# Observations On A Trans-Oceanic Collaboration: Anecdotes From An HP Labs Initiative

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## Abstract

*Over the Spring and Summer, 2001, groups of researchers from HP Labs in Palo Alto, California and another from HP Labs in Bristol, England engaged in a collaborative project to develop a fresh and forward-looking strategy for their Research Center. The overall experience indicated that three general areas presented significant challenges for effective progress: meeting management, communications technology, and document management. Other such elements as: time-zone differences (8 hrs.), working at home vs. the labs, and size of a sub-team were also factors, although these were of lesser importance. The primary observation was that the technologies, as used in this context, were as much hindrances as they were advantages. Distributing documents via email was used most frequently, whereas shared drives and the Center website were considered least useful.  In terms of information sources, collaborators relied foremost on their own personal collections, followed by items located on the Web, and from colleagues outside of HP. Recommendations and areas for additional research are identified.*

## Introduction

Over the course of the late Spring and early Summer, 2001, various participants from the three labs in HP Labs' Solutions and Services Technology Center (SSTC) engaged in an initiative to bring forth a strategy as context and guidance for the Center's activities. The team was predominantly split between locations in Palo Alto, California and Bristol, England.

Following the interim conclusion of these activities, marked by a presentation of some elements of the strategy to HP's CEO, two HP Labs' researchers surveyed the participants about their activities with the Strategy Initiative. The primary emphasis of this study was to uncover specific anecdotal findings regarding the process of a cross-oceanic collaboration. A total of 13 people participated in the web-based survey, which was distributed to everyone on the SSTC strategy discussion distribution list and remained open for responses for a two-week period in July 2001. This report summarizes the results of this survey with a particular emphasis on the technologies and information resources used.

While the literature on computer supported collaborative work (CSCW) is broad and continues to grow and evolve, only select items are useful to inform the

current research project. In particular, those that offer findings regarding proximity (or "propinquity"), the tools used, and the nature of the work product generated, are centrally relevant to this project.

Notably, Kraut et al. (1990) highlighted the importance of proximity in collaborative interactions. They identify several necessary aspects of proximity: concentration of suitable partners, co-presence, low personal costs, and visual channel.  In the current instance, these elements were present, although the "co-presence" was due to electronic means between the two primary teams (Palo Alto and Bristol), which in plenary sessions did include a visual channel. Other sessions were typically conducted with teleconferences, often accompanied with simultaneous viewing of slides either in real time or via files that had previously distributed.

The teleconferences seemed to work well due to the regularly scheduled meetings held for the Strategy Initiative. Egido's (1990) research found  "The results of earlier based laborato ry and field studies… indicated that teleconferencing is best suited for regularly occurring meetings aimed toward the presentation or exchange of neutral information between colleagues in different locations.  However, it appears that the proportion of meetings that match that description is indeed very small." (p. 361). However, for much of the Strategy Initiative, the meetings were called to bring together colleagues from different locations, and although the information presented was not necessarily "ne utral" (i.e., strategy alternatives were under discussion), the participants were not disputative in their demeanor. Perhaps this contributed to the relative efficacy of the teleconferences.

Whereas the Strategy Initiative meetings were relatively formal (i.e., plenary sessions but without specific agendas), still much informal and "back channel" communication occurred at other times amongst the participants. Sometimes this was brought about by the Initiative, but it was just as likely that pre-existing personal relationships amongst the researchers guided the conversations and elements related to the Strategy Initiative were just incorporated into those dialogues.

To this point, Grinter, Herbsleb, & Perry's (1999) research led them to say: "These findings suggest that informal communication plays a critical role in coordinating R&D work. Therefore, one of the central problems of distributed development is generated by the fact that distance profoundly reduces the amount of such communication. The primary reasons for this reduction appear to be fewer opportunities and higher costs" (p. 307). Yet, with familiar colleagues, frequent use of email and leaving voice mail messages were commonplace. At times, other conversations – sometimes standing meetings – were already scheduled and the Strategy conversations occurred as a postscript to them.

Taken together, these topics set the stage for the research project at hand. It was an opportunity to take a specific set of interaction episodes that required remote collaboration and review them as a microcosm of the larger set of collaboration issues encountered by a distributed organization which must, from time to time, find ways of effectively collaborating irrespective of differences in time, distance, or technology. From this perspective a set of four research questions were brought forth.

**Research Questions**

The purpose of this research was to explore remote collaboration processes as R&D researchers worked on a Strategy Initiative.  The research questions were:

- **Q#1:** How did meeting support technologies affect remote collaboration interactions?
- **Q#2:** How did remote collaboration impact work practices in an R&D research lab?
- **Q#3:** Which communication approaches were most effective in accomplishing remote collaborative work and producing work products?
- **Q#4:** Which kinds of information were used to support collaborative development of the Center's strategy?


