**The Global Virtual Manager: A Prescription for Success**

Timothy R. Kayworth
Hankamer School of Business
Baylor University
Waco, Texas 76798
254-710-4751
timothy_kayworth@baylor.edu

Dorothy Leidner
INSEAD
Boulevard de Constance
77305 Fontainebleau Cedex France
33-1-60-72-40-04
dorothy.leidner@insead.fr

**Abstract**

Global virtual teams have emerged in response to the growing demands placed upon organizations to rapidly coordinate individuals located in geographically dispersed locations. Virtual teams promise to improve cycle time, reduce travel costs, and reduce redundancies across organizational units.  Moreover, the use of global virtual teams provides an opportunity to coordinate complex business tasks across a potentially far-flung confederation of organizations. However, virtual teams are beset with a range of challenges inherent to their dispersed, and often impersonal, nature.  While all teamwork involves challenges to be managed, the tools at the disposal of virtual teams limits the options they have for addressing the difficulties of coordination. This field-based research study was undertaken to assess the core issues and challenges faced by a group of twelve culturally diverse global virtual teams with members from Europe, Mexico, and the United States. Our findings suggest that global virtual teams face significant challenges in four areas: communication, culture, technology, and project management (leadership). Drawing from the members' assessments of their virtual team experiences, each area of challenge is discussed  in detail. This is followed by a set of managerial prescriptions that outline specific critical success factors useful for the implementation of virtual teams.

## Introduction

As firms stand poised for conducting business in the 21st century, they face a host of challenges brought on by a changing business environment. The growing popularity of inter-organizational alliances combined with a growing tendency to flatter organizational structures and globalization has accelerated the need for firms to coordinate activities that span geographical as well as organizational boundaries (Townsend, DeMarie, & Hendrickson, 1998). In addition, the shift from production to service related businesses has spawned a new generation of knowledge worker not bound to physical work locations. Taken together, these factors suggest that firms are faced with increased challenges to coordinate tasks across time zones, physical boundaries, and cultures, as well as organizational contexts.

Driven by these demands, traditional face-to-face teams face pressure to operate in a virtual environment and to coordinate activities among team members in physically dispersed locations. Consequently, the global virtual team has emerged as a new form of organizational structure, supported by enabling information and communication technologies, able to meet the challenges of this new work context. Townsend et al (1998) describe this emergent structure:

> "Virtual teams are composed of coworkers geographically and organizationally linked through telecommunications and information technologies attempting to achieve an organizational task (page 17)."

Given a global business context, the deployment of virtual teams is an attractive management strategy for a variety of reasons. First, it allows dispersed organizations to maximize their expertise without having to physically re-locate individuals. The required expertise for a given task or project may be dispersed at multiple locations throughout the organization, however, a virtual team may facilitate the "pooling" of this talent to provide focused attention to a particular problem without having to physically relocate individuals. In addition, virtual teams may allow organizations to unify the varying perspectives of different cultures and business customs to avoid counterproductive ethno-centric biases (Solomon, 1995).

Other benefits include cost reduction, cycle-time reduction, integration of distant members, and improved decision-making and problem solving skills (Lipnack & Stamps, 1997; Townsend et al, 1998, 1998)

Perhaps the growing importance of virtual teams can best be summarized by Hargrove (1998) who states: "in the future, the source of human achievement will not be extraordinary individuals, but extraordinary combinations of people." As firms face the challenges of business in the 21st century, the use of global virtual teams will provide a significant opportunity to coordinate complex business tasks across a potentially far-flung confederation of organizations.

However, as companies seek to leverage the potential benefits of virtual teams, they must also face the numerous complexities inherent to this new type of work group. First, communication among virtual teams may be extremely difficult to manage and less effective than more traditional settings (McGrath & Hollinshead, 1994; Warkentin, Sayeed, & Hightower, 1997; Hightower & Sayeed, 1995, 1996). Given the separation across time and space, firms will need to adopt innovative technologies to provide rich channels of communication to facilitate task coordination among globally dispersed team members. These communications problems may also be magnified by different time zones, disparity among technology infrastructures, as well as differences in technology proficiency among team members. Finally, when cultural differences are added to this mix of potential issues, the management of virtual teams may become exceedingly complex. Regarding culture, Solomon (1995) states:

> "The fundamentals of global team success aren't very different from the practices that work for domestic work teams. But there are more variables. Overlay cultural behavior and expectations on the roles of communication, team leadership and group dynamics, and you immediately understand. Moreover, there are logistics to overcome: challenges inherent in working in different time zones, lots of travel, and busy conflicting schedules (page 50)."

Given this milieu of cultural, technical, communication, and logistical issues, a fundamental assumption of this paper is that the problem space faced by managers in the implementation of virtual teams may be much more varied and complex than that of traditional team settings. To

investigate this relatively new phenomenon, initial research should focus on uncovering emerging issues and challenges inherent to virtual team settings. Such exploratory research will help to inform practice of potential management strategies and to frame questions for subsequent academic research.

