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ANTECEDENTS AND OUTCOMES OF TEAM COMMITMENT IN A GLOBAL, VIRTUAL ENVIRONMENT

Anne L. Powell

Submitted to the Faculty of the University Graduate School
in Partial Fulfillment of the Requirements
for the Degree
Doctor of Philosophy
in the Kelley School of Business
Indiana University

June, 2000

ACCEPTANCE

Accepted by the Graduate Faculty, Indiana University, in partial fulfillment of the requirements of the Degree of Doctor of Philosophy in Business

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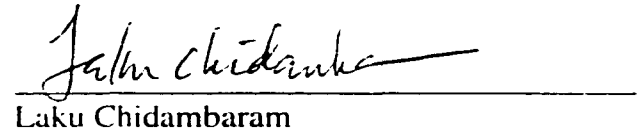
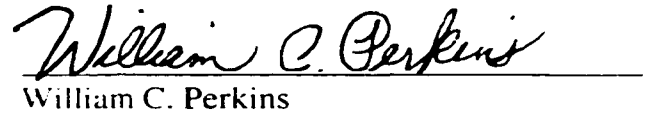


Laku Chidambaram



William C. Perkins

June 2, 2000

PREFACE AND ACKNOWLEDGEMENTS

The road to getting a Ph.D. has not been an easy one, and I am grateful to those people, who along the way, made it a bit easier and more enjoyable.

Faculty support was crucial to my success in the doctoral program. First, I have had an excellent dissertation committee and much of the credit in my timely completion goes to them. Anne Massey has been an outstanding dissertation chair (particularly for a first-time chair). Anne was able to get my dissertation topic focused (no easy task) and throughout the process provided immediate, clear, and perfectly logical solutions to problems. Her expertise and work style were exactly what I needed. I was also fortunate to have Sue Brown, serving on her first dissertation committee, working with me. I wanted her on my committee because of all the help she had given me during the first years of the program – but also because I knew she'd have a ready supply of Kleenex in her office if needed! Laku Chidambaram provided not only statistical help when needed and a class to participate in the experiment, but was a wealth of information on the topic itself. His door was always open for my questions, and his work itself is cited throughout my dissertation. Bill Perkins (who, unlike Anne and Sue, is serving on one of his last dissertations), provided guidance with his years of experience. The dissertation is a much improved piece of work thanks to him. He refined and improved the document immensely with his quick turn-around of drafts and careful attention to detail for consistency throughout the dissertation. The entire group has always been there for me, guiding me through the process, working together, and cheering me on. Anne, Sue, Laku, and Bill – thank you all very much. In addition, I was fortunate to work with Carol Brown at both the MBA level and Ph.D. level. It was largely because of the research

project I conducted in Carol's End-User Computing MBA class that I decided to pursue the Ph.D.

Beginning the Ph.D. program was an intimidating experience. I left a good job, a nice home, and security, to move to Bloomington -- 7 months pregnant, alone, and into a crappy, little house. Fortunately, those students who were ahead of me in the MIS program were excellent role models whose support, understanding, and cheerleading continue to this day. Madhu Rao kept me sane the first year as the only Ph.D. student who told me the first year was the toughest – not the easiest. Mike Morris, Lisa Murphy, Heikki Topi, and Andrew Urbaczewski provided invaluable information and advice on MIS research, statistics, and the Ph.D. program in general. To this day, Cheri Speier's excitement and hugs for each of my achievements – whether it was getting the baby to sleep through the night, passing field exams, defending my proposal, or finishing – have kept me going to the next milestone.

Outside the MIS department, I am greatly indebted to Gerry Aase and Jo Ellen Moore who kept me in the program that awful 3rd year when I was still working on course work and not so sure that I wanted to finish. With Gerry's "someday you'll see the light at the end of the tunnel" and "you'll find your research niche one of these days", and Jo Ellen's "you are going to be SO good at this, just wait and see" and "don't give up yet", they are largely responsible for my not quitting. Others who have helped along the way include Don Bowman from IU Tech Services and Caisy Hung who assisted me in the technical aspects of the dissertation. Jim Burkman was a great colleague for commiserating with and for drinking with – I'll never forget AIS Baltimore! I had a great

office-mate in Cheryl Jarvis, who provided excellent tips on research in general, and was a good friend these last five years.