**Participants**

Thirteen researchers, involved in the HP Labs' Solutions and Services Technology Center Strategy Initiative, participated in this study.  Participants were geographically dispersed, with nearly equal numbers from the United States (7 people, 54%) and United Kingdom (5 people, 38%); one person did not answer this question.  While participants were all from the same Center, they came from one of the three labs in the Center. Throughout this report the term "Center" refers to the organizational abstraction that included three labs and their participants from across Palo Alto, CA, Cambridge, MA, and Bristol, UK. Participants worked at HP Labs an average of 6.5 years, with a range of 0.5 years to 13 years. Most of these participants were managers, although a few minor organizational changes and reporting relationships changed over the course of this study.

Nearly 40% of the participants (5 people) conducted at least some of their work on the Strategy Initiative at home, while 8 people (62%) performed all of their work at the HP Labs sites.  The number of people who collaborated at any one time depended on the type of work.  When people were sharing ideas and working at a high level of abstraction, their collaboration groups were relatively large (average of 6.5 people, ranging from 3 to 10 people).  When people were working closely on producing a work product, the collaborative group size was about half that size (average of 3.6 people, ranging from 2 to 7 people).

**The Strategy Initiative Meetings**

The general approach to the Strategy Initiative (SI) meetings followed common practice. Plenary sessions of a large working group were held weekly, with smaller sub-teams meeting or communicating as necessary. The plenary meetings were held using teleconferences and often, video conferencing technologies. For simultaneous viewing of slides and presentations, NetMeeting was also utilized.

The physical characteristics of the collaboration played a significant role in the ways the meetings were conducted. Participants in Palo Alto gathered together in an appropriately equipped room, as did those in Bristol. One participant typically called in from the US East Coast as well. The physical set up was then two groups, in two rooms (plus one or two individuals in other remote locations), separated by a continent and an ocean and eight hours on the clock, but joined by a variety of electronic means. Documents were often shared beforehand, typically distributed as email attachments. As a result, distinct group processes occurred in each location during the plenary meetings. These are discussed further below.

The work products of the team consisted of working papers, slide presentations, a graphic representation of the strategy, and a software demo. Each of these was created through collaboration that at least in some measure included participants for both the USA and the UK.

**Results**

Data from the web-based survey were analyzed. Open-ended questions were evaluated for recurring themes, with anecdotes pulled out to illustrate the participant's point of view.

**Q#1) Effect of meeting support technologies on remote collaboration interactions**

Due to the economic climate, travel restrictions were imposed on employees during the period of study and few participants were able to engage in face-to-face meetings with people at other sites. Only three people took trips during this period and were able to use some of their time to discuss the Strategy Initiative. As a result, several supporting technologies were used to engage in the Strategy Initiative. These included conference calling (teleconferences), videoconferences, shared file storage, and shared simultaneous displays (using NetMeeting).

**Teleconferences/NetMeeting:** Most participants relied heavily on the use of teleconferences in the Strategy Initiative process, with many participants communicating with their colleagues regularly, often on the phone daily. A few participants expressed that teleconferences worked well for communicating with colleagues on relevant issues, especially in terms of having real-time discussions about the overall Initiative or the specific work product being created. We address one of the distractions, the issue of side conversations, in greater depth later in the paper.

Data suggested that few people supplemented their teleconferences with NetMeeting. NetMeeting was commonly used during the plenary sessions, and typically required some measure of support to operate properly. Also, the smaller teams used NetMeeting occasionally in their own activities, but not as frequently as the plenary sessions. It did turn out that the technology itself was at times a distraction.

NetMeeting, which is basically a peer-to-peer, one-on-one, conferencing collaboration tool was often used as the primary vehicle for creating a shared visual experience related to documents (and diagrams) throughout the plenary, semi-formal meetings. Olson and Olson (2000: 163) found "use of NetMeeting at Boeing was a particularly interesting case of coupling. All teams reported that NetMeeting worked best for formal presentations [loose coupling] or with action items about which only reports of status were allowed [loose coupling]. Discussions were described as [round robins] again indicating a formal process, not free-for-all exchange. The meetings were not good for developing a group process or for establishing a team identity." As a harbinger to the experiences revealed by this study, Olson and Olson (2000: 165) further noted: "The Boeing teams had experienced video and audio conferencing… Although they were ready for such technology, frustrations with the audio and the limited usefulness of the video resulted in declining use of NetMeeting."

One participant in the current study noted that it typically took at least 10 minutes – often as long as 15 – to get the technology in working order, ensure that the proper materials were in storage locations that could be accessed, and were projected in the proper manner (e.g., using "true color"). Olson and Olson, in the same paper, continue: "It appears the users were ready for a technology that was unable to deliver on its promise. This, of course, can cause major problems with subsequent attempts to introduce similar tools because such failure experiences are often very memorable" (p. 165).

