

Christie L. McDaniel. Virtual Management: Trials and Tribulations. A Master's paper for the M.S. in I.S. degree. May, 2007. 91 pages. Advisor: Barbara B. Moran

This study analyzes the differences in virtual and face-to-face team management. It tries to find similarities and differences between the two types of teams. It seeks to find out whether or not managers are trained to lead these teams and to identify the preferred method of work by employees: virtual work or work in a physical, face-to-face environment.

Members of two professional listservs (the North Carolina Project Management Institute and the American Society for Information Science and Technology) were sent links to an online survey. Participants were practitioners and worked on or managed virtual teams at least fifty percent of the time. The survey found that most virtual workers do not get trained to work virtually; furthermore, there is nearly a 50/50 split on work place preference (virtual or face-to-face) among virtual workers. It was also found that the most common complaint about virtual work is related to communication difficulties. Finally, the survey found that the younger the virtual worker, the more likely they are to be closely monitored by their manager.

Headings:

Teams -- Management

Management -- Face-to-face

Management -- Virtual

Gender by role

Age by role

VIRTUAL MANAGEMENT: TRIALS AND TRIBULATIONS

by  
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Dr. Barbara B. Moran

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# 1 - Introduction<sup>1</sup>

## 1.1: Managing the Virtual Team

Imagine managing a team of people all over the world from your home. Think for a minute of the potential conflicts that could arise: miscommunication could cause one team member to misunderstand the current task and waste valuable time. Another potential problem could occur when tension between team members mounts - disagreements could cause arguments which reduce trust and cohesion not only for the parties involved, but for the entire team. Think of how simple it is to misread an email or an instant message from someone: when tone of voice and body language are taken away from our visual cues, one must judge someone else's attitudes and feelings from words alone. Studying and comparing virtual teams with face-to-face teams in order to determine how they should be managed could help both types of teams understand these issues.

With FTF teams problems may be easier (though not easy) to solve because technological barriers are less of a factor than in virtual teams. If a problem arises when you are in the same space, and you share this space both physically and temporally as your team, you can walk directly to the source to solve the problem. You will not have to send out an awkward email or instant message or make a phone

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<sup>1</sup> **Note:** Portions of this paper appears in The Handbook of Research on Virtual Workplaces and the New Nature of Business Practices edited by Kirk St. Amant and authored by Christie L. McDaniel. Copyright 2006, Idea Group, Inc. [www.idea-group.com](http://www.idea-group.com). Reprinted with the permission of the publisher.

call – you can solve the problem face-to-face, thus adding in body language and tone of voice. These two additions are physical cues that inform the other party of your emotional state – whether you are angry, frustrated, or happy with the situation. In addition, if you physically come in to work every day with the same people, you likely have deeper personal relationships than you would if you were working virtually. This type of relationship allows one to better interpret the emotional state of other team members and thus makes problem solving easier. When working with people you have never physically met, you cannot make presumptions into how they feel or might react in certain situations. When working virtually, rarely does one have the opportunity to get to know team members well enough to make guesses into their behavioral tendencies.

Virtual teams have been around since the mid-1980s and are increasing in popularity (Baker, 2002; Zaccaro & Bader, 2003). Zaccaro & Bader (2003) report that virtual teams work in geographically separate places (or they may work in the same space but at differing times) and most of the interactions between team members occur via communication mediated technologies (CMTs). Traditionally, teams typically share the same workspace and work together at the same time; these are face-to-face (FTF) teams. Hart and McLeod (2003) cite the Hawthorne studies as reporting that social interaction between team members has significant, positive influences on team productivity. These social interactions tend to promote trust among team members (Zaccaro & Bader, 2003). Unfortunately, virtual teams do not have the luxury of having this social interaction and Hart and McLeod (2003) suggest that this sense of togetherness may be more important for virtual teams than FTF teams (p. 352).

As a manager or a team leader, how does one promote this sense of oneness, of trust, among a virtual team? Given that the FTF aspect has been taken away, how should management styles change? What technologies should these teams use to

communicate? In order to answer these questions, research must be done to figure out what makes virtual teams and FTF teams fail or succeed. Such a comparison will guide one to understand what techniques managers should use for leading the virtual team.

## 1.2 - Virtual Teams: The Basics

Virtual teams are similar to traditional teams in that they involve a group of people working together toward a common goal. The two types of teams must both have a certain level of trust among team members, everyone must be committed to completing the assigned task, and they all must look towards a manager or a leader to guide their process. The differences between the two, however, are tremendous. For one thing, although both types of teams share a number of components, virtual teams operate differently.

Virtual teams are often made up of people working all over the world. The team members work in different places; some may work at different times; and others may work in different native languages. This disconnectedness, in terms of physicality, may cause several communication barriers. Team members may easily become confused as to what another team member is saying; this confusion could even lead to conflict between employees. In order to make up for lack of physical connectedness, virtual teams use Communication Mediated Technologies (CMTs) in order to stay in touch with one another. It is the power of these technologies and their ability to connect everyone at any time, which has guided the way for an increase in the number of virtual teams.

The following overview will assess the components of a traditional team that must exist within the virtual team and how these aspects must change as the team members go virtual. It will begin by discussing the components of a team, and then

assess what happens when shared physical space is taken away. Next, the differences between these two teams and how these differences affect team productivity and success will be explained. Finally, the role of managers between each team, both FTF and virtual, will be explored.

### 1.2.1 – What makes a team?

In *Manager's Toolkit* (2004), Richard Luecke defines a team as: “not just a collection of individuals; it is a small number of individuals with complementary skills committed to a common purpose with collective accountability” (pp. 95). Typically, teams are used to complete complex, time-consuming tasks; a task that cannot be completed by an individual. Thus, the idea behind a team is generally ‘two heads are better than one’; in the case of most teams, *many* heads are perceived as better than one. With teamwork, businesses get the expertise, innovation, and efficiency of everyone on the team.

In order to be productive, teams must be efficient. Without efficiency, their goal or task may not be reached in an appropriate amount of time, or even at all. Luecke (2004) identifies the following characteristics as important for building ‘effective’ teams (pp. 96):

- Competence – everyone brings something that the team needs
- A clear and compelling goal
- Commitment to the common goal
- Every member contributes; every member benefits
- A supportive environment
- Alignment (i.e., coordinating work schedules, milestones, etc.)

These factors are important aspects of any team, virtual or traditional. In order to be successful, these characteristics must somehow be met.

### *1.2.2 - Analyzing the Effective Team*

The first characteristic of Lueke's effective team is competence. The idea behind competence is that each team member is bringing a necessary component to the table. For instance, the team assigned to building the website for a public school may include a project leader (who may have an additional role), a usability expert, a designer, and an architect. Each of these members should have expertise within their assigned role in order to move the group towards task completion.

The second aspect of the effective team is having a clear goal. With a clear goal in mind, every team member will understand the purpose of the team and the direction everyone should be headed. Without a clearly stipulated goal (or perhaps several goals), team members will not have the information they need to be productive.

Team members must also be committed towards this goal. By accepting the goal and dedicating one's work time towards it, team members set their team up for productivity. To the same extent, all team members must contribute something towards the goal; likewise, they all must benefit from these contributions. Lueke's (2004) example of this aspect best describes the importance of working together: "Have you ever been on a rowing team? If you have, you know that every member of the team must pull his or her oar with the same intensity and at the same pace as everyone else" (p. 99). Business teams are quite similar; every group member is affected by the productivity and commitment of every other group member.

Effective teams must also reside in a supportive environment. If there are actual barriers prohibiting the team from reaching its goal, one cannot expect efficiency nor success. Every team member must be focused on the goal and support the other members of the team.

Finally, the effective team must have alignment. In other words, alignment means coordinating schedules and, generally, working together as one unit. Thus, the team will be *organized* in its endeavors. This organization (or alignment) will ensure that the team is moving together, and coordinating their individual goals with the overall goal in mind.

### *1.2.3 - Other Components of Successful Teams*

Intertwined with building an effective team is the need to build a cohesive, trusting team. Benoit and Kelsey (2003) conclude from their research that low levels of trust among team members have a negative effect on the team's ability to produce quality work – they found that the higher the level of trust between team members, the higher the “mark” (pp. 597) the team received for their work. Obviously, organizations want the highest quality of work possible out of their teams; therefore, it is the manager's duty to build trust among team members. Trust is key when working towards a common goal; if even a single team member loses faith in another's ability to complete a task well and on time, the quality of work produced by the entire team is in danger. However, building trust takes time and effort; particularly, if the team members have not worked with each other before. Benoit and Kelsey (2003) go on to report that “good intentions do not build trust; only the ability to perform and actually deliver on commitments (i.e., integrity) will lead to the formation of trust” (pp. 597). Because of this factor, building trust among a new team may be quite difficult and take time.

In opposition to Benoit and Kelsey's work, research by Dirks (1999) says that trust plays an indirect role on team performance and did not affect the outcome of team deliverables negatively or positively. Dirks argues that trust should not be seen as a motivating factor in developing work but rather, it should be seen as a way to keep team members working towards the same goal. Interestingly, working

towards a common goal has been identified as key to building an effective team (Lueke, 2004). Regardless of whether or not trust among team members affects the final product, it is easy to see that trust has a significant impact on maintaining positive group dynamics which directly relates to the emotional state of employees.

The cohesion of a team has also been identified as a factor contributing to team success and effectiveness. Wellen and Neale (2006) define cohesion as: "the overall attraction or bond amongst members of a group" (pp. 168). Cohesive teams work as one unit with every member's contribution working towards the goal. Characteristics of a cohesive team include both social attraction and the ability of individual team members to complete their share of the work (Wellen and Neale, 2006). Notably, contribution towards the work required to reach the goal was identified by Lueke (2004) as part of building an effective team. The social attraction aspect of teams is similar to that of families; members feel as though they are one unit. Cohesive team members seemingly work well together and are thus more productive.

When a team is not cohesive it usually results in a poor working environment. The cohesiveness of a team can be threatened by what Wellen and Neale (2006) identify as a "deviant" team member. The deviant is the person who does not communicate well with others and often fails to complete work in a timely or acceptable fashion. The deviant has an incredibly negative effect on team perceptions and can bring down performance and production as well as lower trust and cohesion (Wellen and Neale, 2006). A deviant team member can mean the downfall of a productive team. Thus, having effective, trusting, cohesive teams can only translate into better outcomes – something that organizations obviously desire.

### 1.3 - What's in a (Virtual) Team?

On the surface, a virtual team is no different from a traditional team – it should be comprised of a group of people whose skill sets work together in a cohesive manner; and in reaching a common goal. Virtual teams must have the same set of attributes as an effective traditional team: competence, a clear goal, commitment to that goal, equal team member contribution, support, and alignment (Lueke, 2004). How do the two types of teams differ? The main difference is that the virtual team members do not necessarily sit down in the same physical space as a group to discuss problems and pitfalls with their project. They do not meet in a conference room weekly for team meetings; they do not necessarily even live in the same country and they could be working in different time zones. Instead, this type of team typically uses at least one type of technology for communication: email, instant messaging, phone or video conference – to discuss problems or successes with their project. The basic principles of team building do not change when moving to a virtual team; however, the way team members work together and the methods which they use to communicate change completely. And, the way a team communicates is important to reaching all the aspects of an effective team: trust, cohesion, support, and alignment. In order to understand how communication methods impact team effectiveness, we must first investigate the technologies used to communicate virtually.

### 1.4 - CMT: The Difference between FTF teams and Virtual teams

Traditional teams are defined as groups of people working together, in a shared *physical* workspace. Virtual teams are very similar except their shared space is *virtual*. These teams must use technological tools to communicate with each other;

these tools are known as Communication Mediated Technologies, or CMTs. CMTs are becoming more and more common in our world; email, text messaging via cell phones, and instant messaging services are all frequently used examples of CMTs. The fact is, these types of technologies are much more commonplace and therefore it is easy to overlook the barriers that they may create.

Teams that cannot have regular FTF meetings must rely on collaborative technologies to provide social interaction (Baker, 2002). These technologies essentially attempt to replace two components of communication: tone of voice and body language. With traditional teams, team members get more than verbal or text-based communication – they get body language and tone of voice to guess their other teammates emotional situation (Baker, 2002). Understanding the emotional aspect of a fellow team member's state of mind is important in remaining a cohesive, successful team.

Baker (2002) identifies four types of CMTs: text only communication, text communication with video, audio-only communication, and audio communication with video. Each method of communication has its advantages and disadvantages, which will be discussed.

Text only communication is quite common in today's society. There is text messaging, instant messaging, email, wikis, discussion forums, and blogs. Baker (2002) reports that this type of communication works best when one is multitasking and carrying on concurrent conversations – but not for making complicated decisions. This medium has the potential to cause confusion and unnecessary disagreements if it is used for making difficult decisions, or explaining complicated tasks or assignments. However, it is useful for getting quick answers to simple problems.

An example of text communication with video is using one of the aforementioned methods with the addition of a web camera so that you can see the

other person(s) involved. Baker (2002) reports that this gives users a higher level of feedback than simple text-only communication; this is because you can read the facial expressions and body language of others involved. This medium should be used when making situations that involve some difficulty or confusion, but not a high degree of it.