The dissertation couldn't have been completed without the gracious help of faculty whose classes participated in the experiment. Tim Baldwin, Dick Bobst, and Josh Powers of Indiana University provided the pilot study participants from their summer courses. For the actual dissertation, Moez Limayem of City University in Hong Kong, Bob O'Keefe and Heejin Lee of Brunel University in Great Britain, Kil Soo Suh of Yonsei University in Korea, Jon Gant and Laku Chidambaram of the SPEA department here at IU, Efrat Elron and Avi Kluger of Hebrew University in Israel, and Andy Liu of Chun Yuan Christian University in Taiwan all provided me access to their classes. I thank you all for your assistance.

My family has been wonderfully supportive. My parents and siblings have all provided enormous support during the last five years. Mom drove 8 hours round-trip one weekend every month during that first year to watch my son so I could spend more time in the library without worrying about my baby. My younger sister, Katie, herself in the middle of a Ph.D. program, provided constant phone support. My older sister, Mary Beth, took my son for a week or two every summer so I could study for field exams or go to conferences. My dad and brother have always provided the emotional support needed, including hanging out in the delivery room when that was the last place they wanted to be!

Finally, I am so grateful to the little guy who has made my life complete. Although Mike's appearance in my life might not have made getting a Ph.D. easier, it has made my life a thousand times better. I am so grateful to have had him with me at every

step of the way. I am looking forward to our new life together in Edwardsville where I will be able to watch in wonder as he grows and learns even more. My love for Mike will always be endless. Since I began the Ph.D. program 7 months pregnant, it is only fitting that I end it the same way. I can't wait to meet the new little one that will make Mike a big brother. I am sure that Mike will be the best big brother in the world. I'm certain my second child will give me as much joy as Mike has -- I just hope he/she likes to sleep more at night!

ABSTRACT

The conventional ways in which people work are changing. Due to global competition and technological advances, today's employees are increasingly likely to work in virtual teams at some point in their careers. Today's companies are more likely to have an employment force spanning the world, and the face-to-face (FfT) aspect of proximal teams is longer always possible or desirable.

While research on virtual teams is increasing, many questions remain regarding what is needed to ensure the effectiveness of virtual teams. For co-located team members, socialization that occurs both within and outside meeting times can serve to strengthen the bond between team members. Because of the dispersed nature of virtual teams, socialization among members and communication cues are reduced considerable, hindering efforts to establish the important roles of team support and member well-being which could lead to greater team commitment. When team members can't "bump" into each other in the hall, meet informally in the break room, or even see each other, can a relation-based bond exist or be developed between them?

To study the issue of team commitment in a virtual environment, a model and hypotheses were developed based on work in the organizational commitment research stream. An experiment was used to test the hypotheses. Data were collected over the course of four weeks from graduate students around the world working together on virtual teams. The results of this study suggest that 1) commitment to a virtual team does affect satisfaction and performance, 2) work processes, task liking, and collectivism are positively related to normative and affective commitment, 3) task competence, personality, and others' commitment are not significantly related to commitment to the

team. 4) in the lean environment of virtual teams. members have a difficult time distinguishing between perceptions of team cohesion and team work processes. 5) continuance commitment does not play a role in team commitment in an academic. virtual environment. and 6) commitment to the team can be manipulated. These results provide an important extension to existing research on organizational commitment and face-to-face team commitment and carry important implications for the management of virtual teams in organizations.

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CHAPTER 1

1.0 INTRODUCTION

The conventional ways in which people work are changing. Due to global competition and technological advances, today's employees are increasingly likely to work in virtual teams at some point in their careers. Today's companies are more likely to have an employment force spanning the world, and the face-to-face (FtF) aspect of proximal teams is no longer always possible or desirable. Simply defined, a virtual team works across time, space, and organizational boundaries (Lipnack and Stamps, 1997). Like traditional teams, they represent a collection of individuals who are interdependent in their tasks and exist for some task-oriented purpose (Cohen and Baily, 1997; Guzzo and Dickson, 1996). Brought together on a temporary basis for the duration of one or many tasks, team members are not necessarily located in the same building, time zone, or even country, and they communicate with each other through advanced communication and information technology (Jarvenpaa, Knoll, and Leidner, 1998).