This paper discusses the results of an exploratory global virtual team project undertaken with members from Mexico, Europe, and the United States. The goal of this work is (1) to identify specific issues and challenges faced by virtual teams, (2) to identify critical success factors, and (3) to stimulate compelling ideas for future research. To accomplish these goals, we first present the research methodology used to undertake this study. This section includes discussion related to sample selection, group task assignments, and data collection methods. Next, we present research findings that describe the numerous types of challenges faced by the virtual team participants in this study. Throughout this section, respondent anecdotes are provided to richly illustrate the type of challenges faced by global virtual team members. The third section provides a set of guidelines (critical success factors) useful for managers in the implementation of virtual teams. The paper concludes with a discussion of limitations and directions for future research.

**Research Methodology**

Given the complexity of this phenomenon as well as the lack of empirical research to date, we adopted a field-based quasi-experiment that would allow us to observe the dynamics of global virtual teams as they unfolded over time. This strategy permitted us to identify key issues, critical success factors, as well as additional research questions through observing the interaction among a culturally diverse group of physically dispersed team members. Field-based experiments are useful for a number of reasons. First, they allow researchers to observe specific phenomena without loss of valuable contextual information. Second, they provide a means for investigating specific processes or dynamics that occur longitudinally over time. Finally, they are appropriate

for studying emerging areas of interest where key constructs and their relationships may be poorly defined. Use of such an intrusive methodology permits us to evaluate the nature and role of virtual teams without losing valuable contextual information (Eisenhardt, 1990; Yin, 1989).

**Sample Selection**

To study global virtual teams, we created twelve virtual teams, each composed of 5-7 members from three universities located in Europe, Mexico, and the United States. The participating European students were selected from an executive MBA program at a leading business school. The Mexican participants were graduate students from a variety of technical and business backgrounds while the US students were composed of upper level business undergraduates attending a cross-disciplinary introductory course to MIS. Each virtual team contained one team leader from the European school and at least two students from each of the two remaining schools. High levels of prior work experience among team leaders help to insure a more realistic setting for the study. The teams were designed to emulate a matrix organizational structure, whereby team leaders reported to their professor, in terms of receiving performance assessment, and team members reported to their professors. Hence, the team leaders had to motivate the team members to achieve the requisite quality necessary for them to obtain a high performance rating from their professor. However, the team leaders could not motivate the team members through threats, since the members reported neither to the team leader nor to the team leader's "boss" for their performance assessment.

Our strategy was to create highly diverse virtual teams of reasonable size to provide a realistic setting to study global virtual team dynamics. Since multiple nationalities were represented on each team, we could expect a requisite degree of diversity in terms of language, customs, and perceptual differentiation. In addition, there was a wide range of technical competence among students as well as infrastructure capability among member educational

institutions. All these factors helped to insure a realistic setting for a virtual team not unlike those used by major organizations.

**Task Assignment**

Each team was assigned a mandatory task to complete a research project on a given topic.. Each project addressed a specific aspect of information technology and team leaders were asked to produce a written report that specifically addressed the theme of the topic (see Appendix A for list of topics). Each team was allotted six weeks to complete the project and team leaders were given the following instructions:

> "You are not to research the content or write the report. Rather, you are to guide the team, give helpful comments on content, structure, organization, writing, and to point the members to appropriate places to find information and resolve any difficulties."

Although virtual team members were given basic guidelines regarding project task and deliverables, no further advice was given to teams regarding how they were to accomplish the task. This was the responsibility of the project team leader. The US students received the following instructions:

> "Guidance on this project will come from your project leader in Europe. Your main objective will be to segment the work among yourselves and to complete the project as specified by the project leader. The exact details on how your group will communicate (e.g. frequency, what technology, time of day) will all be handled by your group."

Consequently, these guidelines helped to insure that project team leaders would not do all the work and that high levels of communication among team members and their respective team leaders would be necessary to complete the task. Apart from these guidelines, individual teams were given complete autonomy to assign priorities, set schedules, meeting times, and to decide on which telecommunications technologies to interact with. Although certain computer mediated communication systems (CMCS) were recommended (e.g. TCBWorks, PowWow), none were required.

Team members and leaders were evaluated on the overall quality of the final research paper and assigned an individual grade that was a substantial part of the overall grade for the class in which he or she was a participant. In addition, team leaders were asked to evaluate individual performances of their respective team members and individual members were asked to rate the team leader's effectiveness

**Data Collection**

Upon completion of the project, the team members were administered a series of open-ended questions (Appendix B) to assess their perceptions of the virtual team project. Since one set of responses was received per team, each set represents a composite of individual team member perceptions of the virtual team project. For qualitative studies involving multiple cases, both Yin (1984) and Eisenhardt (1989) suggest that data analysis should first focus on identification of unique insights relative to specific cases. As each case (e.g. virtual team) is analyzed individually, certain themes or patterns may begin to emerge and to catch the researcher's attention. This within case analysis reduces the danger of attempting to generalize patterns across teams prematurely before the within-case analysis has been completed. Eisenhardt (1989) states:

> "The overall idea is to become intimately familiar with each site as a single case. This allows unique patterns to occur before investigators attempt to generalize patterns across cases (540)."

The data analysis was completed according to these "pattern analysis" techniques described above.