**Videoconferences/NetMeeting:** Videoconferences were also used but not quite as frequently as teleconferences. During the Strategy Initiative, the highest number of videoconferences that a participant mentioned participating in was 8. Data suggested that only a few people supplemented their videoconferences with NetMeeting. Participant comments suggest one of the reasons was that videoconference technology was considered "clunky".

One study participant noted: "Videoconferences worked poorly - in general I have no access to the video facilities so am only getting the audio portion - but even when I was at a video facility the video seemed more of a distraction than a benefit." Other researchers have identified from other laboratory work that the size of the [video] image of the remote participants strongly affects the interaction (Grayson & Coventry, 1998 viz. Olson & Olson). This is likely related to the present case because the video images of the participants were somewhat blurry and washed out due to the nature and location of the cameras, the lighting conditions, and the design of the meeting rooms -- many of which were not originally designed for video conferencing. While the presence of the visual channel of other participants was recognized to add "something" to the meetings, the image quality nonetheless led participants to recognize that it was not a channel for effectively reading fluid facial expressions, body language, or various meeting management behaviors (e.g., raising an eyebrow or a finger).

Dourish et al. (1996: 36) suggest thinking of videoconferences not in contrast to "real world," but instead "as a part of the real world, and how people organize everyday, 'real world' activities around it." In the situation related to the current study, videoconferences were in fact the only means possible when visual interaction was needed across the distributed locations. While not ideal, they nevertheless did suffice because no other method was available to be able to "see" the other participants. While this may have "felt" better, it's an open question as to whether this actually made a difference in the productivity of the meetings or the quality of the generated work products. This point is echoed by the literature: Frohlich (2001) says:

> "In fact, most experimental comparisons of same task performance in video, audio and face-to-face settings have failed to find any objective outcome benefits of talking head videoconferencing over audio conferencing…. It has even been difficult to find any differences in the technical characteristics of telephone vs. video-mediated conversation, perhaps because people compensate so well in the verbal channel for the lack of information in the visual channel…. However, in most of these studies people will say they prefer the richer video medium to the telephone, and tend to use it when it is available…." (p. 39)

**Shared File Storage:** Most participants did not find storing or accessing documents on shared drives useful. Shared drives did not provide participants

with an effective way to track and manage document versions or support a means for creating new merged document versions. Difficulties made evident by differences in the computer network architecture between Palo Alto and Bristol led to myriad problems with access control, timely retrieval of documents, and the ability to share documents from a common location.

One participant commented on this aspect of using shared drives: "Shared drives were almost impossible for document sharing, leading to multiple divergent versions." One participant suggested that using the web would be more useful in the collaborative process than shared drives: "We should use the web more, especially if we all could post documents to web servers easily without using shared drives or the overhead of the SSTC website." [N.b., SSTC is the name of the research center.]

One of the major challenges to meeting support related to keeping the technology working in an acceptable manner. This included a broad range of issues spanning the range from audio fidelity, to having appropriate access to shared drives, to having the shared display working as expected. Numerous times a support person was necessary to either help get the videoconferences or teleconferences with a shared display operational. By requiring specific individuals skilled at the technology, the collaboration seemed to be more of a "fit to the tools at hand" instead of having the tools themselves "fit the collaboration under way."

## Q#2) Impact of remote collaboration on work practices

Several aspects of collaborating remotely on the Strategy Initiative influenced researchers' work practices. These included:

> ➢ time zone differences,
> ➢ organizational performance, and
> ➢ meeting dynamics.

*Time zone differences*

Most participants commented on the negative impact of the delays in work productivity introduced as a result of the time zone differences. The time zone difference between Palo Alto, California and Bristol, England is 8 hours. Participants indicated that the limited overlap in work hours was inconvenient and delayed progress because they had to "await synchronization" with their colleagues in different time zones.  As one participant commented:

>  "I felt it delayed progress because of the need to await synchronization until our (UK) evening so that development of material could not continue until the next day. In most cases we did not get the expected speed up by

having one group work while the other slept; instead we ended up waiting for the other group to wake up!"

Another participant put it this way:

"Imagine conversation with astronauts (with seconds lag between question and answer). Now change the lag to 12 hours. You get the idea. The choices are: sacrifice sleep, or put up with a very slow asynchrony."

Participants had to adjust their work practices as a result, spending more time working at home either earlier or later than usual.  It's worth noting that the schedule was such that the meetings were typically held at 8 AM in Palo Alto, before the beginning of the typical workday. The corresponding time in England was 4 PM (local time), which is the end of their typical workday. For meetings that ran longer than 1 hour, the workday in Bristol was extended beyond the conclusion of a typical workday.  No other arrangements were attempted (e.g., 12 midnight in California which would be 8 AM in England) or would have been realistic. For some people, this was disruptive to their work-life balance due to such external factors as pre-arranged car pools or day care arrangements on both sides of the Atlantic.

