

## **A MULTIDISCIPLINARY VIRTUAL STUDENT TEAM**

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### **ABSTRACT**

*“In education, we should not strive for getting perfect answers, but instead we should learn from mistakes” (Haataja, J., 1998)*

This paper summarizes the initial assessment on the multidisciplinary virtual teaming aspect of a unique educational project conducted among five universities and a telecommunication company. The students were tasked with providing tactical and strategic recommendations for improving the company’s business. The project was unique in the sense that it challenged each student to learn from his/her mistakes, while collaborating with students from other disciplines and incrementally improve their recommendation. A “perfect” recommendation did not exist for the project as the solution demands a holistic approach with intuitive thinking. The paper in particular, investigates the communication and collaboration pattern that occurred during the virtual teaming session. Virtual teams are increasingly global, creating communication and coordination challenges due to factors such as distance, multiple time zones, and sometimes, cultural differences. The various aspects of virtual team as well as recommendation on technology/social norms involved in setting up such a team are also depicted. Through this study, we intend to provide insights in formulating multidisciplinary virtual teams for students.

### **KEYWORDS**

Collaborative Education, Distance Learning, eWork, Telework, Virtual Team.

## **BACKGROUND**

*"It's not a culture clash, it's a culture mash."--Po Bronson*

In order to address the scalability and operational efficiency challenges faced by a telecommunication company's e-Business division, a consulting team was formed to review and analyze their strategy and management practices. The team, called Education Alliance Fellowship (EAF), consisted of nine students supported by seven faculty members from five universities: Miami University (Ohio), North Carolina A&T State University, North Carolina State University, Ohio State University and Steven Institute of Technology. Students and faculty came from Economics, Finance, MIS, Computer Science, Computer Engineering, Marketing, and Business and Technology departments. The students ranged from sophomores to graduate students. The consulting work spanned over five months from June 2001 till November 2001. During summer, the nine students were co-located; in the fall, students returned to their own universities and worked as a virtual team.

As a whole, the telecommunications domain was new to the students. It was also their first experience working on a multidisciplinary team and working as a virtual team. As a result, the students learned from their mistakes, while working a quite unrelated project to their own coursework

The first challenge was to establish a common language among students. Since each student was culturally different (students belonged to seven specialties), a possibility for culture clash existed, due to lack of common language to convey ideas. The students soon realized that people from different background have different level of understanding. Once the "culture mash", aided through the use of definitions and phrases that were clear to each team member, was achieved, keeping up the constant flux of the e-business market and the company (due to restructuring) was

the next formidable challenge. In an environment that literally changed on a daily basis, the proposed recommendations needed to be constantly updated. This formidable task of formulating recommendations was conducted during the fall virtual teaming session.

During the fall semester, students worked as a multidisciplinary virtual team, each back at their home university. The difficulties involved in virtual teaming during the fall were multi-faceted. As noted, there existed no perfect solution. Whenever a solution was agreed upon among the students, the company representatives and faculty were consulted for their viewpoints. Their feedback was then analyzed to understand the defects in the solution and improve the solution, either by fine tuning the approach, taking up a different approach, or pursuing more research. The students had to balance schoolwork, establish regular contact with company representatives, faculty members, and stay in touch with other team members frequently. Hence we believe that virtual teaming session was the most challenging aspect of the project. This paper focuses on the virtual teaming aspects for the EAF team.

### **Organization of the Team**

The team followed the Controlled Decentralized (CD) (Pressman S. R., 2001) team structure. With a CD team structure, a team leader coordinates team meeting and mundane tasks with secondary leaders managing sub-teams. This team structure allowed each sub-teams to work without distractions. It should be noted that all decisions and deadlines were made by students, at times asking company/faculty members for suggestions. Although achieving consensus from such a diverse team was a big challenge, this flexibility helped the students to be professional. From the start of the project itself, students were asked to “take charge”, to “own” the work.

Through out the project, the faculty members played a significant role. Each week, a faculty member was elected to be the “faculty on call” (i.e. professor who will oversee the project

progress). At regular intervals, the students submitted their work report to faculty member for evaluation. Faculty members, acting as consultants to the students, gave only general directions to the students. Each student was assigned as a “contact person” for company representatives involved with the project. This proved to be effective in reducing repetition of request for the same information, i.e. request to a particular company representative was routed through the respective student contact person only.