**Research Findings**

Upon analysis of our data, we were able to identify four basic classes of issues faced by virtual team groups: communications, culture, technology, and project management. The following pages discuss of these types of challenges in detail.

**Communication**

Regardless of the environment (e.g. traditional vs. virtual teams), effective communication is essential to group functioning (Trevino, Daft, & Lengel, 1991). However virtual teams potentially face a much greater strain on communications as team members attempt to interact, share meaning, and reach consensus in the absence of rich face-to-face interaction. Given these constraints on communications, virtual team members must seek a variety of means to transmit information, meaning, and symbols over time and space through one or more electronic channels.

In the absence of face-to-face interaction, all twelve virtual teams relied heavily on a variety of information technologies to communicate among themselves (Appendix C). Of the twelve teams, nine chose to rely solely on email for information exchange while the remaining three groups used a combination of email and web-based collaboration technologies. Two of these three groups built team web pages to facilitate information exchange and project management.

Member comments suggests that the three groups utilizing a wider range of communication technologies were much more satisfied with their ability to communicate and with their project outcomes. Specific examples of this occurred for those teams that supplemented email with web-based communications tools (e.g. mIRC, PowWoW) and group web pages. In contrast to email, these technologies afforded team members much richer mediums for interaction and management of information. One group noted:

> "Our team used PowWow for our "face-to-face" communication. Our most effective planning and project implementation arose during our conversations. The direct communication allowed for team brainstorming and input in a timely manner. This process could have been done via email, but it would have taken days to reach the results that we were able to reach."

Other comments suggest that these rich computer mediated communication systems (CMCS)

greatly facilitated team's abilities to plan, to exchange ideas, and to reach consensus on a variety

of issues:

> "Once we learned how to access the program [PowWow], we were immediately in business. We were greatly appreciative that everyone's comments could be seen simultaneously, even though we were all in different locations."

While the web communication tools facilitated synchronous group interaction, team web pages

allowed groups to maintain essential project information for team members to access on an "as

needed" basis.

> "Our web page was the home base of our operations. Our page was responsible for displaying our progress. Our team leader posted links to other sites that would offer beneficial information for our project. Each member's progress was posted. The agenda for each team meeting was posted along with an outline for the context of the report."

> "Candy [leader] set up a web page for our team, which provided general information on our project. This web page included an outline, deadlines, and the email addresses of our team members. We referred to this web-page when formulating our rough draft of ideas."

This evidence suggests that those groups most effective at communication were able to draw

from a variety of technologies (e.g. email, web collaboration, WebPages) each offering specific

benefits contingent upon the given needs (e.g. collaboration, volume of information, need for

immediate feedback.) of the group.

In contrast, those groups who relied almost exclusively upon one type of CMCS (e.g. email)

experienced much higher levels of difficulty with communication than their counterparts. These

email communication problems could be attributed in part to the seven-hour time zone

differences between the European project leaders and North American team members. Moreover,

since email communication is asynchronous in nature, team members experienced significant

time delays in sending and receiving emails and were unable to interact in the same rich way

afforded by web-based collaboration tools. These inherent weaknesses often resulted in lost

meanings and untimely decision making. Group 2 commented on these problems:

> "Obviously, email presented some difficult time constraints due to time zones and work/school schedules."

Regarding the use of email, other groups noted:

> "Time zones were a major team hurdle. The team leader is seven hours ahead of the other groups. He would usually email at 2:00 pm his time. The message would get to us at 7:00 am in the morning, and we would e-mail our leader in the afternoon. If we emailed the message at 2:00 pm our time, the message would get to the leader at 9:00 pm. Information took a day to send and receive."

> "Our whole project paper was put together through a series of emails. To me, this was a tedious and strenuous ordeal. Because our communication process only involved the use of emails, our ideas and problems weren't addressed by the necessary deadlines. In our experiences, our email responses weren't replied in a timely manner. This was a result of the differences in time zones."

Our findings support the notion that information technology has limits and may not be able transfer the same rich social, emotional, and non-verbal information present in traditional face-to-face settings (Walther & Burgoon, 1992; Townsend et al, 1998). For example, information rich non-verbal cues such as facial expressions, voice inflections, and gestures, normally present in traditional settings, may be lost or distorted through computer mediated communication systems (Kiesler & Sproul, 1992; Warkentin, Sayeed, & Hightower, 1997). Group 2 noted these types of problems:

> "Talking to someone face to face is always better than over the phone or by email. It gives you an opportunity to see facial and body expressions, hear voice emphasis and inflection, and sense such things as approval or misunderstanding."

Consequently, even those virtual team groups utilizing rich web-based collaboration technologies suffered from the lack of face-to-face contact. The severity of this information loss was determined to a large extent by the richness of the technology being used. Thus, teams relying solely on email tended to experience a greater degree of information loss and distortion than the three teams utilizing richer forms of communication channels.

Communications effectiveness among virtual teams was also impacted by a variety of cultural, technical, and human factors. The sections below discuss each of these influences.