Despite these challenges, a few participants considered the time zone differential more positively -- as a way to "work around the clock"— by working while colleagues at the other site slept.  They also felt that the time difference gave people an opportunity to think more deeply about the issues that arose out of the Strategy Initiative discussions.

*Organizational Performance*

Irrespective of the technical challenges, many participants discussed the positive impact of strategy collaboration on their organizational interactions and performance.  Participants worked with people outside their usual co-located peer groups, which some participants felt gave them a "broader view of what was going on within the organization." Specifically, it "provided an opportunity to develop an understanding of research work and working relationships with other colleagues."  It also provided them with "better alignment across geographically separated labs." Other participants felt that the Strategy Initiative collaboration resulted in significant progress for the advancement of their research program – viewing the impact of the collaboration as a "cornerstone for moving forward with research program in the Center."

A couple of participants felt this collaboration either did not impact their work practices or had a negative impact.  Specifically, they felt that the Strategic Initiative collaboration did not have the "intended impact on what the Center is actually doing."  While these sentiments may be heightened due to the challenges of working remotely, these concerns are more reflective of

dissatisfaction with the Strategy Initiative process itself.

*Meeting Dynamics*

When asked about the challenges related to collaborating on the Strategy Initiative remotely, participants responded frequently in terms of meeting dynamics. Meeting dynamics present challenges even under optimal conditions, but when people are separated geographically and are required to work together on a project, while utilizing technology that is often shaky at best, the remote element can make collaborative work even more complex.

Meeting dynamics were influenced by a number of factors, including political interactions within the Center team, clarity (or absence thereof) regarding the project's purpose and the expected outcomes, management of meeting protocols in remote collaboration (e.g., assignment of decision owners, ground rules, meeting etiquette, summarization of core ideas, agendas, minutes, etc.), and advancement of project goals (e.g., identification of next steps and how to move forward).

Participants commented on a number of these factors. One of the challenges evident in this collaboration study was that some of the participants said they did not have a clear understanding of the purpose and purported benefit of being engaged in the Strategy Initiative. In short, the main challenge for some wasn't the process of collaborating itself, but more so the ambiguity about the rationale for the collaboration in the first place. Expected outcomes were also seen as ambiguous to these people. One participant described this challenge as a "lack of understanding about the expected effect of the strategy process." Other participants recognized "the lack of decision owners or decision process for actually taking the resulting material and doing something with it" to be particularly problematic.

A generally accepted "purpose" for collaboration and expected outcomes is more critical in situations when people are working together remotely -- when they do not have the flexibility to discuss the project informally, for example to clarify goals and objectives, than situations where people are working side by side. Lurey & Raisinghani (2000) found "without a crystal clear understanding of their goals, 'the progress of [team] members will be stymied.'"

Another participant described the challenge associated with distilling various work products contributed by the Strategy Initiative participants. While the exchange of documents, along with multiple people working on them, appeared to work well in most instances, a need was recognized for more focused editing to keep things short and targeted, instead of just creating WORN manuscripts.

> "There is a growing collection of WORN documents (Write Once, Read Never). There is value in the process of writing these documents, as they

help the authors clarify their thinking and subsequent decision-making. However, the group is probably too large and diverse to expect a detailed set of meaningful documents that is of general interest. The challenge lies in providing various levels of abstraction of the core ideas that allow getting the overall picture without leading to excessive competition ("my idea needs to make the core set"). To require a diverse organization to be easily labeled in 7 +/- 2 words (short-term memory) would lead to a loss of valuable work. There should be room for niche contributions."

Another participant commented on a similar issue, suggesting that meeting dynamics would be improved if there were an "ethos of document re-factoring."

"As suggestions accrete in the document it gets big, unclear, muddled in style. It should be not only possible but expected that (a) the document be refactored to regain brevity and clarity and (b) that some person or small group have final arbitration in an area so that documents can go for clarity and precision over inclusiveness."

Additionally, the importance of meeting protocols to address typical group occurrences, like side conversations, was evident from the study findings. Participants reported that while someone would be speaking, especially to a particular set of slides, distracting side conversations would occur. For example, one participant commented:

"Joint meetings were very poorly organized (poor agenda) and appallingly run (chairman needs to think harder about what is going on). Where a meeting was chaired in Palo Alto I noticed that mostly the UK end had the microphones switched off (not the speaker) and an almost separate meeting was being held at each site."

This observation is in concert with Olson and Olson's (2000: 151) research which identified that collaboration meetings "were most successful when they had a formal structure to them or were facilitated." Another participant made a similar observation about the problems presented by side conversations in remote meetings.

"For audio conferences it would be better to have everyone attend from their desks rather than have groups together in conference rooms - this would provide better voice quality - by avoiding speakerphones. It would also improve attention by avoiding side conversations."