### **AN INTRODUCTION TO VIRTUAL TEAM**

Teamwork is a concept used from time immemorial to solve complex tasks. Giant strides in information and communication technologies helped in the evolution of a new kind of team namely, the virtual team. Unlike conventional teams, a virtual team works across time, distance, culture and organizational boundaries, thereby creating an “anyone/anytime/anyplace” concept. Typically, virtual teams are linked through technologies such as electronic mail, videoconferencing, automated workflow, electronic voting, and collaborative writing to engage in synchronous or asynchronous interactions (Coleman, D., 1997).

It is also beneficial for virtual teams to have some face-to-face meetings. Therefore, the interaction between the team members is not usually 100% virtual during the entire span of the project. Compared to face-to-face communication, most studies find that implementation of electronic communication increases the overall “quality” of communication between the team members. This is because of the fact that there is a reduction of back-channel information such as speech acknowledgements and social greetings (DeSanctis, G. & Monge, P., 1998). However, there is no doubt that people prefer face-to-face communication over electronic. Also in case of asynchronous communications (such as emails), every member gets a chance to think and respond at their own pace (no immediate response required).

## **Benefits of Virtual Teams**

In addition to the vital advantage that the virtual team can work from anywhere at anytime, virtual teaming has many other benefits/advantages. Since geographical boundaries do not matter, people can be recruited for their abilities rather than for the convenience of location. Team members of a virtual team can take the advantage of time zone differences to work on a task for 11 or more hours per day without personal sacrifice. Furthermore, virtual teams help organizations to reduce costs and transportation problems. Virtual team helps in optimal usage of company resources (infrastructure, computing resources) located at different places, as these resources can be shared, instead of building the same resources at each location. Surveys suggest that 10% - 15% of large companies currently utilize virtual teams and this number is predicted to double within next few years (Skyrme, J. D., 1993). Because of this growth of virtual teaming, as educators we believe providing students with virtual team experience is highly beneficial.

The employees and the environment also stand to benefit from virtual teaming. The environment benefits, as there will be fewer cars on the roads, resulting in lower pollution, traffic congestion and usage of fossil fuel (that are depleting). Studies show that virtual teaming increases the employee productivity by approximately one hour due to reduction in commuting and other distractions (AT&T., 2001). Moreover the employees are more satisfied because of benefits related to time, money and stress avoided due of less commutation, along with the flexibility of combining work and family life.

## **Challenges of Virtual Teams**

Virtual team requires high degree of trust. According to Handy, "Virtuality requires trust to make it work" (Anschuetz, L., 1998). This stems from that fact that people work remotely and hence cannot be "seen". A sense of cohesion and satisfaction with group interaction processes is

weaker in virtual teams due to the lack of face-to-face interactions. Other factors such as social isolation, information overload might also occur due to electronic means of interaction. The real challenge for successful virtual teaming is in learning how to work with the new communication technologies. As such, virtual team members are challenged to recapture the effectiveness of face-to-face interactions using the virtual tools.

### **VIRTUAL TEAMING TECHNOLOGIES**

The technologies currently used for virtual teaming include intranets, application sharing, group discussion board, email, phone/teleconferencing, chat, fax, video conferencing, shared directories and virtual meeting software. A table compiling the capabilities/concerns of the above-mentioned technologies is included as Appendix A. The technologies can be broadly classified into two, depending upon the mode of interaction occurring:

- Synchronous – The interaction (queries and response) occur instantly, as all participants are available in real time. Examples include teleconferencing, chat, and virtual meeting software.
- Asynchronous – There is a delay before responses are obtained, as all participants might not be available in real time for interaction. Examples include email, group discussion board and fax.

In virtual teams, both synchronous and asynchronous technologies are used to achieve effective interaction among the members. The commonly used technologies for virtual teaming include email, teleconferencing, and virtual meeting and collaboration software.