**Culture**

Culture has been defined by Hofstede (1980) as "the collective programming of the mind which distinguishes the members of one group from another." Thus, culture is learned and may be manifested in different ways according to nationality, ethnicity, or even organizational settings. In virtual team settings, culture may have a profound impact on how individuals perceive information, act upon it, and relate to other individuals. As team members communicate, they will tend to filter information through their cultural "lenses", thereby giving rise to a potentially broad range of misinterpretations or distortions (Solomon, 1995). Thus, a Mexican team member may view the same issue in a totally different way than a member from a European project manager does. Although cultural differences may bring a greater variety of perspectives to bear on a problem domain, they may also create additional communications challenges for team members. Our findings suggest that cultural differences among virtual team members acted to intensify some of the communications problems noted above.

Over half of the virtual teams observed that cultural differences significantly affected their ability to communicate ideas and to coordinate the project. By far, the most common cultural issue was the language barrier between Mexican students and their US counterparts. These linguistic differences accounted for a great deal of information loss and distortion as individual members attempted to decipher communication through their own cultural perspective. The following comments by team members help to illustrate these problems:

> "First and foremost, a language barrier between our group and the Mexican students proved quite challenging. The Mexican students often could not interpret our email messages accurately. Also, even though the Mexican students provided excellent research material, we had to spend extra time editing and rewording material in order to make it presentable."

> "The Mexican students sent email in broken English. This made most of their messages difficult to decipher."

> "The language barrier was another communication problem—we received part of the paper in Spanish! Once when we received the English version, it was very apparent that their grammar and vocabulary [English] were underdeveloped."

> "The main problems our group encountered dealt with being able to understand our team leader and communicate with him. These problems occurred due to cultural differences and differences in time zones."

In addition to language differences, some cultures may vary in their sense of urgency or timing to complete projects and to meet deadlines. Hofstede (1980) has defined this dimension of culture in terms of the relative degree to which a particular culture is formal versus informal. More formal cultures will tend to a greater sense of urgency to set specific timetables and to diligently keep to deadlines. In contrast, informal cultures may place less emphasis on setting and meeting deadlines. Given the potentially diverse composition of virtual teams, groups may consist of individuals from both formal and informal cultures. As a result, team members may have conflicting perspectives on certain attitudes related to project schedules, planning, and punctuality with deadlines. This dynamic was evident through the comments of Group 10:

> "The team leader needs to remember that there are cultures that are more relaxed than others and may need more prompting to provide information on a timely basis."

This indirect reference by American students to their foreign counterparts suggests that virtual team members need to be aware of these differences and identify project management strategies to overcome these cultural barriers.

Cultural differences may also be attributed to factors other than nationality or ethnicity. For example, different organizations may have diverse work cultures as manifested by deeply held core beliefs and assumptions. Consequently, although individuals may have similar national or ethnic backgrounds, they may still exhibit radically different cultural assumptions as engendered by the organization for whom they work. This differentiation in work culture was observed by Group 11 who commented on their project leader's management style:

> "Another issue which arose, was cultural differences. With the project leader, he wrote good English but approached the project in a very business like manner, which required the team members to adjust accordingly."

**Technology**

Virtual team groups experienced varying levels of difficulty in using information technology. The most common problem encountered was the inability to send and receive email messages.

> "Technical problems which hindered our team's performance included the Mexican internet server rejecting our emails and the French server accepting our emails, but not delivering them to our project manager."

> "Working on a virtual team required the use of innovative technology. Our group encountered a roadblock when the server went down before one of our group meetings. We had no way of alerting our team leader that we would not be able to attend our PowWow session."

While all three locations experienced difficulties with technology, the problems were more acute with the Mexican team members.

> "Our group was constantly having problems with emails from Mexico. The messages were either too large or the contents were not transmitted properly. Perhaps if we had set up a web-page, we could have eliminated some of our problems."

> "The majority of time we sent them [Mexican students] mail, it was returned. Another problem we encountered was scrambled mail.

Groups using web-based collaborative tools were not immune to technology problems. One group using PowWow as a collaborative tool experienced technical "glitches" that inexplicably kicked chat participants out of the session. In addition, network limitations resulted in delays for incoming message traffic.

> "We decided to conduct virtual team meetings using the mIRC chat program. On the three occasions when we met, we often encountered problems in accessing the chat room. Sometimes it took as much as 30 minutes to access the room. There was a 10 to 15 second delay in the program, so our messages were not instant. Also, the mIRC program "killed" users or knocked them out of the room."

In spite of the advantages of such synchronous collaborative tools, these types of problems made it very difficult for the particular group to maintain any type of structure or theme throughout the meeting. Given time delays as well as the inherent limitations of the technology (e.g. inability to transfer contextual & non-verbal information), their conversations lacked focus.

> "During our initial meeting, we did not accomplish much related to the work assignment, because everyone was trying to "talk" at the same time, without any structure."

Although this team became more proficient at managing the structure of the meeting, they still encountered language barriers during these sessions.

> "During our second meeting, we were more structured, but encountered communication barriers."

In addition to these technological barriers, there was some evidence that variance among individual's level of skill or familiarity with information technology may have played a significant role in team success in utilizing rich CMCS. One group noted:

> "When we began this project, our technical knowledge was limited. When our team leader suggested the use of PowWow for "face to face" meetings, we were not sure how to access this service."