One participates in audio-only communication when talking on the telephone. In this situation, you get tone of voice, but not body language or facial expressions. The major disadvantage of this communication medium is that it does not support multiple conversations at once (Baker, 2002). With conference calls, more than one person may be involved, but only one can get their point across at a time, as compared to text-only communication where multiple users can communicate at once. This CMT should be used when one team member needs to clarify something with one and only one other team member. It is appropriate to use when confusion hits.

Finally, there is audio communication with video. Audio with video is used when participating in a video conference. Baker (2002) found that this method of communication was most effective in performing collaborative tasks. It seems that audio and video communication media provide the best quality of communication among team members. In fact, Baker (2002) reports that "video has been found to provide benefits such as: allowing individuals to indicate their understanding, augmenting verbal communications with gestures, conveying attitudes by expressions and posture, and interpreting the significance of conversational pauses" (Baker, 2002, pp. 84). This method of communication is most appropriate when several team members need to understand or assess a particularly difficult situation; it is also useful when the team first convenes as it is an effective way to have team members get to know one another.

Baker found that audio with video was the most effective communication method, followed by text only communication, text with video, and audio-only communication. Audio with video communication is most similar to working together in the same physical space, at the same time. Apparently the text with video provides no additional functionality than simple text-only communication; however, being able to both see and hear other team members seems to be most comparable to FTF meetings and is highly successful in enhancing the quality of communication among team members.

It is obvious that the types of interactions in virtual teams differ from the types of interactions in FTF teams. Both types of teams must not only complete their work, but build trust and cohesion as well. The difference between the two is that the methods used for completing these tasks differ. Virtual team managers are faced with two main tasks: making sure the job gets done and making sure that the team members are mentally satisfied with the team's ability to function successfully. Even with the additional complexity of these tasks, virtual teams remain quite effective. Two of their main advantages include the fact that they do not face certain geographical limitations that FTF teams do and thus they can deal with a broader range of customers and stakeholders; also, since they face no geographical limitations they are able to interact with a larger range of customers or clients than FTF teams (Zaccaro & Bader, 2003). Given that virtual teams can be just as effective as and sometimes more effective than FTF teams (Baker, 2002), how should managerial styles change when moving from a FTF to a virtual team?

### 1.5 - Why study virtual teams?

Why should we be studying virtual teams? For one thing, the number of virtual teams are increasing as technology becomes more powerful; also, the number

of virtual teams has increased significantly over the past few years (Baker, 2002; Zaccaro & Bader, 2003) and research conducted on the subject has not kept up with this trend (Baker, 2002). Massey and colleagues (2001) state that: "Virtual teams and the technologies that support them promise the flexibility, responsiveness, lower costs, and improved resource utilization necessary to compete [in the business world]" (Massey et al., 2001, p. 207). Because of this lack of research and popularity of virtual teams, it is necessary to discover the successes and failures behind virtual teams; we must seek out this information as it is necessary to stay ahead in the business world by keeping teams both effective and productive, lest we risk getting left behind.

## **2 – Literature Review**

### *An Overview*

Virtual teams are a fairly new topic of study. For one thing, the technology required to work in a virtual team has only been around for about 25 years; hence, virtual teams as we think of them have been in existence for a little over 10 years. Because of the newness of this topic, there is not a tremendous amount of empirical research on the topic; what is there becomes outdated quickly because of the rapid change of technology. However, as is the case with most things, it is important to take a step back to see the past so that the present can be fully appreciated. At the same time, past studies give remarkable insight into how virtual teams have changed over time; by the end of this chapter it will be clear that even though the technologies have changed, the overall problems have not.

This literature review will take a look at the history of virtual teams, assessing the first comprehensive empirical work on the topic; present studies from the past 10 years, examining the effectiveness of virtual teams in the areas of: trust, cohesion, commitment, leadership, time, communication – in particular, the communication technologies used by virtual teams. This assessment will be followed by a brief discussion of where future literature should go in order to address all of the issues presented by the virtual team.

## 2. 1 - Virtual Teams: A Brief History

Perhaps the first comprehensive analysis of virtual teams can be found in a book edited by Robert Kraut in 1987: *Technology and the Transformation of White-Collar Work*. He prefaces his work by saying that "It is not commonplace to proclaim that rapid changes in communication and computer technology will radically transform the way in which ... work is done in the United States ... They [the technologies prohibiting virtual work] allow people to work at places and times that suit them,, but they also allow employers to exploit workers" (Kraut, 1987a, p. ix). Kraut quite astutely predicted the future of technological communication tools and their effect on work. Virtual work tools like email and instant messaging are great because they allow people to work wherever, whenever they choose; however, they are also the main cause for the blurring of lines between work time and home time. Three pertinent chapters in this book will be discussed here; they analyze the way employees feel about working home, the way employers feel about it, and the social interactions and communication techniques used in virtual work.

In chapter 7, "Predicting the Use of Technology: The Case of Telework", Robert Kraut (Kraut, 1987b) defines telework as: "the use of computers and telecommunications equipment to do office work away from a central, conventional office" (p. 113). He goes on to say that "decision makers" worry about allowing telework (even though the technology exists) because they are concerned about employee productivity and supervision. In this early work, Kraut recognized a key concern about working from home – the idea that employees are less productive if they are not in a traditional workplace. Kraut hypothesizes that "remote work is a transformation of the way work currently is done in America and that new technology is a cause or at least an enabler of that transformation" (p. 114). He also sees that remote work is different because technology is used in every aspect of work. Kraut

(1987b) found that those who worked from home were interested in working from home much more than their current job allowed. He also found that people working from home did more cognitive tasks (reading, writing, and programming) at home while they performed more social tasks in the workplace (face-to-face talking about work; face-to-face talking about non-work, attending meetings, using the telephone, and sending email). Kraut's study shows that employees completed tasks that required an extreme amount of thinking in the home; therefore remaining productive. Given that they spent most of their time at the workplace on social tasks (some work related and others not) it may be presumed that the workers in Kraut's study got more work done in the home and they wished to spend more time working there.

In chapter 8 of *Transformation and the Transformation of White-Collar Work* (Kraut, ed., 1987a) Margrethe Olson discusses employers' perceptions of telework in her chapter on "Telework: Practical Experience and Future Prospects" (Olson, 1987). In her study, she seeks "to analyze telework from the point of view of work organization and personal choice; and to provide a brief overview of company experiments with telework" (p. 135). Olson completed an exploratory survey of fourteen companies with work-at-home pilot programs and 6 companies with informal work-at-home options. She found that "the primary interest in work-at-home of organizations is based on the need to acquire skills in short supply ... [and] the technology supporting work-at-home is not a major factor today" (Olson, 1987, p. 135). Olson concluded that employers wanted workers with very specific skills that were hard to come by; as a result of their need, they allowed people to work-at-home so as to open up their employment base to a much wider geographical net. She also found that the technology of 1987 was of no concern at all to employers; they were confident in the ability of the available technology to allow at-home work. It is also important to note that even though the managers involved in Olson's pilot

study discontinued their formal work-at-home programs after the study was over, they believed the program to be successful. In her concluding statements, Olson hypothesizes that organizational culture and not the technologies of work-at-home programs influence whether or not an organization allows workers to work-at-home. So you see, even without the instantaneous wireless connections of today, organizational culture was an issue with virtual teams.

The final chapter of Kraut's work (1987a) evaluates social interaction and communication between people and the [then] new work-at-home technologies. In chapter 11, "Social Interaction and Office Communication: Effects on User Evaluation of New Technologies" Jeanette Blomberg (1987) completed field observation studies at various organizations. From her observations she found that: "realizing the full advantage from new technologies will require more than designing 'self-explanatory' machines; it will require conceptualizing human-machine interactions as embedded in ongoing human interactions wherein the 'social' significance of the technology is established" (p. 195). Blomberg ascertains that increasing the ease-of-use of communications technologies will not help the communications process for virtual workers; rather, she suggests focusing on the human aspects these technologies are trying to imitate.

### *2.1.2 – Predicting the Future of Virtual Teams*

Seven years after Kraut's work, after Tim Berners-Lee developed the hypertext concept (1991) and the Mosaic browser appeared (1993), Samuel Bleeker (1994) wrote an article for *The Futurist* that discussed where the virtual workforce would go in the decades to come. He predicted that corporations "will be, within a few decades, almost entirely new entities" (p. 9). These new entities were presented as space-less (geographically speaking) in that everyone would work across the Internet and the network connections available in their homes. Bleeker goes on to

say that the new mobile worker "doesn't so much need computer devices that communicate as they need **communication devices that compute** [emphasis added]" (Bleeker, 1994, p. 12). Given that nearly all of today's smart devices – cell phones, Personal Digital Assistants, MP3 players, etc. – all have computing power, it is easy to see that Bleeker was head-on in his predictions. Perhaps Bleeker truly foresaw the need for Communication Mediated Technologies, which will be discussed in the section analyzing more recent studies of virtual teams (section 2.2).

Given the history of virtual teams, they have come a long way. In Kraut's work (1987a), all of the teams presented were not what we consider to be virtual workers today. In 1987, virtual workers were strictly at-home workers and they only worked from home on rare occasions, usually in addition to working a full work week (36 or more hours) in a physical office space. Virtual workers as we think of them today, people working across time and space with people in varying geographic areas, emerged after the Internet boom in the mid- to late-1990s. The remainder of this literature review will be spent discussing virtual teams as we know them today.

## 2.2 – Recent Empirical Research on Virtual Teams

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*"We can't solve twenty-first-century problems with nineteenth-century organizations." –Andy Campbell, as told to Lipnack and Stamps (2000)*

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Because of technological advances, virtual teams today are equipped with instantaneous connections to the people with whom they work. Because of this, most of the current empirical studies conducted within the past 7 years or so analyze the effectiveness of virtual teams. Some of the more frequent topics studied on virtual team effectiveness include: trust, cohesion, commitment, leadership, time, and communication. Each of these topics and the relevant literature will be briefly explored here.

### *2.2.1 – Trust in the Virtual Team*

Lipnack and Stamps (2000) declare that: “people work together because they trust one another ... teams with trust converge more easily, organize their words more quickly, and manage themselves better” (p. 69). Trust is vital to any type of team; but to the virtual team it is critical simply because it is harder to come by and quite easy to lose. In 1999 Jarvenpaa and Leidner focused a study solely on communication and trust in virtual teams. They completed several in-depth case studies of teams both global and virtual in nature. They reported that the teams “were challenged by a common collaborative project, and for whom the only economically practically viable communication medium was asynchronous and synchronous computer-mediated communication” (1999, p. 791). From their analysis they conclude that these types of teams experience what they term “swift trust” which is a type of trust that is temporary and fragile. In this type of trust, teams assume trustworthiness at the onset of the project and work as though trust has already been developed; however, this type of trust is particularly easy to lose.

Powell et al., (2004) declare that “the practitioner points to relationship building, cohesion, and trust as fundamental processes that foster team effectiveness, while suggesting that virtual teams face significant difficulty in achieving them” (p. 9). Majchrzak et al., (2000a) declare that trust can be garnered through an initial face-to-face meeting. Other studies have also found trust to be a key component in virtual teams and particularly difficult to garner (Warkentin & Beranek, 1999; Beranek, 2000). These studies found that training for communicating and participating in virtual teams increases the level of trust among virtual team members (Warkentin & Beranek, 1999; Beranek, 2000).

### 2.2.2 – Developing Cohesion

Cohesion is another commonly measured item of virtual team effectiveness. Salisbury et al. (2006) report that: “perceived cohesiveness encompasses an individual’s sense of *belonging* to a particular group and his or her feelings of *morale* associated with membership in the group” (p. 147). In their study, Salisbury et al. analyzed the discussions of 110 undergraduate students completing a database project by virtual means – the teams never met face-to-face. They found that virtual teams have a hard time creating cohesion but define it in the same way that a traditional, face-to-face team would.

Other studies of team cohesion typically find that cohesion is essential to positive team member satisfaction. Wong and Burton's (2000) study compares virtual teams with face-to-face teams in simulated work environments; their results revealed that fostering team culture was significant in developing an effective virtual team. Lurey and Raisinghani (2001) distributed surveys to 8 companies in the high tech, agriculture, and professional services industries. From these, they collected responses from a total of 67 individuals across 12 virtual teams. They found that "the teams' processes and team members' relations presented the strongest relationships to team performance and team member satisfaction" (p. 523). These findings clearly indicate that it is both difficult and essential to foster cohesion in the successful virtual team.

### 2.2.3 – Becoming a Committed Virtual Team

Powell et al. (2000) report commitment to the virtual team leads to its success. Clear and Kassabova (2005) analyzed the virtual team techniques of several students participating in a virtual, international, collaboration project. They asked students to complete a short form regarding emotions around the team success at various intervals throughout the project. Clear and Kassabova found that the

students who felt their team was committed to the project were more satisfied than those who were not committed. They also found that students committed to the project were slightly more likely to say they were unhappy with the overall process, even though they felt satisfied with the outcome. Finally, they found that when team members felt the other students involved in the project were not committed, they lost their initiative to succeed. Obviously, this study demonstrates that commitment to the project from every member of the team is essential to success and effectiveness. In the instance that students reported being committed, satisfied, and unhappy, the authors report that the particular group of students would have preferred to work alone and not in teams.