With the increased use of teams in organizations, academic research has concentrated on many issues relating to teamwork – one of these being team effectiveness. Research in this area has found issues of task design, team composition, organizational context, and environmental factors to influence team effectiveness (Cohen and Baily, 1997). A complementary stream of research in management of information systems (MIS) examines team effectiveness when members interact through computer-mediated communication (CMC). This research has found that similar antecedents affect

the effectiveness of teams, although differences have been found between face-to-face teams and CMC teams. Social presence, communication frequency, member support, and visual cues are reduced in the virtual environment of CMC. Other issues examined in team and CMC research have included team psycho-social traits and internal and external processes of the team (e.g., leadership roles, conflict resolution, trust, commitment). These traits and processes may be more difficult to create and sustain in the leaner environment of a virtual team, particularly if members are meeting asynchronously. In a recent review of literature on CMC teams, only ten of 184 papers used asynchronous communication in the research. With the growing globalization of organizations, teams are more likely to meet asynchronously and research is needed to determine traits and processes likely to contribute to team effectiveness in global, virtual environments. Leadership, conflict resolution, and trust have been studied in academic research at the global, virtual team level. Although organizational commitment has been extensively studied, team commitment, important today because of increased costs of recruiting and retaining employees, possible positive effect on employee satisfaction, and greater emphasis on teams in the organization, has not been studied as extensively.

Organizational commitment (OC) research has found many factors significant in the formation of OC. Similar to team research, these antecedents include personal characteristics, task characteristics, group relations, and organizational characteristics (Mathieu and Zajac, 1990). Commitment to the organization is positively related to employee satisfaction and performance – important in today's competitive business environment. Research on OC has also found that commitment is actually several

constructs. Individuals can have several forms of commitment, not just to the organization, but also to their union, industry, or team.

This study will bridge these two research streams. Specifically, this research will examine commitment to the team in a global, virtual environment. It is expected that individuals and teams with differing levels of team commitment will exhibit differing levels of individual satisfaction and team performance. Further, this study will investigate the relationship between team commitment and antecedents drawn from MIS and management team research as well as OC literature. While we expect many of the antecedents of OC to also affect team commitment, from the CMC literature we expect that those antecedents related to social presence may be more significant in the formation of team commitment in a virtual environment.

1.1 Nature of Problem

To date there has been a paucity of research on team commitment (McGrath and Hollingshead, 1994). Research on commitment has focused primarily on employee commitment to an organization (Mathieu and Zajac, 1990), despite research that supports the argument that team and organizational commitment are separate constructs (Becker, 1992; Becker and Billings, 1993; Morrow, 1993; Zaccaro and Dobbins, 1989). Research in organizational commitment has found a positive relationship between commitment and performance (Mathieu and Zajac, 1990). Research on co-located teams has found team commitment is positively related to performance and satisfaction (Becker, 1992; Becker, Billings, Eveleth, and Gilbert, 1996). Because performance and satisfaction are positive outcomes, it is important to know whether similar effects occur when team members are dispersed and likely meeting asynchronously. If we know that there are desirable

outcomes when individuals express commitment to their team, how do we get it in a virtual world?

Many questions remain regarding which factors important to the effectiveness of co-located teams will also be important in virtual environments. While many factors are explored, the focus of this research is on the relationship between team commitment and team performance, where the team is meeting virtually and asynchronously. For co-located team members, socialization that occurs both within and outside formal meeting times can serve to strengthen the bond between team members. Because of the nature of virtual teams, communication cues and socialization among members are reduced considerably when communicating via leaner, computer-mediated environments (Chidambaram, 1996; Lipnack and Stamps, 1997). Other researchers have also found that the dispersed nature of virtual teams creates a greater need for socialization efforts (Allen, 1977; Galegher and Kraut, 1994; McGrath, 1991) and that it takes longer to establish relational links in virtual teams as compared to traditional FtF teams (Chidambaram, 1996; Walther, 1992). Thus, efforts to establish relationships that may influence one's team commitment may be hindered. When team members can't "bump" into each other in the hall or meet informally, can a relation-based bond be developed? In addition, because technology now enables global, virtual meetings, will cultural differences among team members affect team commitment?