These comments suggest that level of technical expertise may play a pivotal role in virtual teams ability to adopt and successfully use innovative information technologies.

**Project Management**

Given the multi-faceted challenges associated with virtual teams, it was not surprising that virtual team members perceived project management to be an important element of success. Four of the twelve teams perceived virtual team leaders to be extremelyeffective and four, adequate, while the remaining four felt that their virtual team leader's performance hindered project success:

> "Unfortunately, I cannot say that our group leader was key to our success. I had a hard time getting any direction from him. I also encountered difficulties on the different levels we conversed on. He had difficulty bringing things down to our level, and I often had to go to someone else for clarification."

From our analysis of virtual team member comments, we identified several challenges related to effective project management. First, effective project managers were able to articulate project goals and to assign responsibilities with specific schedules and work deadlines. In contrast, those virtual team leaders unable to effectively articulate goals and plans for achieving them were perceived to be much less effective by team members. The following comments illustrate both positive and negative examples of this:

"He was an extremely effective team leader in our virtual team project. He provided us with a clean and precise outline of goals."

"She was extremely effective in her role in managing our virtual team. She provided appropriate deadlines, while remaining flexible to the fact that we have other responsibilities in school. Lastly, she specified exactly what she expected from us and when she expected it, giving us the guidance we needed."

"He gave us deadlines without asking us how much time we needed, or whether it was even plausible. Then, he wouldn't care about the deadlines-indirectly creating an attitude that timing was not important. Carlos also did not adequately explain his idea/view of the project. We had to get clarifications from others, because when we did ask him for clarity, he did not do a good job of it."

Another challenge of project management was related to the degree to which project managers were able to provide continuous feedback throughout the life of the project. The ability to provide suggestions and advise and to solicit team member's opinions was considered highly desirable, while the absence of this type of continual feedback had adverse effects on several groups.

"The incompetence of our leader hindered our success. She never acknowledged our suggestions concerning the use of web technology despite our repeated efforts to encourage the use of such techniques. She failed to give us direction, and never encouraged our group to explore any technologies. Not once did she collaborate with the Mexicans in our group, and she gave unreasonable deadlines."

In contrast, it was evident that effective project managers put a high priority on regular communication; providing valuable advise while at the same time soliciting feedback from individual team members.

"Our project leader was very effective in directing our team's activities. She contacted us promptly with her ideas concerning the electronic commerce project. She seemed eager to take the leadership role while still inquiring other's ideas and suggestions. She responded quickly to questions and comments that the team members had."

"Our team leader was quite effective in offering ideas and suggestions without telling us what to do. He was also willing and anxious to hear our opinions and ideas on the topic. After hearing our suggestions, he would direct and advise us.

Third, effective project managers were perceived to be highly flexible, whereas ineffective leaders tended to be less yielding to the needs of respective team members. Given the multiple challenges of global virtual team settings, flexibility seemed to be the "order of the day".

Therefore, team members placed a high premium on the leader's ability to remain flexible to accommodate a variety of possible situations.

> "The project manager's flexibility contributed to our success. Our virtual team leader, established a fair schedule of deadlines for our group. She was more than willing to work with us and our schedules. For example, she offered to conduct a virtual team meeting at 2am in the morning time to accommodate us."

> "In order to deal with the time differences, he was very flexible with his personal schedule, allowing us to have team meetings at odd hours of the day for him."

> 'At first our project leader proposed an extensive paper on our topic, however, he was very reasonable and eager to compromise when we approached him about the length of our assignment."

In addition, virtual team leaders judged to more empathetic about their team members were considered to be much more effective than those who were less caring. The following comments illustrate both positive and negative examples of this.

> "If we were ever unclear about a topic or meaning, he would research with us to find the answer. This care and concern contributed to his effectiveness."

> "He never attempted to persuade the Mexican students to get involved and do their fair share of the project, and he certainly never attempted to help us out with the added work load. Many of our pleas for advice and direction went unanswered as well. This led to resentment of our project manager as well as the Mexican students."

> "He did a great job of delegating responsibilities to each group member. He was faithful in communicating suggestions to help improve our work. He was very patient with the deadlines he projects, and gave us a clear picture of what he wanted each of us to accomplish."

Since virtual team environments provide a radically different social context, the ability to develop relational links among team members may be hindered. The inability to develop these relationships within a social context may negatively impact such outcomes as creativity, morale, decision-making quality, and process loss (Walther & Burgoon, 1992). Furthermore, the lack of a social context may alter or hinder the process through which team members develop trust (Jarvenpaa, Knoll & Leidner, 1998). Consequently, these arguments suggest that one role of team leaders should be to provide a setting for group socialization processes to occur.

> "An important part of working with a team is trusting and getting to know one's teammates. By allowing this important step, team morale is built and members are more receptive to one another's contributions."

"Trust was the big issue- we needed to learn to trust that team members would do their best possible job. This all you can really ask of anyone."

Evidence of the use of rich communication channels to facilitate socialization was apparent from our study. In at least two groups, team leaders played a pivotal role in helping to engender a sense of trust and cohesion among team members.