Vickery, Clark, & Carlson (1999) studied the strength and performance of virtual positions throughout the US Air Force systems. Through data gathered from surveys, interviews, and analysis of archival data from the Aeronautical Systems Center at Wright-Patterson Air Force Base in Ohio. In their results, they found that virtual teams performed better with complex tasks rather than simple ones. Eighty-four teams took the survey and the authors found that "overall, the architecture of the parent organization has a significant effect on both allegiance and the control climate of the virtual position, and, as a result, virtual position strength" (p. 291). Therefore, not only the team members, but the organization as a whole, must be committed to the idea of the virtual team.

How does one foster commitment in a virtual team? Fichman-Shachaf (2003) says that virtual team commitment can be manipulated and fostered through team training. Other studies proclaim that training can increase commitment to the team's goals and objectives (Warkentin & Beranek, 1999; Beranek, 2000). Training comes up in other aspects of virtual team effectiveness – particularly with trust and cohesion. Training seems to be really great for bringing team members together in order to function as one unit.

#### *2.2.4 – The influence of leadership in virtual teams*

Lurey and Raisinghani (2001) found successful leadership to be related to virtual team effectiveness. Fichman-Shachaf (2003) reports that: "the leader's role becomes more ambiguous in the virtual team in that the leader is not the information gatekeeper but rather a negotiator and facilitator" (p. 28). In this environment of shared knowledge, the virtual team leader must act as more of a traditional leader, not necessarily as a bearer of information. Johnson et al. (2002) found that in virtual teams when no defined roles are assigned, team members typically share the leadership role. However, Johnson and his colleagues (2002) studied students; in the industrial world, leaders are typically assigned. Since that is the case, we must address the characteristics necessary of effective leadership in virtual teams.

Klenke (1996) identifies the following leadership qualities in virtual organizations: motivation, networkers, champions of change, and guiding in the creation of a high performance culture. One particularly notable quality required of effective virtual team leaders is mentoring ability; Kayworth and Leidner (2001) found that leaders who mentored team members were perceived as effective leaders by the virtual team. Fichman-Shachaf (2003) analyzed empirical research on leadership in virtual teams and found four points of effective virtual team leadership that should be discussed. She identifies them as:

1. Communication (the leader provides continuous feedback, engages in regular and prompt communication, and clarifies tasks);
2. Understanding (the leader is sensitive to schedules of members, appreciates their opinions and suggestions, cares about member's problems, gets to know them, and expresses a personal interest in them);
3. Role clarity (the leader clearly defines responsibilities of all members, exercises authority, and mentors virtual team members);
- and 4. Leadership attitude (the leader is assertive yet not too "bossy," caring, relates to members at their own levels, and maintains a

consistent attitude over the life of the project) (Fichman-Shachaf, 2003, p. 29).

The ideal virtual team leader is effective at bridging the virtual gap and pulling team members together. This profile of characteristics for virtual team leaders can easily be transferred to the face-to-face, non-virtual, world. In fact, Switzer (2000) found that there are no differences between leadership profiles of face-to-face and virtual team leaders. The important thing to remember is that while the leader of a virtual team should share similar qualities with a face-to-face team leader, virtual team leaders will use a different means to accomplish these tasks.

#### *2.2.5 – Virtual Teams and Time*

Time is a particularly interesting aspect of virtual teams. For one thing, most virtual teams only work together for a limited amount of time; during the time period a member is working on one virtual team, he or she may also be a member of additional teams. Fichman-Shachaf (2003) declares that: "virtual team members work together during a defined period of time, through which they develop as a team, figure out how to accomplish the shared tasks, perform their tasks, and disband" (p. 32). It has also been said that virtual teams work in "developmental patterns" that revolve around time; these patterns are similar to those of face-to-face teams with the exception of virtual teams having a distinct beginning, middle, and end in mind (Fichman-Shachaf, 2003).

Johnson et al. (2002) studied masters' students completing an online project. In relation to time, they found that students almost always went through a cycle of forming, norming, and performing as identified by Tuckman (1965). In the forming stage the teams went through social interactions to get to know one another as well as a goal setting time period where they planned out their project tasks. The norming stage occurred when students went through processes that kept them

functioning as a team. For instance, norming activities in Johnson et al.'s study included punctuality with completion of tasks, knowledge and information sharing related to the project, and a quick response to group and team member feedback. In the performing stage students worked on the assigned tasks through collaboration.

#### *2.2.6 – Communication in Virtual Teams*

Communication is one of the most essential aspects of all teams and is a particularly difficult issue for virtual teams. Fichman-Shachaf (2003) identifies communication as one of the most integral components of virtual teams. The reason that communication is such an issue is because it is necessary for the team to complete its task effectively; at the same time, communication problems arise because virtual teams do not work in a shared physical workplace. In this section, current empirical research on virtual teams will be explored, and the technologies used to communicate within virtual teams will be discussed.

##### *2.2.6.1 – Empirical research on virtual communicating*

The issue of communication differences between face-to-face teams and virtual teams is of interest to researchers (Warkentine et al., 1997; Carletta et al., 2000; Balthazard et al., 2004). Balthazard et al. (2004) studied well-trained managers (they were all from MBA programs) in 63 virtual teams. They found that “although expertise is the best predictor of task performance, it is primarily group interaction styles that predict contextual outcomes in virtual teams” (Balthazard et al., 2004, p. 41). Balthazard and colleagues’ work is indicative of the importance of communication in virtual teams.

Warkentine and colleagues (1997) studied graduate students in a computer architecture class working in virtual teams. The researchers assigned students to 12 teams, 6 were given virtual team communication (VTC) training and the remaining 6

were given no training. They found that "teams that were given appropriate training exhibited improved perceptions of the interaction process over time; specifically with regard to trust, commitment, and frank expression between team members" (p. 271). When analyzing virtual teams, Warkentine et al. found that training team members on how to work and communicate within virtual teams helped teams operate more effectively. Carletta et al. (2000) found that informal communication among virtual team members is particularly low when compared with informal communication among face-to-face team members. Completing field observations, facilitated discussions, and a questionnaire, the researchers studied team members across two teams in the supply chain portion of an automotive supply company. Carletta and colleagues found that with a lower amount of non-work related, informal interaction that teams may not act as one solid unit as they would in a traditional environment.

#### *2.2.6.2 – The Impact of Communication Mediated Technologies*

Virtual teams use technology to communicate with one another. Given the importance of communication in virtual teams; the technologies they use are a critical aspect of empirical research on virtual teams. Carletta and colleagues declare: "Communication technology can have a very large impact on teams because their members are seldom collocated" (Carletta et al., 2000, p. 1237). Given the importance of these technologies on virtual teams, this section will discuss recent empirical research on the effects of communication mediated technologies as well as issues related to media selection by virtual team members.

Fichman-Shachaf (2003) argues that "technology appropriation, which is the adoption and use of technology by the virtual team, is a main concern in several studies on virtual teams" (p. 36). The technology appropriation model was created based on a study by Majchrzak and colleagues (2000b). The researchers studied a

virtual team tasked with creating a product over 10-months used collaborative technologies. Because of communication issues, the studied team decided to change their organization, not their communications technology. In the long run, this method did not work; the team members succeeded at their task once they reverted back to their original organization with a new communications technology appropriate to their team. Thus, the authors conclude that instead of changing the way team members communicate, team managers should change the technologies used for communication.

Another issue related to communications within virtual teams is how the current relationships between team members affect the use of communication mediated technologies. Warkentine and Beranke (1999) discovered that "relational links among team members have been found to be a significant contributor to the effectiveness of information exchange in the use of Computer-Mediated Communication systems" (p. 271). From this one can conclude that developing a personal connection between team members is just as important as choosing the right technology to use for communications.

Finally, one major issue with communication mediated technologies that must be addressed is the issue of choosing the type of technology necessary for effective communications in virtual teams. Whether or not communication mediated technologies have an impact on virtual team effectiveness has been debated among researchers (Lurey & Raisinighani, 2001; Pauleen & Yoong, 2001; Majchrzak et al., 2000a; Baker, 2002). Lurey and Raisinighani (2001) concluded that no connections were found between the method of communication used in virtual teams and their effectiveness. The researchers analyzed 67 team members across 12 virtual teams through both quantitative and qualitative data. The authors feel that even though the quantitative data showed no statistical significance between virtual team communication technologies and effectiveness, the qualitative data suggests

otherwise. They felt that their interview answers suggest that the team members' feelings of satisfaction were quite related to communication mediated technologies.

As for specific communications, Pauleen and Yoong (2001) found that email was used for most virtual team communications but chat (in their study the chat software ICQ was used) was used mainly for informal communications. Lurey and Raisinighani (2001) found that email was used most frequently between virtual team members, followed in frequency by the personal phone call. Majchrzak and colleagues (2000a) found that team members used face-to-face and the telephone for ambiguous tasks and collaborative technologies (like email or chat) for more routine tasks. The researchers also felt that when team members were asked to complete all tasks virtually that they were able to do so easily (Majchrzak et al., 2000a).

Baker (2002) studied 64 virtual teams and their use of four types of collaborative technologies which were discussed in the Introduction. To sum up, Baker (2002) studied text-only, audio-only, text with video, and audio with video communications. He found that using audio with video increased team performance when making "strategic decisions" (Baker, 2002, p. 79). The teams made significantly better decisions when communicating using audio and video communication technologies (like a video conference).

### *2.2.7 - Summing up the Communications Issue*

Even though Lurey and Raisinghani (2001) did not find statistical significance between communication mediated technologies and virtual team effectiveness, other researchers have found significance between the two (Majchrzak et al., 2000a; Baker, 2002). Also, Lurey and Raisinghani (2001) still believed that the technologies played a significant role (perhaps indirectly) in team satisfaction. From the research presented here, one may conclude that re-creating the face-to-face communications

as much as possible is important when making difficult decisions as a group. However, using email or chat works fine when communicating between team members on simple tasks; or when only two team members need to communicate on a more difficult issue.

### 2.3 – Remaining Questions

This literature review has analyzed the history of virtual teams, the factors that go into creating effective virtual teams, and the communication technologies used within virtual teams. From empirical research, it may be concluded that the key to successful virtual teams is knowing when to use the proper method of communication. But, what happens in a real world situation when managers and team members are pressed for time and no one sits down to assess how ideas and tasks are being communicated between the group? Are managers and team members being trained on how to work virtually? Which method of team work do employees prefer – working virtual or working in a shared physical space? These questions will be explored in this research study.

## **3 - Methodology**

### *Overview*

A quantitative study was conducted by surveying project managers and virtual team members. The survey was administered by contacting members of the North Carolina Project Management Institute (NC-PMI) listserv as well as the American Society of Information Science and Technology (ASIST) listserv. The survey sought information about the following: methods of communication used for virtual teams and their effectiveness; methods of conflict management within virtual teams; and whether or not team members prefer working virtually to working face-to-face. This chapter will discuss the development of the survey instrument, pilot testing, the procedures used for distributing the survey, and brief information about the survey participants.

### **3.1 – Survey Development**

The survey was developed by the Principle Investigator (PI). The PI analyzed research questions from the literature review and developed the survey instrument. The questions were designed to answer several general research questions: do people prefer working on virtual teams; what do they use to communicate virtually; and what are the advantages and disadvantages of virtual work. The section below describes the survey questions; a full version of every survey question appears in Appendix B.

The first set of questions included demographic questions. These questions sought the age, race, gender, and virtual team member type of the respondent.

Virtual team member type includes virtual team: member, manager, or both. It also asked the participant to identify their primary professional role which included practitioner, educator, or student. This question was added with the ASIST listserv in mind as it has a mix of members, while the NC-PMI listserv includes only professionals.

The next set of questions included general questions about working in virtual teams. Respondents were asked to describe the type of organization they worked in (corporation, non-profit, educational institution, or other); they were also asked to describe the industry they worked in (advertising, consulting, engineering, health care, research, social services, teaching or training, technology, or other). The categories used in both of these questions were gathered from the US Census Bureau and were edited to fit the purposes of this survey. Finally, respondents were asked if they received any special training.

Participants were then asked a set of questions about communicating within the team. The first question involved working with an unproductive employee; participants were only allowed to answer 'yes' or 'no'. If the participant entered yes, they were then asked which communication methods were used to deal with the situation; potential answers included: Instant Messaging, Phone, Video Conference, Face-to-face meeting, Email, or all of the above. They were then asked if this method was effective and were able to provide an answer of either 'yes' or 'no'. If they answered no, they were given an open-ended text box explaining their answer.

Next participants were asked if they had dealt with conflicts between employees. If they answered 'yes' they were given additional questions. An answer of 'no' would send the participant on to the next set of questions. For those answering yes, a set of questions matching the ones previously described for dealing with unproductive employees were given.

The participants were then asked to rate how well their manager dealt with being behind on deadlines. They were given the following answer choices of a Likert-type scale: '1 – not well at all', '2 – fairly well', '3 – well', '4 – very well', or 'the team has not yet encountered this situation.