## RECOMMENDATIONS

### Essential Considerations

The trust, required in virtual teams, has to be built based on a proactive, enthusiastic and generative style of actions, like effective communication among team members. To ensure effective communication, the EAF had the rule “Any and all questions will be answered within 24 hours”, called henceforth the “24 hour rule”. When team members need more time to answer, at a minimum the question was acknowledged within 24 hours. To build an effective virtual team, each member in the team must have a shared understanding of the overall project goals and each other’s value and belief. Team members feel a sense of solidarity, cohesiveness and intimacy between themselves through the sharing of humor, gestures and life stories that are not a formal part of the project. Hence, these actions should be encouraged within team members, especially if members are students.

Lastly, it is essential that all technical problems involved in setting up the virtual team should be ironed out at the start of the project. The technical problems include setting up proper channel of communication, such as teleconferencing bridge, and web meeting software<sup>1</sup>.

### Virtual Team Meeting Management

To overcome the lack of face-to-face meeting, during virtual team meetings the following etiquette should be adopted:

- In teleconferencing sessions, always identify one self before talking.
- Establish formal protocols for turn talking.

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<sup>1</sup> Web meeting software: - A software application used for interaction between remote (virtual) team members. The package usually has features such as Chat, File transfer, Whiteboard

- Provide detailed responses to queries on project related matters, and show respect for other team member's views/ideas.
- Must have a "technology facilitator" who will over see the meetings and ensure that the laid down protocols are followed. In other words, technology facilitators will co-ordinate the conference and iron out the technical/social concerns regarding virtual teaming.
- Must have an "attendance coordinator" who takes note of the attendance and also prepares the minutes of meeting.

To insure team members are progressing through the developmental stages in an orderly and effective manner, the pattern of team communication should be monitored. A check and recheck must be done to make sure that assignment, feedback, and goals are communicated and understood with precision. The progress of the project through team communication patterns and behaviors should be monitored as well. Furthermore, the project tasks, timelines and deliverables should be actively intervened as needed to insure they are on track.

By asking the students to own the work, faculty and company representatives laid the foundations for trust building. The background work of creating the common language and building the required trust was done during summer. For the communication issues, two students were selected as facilitators. Those facilitators were responsible for setting up the Teleconference Bridge, facilitating the meeting and taking care of any administrative issues. One student volunteered to take minutes of the meeting at each conference call and forward them to the rest of the team. The team members have created a web-community (using MSN web-community) where all had an access to it. The team arranged two face-to-face meetings where all the members met each other for two to three days. The purpose of those meetings was to discuss the

project progress/status, work collaboratively on some topics and to review and rehearse the rough draft of the final presentation that was given to the client.

### **Recommended Technologies**

For EAF project, the recommended technologies include email, teleconferencing, chat and web meeting software. Popular choices of web meeting software are Windows NetMeeting and AT&T Web Meeting Service. When face-to-face interaction was not possible, Windows NetMeeting was used for this project. Email was the primary medium of communication among the team members, supplemented by weekly teleconferences between team members and faculty on call. It was decided to setup an account in a web community (msn community). For simplicity and archive purposes, group-emailing service of the community was used. Questions were posted in the bulletin board of the web community. The web community site also hosted all the project files such as MS Project plan files. The web community site also included information about team members, contact information and other miscellaneous information.

Other features of the web meeting software such as file sharing and chat were also used. The EAF also implemented an informal means of communication with other group members. Specifically, each team member created a username for MSN Chat software, in order to facilitate communication between one or more members at a time. However, these features were used for basic communications such as, setting up meeting time and for discussing trivial issues.

### **QUANTITATIVE ASSESSMENTS AND ANALYSIS**

To gain a better understanding of the ways in which distributed members used different communications and collaboration tools, and the types of communication and coordination

problems they experienced, a quantitative approach was used. Two types of quantitative information were collected.