"He [the leader] allowed us to get to know each other on PowWow. We joked with each other and established a high level of trust among the members of the group. This trust fostered a unique working relationship, which proved to be very successful.

"One method that the leader would use to help us through the times was humor. He sent us jokes and tried to lighten the mood. I think that was an excellent idea. Humor works well in tough situations."

## Critical Success Factors

Although this study was limited to the twelve virtual teams studied, a number of implications useful for management practice can be drawn from our findings. Table 1 summarizes these critical success factors for each of the four areas of challenge described above.

**Table 1: Critical Success Factors for Global Virtual Teams**

| Virtual Team Challenge | Critical Success Factors for Effective Global Virtual Teams |
|---|---|
| Communication | • Emphasize continuous communication<br>• Set meeting schedules and rules of engagement<br>• Conduct periodic face-to-face meetings<br>• Engage in team building activities at onset of virtual team creation |
| Culture | • Instill a sense of cultural awareness<br>• Create teams from complementary cultures |
| Technology | • Utilize multiple computer mediated communications system (CMCS)<br>• Train team members in the use of various CMCS<br>• Insure infrastructure compatibility among geographic locations<br>• Assess political and economic barriers to international telecommunications |
| Project Management (Leadership) | • Set clear team goals and provide continuous performance feedback<br>• Build team cohesiveness<br>• Express flexibility & empathy towards virtual team members<br>• Exhibit cultural awareness |

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|---|---|
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**Communication**

The complexities of virtual team environments (e.g. time, distance, culture) may place a significant strain on the ability of team members to frame issues, achieve mutual levels of understanding, and to reach consensus on key decisions. Consequently, the ability to achieve effective communication patterns is essential to the success of virtual team functioning. Regarding the importance of communication, one team noted:

> "Communication! Communication! Communication! Without frequent and effective communication, a virtual team cannot exist; much less accomplish an often difficult task. Communication must be clear and decisive, but not commanding or overbearing."

Our analysis of team comments identifies several strategies useful for facilitating effective communications in virtual team environments. First, virtual teams need to engage in continuous communications over a wide range of computer mediated computer systems (CMCS). Given the lack of rich face-to-face interaction inherent to virtual team settings, groups must strive to communicate in a frequent, ongoing manner with constant feedback from team leaders.  This can be accomplished through setting specific guidelines regarding meeting times, frequency, and specific agendas for discussion. Furthermore, team leaders should seek to establish specific rules of engagement that govern exactly how and when team members should communicate with each other. For example, a simple rule of engagement may state: "all meeting times will be scheduled according to London Standard Time."   Such policies, normally taken for granted in face-to-face settings, may be extremely important in the virtual environment.

A third suggestion is that virtual team members conduct periodic face-to-face meetings either through videoconferencing or in actual face-to-face settings. Research suggests that rich face-to-face interaction can facilitate communication through building team trust (Jarvenpaa, Knoll, & Leidner, 1998) and enabling team members to exchange valuable social, emotional, and

contextual information (Kiseler & Sproul, 1992; Warkentin, Sayeed, & Hightower, 1997; Dubrovsky, Kiesler, & Sethna, 1991).

Finally, the importance of getting to know one's virtual team peers is vitally important to subsequent team member communication effectiveness. The rationale for this is that team trust and cohesiveness can create a sense of unity, which can breed communication effectiveness among team members (Jarvenpaa, Knoll, & Leidner, 1998). This rational is evident from numerous comments received from virtual team members:

> "Get to know your team members. The more you know about your partners, the more comfortable you will feel in working with them. This comfort will aid in productivity and communication."

> "I would recommend that the team as a whole meet on-line and have a "chat" session to learn about each other's personalities, cultural backgrounds, and work habits. This should help facilitate better communication over the life of the project and prevent miscommunications and unintended insults."

These comments suggest that a very useful strategy might be to engage in team building activities as a virtual team is initially created to engender a sense of trust, cohesiveness, and awareness of each other's differences. The importance of this strategy is noted by Townsend et al (1998) who comment:

> "Developing virtual teams goes well beyond the technical problem of linking them together. As workers increasingly interact in a virtual mode, it is imperative that they rebuild the interpersonal interaction necessary for organizational effectiveness."

**Culture**

Earlier comments suggests that cultural differences among team members may lead to various instances of miscommunication since different cultures may attend to certain biases, assumptions, or views of the world. These cultural differences may not necessarily be a reflection of such factors as ethnicity, language, nationality, or religion. Rather, cultural differences may also be a reflection of the distinct organizational cultures to which team belong. Regardless of the source, the fact remains that the "cultural factor" may lead to information distortion and various instances of miscommunication. To offset these problems, it is vitally important to undertake a strategy to build awareness of cultural distinctions among team

members. This could be accomplished through various team-building exercises as discussed earlier as well as through more formal training methods.

Organizations should also seek where possible to assemble virtual teams with members from complementary cultures. Although culture is difficult to measure, research by Hofstede (1980) suggests that culture clusters depending upon the relative positions on for primary dimensions (collectivism, uncertainty avoidance, masculinity vs. femininity, and power distribution). Team member cultural differences could be assessed based upon where they lie along each of these four dimensions. Presumably, multi-cultural teams could then be assembled based upon the "degree of fit" across these dimensions. Alternatively, and more realistically, firms should train virtual team members in the communication styles of various cultures to increase their intercultural awareness.