Next participants were given the following set of questions in a table and were allowed to give answers of duration: 'your team meets face-to-face', 'your team meets using communication mediated technologies (IM, phone, or video conferencing)', 'you email other team members', 'your manager emails you about the team's task'. They were allowed to select answers on the following scale: 'never', 'once a month', 'more than once a month', 'once a week', 'more than once a week', 'once a day', or 'more than once a day'. Participants were only allowed to check one choice per question.

The final section of the survey had respondents answer several concluding questions. The first was 'how are performance appraisals carried out and what criteria are used'. They were then asked if they perceived their team was effective and were allowed to indicate either a 'yes' or 'no' answer. Participants were then given an open-ended text box and asked to explain their answer. The next question was 'what method of work do you prefer' and participants were allowed answers of 'virtually' or 'face-to-face'. Finally, participants were given an open-ended text box and asked to explain the advantages and disadvantages of working virtually based upon their professional experiences.

### 3.2 – Survey Procedures

The survey was constructed and put on the Web using Odum Institute's Qualtrics software. The software allows for the building, distribution, and collection of results for online surveys. The survey went through a pilot test with 7 people taking

the survey. These people included family members and friends employed in the technology industry as well as graduate students from the School of Information and Library Science who had experience working on virtual teams. Pilot testers returned information regarding the formatting of the survey which resulted in the re-wording a few questions for clarity and the addition of skip logic. The skip logic was added in so that if a participant chose a close-ended answer they would not be required to answer the open-ended portion. This was utilized for questions 8 and 9.<sup>2</sup>

Participants were recruited from the NC-PMI and ASIST listservs. The number of listserv members of each of these lists is unknown; because of this, it is difficult to determine sample size and therefore the results may not be generalizable. However, there were 69 survey respondents, five of whom identified themselves as 'educators' and were thus eliminated from the pool of professionals, leaving 64 surveys to analyze. Of these 64 respondents, some respondents did not answer every question; therefore, it is important to note that the survey was analyzed based on total respondents for each question.

The principle investigator contacted the NC-PMI chapter officers to ask about contacting the listserv. The head of communications for this organization returned an email saying that the organization sent out one e-newsletter per month and that the survey could be included in that. The principle investigator was informed that only 2-3 sentences were allowed along with the survey link for the newsletter; because of the Institutional Review Board (IRB) requirements, an introductory page detailing the rights of the participants was included at the beginning of the survey.<sup>3</sup> The newsletter was sent out on March 2, 2007 to the local PMI members; on March 20, 2007 the ASIST listserv was contacted as well. Respondents received the following message:

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<sup>2</sup> See Appendix B.

<sup>3</sup> See Appendix A.

### ***Virtual Project Management Study***

*Do you work from home at least 50 percent of the time?*

*Are you a virtual manager or managed by someone working virtually?*

*If so, please take 10-15 minutes to participate in an online study researching the managing styles of virtual teams.*

*The study involves identifying the major differences in participating in and managing virtual teams as compared with traditional, face-to-face teams.*

*Click on <http://ils.unc.edu/~cmcdanie/virtualmanagement.html> to start the survey.*

Once participants clicked on the link, information regarding IRB information and participant rights were detailed (Appendix A). After reading the message in its entirety, participants were then given a link to begin the survey; where they were given seventeen questions to answer about their management or participation in virtual teams.

One major issue with the distribution of the survey was that it was impossible to use follow-up emails. The NC-PMI listserv only sends out one email newsletter per month; because of this, the PI could not directly contact the listserv to remind members to take the survey. Since no reminder emails were sent to NC-PMI, the PI decided not to send reminder emails to the ASIST listserv so that procedures would remain exact for both organizations. Unfortunately, this had an obvious effect on response rate and resulted in fewer completed surveys.

### 3.3 - Survey Data Analysis

The survey answers were analyzed using both the Qualtrics software and SPSS. Qualtrics automatically creates demographic percentages with mean, mode, and standard deviation; these were used to supplement the cross tabulations in SPSS. Qualtrics was also used to generate percentages for every question. Cross-tabulations were created using SPSS and were analyzed for statistical significance using Pearson's chi square test. Chapter 4 will discuss the results of these tests.













## **4 - Results**

Sixty-four survey responses were obtained from the NC PMI and ASIST listserv members. These responses were analyzed using the Qualtrics software and SPSS. Each question in the survey was analyzed, first separately using descriptive statistics, and then certain questions were cross-tabulated with the demographic variables to provide additional information about the relationships between the variables. This chapter will outline the quantitative results, beginning with a discussion of survey participants, followed by an overview of the results of the descriptive analyses, and will conclude with a discussion of the analysis of the questions cross tabulated with the demographic variables; a discussion of the open-ended, qualitative questions will occur in chapter 5.

### **4.1 – Survey Participants**

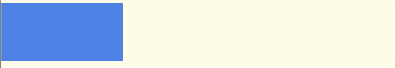
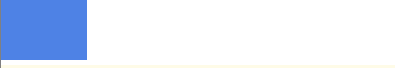

The following pages present charts that show the demographic characteristics of the respondents. The demographics used to describe participants include age, race, gender, and virtual team member type.

**Table 1: Demographics of Survey Respondents**

Age Group		Number of responses	Percentage
18-24 years		0	0%
25-34 years		14	21.88%
35-44 years		23	35.94%
45-54 years		17	26.56%
55-64 years		9	14.06%
65 years and over		1	1.56%
Race		Number of responses	Percentage
American Indian and Alaska Native		0	0%
White		51	79.69%
African American		7	10.94%
Asian		3	4.69%
Hispanic		1	1.56%
Other		2	3.13%
Gender		Number of responses	Percentage
Female		31	48.44%
Male		33	51.56%

For the purposes of this study, team member role was considered part of the demographic variables. Participants were asked to identify themselves as a team member, manager, or both member and manager. Typically with large organizations, there are teams within teams; because of this, team members may in fact manage one virtual team and be a team member in another team (thus having their own virtual manager). Table 2 represents the respondents by team member role.

**Table 2: Team Member Type of Participants**

Participants by Team Member Type			
Team Member Type		Number of responses	Percentage
Member		20	31.25%
Manager		14	21.88%
Both		30	46.88%

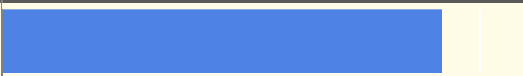
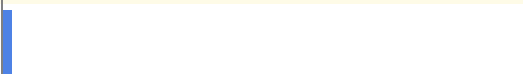

From these tables, one can see that the majority of respondents were between the ages of 35 and 44, white, male, and both a virtual team member and manager. However, from table 3 it is obvious that the ratio of males to females was nearly equal (33:31) with slightly more males.

#### 4.2 – Question by Question Analysis

In this section, the results of each question will be reported using descriptive statistics. The first few questions were general questions about the virtual teams. The tables below show these questions and the number of responses with a brief discussion of each.

The first question (Question 5) asked respondents to describe the type of organization they work for. Table 3 (below) shows respondents' answers.







**Table 3: Type of Organization**

Question 5: Which best describes the type of organization you work for?			
Answer		Response	%
Corporation		47	92.16%
Non-profit		1	1.96%
Governmental Organization		0	0%
Educational Institution		0	0%
Other - please specify:		4	5.88%
Those who reported 'other' answered with the following:			
Privately owned corporation			
IT for networking Company			
Independent Contractor working for a corporation.			
Consultant			

As can be seen in Table 3, over ninety percent of the respondents work in a corporation. Only one reported working for a non-profit organization.

The next question (Question 6) asked respondents to describe the type of industry they work in. Table 4 (below) shows the answers given by respondents.

**Table 4: Type of Industry**

Question 6: Which best describes the industry you work in?			
Answer		Response	Percentage
Advertising		0	0%
Consulting Firm		10	19.61%
Engineering		0	0%
Healthcare		4	7.84%
Research		3	5.88%
Social Services		0	0%
Teaching or Training		1	1.96%
Technology		29	56.86%
Other - please specify:		5	7.84%
Those who reported 'other' answered with the following:			
Pharmaceutical			
Biotech			
Banking			
Logistics			
Library Association			

As can be seen in Table 4, most respondents work in the technology industry, however consulting also had a significant amount of representation with nearly twenty percent of the respondents.

The next question (Question 8) asked whether the respondents' organization had provided any training for those working in a virtual team. Table 5 (below) shows the responses for Question 8.

**Table 5: Special training provided for virtual teams**

Question 8: Does your organization provide any special training for working within a virtual team?			
Answer		Response	Percentage
Yes		15	29.41%
No		36	70.59%

As Table 5 shows, most of the participants received no training for working within the virtual team. Fewer than thirty percent of respondents received training to prepare them to work virtually.

The next question (Question 9) asked if the respondents had ever managed or worked with unproductive employees. As can be seen in Table 6, below, nearly ninety-five percent of participants have either managed or worked with unproductive employees in virtual teams.

**Table 6: Managing or Working with Unproductive Employees**

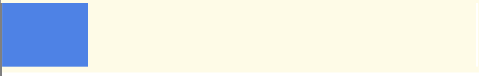
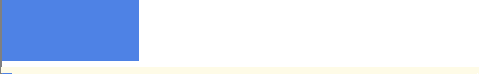

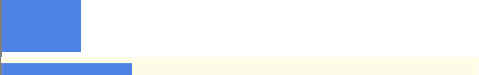


Question 9: Do you manage or have you worked with unproductive employees?			
Answer		Response	Percentage
Yes		48	94.12%
No		3	5.88%

Question 9a was asked if respondents answered yes to question 9. It asked them what communication they (or their manager) use to deal with unproductive employees. Table 7 shows that there is a mix of communication mediated technologies used when communicating with unproductive employees. The two most predominant seem to be email and phone, while the use of instant messaging and holding a face-to-face meeting is nearly equal. Interestingly enough, video

conferencing was last. Some respondents reported using all methods to deal with the unproductive employee.

**Table 7: Communication Methods Used to Deal with Unproductive Employees**



Question 9a: If so, what communication methods do you (or your manager) use to deal with these employees? Please check all that apply.

Answer		Response	Percentage
Instant Messaging		24	18.32%
Phone		38	29.01%
Video Conferencing		3	2.29%
Face-to-face meeting		22	16.79%
Email		36	27.48%
All of the above		8	6.11%

The next question (Question 9b) asked whether the methods used to communicate with unproductive employees were effective. Table 8 shows how respondents answered this question.

**Table 8: Effectiveness of Methods Used to Deal with Unproductive Employees**

Question 9b: Would you say that this method is effective?

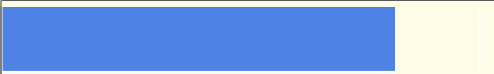

Answer		Response	Percentage
Yes		37	77.08%
No		11	22.92%

From Table 8, one can see that over seventy-five percent of respondents reported that the communication method used was productive in dealing with the

unproductive employee. Only twenty-two percent of participants indicated that it was not an effective method. Those answering that the method was not effective were given an open-ended question asking them to explain their answer. These responses will be discussed in chapter 5.

The next question (Question 10) asked whether the respondents had ever had to manage or deal with conflict between employees. Table 9 (below) shows how this question was answered.

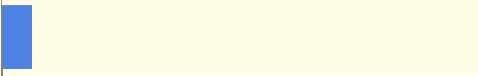

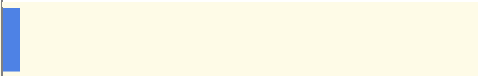


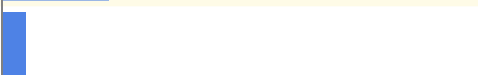
**Table 9: Conflict Between Employees**

Question 10: Have you ever managed or deal with conflict between employees?			
Answer		Response	Percentage
Yes		42	82.35%
No		9	17.65%

From Table 9, one can see that the majority of the respondents (over 82 percent) have dealt with conflict between employees.

The next question (Question 10a) asked about the communication methods used to deal with conflict on virtual teams.



**Table 10: Communication Methods used to Deal with Conflict**

Question 10a: If yes, what communication methods did you (or your manager) use to deal with these conflicts?			
Answer		Response	Percentage
Instant Messaging		5	6.25%
Phone		27	33.75%
Video Conferencing		3	3.75%
Face to face Meeting		23	28.75%
Email		18	22.5%
All of the above		4	5%

As Table 10 shows, of the respondents that indicated they have dealt with conflict between employees, most reported using the telephone to deal with the conflicts. However, face-to-face meetings and email were also used heavily.

Next the survey asked whether these methods for dealing with conflict were effective.

**Table 11: Effectiveness of Methods used to Deal with Conflict Between Employees**

Question 10b: Would you say that these are effective methods?			
Answer		Response	Percentage
Yes		31	83.78%
No		6	16.22%

As seen in Table 11, eighty-three percent of respondents indicated that the method of communication used to deal with conflict between team members was effective.

The next question (Question 11) asked how the respondents felt they (or their managers) dealt with the team being behind on deadlines.

**Table 12: Being Behind on Deadlines**

Question 11: On a scale of 1 to 4, how well do you (or your manager) deal with the team being behind on deadlines?			
Answer		Response	Percentage
1 - Not well at all		3	5.45%
2 - Fairly well		20	36.36%
3 - Well		16	29.09%
4 - Very well		13	23.64%
The team has not yet encountered this situation.		3	5.45%

Table 12 indicates that nearly all the respondents felt that their teams dealt with being behind on deadlines well. Eighty-nine percent of the respondents reported that they dealt with such an issue either fairly well, well, or very well.

