding reality in physical space. Yet, despite the novelty, no one seems to have any difficulty understanding it. In particular, it drives practice in a natural way: in discussions within the extended room, people can either talk to the back of the heads of those ahead of them, or turn around and talk to their faces. We have seen both happen.

The advantage of talking toward the front, is that microphones can be placed to capture talk directed toward the front. This is necessary, as talk directed at the presenter (from either end) will directed to the front. If people turn toward the back, additional microphones are needed.

It is interesting to note that this fifth solution also leads to minimal disruption when reconfiguring between a small and large meetings.

By designing iteratively with working configurations, we produced in the end a solution that not only met the needs as identified at the outside, but also many more needs that were discovered and articulated as we went along.

**DESIGNING WITH AND BEYOND MODELS**

Our story of video as being a mechanism for plugging rooms along their edges worked well for the small meetings. However, as we stressed it in the large meetings,

it began to get in the way, preventing us from seeing solutions which were at odds with that story.

This design effort produced a novel configuration that used a single video channel for symmetrically coupling two sites in support of large meetings with presentations from both sites and inter-site discussion by all participants.

Early success in small meetings led us to pursue using video to implement configurations of the two rooms that could be described in physical terms: rooms and tables coupled at their ends, behind one another, beside one another.

However the early success with finding solutions using physical models interfered with our getting to a final solution that could not be described as something that could be achieved physically.

At each stage in this work, we talked over what we were seeing with participants, often while the meeting was in progress (as side conversations, or as a meeting topic proper).

To overcome our joint difficulty with getting beyond the physical, we imagined with the participants an ideal configuration driven by this model. We let go of practicality to image something better. And from the result, which we could not realize in practice, elements emerged which let us get beyond our constraining assumption.

While nothing succeeds like success, it is also true that nothing constrains like success. Getting beyond our own thinking is one of the hardest things to do in design. We were successful in this case because imagined but impractical solutions led to new practical designs.

It should also be noted that this story of design is one that has only emerged long after the design has been completed. It is *not* necessary to understand what you are doing in order to do it well.

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