These observations were consistent with other findings, such as those of Heath and Luff (1992: 3) who wrote: "Collaboration necessitates a publicly available set of practices and reasoning which are developed and warranted within a particular setting, and which systematically inform the work and interaction of various personnel." In other words, a "set of practices" provides context for how

participants interact with each other. Aside from the expected elements of propriety, side conversations splinter the group, distract participants from the overall meeting objectives, and provide a disadvantage to those people participating at remote locations who are unable to engage in the conversation.

It is recognized that "side conversations" may add value in certain instances – for example, in an open control room where each individual has a specific focus of action, yet needs to be aware of what was going on elsewhere. Heath and Luff (1992:6) noted that for workers in the control room for the London Underground, side conversations enabled "… them to gather the appropriate information to grasp the details of the current operation of the service."

In their research on remote collaborations, Grinter, Herbsleb & Perry (1999) observed: "The central site was in all cases where the weight of decision making authority arose.  There are inevitable side conversations, hall talk, 'meetings over the water cooler,' and so on, where early notice of current thinking on technical questions or management decisions is disseminated…. For satellite sites, on the other hand, it is difficult not to be constantly surprised." (p. 313-314) The companion notion of meeting dynamics, including effective agendas and floor management, arose in the current study.

So whereas the side conversations may well be a nuisance for some participants, particularly those who are remote, the conversations may contribute to some extent to those located together on location. On the other hand, this calls forth questions of meeting dynamics, appropriate procedure, and the leadership conducting the meeting. However, the relative balance of the advantages of monitoring, vs. the social and organizational disadvantages due to distracting side-conversations was not assessed in the present study.

### Q#3) Communication approaches for accomplishing remote collaborative work and producing work products

Participants rated the usefulness of a variety of means of communication in getting work done on the Strategy Initiative (Figure 1).  Responses were scored on a 0-4 point scale and rank ordered.

Participants indicated that the three **most** useful communication approaches used in the Strategy Initiative project were:

- distributing documents via email to colleagues for review and editing
- engaging in informal conversations with colleagues
- meeting in face-to-face scheduled meetings.

Participants indicated the three **least** useful communication approaches were:

- storing/accessing documents on shared drives
- using NetMeeting
- storing/accessing documents on the Center's website.

One important aspect of communication approaches is to see the means of communication within the context of the work culture in the Labs, which has an e-mail-centric manner of working. Labs' personnel haven't focused on either the behaviors of using shared document repositories nor the simplification of repositories that make them easy to use and "top of mind" for collaborative projects. This observation provides insight into the findings of those communication approaches that were identified as being "most" useful.

Similarly, of those approaches that were least useful, two of the three involved document repositories, which speaks to both aspects – using them is not yet a broad-based skill, nor are they particularly easy to use so that they can be part of a project as a simple afterthought.

NetMeeting was also seen as low in utility due to the regularly occurring problems with setting it up and running it during a meeting. At times these were knowledge problems (e.g., which machine to call, which IP address to use, how to use the name directory). At other times these were technical problems (e.g., software running far too slowly with too many simultaneous viewers, inappropriate software configuration). In each case, both the technology, and its relative complexity leading to steep learning in real time on the part of users, were inhibitors. In short, people wanted to get on with their work, not fiddle with computers. As a result, these aspects were rated by users as low in their overall usefulness.