Question 12 asked respondents how frequently the virtual team engaged in certain activities. As can be seen in Table 13, the frequency of activities is varied.



**Table 13: Frequency of Virtual Team Activities**

Question 12: How often does the following occur?							
Answer	Never	Once a month	More than once a month	Once a week	More than once a week	Once a day	More than once a day
Your team meets face-to-face	51% n=24	42.6% n=20	2.1% n=1	4.3% n=2	0% n=0	0% n=0	0% n=0
Your team meets using communication mediated technology (i.e., IM, phone, or video conferencing)	0% n=0	4.3% n=2	8.6% n=4	27.7% n=13	27.7% n=13	4.3% n=2	27.7% n=13
You email other team members	0% n=0	0% n=0	0% n=0	2.1% n=1	12.8% n=6	12.8% n=6	72.3% n=34
Your manager emails you about the team's task	4.3% n=2	8.6% n=4	8.6% n=3	21.3% n=10	25.5% n=12	8.6% n=4	25.5% n=12

These responses show that teams rarely, if ever, meet face-to-face. In fact, over half of the respondents reported that their team *never* meets face-to-face. However, an almost equal percentage of respondents reported meeting face-to-face with their team once per month. Most of the respondents reported using a form of communication mediated technology to communicate with other team members. Nearly ninety percent of respondents indicated that their team meets via instant messaging, telephone, or by video conference once per week or more. Furthermore, seventy-two percent of respondents indicated that they emailed other team members more than once per day. Finally, approximately eighty percent of respondents indicated that they were contacted by the team manager via email about the team's tasks once per week or more.

The next question (Question 14) probed for how the respondents felt about the effectiveness of his or her team.



**Table 14: Effectiveness of Virtual Teams**

Question 14: Would you say that your team is effective and productive?			
Answer		Response	Percentage
Yes		46	97.87%
No		1	2.13%

An overwhelming number of respondents indicated that their team is effective and productive (ninety-seven percent) as can be seen in Table 14. Respondents were asked to explain their answer in an open-ended question which will be discussed in chapter 5.

The next question (Question 16) asked respondents whether they preferred working virtually or working face-to-face.

**Table 15: Type of Work Preference**

Question 16: Which method of work do you prefer?			
Answer		Response	Percentage
Virtual		25	53.19%
Face-to-face		22	46.81%

Interestingly enough, responses to this question are nearly equally divided. Fifty-three percent of respondents prefer working virtually and 46 percent prefer working face-to-face. This is notable because all of the respondents worked virtually at least fifty percent of the time; it is interesting to ponder whether or not more respondents would prefer working face-to-face if members of both traditional and virtual teams had taken the survey.

### 4.3 – Further Analyses

Every question in the survey was cross-tabulated by age, gender, and team member role in order to test for trends based on demographics. Race was not used as a comparison demographic because most of the survey respondents were predominately white, thus making any statistical analyses unreliable.<sup>4</sup> Because most of the data collected were nominal, the results of the survey questions were analyzed with Pearson's chi square. This section will discuss the trends found for each question as they relate to the demographics, including those found to have statistical significance.

#### *4.3.1 – Analysis by Age*

Question 7 asked respondents to identify their virtual team role either as a member, manager, or both. This question was analyzed with age to determine whether or not there was a significant age difference among team members and managers; for statistical purposes, those identifying themselves as 'both' were analyzed as virtual team managers. Also, given that respondents gave their age in ranges (see Appendix B – section 8.2), the age categories were collapsed for analysis. Those reporting their age range as between 25 and 44 were collapsed into one group and those 45 and over were collapsed into another group.

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<sup>4</sup> See section 4.1 for a full breakdown of survey respondents by race.

**Table 16: Team Member Role by Age**

Answers to question 7: Identify your role in the virtual team		
Age Group	Member	Manager
25-44	70% n=14	30% n=6
45 and over	52% n=23	48% n=21

$$\chi^2 = 1.77 \text{ DF} = 1 \text{ p} \leq 0.20$$

Table 16 indicates that those in the younger age group (25-44) were more likely to be placed in the team member role than the team manager role than those in the older age group (45 and over). Merely thirty percent of respondents in the 25 to 44 age category identified themselves as a virtual team manager. Conversely, forty-eight percent of respondents in the 45 and over age group identified themselves as a manager. There were far fewer managers than members in the younger age group. Comparatively, respondents 45 and over were nearly just as likely to identify themselves as a team member as manager.

Question 12 asked respondents to identify how often they use certain communication mechanisms with their virtual team: face-to-face meetings, instant messaging, video conferencing, and email. It seems to be generally thought that younger employees are monitored more closely than their older colleagues. With this in mind, question 12 was analyzed with age in search of trends that would indicate how frequently younger workers in virtual teams are monitored. Given that question 12 asked respondents to rate several communication activities based upon frequency, each individual portion of question 12 was individually analyzed. Furthermore, given the large range of potential answers and categories to this question, the data was collapsed as follows: those aged 25-44 were analyzed as one group; those aged 45 and over were analyzed together; the time periods were also

broken up into two categories (never and sometimes as well as once a week or less and more than once a week, depending upon the question). Several components of this question showed statistical significance when analyzed with age. The tables below show how the components of question 12 were answered by the age groups; these results will be presented in order of the question asked.<sup>5</sup>

The first portion of Question 12 to be analyzed with age asked respondents how often their virtual team meets face-to-face.

**Table 17: Occurrence of Face-to-Face Meetings in Virtual Teams**

Answers to question 12: How often does your team meet face-to-face		
Age Group	Never	Sometimes
25-44	34% <sup>6</sup> n=11	65.6% n=21
45 and over	73.9% n=17	26% n=6

$X^2 = 8.37$  DF = 1  $p \leq 0.01$

Table 17 indicates that younger team members (those in the 25-44 age group) are likely to meet more often than their older counterparts (those in the 45 and over age group). Nearly seventy-four percent of respondents in the older age category report that they never meet face-to-face with their virtual team. Conversely, over sixty-five percent of respondents in the younger age group report their virtual team meets face-to-face sometimes, as compared with only twenty-six percent of the older age group. When analyzed with Pearson's chi square, statistical significance was found with this data ( $p = 0.01$ ); therefore, one may conclude that those in the younger age category meet face-to-face more often than those in the older age category.

<sup>5</sup> Note that there were no respondents in the 18-24 age group

<sup>6</sup> Note that these percentages were calculated based on the total number of respondents by AGE group; not the total number of respondents taking the survey.

The next portion of Question 12 asked respondents how often they meet using communication mediated technologies (instant messaging, phone, or video conference). Table 18 shows the number of respondents for this question by age category.

**Table 18: Occurrences of Communication Mediated Technology Meetings in Virtual Teams**

Answers to question 12: How often does your team meet using communication mediated technologies		
Age Group	Once a week or less	More than once a week
25-44	28% n=9	71% n=23
45 and over	56.5% n=13	39% n=9

$X^2 = 5.17$  DF = 1  $p \leq 0.025$

Table 18 indicates that those in the younger age categories meet using communication mediated technologies more frequently than those in the older age categories. Seventy-one percent of the 25 to 44 years old respondents reported that they meet using communication mediated technologies more than once per week while only thirty-nine percent of those in the older age categories met this frequently. When analyzed with Pearson's chi square this question was found to be statistically significant ( $p = 0.025$ ). Therefore, from this data we can conclude that younger colleagues meet with their virtual teams more often than older team members.

The next portion of Question 12 asked respondents how often they emailed other team members. Table 19 (below) indicates the responses.

**Table 19: Frequency Virtual Team Members Email Each Other By Age**

Answers to question 12: How often do you email other team members		
Age Group	Once a week or less	More than once a week
25-44	3.1% n=1	96.8% n=31
45 and over	0.0% n=0	100% n=23

$$X^2 = 0.73 \text{ DF} = 1 \text{ p} \leq 1$$

Table 19 indicates that both younger and older respondents email their virtual team members quite frequently. Nearly ninety-seven percent of those aged 25 to 44 report emailing their team members more than once per week while one hundred percent of those 45 and over report emailing their team members this frequently. Not surprisingly, no statistical significance was found when analyzing this question.

Finally, the last portion of Question 12 asked respondents how often their managers emailed them about the team's tasks.

**Table 20: Frequency Emails are Received from the Manager by Age Groups**

Answers to question 12: How often does your manager email you about the team's task		
Age Group	Once a week or less	More than once a week
25-44	31.2% n=10	68.7% n=22
45 and over	52% n=12	47.8% n=11

$$X^2 = 2.44 \text{ DF} = 1 \text{ p} \leq 0.20$$

Table 20 shows that respondents in the younger age category are emailed by managers more often than those 45 and over. Nearly sixty-nine percent of respondents aged 25 to 44 report that they are emailed more than once per week by their manager. Conversely, approximately forty-eight percent of those 45 and over

are emailed more than once per week by their manager. Pearson's chi square test was conducted on this question ( $p = 0.20$ ); while no statistical significance was found, the percentages seem to suggest that younger respondents are emailed more frequently by their managers.

Question 16 asked respondents if they preferred working virtually or working face-to-face. It seems to be generally thought that younger workers would prefer working virtually when compared with older workers. Table 21 shows how respondents answered this question when broken down into age categories.

**Table 21: Preference of Work by Age**

Answers to question 16: Which method of work do you prefer		
Age Group	Virtual Work	Face-to-Face Work
25-44	59% n=19	41% n=13
45 and over	62% n=18	38% n=11

$$X^2 = 0.04 \text{ DF} = 1 \text{ } p \leq 1$$

Table 21 indicates that there is not a difference in work preference between younger and older workers working in virtual teams. Both age categories predominately preferred virtual work to face-to-face work.

#### 4.3.2 - Analysis by Gender

When analyzing the survey with gender, questions 7, 12, and 16 seemed to have interesting results. Question 7 asked respondents to identify themselves in a virtual team role; respondents identified themselves as either a virtual team member, manager, or as both. For statistical purposes, those answering 'both' were considered managers.

**Table 22: Team Member Role by Gender**

Answers to question 7: Identify your virtual team role		
Gender	Member	Manager
Female	29% n=9	71% n=22
Male	31% n=10	69% n=22

$$X^2 = 0.138 \text{ DF} = 1 \text{ } p \leq 1$$

Table 22 shows that nearly an equal percentage of males and females act as virtual team managers. Seventy-one percent of female survey respondents identified themselves as a virtual team manager. Comparatively, sixty-nine percent of male survey respondents identified themselves as a manager. While this question was not found to be statistically significant ( $p \leq 1$ ), it is interesting to note that there were an equal number of both male and female virtual team managers among survey respondents ( $n=22$ ).

Question 12 seemed to indicate certain trends associated with gender. One portion of Question 12 asked respondents how often they met using communication mediated technologies.

**Table 23: Frequency Teams Meet using Communication Mediated Technologies by Gender**

Answers to question 12: How often does your team meet using communication mediated technologies		
Gender	Once a week or less	More than once a week
Females	50% n=14	50% n=14
Males	33.3% n=9	66.6% n=18

$$X^2 = 1.57 \text{ DF} = 1 \text{ } p \leq 1$$

The data presented in Table 23 seem to indicate that males meet using communication mediated technologies more often than females. Fifty percent of females met more than once per week using communication mediated technologies. On the other hand, nearly sixty-seven percent of males met this often.

Question 16 asked respondents for their type of work preference: virtual or face-to-face. This question was analyzed with gender; Table 24 shows how respondents answered this question when broken down by gender.

**Table 24: Preference of Work by Gender**

Answers to question 16: Which method of work do you prefer		
Gender	Virtual	Face-to-Face
Female	64.3% n=18	35.7% n=10
Male	42.3% n=11	57.7% n=15

$$X^2 = 2.62 \text{ DF} = 1 \text{ p} \leq 0.20$$

Table 24 indicates that there seems to be a trend with females preferring virtual work over males. Nearly sixty-five percent of female respondents reported preferring virtual work to face-to-face work. However, less than forty-three percent of male respondents reported a preference for virtual work to face-to-face work.

#### 4.3.3 – Analysis by Role

When cross tabulating every question in the survey with team member role, questions 9 and 10 were found statistically significant when tested with Pearson's chi square test. This section will discuss the results. Respondents were allowed to identify themselves in a team member role as team member, manager, and both; given that those identifying themselves as both are both members and managers, for the purposes of this analysis they were combined into the 'manager' category and cross-tabulated accordingly.

Question 9 asked respondents if they had managed or dealt with unproductive employees; it showed statistical significance when analyzed by team member role ( $p = 0.001$ ). Table 25 shows the cross-tabulations between role and unproductive employees.

**Table 25: Dealing with Unproductive Employees by Team Member Role**

Answers to question 9: Do you manage or have you dealt with unproductive employees as answered by team member role		
Answer	Member	Manager
Yes	14	43
No	6	1

$$X^2 = 10.85 \text{ DF} = 1 \text{ } p \leq 0.001$$

Not surprisingly, team members reported having dealt with unproductive employees (6/20 respondents) less frequently than the managers.<sup>7</sup> The managers had experienced dealing with unproductive employees almost uniformly; 43 out of 44 self-identified virtual team members reported that they had dealt with unproductive employees on their virtual team.

