Virtual Teams and Group Collaboration Technologies: Challenges in Supporting Distributed Groups

Charles Steinfeld
Michigan State University

Organizations increasingly depend on virtual teams, in which interaction and collaboration takes place among geographically-distributed, and often culturally-disparate individuals. Often these teams are globally dispersed, following the patterns created by multinational firms, global alliances, and international trade. Yet, it is by no means guaranteed that virtual teams will be a success, and participants often find the experience to be frustrating even when work is supported by sophisticated group collaboration technologies. The best technology cannot work if team members are not prepared for the challenges raised by working across time zones and national borders. For example, one team of software developers comprised of US and Spanish participants used a sophisticated Web-based system that included version control and notification services when any one person was working on pieces of code. They found direct communication by video conferencing to be difficult due to language differences, but were certain that they could simply use email to divide up their programming tasks by location and then assemble the result at the end of the project period. This group failed, however, because they both ended up designing the same software modules due to a simple misunderstanding at the outset that was never discovered until it was too late.

In this essay, some of the characteristics of virtual teams that make it difficult to rely on “business as usual” are explored. I explain what virtual teams are and note why their importance increasing. I discuss the types of technologies are available to support such teams, and why it is difficult for virtual teams to be productive and rewarding. I close with some advice for improving the work of virtual teams.

What are Virtual Teams and Why are They Important?
Virtual teams have been defined in various ways, although the essential elements of physical dispersion and interaction mediated by communication and information systems are fixtures in any definition. Lipnack and Stamps (2000, p. 18) define a virtual team as “a group of people who interact through interdependent tasks guided by a common purpose” and work “across space, time, and organizational boundaries with links strengthened by webs of communication technologies. Often virtual teams are temporary in nature, have not worked together beforehand and so do not know each other well (referred to as zero history groups), are culturally diverse, and are reliant on computer mediated communication that enables not only the spanning of distance, but also time through asynchronous interaction. The potential payoffs to organizations from virtual teams are considerable. Firms can gain increased flexibility as teams with the proper
expertise can be formed quickly without regard to any member’s physical location. Firms can respond more rapidly to changes in their environment and reduce costs formerly caused by the need to move people. These benefits are even greater when virtual teams need to deal with issues that are sensitive to diverse local cultural contexts, such as the design and introduction of new products for specific national markets, since it is possible to incorporate locally-based participants. Growing concerns over the safety and security of travel are now fueling even greater interest in global virtual teams.

**What Tools Exist to Support Virtual Teams?**
A number of different schemata can be used to classify the wide variety of tools that support virtual group collaboration. Group collaboration systems may primarily support synchronous (e.g. video conferencing, whiteboard, real time chat) or asynchronous interactions (e.g. newsgroups and mailing lists, collaborative writing systems, group calendars). Additionally, systems may be designed to impose or support more structured work processes (often called prescriptive systems) or unstructured group interactions (often called permissive systems). An example of the former includes group decision support systems (also often called electronic meeting systems), which lead groups through a series of steps designed to improve problem solving and decision making. These steps include, but are not limited to generating, exploring and organizing ideas, evaluating alternatives, voting, and producing reports, and often require experienced meeting facilitators (Nunamaker, Briggs and Mittleman, 1995). Another example of structured group support is a workflow system that determines the routing of documents through an organization. Permissive systems such as real time chat, video conferencing, or simple email, do not explicitly structure group interactions.

More recently, the groupware field has experienced dramatic growth in Web-based collaborative systems. Using browsers as the interface, such systems offer virtual teams shared work and file spaces, threaded discussions, and records of team activities to help dispersed teams collaborate on projects. One popular system developed in Germany, for example, is known as BSCW, for Basic Support for Cooperative Work (http://bscw.gmd.de/). Groups of people working on a common project can share documents, see who has worked on particular documents, and manage team membership. The advantage of Web-based systems is that participants do not need to have any specific software installed on their computers, and can access group resources from anywhere they can connect to the Internet. Perhaps the most exciting new development in the area of tools for group support is the development of peer-to-peer group collaboration systems such as Groove\(^1\) (http://www.groove.net). Systems such as Groove bundle a number of communication and coordination tools into a client application, such as real time chat, voice over IP, email, message boards, follow me browsing (where each group member sees the web pages that one person has chosen to load), shared whiteboard, shared outliner, shared file system, and group calendar. Information is stored locally, reducing the normal delays associated with interacting with a Web server. However, while connected to the Internet, all group members’ spaces are synchronized behind the scenes.

---

\(^1\) Groove is a registered trademark of Groove Networks, Inc.
What Problems Are Experienced by Virtual Teams?