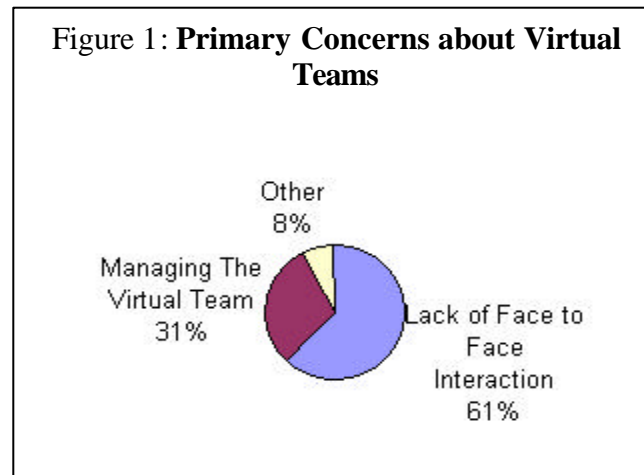
First, questionnaires were administered before and after the team's virtual project experience. Questionnaires were published on the Web, and students completed the survey online in order to coordinate data collection. The first questionnaire was used to examine equivalency in interest, experience and skills across teams, as well as to assess expectations about working with their remote counterparts. The second questionnaire assessed such measures as the degree of satisfaction with the experience, comfort with the group's communication, and trust in team members, the usefulness of the communication and collaboration tools provided, and assessment of the group's output.

A second type of quantitative information was achieved by analyzing the e-mail response time. The subjects/issues analyzed were taken from the topics that the team discussed via the e-mail. The time taken between the first e-mail message (initial message) about a particular subject and each response message associated with that subject was calculated. After that, the average of the measured time intervals was calculated for each selected subject. Through this analysis, it has been noticed that e-mail subject responses were in two types. One type was where each respondent replied to the original sender/message, while the other type was when each respondent replied to the last e-mail message that sent about certain subject, which forms a chain of messages each is a response to a reply.

### **Results of the Survey**

The focus of survey was to understand the human aspect of the virtual team. This section attempts to comprehend the team's impression on the various aspects of virtual teaming experience.

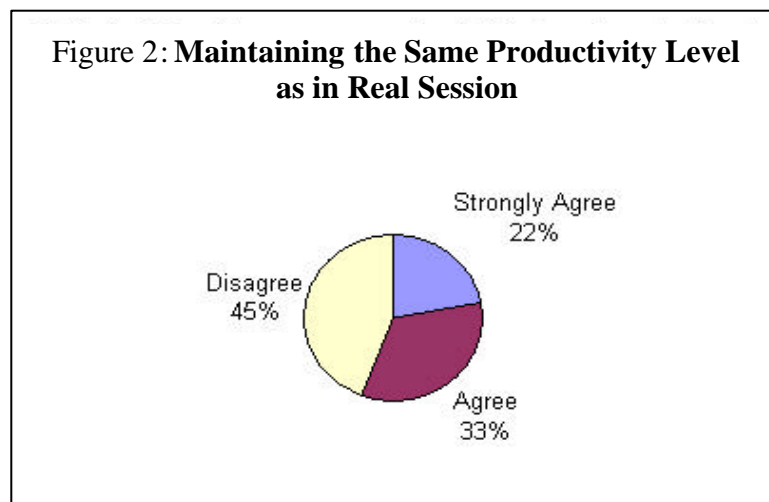
**First Survey.** The first questionnaire was administered before the virtual teaming session. Figure 1 delineates the primary concerns about virtual teaming. Most were concerned about the lack of face-to-face interaction. Others were concerned about the management of the virtual team. 8% of the members have concerns like, would it be difficult to monitor the progress of team members.



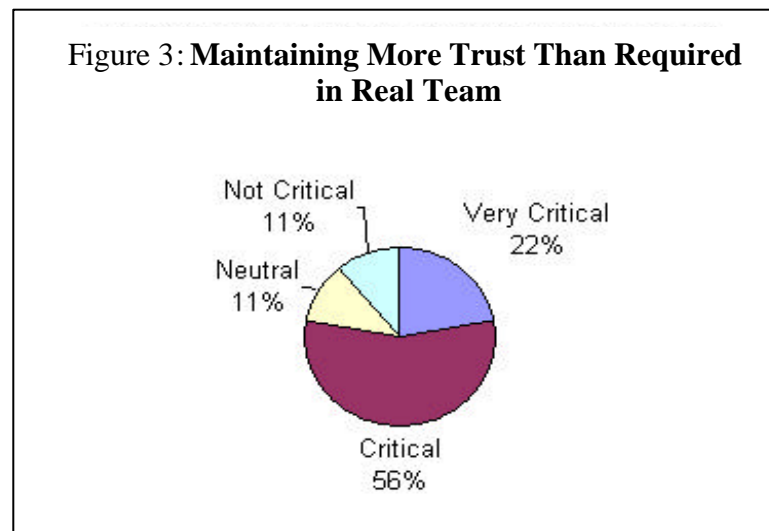
Analyzing the other responses of the survey, the team members had similar views in most of the aspects. The similarities are summarized below:

- About 78% of the team members strongly believed that the initial face-to-face teaming session (summer session) was the sole reason for building the trust among the members. While the rest (22%), say that the summer helped (but not the only factor) in getting to know members.
- All the members agreed that prompt feedback (to issues/questions) among the team members is very critical in virtual teaming. Reflecting the need for the “24 hour rule”.
- All were of the opinion that it was important to iron out the communication related technological issues before the start of the project.

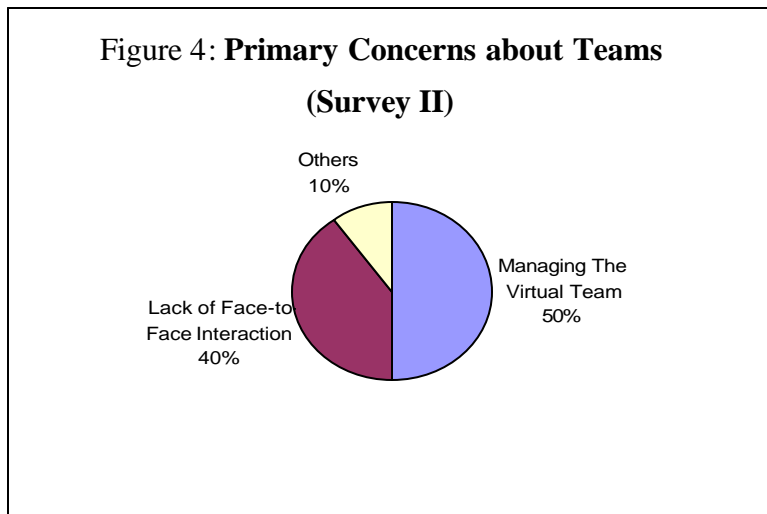
- The members believe that during virtual teaming session, it's important to have face-to-face meeting once per month.
- The members felt it was important to have a central repository (such as web communities) where members can share information/files.
- As shown in figure 2, a small majority (55%) believes it is possible to maintain the same productivity level in virtual teaming as it is in real session.



- As figure 3 shows how the majority of the team members indicate the criticality for maintaining more trust in virtual team.



**Second Survey.** The second questionnaire was administered after the virtual teaming session. Figure 4 delineates the primary concerns the members had about virtual teaming after the end of the virtual experience. After the virtual teaming session was over, it's interesting to note that most members listed managing the team rather than lack of face-to-face interaction as their primary concern. 10% of the members had a different concern, for example, that it would be difficult to monitor the progress of team members.



As in the first questionnaire, in the second questionnaire the members still believe strongly that during virtual teaming session, it's important to have face-to-face meeting once per month. Furthermore, the majority of the team members (89%) still believe in the criticality of maintaining more trust in virtual team. 56% of the team indicated their disagreement on maintaining the same productivity in the second survey, while on the first survey 55% did agree that it is a possible thing to maintain the same productivity. The team members attributed this change in answer to some personal reasons, which do not apply in any general case analysis.

Analyzing the other responses of the second survey, the team members had different views about the overall experience. Those views can be summarized as follows:

- 78% of the team members agreed that the team was almost successful in achieving its goals and maintaining positive personal relationships, while 22% gave a neutral answer or disagreed.
- Most of the team agreed that the overall use of the communication methods/protocols was almost successful, while few of them gave a neutral answer or disagreed.
- Majority (50%) said they were highly impressed with “24 hour rule” while the rest were neutral with one member not impressed. This indicates that the rule was highly effective.
- Majority of the team agreed on the effectiveness of the using the conference call and how this contributed greatly on the success of the project.
- 33% of the team was impressed about the virtual teaming with respect to the real session. On the other hand, 44% had a neutral opinion. One of the members was not impressed by the virtual teaming experience; while another claimed that virtual teaming experience was worse with respect to the real session. This could be attributed to the school work and schedule conflicts with school commitment.
- Majority faced difficulties in balancing their school work and project work.