Finally, question 10 was also found to be statistically significant when analyzed with team member role ( $p = 0.001$ ). Question 10 asked respondents if they had dealt with conflict between employees. The table below shows respondent's answers to this question as separated by team member role.

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<sup>7</sup> Note that 1 respondent who identified themselves as both a team member and manager answered that they had not dealt with conflict between team members.

**Table 26: Dealing with Conflict Between Employees by Team Member Role**

Answers to question 10: Have you managed or dealt with conflict between employees, as analyzed by team member role		
Answer	Member	Manager
Yes	10	41
No	9	2

$$X^2 = 16.48 \text{ DF} = 1 \text{ p} \leq 0.001$$

Nine out of nineteen team members reported never having dealt with conflict between employees in their roles on virtual teams. Nearly all of those identifying themselves as team managers reported having dealt with conflict between employees (41/43 respondents).

#### 4.4 – Results Summary

The results have this study have been presented in this chapter. The findings that are most notable include the fact that most virtual team members do not get any special training for their work in virtual teams; respondents were just as likely to report preferring to work in a face-to-face environment as in a virtual environment – and these respondents work from home at least 50 percent of the time. Also, from the cross tabulations it is easy to conclude that those in the lower age ranges (25 to 44) were more likely to attend face-to-face meetings and were more frequently emailed by their managers than those in the upper age ranges (45 and over). The next chapter will discuss the meanings of these results as well as analyze the qualitative data gathered from the survey’s open-ended questions.

## 5 - Discussion of Results

In addition to the descriptive statistics in chapter 4, there are also several open-ended questions from the survey that must be analyzed and discussed. Trends from the survey, including general descriptive trends based on questions as well as statistical significances found from the cross tabulations, and the analysis of qualitative data will be discussed in this chapter.

### 5.1 - Trends from the Survey

Nearly every respondent had either managed or worked with unproductive employees in a virtual environment. Most of those participants dealt with the situation in a virtual manner – that is not with a video conference (which is virtual, but simulates the face-to-face environment), nor with a face-to-face meeting. About two-thirds of respondents felt that the method used was effective. According to the literature, when dealing with conflict, virtual team managers should either have a face-to-face meeting or simulate the face-to-face environment.

Another question asked participants if they had dealt with conflict between employees. Nearly all of the respondents answered 'yes'; the communication method used for this was, in order of frequency: the telephone, a face-to-face meeting, or email. It is interesting to note that face-to-face meetings were not a common communication method to use when an employee was unproductive. However, when dealing with a problem between two people, participants were more likely to use a communication method that all could use simultaneously. It was a bit

surprising that email was more popular than instant messaging; both provide similar contexts with text-only communication, but instant messaging is more interactive. Nearly all of the respondents reported that the communication method used was effective.

Question 11 asked participants how their manager dealt with being behind on deadlines when working in a virtual environment. Most respondents reported either 'fairly well', 'well', or 'very well'. Very few people reported that they did not deal well with being past deadlines in the virtual environment. One reason for this is that virtual teams may tend to be a bit more structured than face-to-face teams simply because team managers feel the need for structure because of the lack of physicality.

Nearly half of the respondents reported that they never meet face-to-face. Others reported that they meet face-to-face once a month. This seems to be the typical behavior of virtual teams; it is actually surprising that nearly half of respondents meet face-to-face at all. The respondents reported frequent use of communication mediated technologies for meetings; many even reported using a communication mediated technology to meet with co-workers more than once per day. Nearly every respondent reported emailing team members more than once per day. For the virtual team, instant messaging, email, the telephone, and video conferencing have completely replaced the face-to-face meeting.

Nearly every respondent reported that their team was effective and productive. This indicates that the virtual team is successful and that organizations implementing the use of virtual teams can expect the same levels of success and productivity as with a face-to-face team.

Finally, respondents were slightly more likely to say that they preferred working virtually to working in a face-to-face environment. However, there was not much variation in the responses. Most managers would agree that working virtually

is not for everyone and requires a certain work ethic; virtual workers must be willing to structure their work day in a (potentially) unstructured environment. One's preference of work environment is most likely situational.

#### 5.1.1 - Discussion of Relevant Cross-Tabulations

Age ranges provided several interesting statistical differences. The table below outlines all of the statistical differences found that relate to age.

**Table 27: Summary of statistically significant differences when analyzed with age**

<b>Statistically significant differences found when analyzed by age</b>
People ages 25 to 44 meet with their virtual teams face-to-face more frequently than those 45 and over.
People ages 25 to 44 sent more emails to their virtual team co-workers than did their older counterparts.
Respondents ages 25 to 44 received more emails from their managers than those aged 45 and over.
People aged 25 to 44 met using communication mediated technologies more frequently than did respondents 45 and over.
Those in the 35 to 44 age category reporting meeting face-to-face more frequently than those in the 55 to 64 age category.

From these statements we can draw the conclusion that people in the lower age groups (25-44) seem to be more closely monitored in virtual teams by managers than those in the upper age group (45 and over). Those in the 25 to 44 age category were more likely to be emailed frequently by their team manager than those above age 45. Also, those in the 25 to 44 age groups meet face-to-face with their virtual teams more frequently than those 45 and over. These two results seem to signify that managers more closely monitor younger virtual team managers via constant email monitoring and more frequent face-to-face meetings.

Also, those in the lower age ranges (25 to 44) were more likely to email other team members more frequently than those in the higher age ranges (45 and over). Perhaps those in the younger age group are more used to email and therefore feel more comfortable using it frequently than their older counterparts. Or, perhaps those in the older age group are more likely to want to work independently. Given that they are emailed less by their managers, perhaps those in the older age categories are seen as most productive when working alone.

Finally, people under 35 and over 55 were much less likely to have dealt with conflicts in virtual teams; perhaps this is because those under 35 are less likely to have management positions than their more experienced colleagues. Those between 35 and 54 are more likely to be in middle management type of positions, and thus managing people. Those over 55 most likely have moved on from managing people to some other type of position in their virtual team.

When analyzing cross tabulations with gender, it was found that males were likely to meet more frequently with their team using a communication mediated technology than their female colleagues. Perhaps this can be compared to the face-to-face version of this predicament: the "old boys" network. Research has shown that even though women are gaining ground in the technology workplace, they still do not get the networking opportunities that men get. This occurs because men have lunch together at work and oftentimes engage in activities together outside of work, resulting in closer at-work ties (McDaniel, 2005a; McDaniel, 2005b). Perhaps given that this research shows that women do not meet with their team members via communication mediated technologies as often as men, one can conclude that while the old boys' network has not changed in principle, the mediums that re-enforce it have changed.

When analyzing cross tabulations with virtual team member role, it was found that virtual team members were less likely to have dealt with unproductive

employees and conflict between employees than virtual team managers or those identifying themselves as both a virtual team member and manager. This is not surprising given that oftentimes it is the virtual team manager that must deal with these types of problems.

## 5.2 - Qualitative Results

To supplement that survey questions, five open-ended questions were presented on the survey; the answers to these questions will be discussed at length here. These questions were designed to get respondents' opinions on the advantages and disadvantages of working virtually. Each question was analyzed separately and similar responses were categorized together. The results will be discussed on a question by question basis.

Question 9c asked respondents if the method of communication used to handle unproductive employees was effective. The answers to this question can be grouped into two main categories: those who felt that face-to-face was an effective way to deal with unproductive employees, hence virtual communication methods were ineffective in this situation; and those, who felt the effectiveness of the technology for dealing with an unproductive employee was dependent upon the particular employee. The majority of respondents felt that the effectiveness of the technology depended upon the person using it and the particular situation the team members were in at the time. However, those who felt that virtual methods were not appropriate methods for dealing with unproductive employees were quite passionate in their answers.

*"There is nothing as effective as a face to face meeting in my opinion."*

Several respondents felt that virtual methods were not appropriate measures for dealing with unproductive employees, regardless of the circumstances. One respondent reported (as shown above) that face-to-face meetings are always better communication methods than virtual ones. Another respondent felt that virtual communication methods were not effective because “the vast majority of communication exchanges are missing that seventy percent – body language and tonal inflection”. The main difference between virtual and traditional work is just this – that one must use technologies that replace these two aspects of communication; many feel that without body language and tone of voice, one cannot judge the mental state of one’s team member.

*“These methods can be effective but it depends upon the person being managed.”*

Many respondents felt that the effectiveness of virtual workers was dependent upon their general work ethic. The overall feeling of the respondents with responses was that it was not the fault of the technologies; rather, it was that the employees were simply difficult employees. Respondents felt that regardless of the type of team, difficult workers are simply hard to deal with. In fact, one respondent reported that “the key to working virtually is maturity and focus. As an individual you must be mature enough to manage work time and focus without distraction.” This point was made frequently – it takes a certain type of worker to be able to handle virtual work. This type of person must be self-motivated and not easily distracted. It is interesting that many respondents placed blame upon the team member, not the technology; typically, technology is an easy scapegoat. However, if there are unproductive workers working in a virtual environment, the fact that they are unproductive may be easier to mask than if they were working in a shared physical environment.

There were a vast range of answers to this question. However, either respondents felt that body language and tone of voice were so integral in dealing with an unproductive employee that virtual methods of communication were simply not appropriate; others, felt that it was the team member, and not the technology used that lead to unproductiveness.

Question 10b asked respondents which methods of communication mediated technologies were or were not effective in dealing with conflict between employees. Nearly every respondent reported that face-to-face communication was the most effective method in dealing with conflict between employees. Most also reported the telephone is a second effective method for dealing with conflict. Very few respondents reported communication mediated technologies as helpful in this situation; out of all of the respondents four reported email as effective and two reported instant messaging as effective. Those who reported ineffective methods of communication reported mostly instant messaging and email. While most of the respondents seemed to feel that virtual teams could work in an effective, productive manner, the majority of respondents did not want to use a virtual communication tool to mediate conflicts. This particular scenario is most likely when body language and tone of voice become crucial to resolving the conflict.

Question 10c asked respondents why certain methods were ineffective in dealing with conflicts between employees. Respondents were asked why certain communication methods were ineffective in dealing with conflicts between employees. Participant responses to this question did not vary as much as with other questions. The responses to this question can be placed into three general categories: virtual methods of communication are simply ineffective; email is not the proper outlet for dealing with ineffective employees; and, conversely, people do not

express true sentiments in a face to face environment and are more likely to do so over email.

Some respondents felt that virtual working is simply ineffective when dealing with conflict between employees. One respondent stated that "Again I fall back [on] face-to-face [methods] and direct communication. Artificial communication leaves a lot to be desired and is avoided unless there are no other options." Many participants responded with statements similar to this one, and did not specify which type of virtual communication was ineffective; they simply felt that virtual communication as a whole was not the appropriate method to deal with conflicts.

The other general feeling was that email is a terrible, yet commonly used, outlet to deal with conflict between employees. In fact, this was the most common statement; the general consensus was that email leaves too much room for interpretation and should not be used to deal with conflict; most felt that using email to deal with conflict simply caused more conflict. Two answers summed up the overall feeling of participants; the first stated that "You must be very careful when writing emails. Statements can easily be taken out of context." The other stated that "Email ... [is] not as effective since you cannot see the nonverbal reactions to statements." From the responses, one may conclude that email is simply an inappropriate context for dealing with conflict; conflict between employees is often a very delicate situation and using email to attempt to resolve the conflict often causes *more* conflicts. The general problem with email is that it is a text-only communication method; with text-only methods, one cannot put any value-based interpretations into text-only communication methods. There is no tone of voice to judge, no body language to read, and because of that team members often become overly defensive when conflict arises. As one respondent put it, "The personal touch of a face-to-face meeting, in which all parties can see the nuances of facial

expression and body language, make a difference in resolving differences and coaching employees.”

Finally, there were two responses that were very different from the rest. These two respondents felt that face-to-face meetings caused team members to not open up enough because they were too worried about the response of the other team members. These two responded with: “People do not open up enough face-to-face” and “face-to-face meetings did not permit full and frank discussion of all the issues involved.” These two respondents felt that, in the face-to-face environment, employees did not state their true feelings and that, in the virtual environment, employees were more likely to state how they truly felt. While this was not the dominant sentiment, it was interesting to note that some feel completely different about dealing with conflict than the majority of the sample.

The problem with using email to resolve conflict is that it often causes miscommunications. When trying to deal with conflicts in a teaming environment, there is no room for miscommunication. At the same time, some team members may not open up enough in a face-to-face environment to say how they truly feel, thus the conflict never really gets resolved. Perhaps the most appropriate way to deal with conflict would be with either an audio-only or audio-visual communication method because it is not as intimidating as the face-to-face environment, yet does not include the ambiguity of email.

Question 13 asked respondents how performance appraisals were carried out in virtual teams and what criteria were used to perform them. Performance appraisals seem to be either conducted via phone or in a face-to-face environment. The majority of respondents said that they were emailed forms to fill out and send back to their managers which were then discussed one-on-one (manager and team member) over the phone. The standard way to carry out performance appraisals seems to involve employees filling out an objectives/goals form at the beginning of

every quarter, and then having their manager give a performance review of those goals and objectives at the end of every quarter.