Studies of virtual teams in practice reveal that they are frequently beset by a number of difficult problems related to their communication and coordination. Often these problems are related to typical group dynamics, such as the tendency for some people to dominate discussions in groups. However, virtual teams face new problems that arise from the dual challenges of working across time and distance. Among the problems witnessed in virtual teams are:

1) difficulties in changing group communication practices due to the extra efforts required to introduce a new technology across locations, even when it was clear that teams are having coordination problems. One US and Dutch engineering design team in a virtual team study waited two months before giving up on email for coordination, despite participants in both locations expressing frustration with the lack of timely feedback. Finally, the Dutch participants forced the group to meet via video, but this occurred so late in the project that they were unable to complete all of the work initially planned.

2) lack of awareness of such information as when teammates are available, on what activities they are working, or what else is occurring at the remote site that might influence teammates’ work. Participants in our virtual team studies frequently complained that they did not know if their remote partners had seen recent messages. In one case, a team of engineering design students experienced a breakdown when participants in one country were unaware that those in another had a university vacation. They interpreted the lack of communication as a lack of interest and commitment.

3) difficulties in forming good working relationships with remote teammates. Virtual team members often do not know each other well at the outset, and have little opportunity to meet in person. Hence they are challenged with forming good working relationships when all interactions are mediated by technology. Unfortunately, in most real time meetings in our studies, participants tended to “stay on task” and avoid the social interactions that can help build friendships. On the other hand, when interacting through asynchronous media such as email, the limited richness of the channel can delay formation of good relationships.

4) lack of trust in remote teammates. The dual effect of lack of awareness and relatively limited social relations can end up diminishing the amount of trust remote participants have in each other (Jarvenpaa, Knoll and Leidner, 1998).

Can group collaboration technologies help virtual teams overcome these problems? The answer is yes and no. In some cases, tools can be designed explicitly to address particular problems. For example, instant messaging systems have long recognized the need to provide communication availability awareness, so that senders know when a desired communication partner is online. A number of researchers have developed systems that supply workspace activity information, both for real time collaboration (Dourish and Belotti, 1992) and for asynchronous collaboration (Steinfield, Jang and Pfaff, 1999). However, I have witnessed situations where the supply of this type of information creates new problems. In one team, providing activity awareness revealed to Dutch participants that their remote US teammates were downloading work only minutes before planned real time meetings. This was interpreted by the Dutch participants as a
lack of preparation, and it consequently harmed group relations. It nicely illustrates an unintended consequence of technology.

How Can We Better Realize the Benefits of Virtual Teams?

In order to realize the benefits from virtual teams, it is important to provide a robust communication and collaboration infrastructure with features that address critical dispersed group needs. Group tools are needed that support both synchronous and asynchronous interaction, provide shared workspaces and archives for group artifacts, supply needed awareness information such as participant availability and activity, and enhance distributed activity through services such as that provided by structured workflow, decision support, and project management software. However, all of these systems are used within a social and organization context made complex by the fact that participants live and work in different locations. Information systems researchers have contributed a number of important insights into how these complex virtual team systems can be better managed. Three of the more important implications are:

1) In general, groupware systems provide benefits to the team only when everyone chooses to use them. Some systems, in fact, create problems when only a subset of the team makes use of them. For example, in systems that provide asynchronous awareness support, if only a few members rely on the system to exchange group work, they may incorrectly assume that non-using members are inactive. Often these are critical mass problems – users adopt only when enough other participants have also adopted. One approach to solving this problem is to mandate or otherwise promote system use, for example through rewards or other incentives. This may backfire if the group’s task is not matched well with the tools chosen. Alternatively, the impetus may be on groupware designers to ensure that tools provide enough individual benefit even before critical mass is reached to help stimulate adoption.

2) Even if use of tools is mandated, effective use may not follow. Team members require training in order to take full advantage of the capabilities of a group collaboration system. Training must deal with more than how to use each feature. It should illustrate the way to solve group problems using particular features and how to deal with group use of a specific feature (e.g. agreeing on a file structure prior to uploading content to the group space). Moreover, to enhance interaction across locations and cultures, training in cross cultural communication practices as well as working in distributed teams is required. In my experience, groups were more successful when encouraged to share schedule and other contextual information up front, as well as to leave time for socializing during team meetings.

3) There is a fine line between supplying needed information about team participants’ activities to each other and invading participants’ privacy. Many designers suggest that participants be given the ability to configure their privacy preferences. On the other hand, people have a tendency to set privacy controls to the maximum, which can harm collaboration. Getting the right balance is difficult, but at a minimum, participants should always be aware of what information is collected and distributed about them.
In this article, I have only briefly touched upon the many issues faced by virtual teams, and the implications for designers of group tools, participants and team managers. The challenges are imposing, but the potential payoffs make efforts to better support virtual teams worth the while.

**Recommended Reading**


**Biographical Statement**
Charles Steinfield is Professor in the Department of Telecommunication at Michigan State University, where he is a recipient of the Teacher-Scholar and Distinguished Faculty Award. He holds a PhD in Communication Theory and Research from the Annenberg School for Communication at the University of Southern California. He recently completed a three-year NSF-sponsored study of globally distributed virtual teams (Award # 9811568).