**Technology**

Several teams in this study adopted multiple computer mediated communication systems to accommodate a variety of communication needs. A contingency perspective would suggest that different types of CMCS might be appropriate depending upon the specific communication needs. For example, group discussion of a critical design issue on a software project may require a more rich communication channel due to the need for high group interaction, immediacy of feedback, as well as the need to view others comments in a synchronous manner. These types of communication needs would be best served by a web-based collaboration or GSS tool able to provide immediate feedback to team members. In contrast, simple email may be effectively used for communication needs requiring less interaction and less immediate feedback. An example of this might be the need to distribute a weekly status report among team members. These arguments suggest two management strategies in the design of virtual teams. First, managers should seek to provide a broad portfolio of information technologies (CMCS) to accommodate the varying communications needs of team members. Some of these technologies might include

desktop video conferencing systems (DVCS), group support systems (GSS), collaborative

software systems (e.g. LotusNotes), as well as the internet and intranets (Towsend et al, 1998).

Second, management should place a high emphasis on training virtual team members across a

wide variety of technologies. Team members familiar with multiple technologies such as those

described above will be much more likely to adopt and use these technologies in an effective

manner. Regarding the importance of training, Townsend et al (1998) note:

> "What is different about the virtual team is the amount of technical training that is required to
> empower the team member to function in the virtual environment. Learning to use all of the traditional
> team skills in an environment where most interactions take place through a telecommunications
> medium is a critical challenge."

As evidenced from this study, differences in IT infrastructure capabilities among geographic

regions led to problems in transmitting information in a timely and effective manner. Therefore,

virtual team designers should also consider the relative strengths and weaknesses of the

infrastructures represented by the various geographic regions of virtual-team members.

Additionally, team designers should assess the various political (e.g. transborder data flow

regulations) and economic (e.g. transmission costs) ramifications of communicating across

national boundaries.  Overall, managers should follow a strategy that seeks to maintain low

telecommunications costs while at the same time maintaining high quality transmission

capabilities across team member countries.

**Project Management**

Given the inherently complex nature of virtual team environments, the quality of project

management (e.g. team leadership) becomes a vital issue (Hooijberg, Hart, & Dodge, 1997).

Numerous remarks by virtual team members suggest that the project leader's ability to manage

these teams had a significant impact on the perceived success of virtual team performance. Based

on our analysis of these comments, several themes emerged that identify certain qualities of

effective project management as demonstrated by virtual team leaders. First, effective team

leaders were able to set clear goals for individual teams members and to provide constant feedback regarding performance relative to these goals. Second, effective team leaders were able to engage in activities to build cohesiveness among team members. As noted earlier, some team leaders incorporated their sense of humor or were able to share personal aspects of their lives in order to get to know their team members better. A third dimension of effective project management was demonstrated by the leader's degree of flexibility and empathy expressed towards other team members. This need for leader concern and understanding towards virtual team members was a consistent theme throughout the project. Finally, virtual team designers should seek virtual team leaders with high degrees of awareness towards other cultures. Team leaders with a variety of work and personal experience in other cultures will potentially have a greater degree of awareness regarding the potential for cultural biases that may lead to information distortion and miscommunications. As these "culturally aware" individuals manage virtual teams, they will be much more likely to recognize and deal with culturally based team issues in a more consistent and effective fashion. These arguments are supported by Odenwald (1993) who states:

> "Leaders must be flexible, willing to support the team process, have a desire to help the team work together, understand team cultural factors, be able to listen and communicate, and be able to understand other members behaviors (page 50)."

### Conclusions

Although the small sample size precludes vast generalization, the study provides rich insights into some of the types of challenges faced by culturally diverse global virtual teams. Through these insights, we have been able to articulate a set of critical success factors believed to be important in the successful  design and deployment of virtual teams.  While some of the success factors for virtual teams are no different from success factors for face-to-face teams, and certainly three of the major domains--communication, culture, and project management--are equally important in face-to-face environments, some of the challenges within these domains are

unique to the virtual environment. For example, such problems as delayed communication, misunderstandings arising from lack of response, lack of a shared context within which to interpret messages, and inability to monitor team members, are more pronounced in the virtual environment. More significantly though, the solutions at the disposal of team leaders to address the problems of teamwork are quite different in the virtual environment from the face-to-face. In face-to-face environments, increased monitoring can be employed as can frequent one-on-one discussions with various members. In the virtual environment, much of the control and reward capabilities of the leader are reduced so that the leader must create inventive solutions to address team problems.

Several issues for future research emerge from this study. The 12 virtual teams in this project were given the freedom to select whatever CMCS seemed to be most appropriate for the assigned task. Interestingly, there was a significant variance among teams in their adoption and use of various technologies (see Appendix C). While some teams adopted email alone, others adopted email, internet collaborative tools, as well web pages. Anecdotal evidence suggests that team member experience with technology may have had a significant role in their adoption of technology, however, this is not clear. Future research is needed to identify those factors that lead to the adoption and diffusion of technology in virtual team environments.