About half of respondents, however, reported that performance appraisals are carried out in a face-to-face environment. These appraisals were typically done yearly, instead of quarterly, simply because of the difficulty in arranging face-to-face meetings. Most of the time, employees were emailed papers to fill out and send to the team manager before the review, and then the employee had to arrange an in-person meeting with the manager.

Performance appraisals are situational; if the team feels the need to evaluate employees often, they should most likely be done over the phone, but never over email or instant messaging, as this leaves too much room open for miscommunication. However, if there is no need to carry out performance appraisals often, the trend seems to be to hold a face-to-face meeting yearly.

Question 15 asked respondents to explain why or why not their team is effective and productive. Most team members and managers agreed that completing projects on time and having a good relationship with the client or customer provided for an effective and productive team. In analyzing and grouping the responses to this particular question, several themes arose: the importance of selecting virtual team members, communication – for better or worse, the key to managing virtual teams, mixing communication technologies, and comparisons with face-to-face teams.

Several participants felt that the selection of virtual team members is one of the key components of developing an effective, productive virtual team. One mentioned that: "Of course, selection of people able to work in this environment is important. Over the years, we have reduced staff by forty percent so almost all low performers have been eliminated." Most agree that some people just are not cut out to be virtual workers. Respondents indicated several qualities needed for the virtual

worker: a professional attitude, a mature employee, an effective communicator, as well as someone who is organized and efficient at multi-tasking.

The issue for workers is that the environment is not necessarily structured unless the worker makes it that way. According to respondents, an effective virtual worker sets up structure and utilizes the flexibility of the virtual work environment to accomplish more tasks.

Another theme in defining the 'effective and productive' virtual team was communication. Nearly every respondent mentioned that their team was successful because he or she spent a significant amount of time working out the communication setbacks until methods of communicating were developed that were 'crystal clear', as one respondent put it. One replied that "we all communicate constantly" and went on to say that they spoke daily over the phone, via email or instant messaging. The experienced, successful virtual team is one that is seasoned in communication skills, as was nearly unanimously mentioned by the survey respondents.

One respondent spent quite a bit of time explaining how to effectively manage the virtual team; the response embraced much of what the other manager responses. Managers reported that working out the details and finding structured methods for employees to stay abreast of deadlines and the completion of milestones was essentially in successfully managing in a virtual environment. The participant wrote that: "weekly detailed written statuses and meetings are a must. These things makes it easier for me to tell when things getting ahead/behind schedule." This way, not only is the manager aware of when team members hit a wall, or start becoming unproductive, but the entire team is knowledgeable of the situation. This way, if a team member has simply run into a problem or issue, the other team members or the manager may be able to help them through it. Likewise, if the employee has suddenly become unproductive, the manager becomes immediately aware of the situation and can step in and deal with it quickly.

Another commonality between respondents was dealing with the choice of communication mediated technologies. This issue came up several times both in the responses to the survey and in the literature. The choice of which technology to use for different situations is vital in keeping communication efficient. One respondent stated that: "An excellent mix of phone, email, IM [Instant Messaging] and face-to-face meetings are utilized to deliver projects to clients on time and within budget." Knowing which method of communication to use for which situation is crucial; for instance, face-to-face meetings or the phone are appropriate to mediate conflicts while email or instant messaging may will suffice to delegate tasks to team members.

Finally, several respondents indicated that if they had to meet on a face-to-face basis, the team would never be effective and productive and would get behind on deadlines. One may conclude from this that many virtual teams may, in fact, be even more productive than face-to-face teams. Even though the development of personal relationships is a part of being a successful team, in a virtual environment, one does not have to constantly build those relationships on a day-to-day basis. Because employees spend virtual work time on work, and not socializing, they are more productive.

This particular question brought up many issues with virtual teams; knowing what makes a successful, productive team in the virtual environment is critical. From all of the data collected, one may conclude that because people enjoy the perks of working from home – having a flexible schedule, spending more time with family and having no commute – enough that they work hard at developing clear, concise communication skills and are more productive.

Question 17 asked respondents: in your experience, what are the advantages and disadvantages of working virtually. As can be expected, there was an incredible amount of variation by participants in response to this question. However, after

sorting through the answers, the advantages seem to all fall under the heading of 'flexibility' while the disadvantages fall under the category of 'communication problems'. The major points of each side, both the advantages and disadvantages, will be discussed at length here.

The majority of the advantages presented in question 17, revolved around the issue of flexibility. Most employees felt that their work schedules were simply more flexible in the virtual environment and thus they were better able to accommodate their personal work/life needs. Advantages that were repeated several times appear in the table below.

**Table 28: Advantages of Virtual Work**

<b>Advantages</b>	
Fewer interruptions/distractions	Better work/life balance
Greater productivity	Easier to stay on task
Teams are more robust (can seek out desired skill sets)	With communication mediated technologies, employees have more time to think about responses
All communication is documented so it is easy to trace the root of a conflict	Team creation and disbanding is faster and cheaper than with face-to-face teams
Can set one's own pace and work hours	Design an office space to your liking
Forces documentation and communication to be concise	Cuts down travel and re-location costs
Saves the employee money on gas and time from the lack of a commute	Greater flexibility in attire/appearance

Virtual workers generally seem to greatly enjoy the flexibility that virtual working provides. Those who work from home are particularly happy with their work environment and relish the fact that they can adjust their work life to work with their personal life without the limitations of space and time. However, there were also several disadvantages were mentioned with working virtually.

Several respondents named disadvantages to virtual working; of these participants, all of the points made seemed to revolve around communication problems. The table below outlines the most commonly mentioned disadvantages to working virtually.

**Table 29: Disadvantages of Virtual Work**

<b>Disadvantages</b>	
Distraction by family and friends	Difficult to reach and communicate with people
Unable to easily develop a good work relationship	Time differences in global teams cause communication issues
No mood or tone to team members' communication	Requires more time and effort solving communication issues
Electronic communication is easily misinterpreted	Loss of camaraderie and the sense of "working together towards a common goal"
No one around to brainstorm with	Cannot see facial expressions
You have to force yourself to "turn work off"	No sense of community in virtual teams
You cannot form networks	Relationships are hard to create
It is difficult to build trust with clients	

It is interesting to note that while several respondents entered the fact that there are no distractions from co-workers as an advantage, they felt that they were now distracted by family and friends in the virtual working environment. The main difficulty, however, with virtual teams is communication. Team members in virtual teams must focus on how they communicate with teammates so as to keep communication lines open and effective. Dealing with the fact that there is no body language or tone of voice causes room for misinterpretations; this is something that can be detrimental to any team if not dealt with properly. To that end, one respondent stated that he (or she) was "more likely to respond to someone you've met than to someone who has no face." This statement sums up the communication issues with virtual teams quite well.

Two of the disadvantages noted are key components of virtual teams: having a sense of "working towards a common goal" and gaining trust with teammates and clients. In the virtual environment, these things must be fostered in order to be a successful virtual team. However, when a team becomes self-aware of the disadvantages of working virtually, they may be better equipped to resolve these issues.

### 5.3 - IBM: I've Been Moved has become I'm By Myself – Conclusions

One of the respondents stated saving on re-location costs as an advantage to virtual teams. The respondent went on to say that because the company does not have to relocate workers for specific projects, they can develop more robust teams at a lower cost. The participant stated that the running joke was that IBM (their place of employment) once stood for 'I've Been Moved' because everyone was so frequently re-located; but with the growing popularity of virtual teams, they now joke that IBM stands for 'I'm By Myself'. While virtual workers may have the chance to enjoy working in the comfort of their home, they are now faced with a lonely workspace. The majority of virtual workers who took the survey enjoyed working from home and felt prepared for it; however, they also felt that certain types of people are not successful at virtual working simply because they lack discipline. Most survey respondents stated that they had developed strict routines in order to maintain structure and they felt that effective communication skills were necessary for every member of the virtual team. As more companies move towards the virtual workplace in order to adjust to global business demand and to save on workspace cost, we must continue to monitor the difficulties that virtual workers face, bearing in mind the components of an effective team: working towards a shared goal, maturity, and open communication.

## 6 - Conclusion

One of the respondents said of virtual teaming: "I believe if we were more used to working virtually ... [things] could be handled as well as working face-to-face." It is becoming obvious that virtual work is not the way of working in the future; it is how we work *now*. It will only continue to grow and become more common as technology progressively becomes smaller and faster so we can truly be constantly connected, for better or worse. Because of this, the study of virtual teams is becoming increasingly important. Based on the results of this study, several tips for virtual managers have been developed; along with these, this chapter will present future trends and a general discussion of the importance of research on virtual teams.

### 6.1 - Tips for Virtual Team Managers

The main conclusion that can be drawn from this research study is that virtual teams have one potentially fatal flaw: communication barriers. Most survey respondents felt that they spent too much of their time focused on communication in attempts to both give and receive effective communication with virtual teammates. In general, survey respondents felt that it was not the communication mediated technology that caused communication issues between team members; rather, it was the lack of body language and tone of voice that caused difficulties and misunderstandings. Given that this was the main disadvantage when working with virtual teams, several tips have been created for virtual team managers to use in

order to develop easy, effective communication channels between virtual team members.

As a virtual team manager, how does one deal with these communication barriers? Based on the research presented here, most would agree that the answer lies within creating direct communication channels and setting the tone for the team at the onset of the project. In order to prevent communication difficulties when working virtually, there are several steps that the team manager can take that will help increase team effectiveness.

First, all teams should meet face-to-face at least once, in order to develop social bonds with one another. It is important to attempt to introduce everyone to the project's goal(s) and assign tasks in person. This helps alleviate potential confusion as to what person is assigned to which role and to make sure everyone has a clear concept of what the overall goal is. If it is not possible to meet in person, then the manager should arrange a conference (preferably video, if not then phone) for the team to get to know each other and to learn each other's roles. These people are on your team for a reason – tell them that and encourage them to get to know each other as both team members and individuals.

However, if the manager can hold a FTF meeting with the team, research shows that this would most likely do a better job of establishing relationships quickly between team members (Zaccaro & Bader, 2003). Zaccaro & Bader (2003) report that it is difficult for virtual team members to build high-levels of trust and identification with the team because these emotional states are typically developed in person; virtual teams do not, by definition, provide this environment.

Having a FTF meeting that promotes social activities before the team begins work is a great way to establish personal relationships among team members. These activities promote team cohesion and builds trust, thus helping the team become more productive in the long run. By getting to know each other on a personal basis,

the team members will trust each other more and thus perform more productively as a team (Benoit & Kelsey, 2003). With trust and cohesion developed from FTF meetings, virtual teams will perform more efficiently and be equipped with behavioral knowledge about other team members in order to better judge emotional responses.

After attempting to develop social bonds as a team at the onset of the project, the team manager must then attempt to quickly build trust among team members once they are back in the virtual world. One way to do this is to have small deliverables due near the beginning of the team's tenure. This will let the other team members know how their peers work; if every team member gets their portion of the task completed on time, trust will be built among the team members. Benoit and Kelsey's study (2003) concluded that trust is built through learning that other team members are dependable. To prove dependability, the team manager can set short, easy tasks to help develop trust among the team.

A third suggestion for virtual team managers is to not be afraid to redefine roles and reassign tasks within the team in order to ensure better outcomes for the project as a whole. People have different personalities and therefore work in different ways; and a virtual manager may not have the insights into team members' personalities the way a FTF manager does, simply because of decreased interaction; this may result in a need to change the organizational structure within the team. In a study by Majchrzak and colleagues (2000) the team managers had to re-structure the organization of their work because of team member differences, which in the end turned out to be beneficial to the team members and the outcome of their work.

Examples of how to change the organizational structure include shifting employees around from their original assignments; re-designing the frequency and duration that meetings are held; or changing the communication mediated technology through which your team typically communicates. For instance, if there

seems to be a lot of misunderstanding after your team's weekly group instant messaging meeting, you could change the technological medium to a video conference in order to reduce conflict. Regardless of the issue, do not be afraid to make changes even after the team has started working together if it means that communication channels might be made clearer.

A fourth suggestion for virtual team managers deals with conflicts. Even though there will always be conflicts when people work together, it is the manager's job to ensure they do not become personal conflicts (Zaccaro & Bader, 2003). Professionals may dispute over aspects of the project or what type of technology to use – that is typical of teams. However, when disputes become petty and people simply are not communicating because of personal disagreements, the team manager should step in and alleviate the problem. The best way to alleviate personal conflicts is to arrange a meeting with all parties involved. Regardless of the communication medium used, the manager must focus on open, direct communication between conflicted team members. The quicker the conflict is resolved, the faster the team becomes productive again.

Based on other trends in this study, it may be concluded that it is most important for managers to monitor employee productivity. Those inexperienced with virtual team work may need to be closely monitored by the team manager as they transition into a different type of work. The most important thing, however, that the manager or organization can do to ensure effective virtual teams is to provide training. Over seventy percent of survey respondents reported that they received no training for working virtually; at the same time, the biggest complaint with virtual teams was communication issues. Virtual team training should focus on developing concise communication from employees via communication mediated technologies. It should teach virtual employees to try not to infer emotional state from text-only communication methods – this causes huge misunderstandings. The important thing

to remember is that email and instant messaging are *not* personalized communication channels; therefore, what is shared via email and instant messaging should *never* be taken personally.