### **Communication Pattern**

The team members followed the “24 hours rule” strictly. Initially, there were problems in applying this protocol as students started their schoolwork. Hence members who raised the issues might have been viewed lack of response as lack of good commitment to the project, especially when the communication pattern among them was vague. With strict following of the “24 hour rule” such misunderstanding was eliminated. Overall, the team maintained a positive attitude as issues/concerns were openly discussed and resolved. Communication patterns mainly consisted

of important information like conference call timing, task assignment among member, some operational/technical issues, and other important issues. During the conference call the team's spirit was upbeat as evident from the fact that other team members volunteered to help members in getting their tasks accomplished.

As a quantitative measure for the team member's reaction, the average e-mail response time was defined and calculated. The analysis covered two types of response patterns. The first pattern was when each team member responded to a specific e-mail while the second pattern was when a chain of responses (response to a reply) were received to a specific e-mail message. Table 1 shows the communication subjects and the associated response time.

<b>Communication Subject</b>	<b>Number of reposes</b>	<b>Average response time</b>
Communication issues	8	26 hours
Scheduling issue	5	35 minutes.
General discussion	6	6 hours
Travel issue	4	1 hour
Miscellaneous	9	6 hours

**Table 1: Communication subjects and response time**

As mentioned earlier that the team faced some difficulties in arranging the communication issues among the members, which is obviously resulted in 26 hours average repose time associated with this subject. According to the rest of the results, it is obvious that the team showed a fast response action. For example, it took the team about 6 hours to finish discussion, while only 35 minutes was spend to resolve scheduling issues (like scheduling conference calls). Some

miscellaneous subjects took from the team members about 6 hours in average such as distributing the notes after every conference call, coordinating for sending a get well card for a sick member, and discussing the face to face meeting issues.

### **FUTURE RESEARCH**

As future research an intensive analysis of the project is recommended. Also the following questions needs to be addressed: What are the necessary conditions for incorporating virtual teams as a part of course projects? What are the most effective ways of communicating social information in virtual teams?

Additionally, systematic research is needed to understand the effectiveness of similar projects where students are “in charge” and faculty acts as consultants. Understand effective leadership styles and contrast virtual teams with and without initial face-to-face contact. Does trust exist in virtual teams and upon what is it based? (Jarvenpaa, L.S, & Leidner, E.D. 1998).

What are the factors affecting performance in teams. Factors such as satisfaction, task structuring, anonymity, parallel communication, and group memory increase group performance over time. Similar projects should be undertaken among universities of, not just United States, but around the world to enrich the learning experience of students. This does not only build understanding among students belonging to different discipline and different cultures, but also fosters a sense of “oneness.” With the EAF team, this oneness was demonstrated when every team member took the time to send their concern when one of their team member fell sick.

### **CONCLUSION**

“Unity in diversity”. Students belonging to diverse background worked in unity to achieve the common goal. Every student who participated in the EAF felt that the project was a unique and

that it enabled them to be better equipped for the modern work environment. They are confident to face the realities of the present work environment where people belonging to different background have to work cooperatively as a single unit to achieve a common goal. Our goal was to provide new insights into student virtual team processes, where students were asked to learn from their mistakes, cope up with unpredictable environment, and make decision based on their judgment, with faculty acting as a consultant. The technologies used include email, teleconferencing and net meeting. Also the “24 hour rule” was highly effective. Our results have generated a number of useful insights that can be explored in future research, particularly in the area of technology appropriation, and the interaction of technology use and trust.

## REFERENCES

Anschuetz, L. (1998). *Managing geographically distributed teams*, IPCC 98 Proceedings. Vol. 2, (pp.139 -140).

AT&T. (2001). *Telework webguide: the future of telework*, [On-line] Available: <http://www.att.com/telework/>.