Figure 1: Usefulness of Communication Approaches
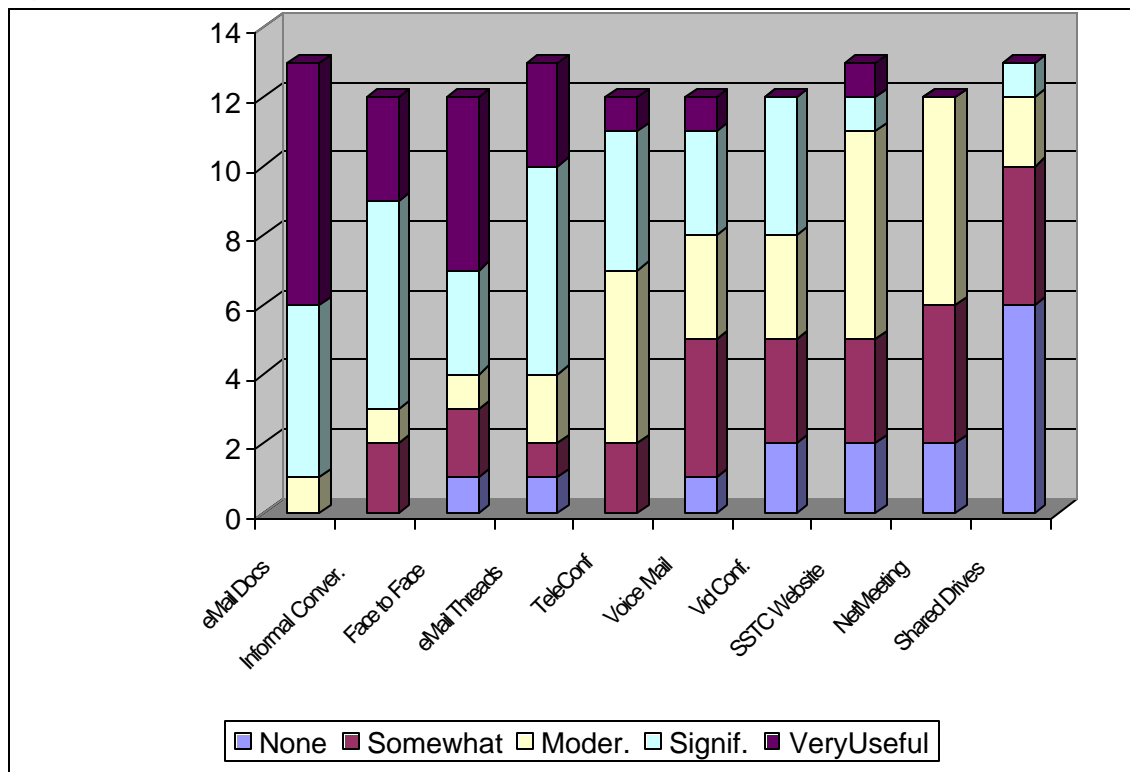


The Y axis refers to the number of participants.

## Q#4) Information used to support collaborative strategy development

Participants used a variety of information to inform their thinking as they engaged in the Strategy Initiative.  Participants were asked to indicate whether they used information sources as core materials, background materials, facts, or not at all. Responses were coded on a 0-3 point scale to get a sense of the ways the sources were typically used. For our working definitions, the authors considered "core" materials to mean those that were directly related to the content of the work products, whereas those denoted as "background" were those that provided supporting and other contextual information. "Facts" were just data or specific findings, found from sources of authority that could be used in either situation (Figure 2).

The top three sources used to develop strategy papers or slides were:

- personal collections
- items from the WWW
- HP colleagues outside of HP Labs and Library resources and services (Combined: visits to the library, searches on library web services, and consultations with research analysts).

In regard to information sources for this particular Strategy Initiative project, it's important to recognize that the individuals involved with the team already had significant knowledge about the field of study – there was state of the art familiarity with technology issues, as well as familiarity with both the corporate and Lab's strategy initiatives. To some extent, the Strategy Initiative was really a "fitting exercise" although in a positive sense. The goal of the SI team was to draw on the expertise of the Center's personnel and draw these into a beneficial contribution within the strategic directions of the company and the Labs. As a result, many of the participants turned to their personal collections of materials – which have often been accumulated through years of diligent research – as their first resource. Personal collections were also most frequently used core materials for the project.

Researchers also needed access to new papers and scientific publications related generally to the Strategy Initiative, as well as business information, such as competitive information regarding other companies and their products. For this, the WWW was broadly used, most frequently as a source of background information. Hirsh (1999), in a study of information usage by HP Labs researchers, found similar usage of the WWW as a source of background information. In that study, 44% of the participants reported using the WWW to find information about companies and products, and university and government activities.

Also, many of the researchers have colleagues throughout the company (outside of the Labs) from around the world. As a result of serving on various task forces with them over the years, a sense of trust is developed for their potential contributions, as well as the unique and distinct insights they can bring to focus on a situation. It's typical for researchers, such as those involved in the Center's Strategy Initiative to turn to these trusted colleagues. Hirsh (1999) also found a reliance on colleagues, with 37% of the participating HP Labs researchers reporting communication with their colleagues, both inside and outside the company, often as the first place to turn to meet their information needs.

The Intranet ranked as the most frequently used source for facts. Participants used the Intranet to look for internal information about HP strategies, HP businesses, and HP Labs projects. Additionally, library services and resources (as defined above) were utilized primarily to support fact-finding in this Strategy Initiative – to identify facts that would support their contributions and general knowledge applied in developing new strategies.