## 6.2 – Future Trends

As workers become increasingly experienced with virtual work, the communication boundaries we face today will no longer be an issue. We can expect the boundary-less office to become the norm; because of this, we must adapt our communication and managerial styles to work in this new environment. The research presented here shows that most virtual workers are well aware of the advantages and disadvantages of virtual work; this self-awareness will guide them in becoming more effective virtual workers.

Ideally, the perfect work environment would offer a mixture of virtual work and collocated work. In this way, employees become more productive in individual, delegated tasks. At the same time, when a conflict arises or when a task requires the synchronous attention of two or more individuals, they can go into a shared office. This will provide the face-to-face networking virtual workers seem to find missing in their virtual work lives.

As the popularity of virtual working increases, employees must maintain the flexibility to learn a new style of communication using technology. Not only must employees be adaptable in using technology and learning new technologies as they change, but they must fully integrate the new technologies into the workplace as they replace face-to-face communication.

### 6.3 – Further Research

Even though this study found several statistically significant differences with virtual teams, it did so with a relatively small sample size. Additional research should be carried out with a larger sample size. It is believed that with more respondents, even more results would have statistical significances. Also, this study focused solely on virtual team members. A follow-up study should be completed on both face-to-face and virtual teams. With this type of study, researchers will be able to compare and contrast the two types of teams. Such an analysis will provide empirical evidence to support the similarities and differences in virtual and face-to-face teams. With this knowledge, training programs for virtual teams can be developed. Given that the number of virtual teams continues to develop with technological advances, training programs are critical. Once employees are trained in virtual communication skills, they will become even more productive employees.

### 6.4 – Final Thoughts

Technology constantly changes; and for the virtual worker, this may prove to be challenging as it is their mode of work. Over the past few years the basic methods of technology used to communicate have not changed: email and instant messaging continue to be just as popular (if not more so) today as they were five years ago. With the addition of collaborative tools such as Google documents and spreadsheets as well as Writeboard, collaborating across space and time will become easier. This research shows that, for the most part, employees enjoy virtual working and are well aware of its problems. As they have become experienced virtual workers, they have learned how to be more effective communicators. While people continue to enter the virtual workforce, training should be developed so they can adapt more readily and enjoy the benefits of virtual working.

## 7 - Bibliography

- Baker, G. (2002). The effects of synchronous collaborative technologies on decision making: A study of virtual teams. *Information Resources Management Journal*, 15(4), 79.
- Balthazard, P., Potter, R. E., and Warren, J. (2004). Expertise, extraversion and group interaction styles as performance indicators in virtual teams: how do perceptions of IT's performance get formed?. *SIGMIS Database* 35, 1 (Feb. 2004), 41-64. DOI= <http://doi.acm.org/10.1145/968464.968469>
- Benoit, A., & Kelsey, B. (2003). Further understanding of trust and performance in virtual teams. *Small Group Research*, 34(5), 575.
- Beranek, P. M. (2000). The impacts of relational and trust development training on virtual teams: An exploratory investigation. *Proceedings of 33 Hawaii International Conference on System Sciences*, January 4-7, 2000, Maui, Hawaii.
- Bleeker, S.L. (1994). The Virtual Organization. *The Futurist*, March-April ed., 9-14.
- Blomberg, J.L. (1987). "Social Interaction and Office Communication: Effects on User's Evaluation of New Technologies" from *Technology and the Transformation of White Color Work*; ed. R.E. Kraut. 195-210.
- Carletta, J; Anderson, A.H.; McEwan, R. (2000). The effects of multimedia communication technology on non-located teams: a case study. In *Ergonomics*, 43(8), 1237-1251.
- Clear, T. and Kassabova, D. (2005). Motivational patterns in virtual team collaboration. In *Proceedings of the 7th Australasian Conference on Computing Education - Volume 42* (Newcastle, New South Wales, Australia). A. Young and D. Tolhurst, Eds. ACM International Conference Proceeding Series, vol. 106. Australian Computer Society, Darlinghurst, Australia, 51-58.
- Dirks, K. (1999). The effects of interpersonal trust on work group performance. *Journal of Applied Psychology*, 84(3), 445-455.
- Fichman-Shachaf, P. (2003). Global Virtual Teams: The Impact of Cultural Diversity and Information and Communication Technology on Team Effectiveness. Unpublished Doctoral Dissertation, University of North Carolina at Chapel Hill.
- Jarvenpaa, S.L.; Leidner, D.E. (1999). Communication and Trust in Global Virtual Teams, *Organization Science*, 10(6), 791-815.

- Johnson, S.D.; Suriya, C.; Won Yoon, S.; Berrett, J.B.; La Fleur, J. (2002). Team development and group processes of virtual learning teams, *Computers & Education*, Volume 39, Issue 4, 379-393.
- Kayworth, T. R., Leidner, D. E. (2001). Leadership effectiveness in global virtual teams. *Journal of Management Information Systems*, 18(3), 7-40.
- Klenke, K. (1996). IS leadership in virtual organizations. In *Proceedings of the 1996 ACM SIGCPR/SIGMIS Conference on Computer Personnel Research* (Denver, Colorado, United States, April 11 - 13, 1996). SIGCPR '96. ACM Press, New York, NY, 22-35. DOI= <http://doi.acm.org/10.1145/238857.238864>
- Kraut, R. E., ed. (1987a). From *Preface in Technology and the Transformation of White Color Work*, ix-x.
- Kraut, R.E. (1987b). "Practicing the Use of Technology: The Case of Telework" from *Technology and the Transformation of White Color Work*; ed. R.E. Kraut. 113-134.
- Lipnack, J., & Stamps, J. (2000). *Virtual teams: People working across boundaries with technology* (2nd ed.). New York, New York: John Wiley & Sons, Inc.
- Luecke, R. (2004). *Harvard business series: Manager's toolkit: The 13 skills managers need to succeed*. Boston, Massachusetts: Harvard Business School Press.
- Lurey, J.M.; Raisinghani, M.S. (2001). An empirical study of best practices in virtual teams. *Information and Management*, 38(8), 523-544.
- Majchrzak A., Rice, R.E., King, N., Malhotra, A. & Ba, S. (2000a). Computer-mediated inter-organizational knowledge-sharing: Insights from a virtual team innovating using a collaborative tool. *Information Resources Management Journal*, 13(1), 44-53.
- Majchrzak, A., Rice, R. E., Malhotra, A., King, N., & Ba, S. (2000b). Technology adaptation: the case of a computer-supported inter-organizational virtual team. *MIS Quarterly*, 24(4), 569-600.
- Massey, A. P., Hung, Y. C., Montoya-Weiss, M., and Ramesh, V. (2001). When culture and style aren't about clothes: perceptions of task-technology "fit" in global virtual teams. In *Proceedings of the 2001 international ACM SIGGROUP Conference on Supporting Group Work* (Boulder, Colorado, USA, September 30 - October 03, 2001). C. (. Ellis and I. Zigurs, Eds. GROUP '01. ACM Press, New York, NY, 207-213. DOI= <http://doi.acm.org/10.1145/500286.500318>
- McDaniel, C.L. (2005a). *The Effects of Stress on the Gender Gap in Information Technology*. Unpublished undergraduate honors thesis, University of North Carolina, Chapel Hill.
- McDaniel, C.L. (2005b). 'Preparing for the IT Workforce – Gender Differences in the College Years' in the *Encyclopedia of Gender and Technology*.

- Olson, M.H. (1987). "Telework: Practical Experience and Future Prospects" from *Technology and the Transformation of White Color Work*; ed. R.E. Kraut. 135-152.
- Pauleen, D.J.; Yoong, P. (2001). Relationship building and the use of ICT in boundary-crossing virtual teams: a facilitator's perspective. *Journal of Information Technology*, 16(4), 205-221.
- Powell, A., Piccoli, G., and Ives, B. (2004). Virtual teams: a review of current literature and directions for future research. *SIGMIS Database* 35, 1 (Feb. 2004), 6-36. DOI=  
<http://doi.acm.org.libproxy.lib.unc.edu/10.1145/968464.968467>
- Salisbury, W. D., Carte, T. A., and Chidambaram, L. (2006). Cohesion in virtual teams: validating the perceived cohesion scale in a distributed setting. *SIGMIS Database* 37, 2-3 (Sep. 2006), 147-155. DOI=  
<http://doi.acm.org.libproxy.lib.unc.edu/10.1145/1161345.1161362>
- Switzer, J.S. (2000). *Virtual teams: Profiles of successful leaders*. Unpublished doctoral dissertation, Pepperdine University, California.
- Tuckman, B. W. (1965). Development sequence in small groups. *Psychological Bulletin*, 63, 348-399.
- Vickery, C. M., Clark, T. D., & Carlson, J. R. (1999). Virtual positions: an examination of structure and performance in ad hoc workgroups. *Information Systems Journal*, 9(4), 291-312.
- Warkentin, M. E., & Beranek, P. M. (1999). Training to improve virtual team communication. *Information Systems Journal*, 9(4), 271-289.
- Warkentin, M. E., Sayeed, L., & Hightower, R. (1997). Virtual teams versus face-to-face teams: An exploratory study of web-based conference system. *Decision Sciences*, 28(4), 975-996.
- Wellen, J.M. & Neale, M. (2006). Deviance, self typicality, and group cohesion. *Small Group Research*; 37(2) 165-186.
- Wong, S. & Burton, R. M. (2000). Virtual teams: What are their characteristics, and impact on team performance? *Computational & Mathematical Organization Theory*, 6(4), 339-360.
- Zaccaro, S. J., & Bader, P. (2003). E-leadership and the challenges of leading E-teams: Minimizing the bad and maximizing the good. *Organizational Dynamics*, 31(4), 377-387.

## 8 – Appendices

### 8.1 – Appendix A – Recruitment Email

The message below was given as the first page of the survey at <http://ils.unc.edu/~cmcdanie/virtualmanagement.html>.

#### Virtual Management Survey

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This study is being conducted by Christie McDaniel, a Master's student at the School of Information and Library Science at the University of North Carolina at Chapel Hill and under the direction of Dr. Barbara Moran. Your participation is completely voluntary and you may stop participating at any time. No identifying information will be recorded; therefore, your privacy will be protected by your anonymity. This study has been approved by the UNC Chapel Hill Institutional Review Board. If you have questions or concerns about your rights as a research subject you may contact, anonymously if you wish, the Institutional Review Board at 919-966-3113 or by email to [IRB\\_subjects@unc.edu](mailto:IRB_subjects@unc.edu). If you contact the IRB, please refer to study number 07-270.

The link below will take you to the very brief questionnaire; by clicking the following link, you are agreeing to participate in this research study.

#### **[Take the survey](#)**

If you have any questions or concerns, please contact the Principal Investigator or Faculty Advisor in charge of this study:

Christie McDaniel, Principle Investigator  
919.370.9290  
[christiem@unc.edu](mailto:christiem@unc.edu)

Barbara Moran, Faculty Advisor  
919.962.8067  
[moran@ils.unc.edu](mailto:moran@ils.unc.edu)

## 8.2 - Appendix B – Survey

**1. What is your age group?**

18-24 years	45-54 years
25-34 years	55-64 years
35-44 years	65 years and over

**2. Please identify your race.**

American Indian and Alaska Native	Asian	White
Hispanic		African American
Other		

**3. Please identify your gender.**

Female  
Male

**4. Please identify your primary professional role:**

Practitioner  
Student  
Educator

**5. Which best describes the type of organization you work for?**

Corporation	Educational Institution
Governmental Organization	Non-profit
Other - please specify <input type="text"/>	

**6. Which best describes the industry you work in:**

Advertising	Social Services	Consulting Firm
Teaching or Training		Engineering
Technology		Healthcare
Research		Other - please specify <input type="text"/>

**7. Which best describes your role in your virtual team(s)?**

Member  
Manager  
Both

**8. Does your organization provide any special training for working within a virtual team?**

Yes  
No

**9. Do you manage or have you worked with unproductive employees?**

Yes  
No

**9a. If so, what communication methods do you (or your manager) use to deal with these employees? Please check all that apply.**

Instant Messaging	Phone
Video Conferencing	Face-to-face meeting
Email	All of the above

**9b. Would you say that this method is effective?**

Yes  
No

**9c. If it is not effective, please explain.****10. Have you ever managed or dealt with conflict between employees?**

Yes  
No

**10a. If yes, what communication methods did you (or your manager) use to deal with these conflicts?**

Instant Messaging	Phone
Video Conferencing	Face-to-face meeting
Email	All of the above

**10b. Would you say that these are effective methods? You may specify in the boxes which methods are or are not effective.**

Yes  
No

**10c. If it is not effective, please explain why it is not.**



**14. Would you say that your team is effective and productive?**

Yes

No

**15. Please explain your answer.**

**16. Which method of work do you prefer?**

Virtual

Face-to-face

**17. In your experience, what are the advantages and disadvantages of working virtually?**