Coleman, D. (1997). *Groupware, Collaborative strategies for corporate LANs and intranets*, Prentice Hall, Upper Saddle River.

Cynthia, C. (1997). *Virtual teams*, Center for the Study of Work Teams, University of North Texas. [On-line] Available: <http://www.workteams.unt.edu/reports/Cantu.html>

DeSanctis, G. & Monge, P. (1998). *Communication processes for virtual organizations*, Journal for Computer-Mediated Communication, vol 3, issue 4, June 1998. [On-line] Available: <http://www.ascusc.org/jcmc/vol3/issue4/desanctis.html>

Haataja, J. (1998). *Can we trust computational results?*, CSC News magazine, vol. 10, No.3, September 1998.

Jarvenpaa, L.S, & Leidner, E.D. (1998). *Communication and trust in global virtual teams*, Journal For Computer-Mediated Communication, vol 3, issue 4, June 1998.

Lau, F., Sarker, S. & Sahay, S. *An exploratory study to facilitate virtual team development*. [Online] Available: <http://www.bus.ualberta.ca/flau/Papers/virtual.htm>

McMahan, K. L. (1998). *Effective communication and information sharing in virtual teams*. [Online] Available: <http://www.bizresources.com/learning/evt.html>

Olson, M. G. & Olson, S. J. (2000). *Distance matters*, School of Information, University of Michigan.

Pressman S. R. (2001). *Software Engineering A Practitioner's Approach*, fifth edition, Mc Graw Hill, pp 61.

Skyrme, J. D. (1993). *Teleworking – achieving the business benefits*.

## APPENDIX A

*The types of Technologies that could be used for virtual team along with their benefits and Issues. Mode is either A – asynchronous or S – synchronous. Adapted from Coleman 1997. Also included is the analysis of the technology in context with the EAF team.*

<i>Technology</i>	<i>Mode</i>	<i>Benefits and Issues</i>
Email	A	<p>Familiarity. Ease of use. File attachment. Broadcast option. May increase cooperation or miscommunication. Poor context, easily misinterpreted. Lack visual cues.</p> <p><i>Since the EAF team had a real session, many of the said challenges are out of context. Moreover for the team, email is the preferred medium for communication with company contacts.</i></p>

Voice mail	A	<p>Familiarity. Ease of use. May increase cooperation or miscommunication. Lack visual. Restricted message length. Lack acknowledgment. Cost.</p> <p><i>Not required for EAF team, as the team has access to email.</i></p>
Fax	A	<p>Familiarity. Ease of use. Efficient. Convenience. Written text and images only. Lack visual cues. May increase cooperation or miscommunication. Lack acknowledgment. Cost.</p> <p><i>Not a necessity for the team.</i></p>
Phone/ Teleconference	S	<p>Familiarity. Immediate response. Voice only. Lack visual cues. Same time different place. Unequal participation. Cost.</p> <p><i>The issues can be dealt by establishing sufficient protocols for participation. The team used conferencing to stay in touch with the faculty and each other.</i></p>
Non-real time conference or discussion board/ bulletin board	A	<p>Threaded discussion. Convenient. Information dissemination and archive. Broadcast option. May improve relationship, coordination, and collaboration. May lead to misunderstandings. Lack visual cues. Poor context. Lack acknowledgment</p> <p><i>Due to the convenience of archives, it would good to have discussion board to post all question. Highly recommended</i></p>
Videoconference	S	<p>Real-time interaction. Same time different place. Richer context with voice and non-verbal cues. Greater sense of connection. Video</p>

		lags behind voice. Cost. Special facilities.  <i>Not required, due to feasibility/requirements issues.</i>
Collaborative writing	A	Efficient. Convenient. Multiple ownerships. Different time and place. Requires coordination. Unfamiliarity. No visual cues. May increase cooperation or miscommunication.  <i>Not required, as team plans to have versions of document</i>
Online chat	S	Efficient. Immediate response. Same time different place. Poor context. Lack visual cues. Equal participation. Can be confusing. Irrelevant information.  <i>As and when required, for online discussion. Require and using capability of the web meeting software.</i>