**Figure 2: Information Sources**
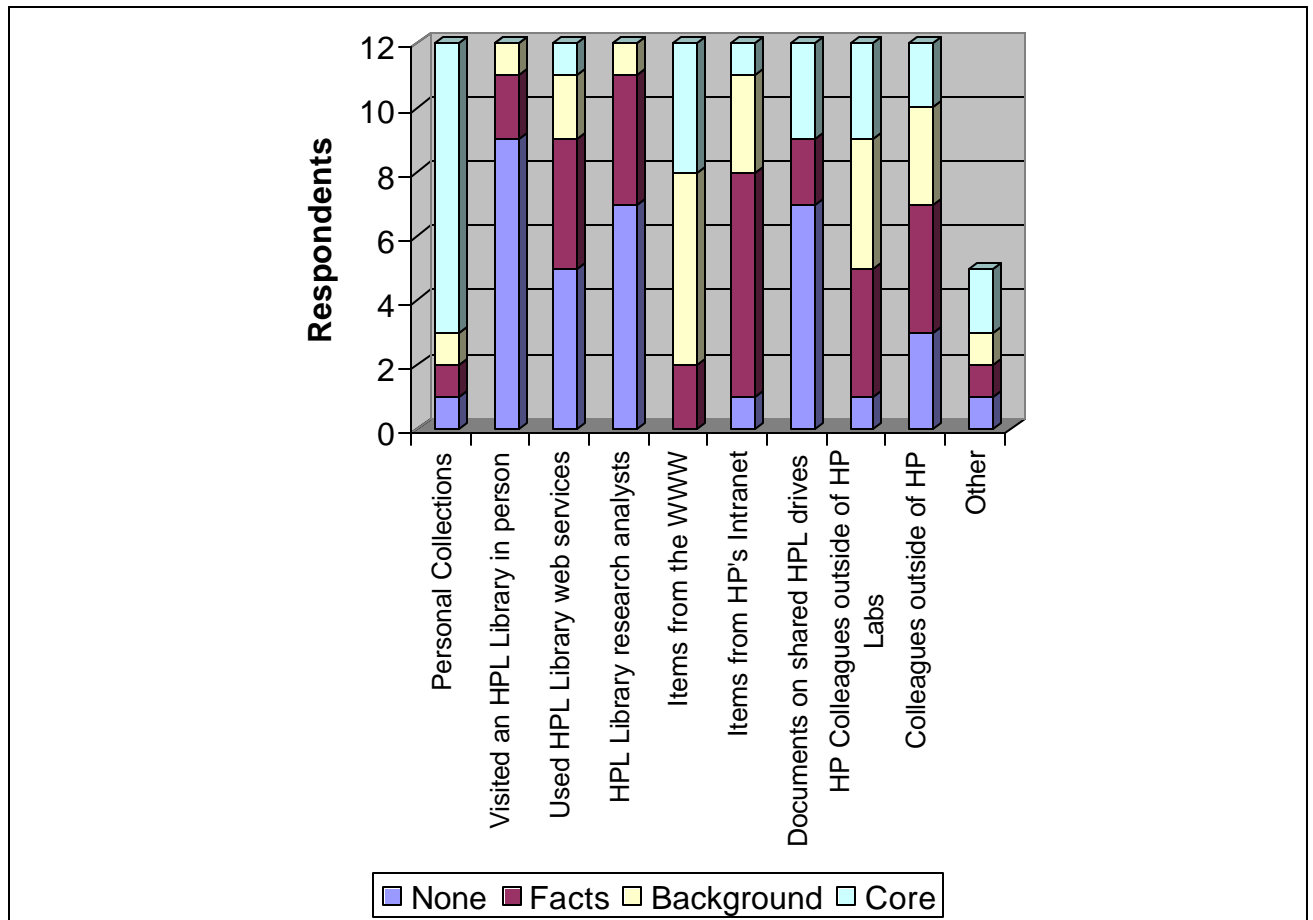


## Discussion

Participants identified a number of challenges to effective collaboration across Labs and Departments in the SSTC Center, which can be summarized around three general activities (see Table 1):

- participating in meetings through videoconferences, teleconferences, and real time communication due to technical difficulties or fidelity problems;
- sharing documents through access controls and security aspects of shared drives (instead of using the web); and,
- setting goals and objectives through various means, including establishing the purpose of strategy work, performing document re-factoring, and overcoming organizational boundaries.

## Table 1: Problematic Elements of the SI Collaboration

| Activity | Means/Technology | Problems |
|---|---|---|
| Meetings | Videoconference | Clunky<br>Poor or no access<br>Require technical support personnel |
| | Teleconference | Poor agendas<br>Poorly run<br>Side conversations<br>Poor sound quality (speakerphones) |
| | Real time communication | Travel restrictions |
| Sharing documents | Shared drives | Version control |
| | Web | Not used<br>Should be able to easily post documents to web servers |
| Setting goals and objectives | Purpose of strategy work | Unclear directives<br>Over-reliance on "fitting" previous content into new categories |
| | "Document re-factoring" | Need ethos to support re-factoring |
| | Organizational boundaries | Need to breakdown organizational boundaries – prevents creation of unified strategy |

A few participants expressed that teleconferences worked well for communicating with colleagues on relevant issues, especially in terms of having real-time discussions about the overall Initiative or the specific work product being created, although the technology itself was at times clunky and a distraction.  Overall, one interesting and related finding came from Olson and Olson (2000: 154): "numerous examples where participants were unaware of the difficulty they were having with the communication channel. They adapted their behavior rather than fix the technology."