A second research issue has to do with the effect of culture on virtual team communication patterns and effectiveness. Although culture is widely assumed to have a crucial role in communication effectiveness, how much of a role does it really play? Additional research is needed to investigate how technology use might vary across cultures.

Another issue has to do with team member performance evaluation. Under most conditions, virtual team leaders will be in a position to evaluate other virtual team members even though in a matrix structure they might not have reward power. In traditional face to face settings, subordinates may engage in certain behaviors designed to favorably influence the perceptions of

their supervisor (e.g. showing up to work early and leaving late). However, how might team members attempt to shape the perceptions of their supervisor given the inherent lack of face to face interaction in virtual team settings. Research needs to assess the types and nature of communication utilized by employees in their attempts to favorably shape supervisor perceptions.

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**Appendix A**
**Virtual Team Topics**

Team 1:  "Strategic use of Internet"

Team 2:  "The Strategic Impact of the Internet in the Textile Sector"

Team 3:  "Quality-Based IS Development"

Team 4:   "Use of EIS in the Management of Universities"

Team 5:   "Strength and Weaknesses of Virtual Teams"

Team 6:   "Integration of DSS , EIS and ES/KBS"

Team 7:   "Potential of Electronic Commerce "

Team 8:   "Use of Expert Systems in the Financial Sector "

Team 9:   "Relevance of DSS and EIS in Decision-Making"

Team 10: "Requirements Specification of a DSS/EIS"

Team 11: "Role of  Intranets in the organizations"

Team 12: "Strategic Planning of IS/IT in the government sector"

**Appendix B**
**Open-Ended Questions**

1. As a group, how successful do you feel your virtual team was in accomplishing the task given to you by the project manager?

2. What factors contributed to your success? What factors hindered you in your efforts to complete this project? (Note: e.g. technical issues, culture, group dynamics, project leadership)

3. To what extent did you use various technologies to communicate with team members (e.g. email, web communication tools)? How effective were these technologies?

4. What were some of the novel and unique problems/issues/challenges associated with working with groups in a virtual team environment? (e.g. group dynamics)

5. How effective was your project manager in directing your team's activities? What made him/her effective or ineffective?

6. After completing this project, you have been asked by a consulting firm to make recommendations on how to run a successful international (e.g. cross-cultural) virtual team. How would you answer this question (e.g. what are the critical dos and don'ts)?

**Appendix C**
**Team Use of Computer Mediated Communication Systems**

| Team Number | Technology Used | Comments |
|---|---|---|
| 1 | Email | Didn't use web technology because of lack of technology in Mexico |
| 2 | Email | Email was ineffective with long delays in sending and receiving emails. |
| 3 | Email | Group tried to use collaborative CMCS, however project manager did not express support of this move. |
| 4 | Email, Virtual Chat (mIRC) | Used email for individual communication and Virtual Chat for group interaction |
| 5 | Email, PowWow, WebPages | Used email for daily messages, PowWow for group conferencing, and WebPage to store research information. |
| 6 | Email | Email used to communicate effectively across time zones. |
| 7 | Email | Email was effectively used to share ideas, suggestions, and questions. |
| 8 | Email | Group suggested use of collaborative tool, however, project manager didn't feel it was necessary. |
| 9 | Email, PowWow, WebPages | Email used to communicate meeting schedules and individual progress. WebPage used as "home base" of operation display agendas and project progress. PowWow used as a collaborative tool to facilitate group planning and implementation. |
| 10 | Email | Email was not effective |
| 11 | Email | Email was effective due to low number of team members. |
| 12 | Email | Tried to use PowWow, but were unsuccessful |

**Tim Kayworth** is an Assistant Professor of Management Information Systems in the College of Business at Baylor University.  He has prior industry experience with Coopers & Lybrand and has also held positions as director of MIS and operations manager for private sector firms. Professor Kayworth's current research interest centers on the management of information technology in organizations and the impacts of IT infrastructure and its development within organizations. He has conducted field-based research addressing the use and effectiveness of corporate IT standards in contemporary firms. His research has entailed both survey-based as well as interview based data. Professor Kayworth's work has been published at *the International Conference on Information Systems (ICIS)* and the *Journal of Information Technology Management as well as in numerous conference proceedings.*


**Dorothy E. Leidner** is Associate Professor of information systems at INSEAD in Fontainebleau, France. She is currently visiting Southern Methodist University during the academic year 1999.  She received her PhD in Information Systems from the University of Texas at Austin, from where she also obtained her MBA and BA.  Dr. Leidner has published her research in many of the leading journals, including MIS Quarterly, Information Systems Research, Organization Science, Decision Support Systems, and the Journal of Management Information Systems. Her current research interests include knowledge management systems, the role of IT in transforming organizational culture, internet based education, and electronic commerce strategies. She has considerable international experience, having also been a visiting professor at the Instituto Tecnologico y des Estudios Superiores de Monterrey, Mexico and at the Institut d'Administration des Entreprises at the Université de Caen, France, and at Warwick Business School, UK.