Thus, the greatest challenges to effective collaboration identified in this study were both technical and cultural.  As HP Labs no longer operates as fully intact co-located teams and is not yet functioning in a mode as fully dispersed teams, the research environment needs to support a range of collaborative behaviors. These collaborative behaviors range from research efforts in which:

   a) teams include members who are mostly co-located with a couple of remote participants to

b) teams include primarily distributed members with a couple of collocated participants.

Presently, most collaboration relies heavily on either real time communication of information (i.e., via teleconferences) or asynchronous exchange of information (i.e., email).  Document management and other collaborative tools were either not available or hardly utilized. Naturally, all distributed organizations face similar collaboration challenges, and these can in some measure be ameliorated by technology; other factors, such as organizational culture, individual rewards, propensity to adopt innovations regarding working, and clarity of expected outcomes, also have a significant role. Each, in turn, strongly influences how collaborations proceed, and how various technologies can support them.

Collaborative technologies could provide significant support to remote collaborative activities.  However, technology alone is not enough to improve collaborative processes.  Efforts to promote and foster a collaborative culture are critical to this success. It's not technologies, but how they are used, that has significant impact on organizational performance. At one end of the spectrum, people can adopt a communication means such as Instant Messaging easily and quickly, and do this on a "one person at a time" basis. In contrast, a full-fledged collaboration system that includes document management, group calendaring, version control etc. is both a much more significant undertaking as well as requiring nearly a whole new way of working. Both of these examples bring to mind very advanced technologies, but they differ significantly in terms of the behavior impact they can have.  As Olson and Olson (2000) found: "One should not attempt to introduce groupware and remote technologies in organizations and communities that do not have a culture of sharing and collaboration." (p. 164)

Overall, the evolution of collaboration, and the tools to support it have been a "mixed bag" with both positives and negatives. It is nearly taken as a maxim that collaboration is desirable for improved organizational performance. Yet, many attempts to enable or enhance effective collaboration have become caught in the complexities of human behavior.  Breitstein-Arazi and Rasmus (2000: 6) summed this up succinctly: "Real-time collaboration tools will not become an integral part of an enterprise's collaboration environment. There are currently too many difficulties associated with the use and performance of real-time collaboration tools that prevent them from becoming an integral part of an enterprise collaboration environment any time in the near future."

There is empirical evidence that remote collaboration can negatively impact productivity. Frohlich (2001: 17) reporting on a Bell Labs 1988 experiment found that "the outcome of the experiment was that the Standard group produced a steady stream of outputs early in the collaboration, while the Remote group were never able to deliver any significant outputs before the collaboration eventually petered out."

There were also successes in the collaborative process of this Strategy Initiative exercise. One positive result of the collaboration was that participants indicated that this project opened up communication across labs, so that they no longer felt bounded as by "silos". One notable point, however, is that this finding is not necessarily related to the cross-oceanic collaboration, but more parallel to the fact that members of distinct labs were working together on a common topic, which is out of the ordinary.

Another success was related to the process of collaborating and producing documents during the Strategy Initiative. Most participants indicated that the exchange of documents, with various people editing them and contributing their point of view, worked fairly well and provided an opportunity for a broad range of opinions and perspectives to be included. While each major document had an assigned, lead author, numerous participants contributed across documents that drew their expertise or their interests.

## Conclusions

This study explored what worked and did not work well in a remote collaborative activity aimed at engaging in a Strategy Initiative for HP Labs. Participants responded to a web-based survey, which included a number of open-ended questions intended to identify barriers and successes in remote collaboration processes. Key recommendations, based on these findings, include:

> ➢ Establish guidelines for meeting etiquette for remote meetings, which also address the management of different types of remote meetings (e.g., brainstorming meetings, formal presentations, project meetings). Implement these meeting guidelines and communicate these guidelines widely throughout HP Labs.

> ➢ Focus some amount of collaboration time on familiarity with the tools at hand and how to use them.

> ➢ Integrate library resources and enlist the contributions of the Global Library & Information Services librarians early in the collaborative process.

> ➢ Promote a culture that supports remote collaborative activities through such means as allowing shifts in work hours and more time working at home to enable real time communication across geographic sites, encouraging document sharing, and fostering increased time spent on other collaborative activities.

> ➢ Provide additional collaborative technologies to support remote research efforts (e.g., document management systems, web repositories).

> ➢ Set clear goals and objectives for teams working on remote collaborative projects, including expected outcomes and task owners.

> ➢ Reward contributors, not just the owners, who engage in collaborative processes.

Additional research is needed to verify these findings with a larger sample focused on different remote collaborative activities.  Additionally, a more in-depth look at how information (formal and informal communication) flows through the remote collaborative processes and what technologies can be used to support these collaborative interactions is also needed.

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