1.2 Commitment Defined

The definition of commitment has changed over time to reflect research findings. Originally, the most popular definition of commitment was offered by Mowday, Porter, and Steers (1982) and referred only to organizational commitment: an identification with

and involvement in the organization characterized by (1) internalization of the values and goals of the organization; (2) willingness to work extra hard on behalf of the organization; and (3) a strong desire to remain a member of the organization. Recently, definitions of commitment have reflected both the *nature* of commitment and the *focus* of commitment as researchers recognized that many forms of work commitment can be conceptually and empirically differentiated from each other (Mathieu and Zajac, 1990; Morrow, 1983; Morrow and McElroy, 1993; Reichers, 1985).

Definitions regarding the *nature* of commitment are still focused on organizational commitment and have been defined by multiple components. Meyer and Allen (1991) defined three components of commitment: *affective* (emotional attachment, identification, involvement with organization); *continuance* (awareness of costs associated with leaving); and *normative* (feeling of obligation to remain with the organization). Or, an easier way to think of it: want to, need to, ought to. O'Reilly and Chatman (1986) also proposed a three-component definition of commitment, but labeled their three components as *identification* (attachment based on a desire for affiliation), *internalization* (congruence between individual and organizational values), and *compliance* (attachment undertaken for specific rewards). However, identification and internalization are highly correlated and research results have not always distinguished between the two (Caldwell, Chatman, and O'Reilly, 1990; O'Reilly, Chatman, and Caldwell, 1991).

Besides the nature of commitment, researchers have also examined the *focus* of commitment. In a review of commitment literature, Morrow (1993) stated that organizational commitment is distinguishable from other forms of workplace

commitment. Several foci of commitment have been identified including: top management (Becker, 1992), team (Becker and Billings, 1993; Zaccaro and Dobbins, 1989), team leader or supervisor (Becker et al., 1996), union (Kelloway, Catano, and Southwell, 1992), and occupation or profession (Meyer, Allen, and Smith, 1993). While this work has led researchers to conclude that commitment is multi-focused, the bulk of research has still been done on organizational commitment.

Overall, researchers have defined commitment as a "psychological bond" that ties the employee to an entity but the nature of that bond can differ depending on the nature and focus of the commitment.

1.3 Research Objectives and Questions

The primary objective of this study is to contribute to a *theoretical understanding of team commitment in a virtual and diverse meeting environment.* Antecedents that influence team commitment and variables that are affected by it will be examined in this study. Specifically, data will be collected to explore the relationship between team commitment and team outcomes. Empirical work in co-located environments has found positive relationships between team commitment and satisfaction and performance (Becker, 1992; Becker et al., 1996; Klein and Mulvey, 1995). To date, empirical work has not been conducted in a global, virtual setting. The first research question addresses the importance of team commitment in a virtual setting with regard to positive outcomes of satisfaction and performance.

> *RQ1: Does team commitment in a virtual setting affect outcomes of virtual team meetings, i.e., overall satisfaction and performance?*

This research will also explore variables found to influence team commitment in a co-located, one-culture setting and extend them to a virtual, cross-cultural setting. Literature in psychology, management, and management of information systems (MIS) on the development of commitment were examined to identify an initial list of variables. Further, literature on organizational commitment in psychology and management provided additional factors to test in a global, virtual team setting. These variables were examined throughout the life of the virtual team to determine if the importance of certain variables changes over time. The second research question addressed in this study was:

> *RQ2: What factors influence the development of team commitment in a global, virtual environment and do they change over time?*

Finally, research in management of teams has found that cohesion in FtF teams can be manipulated – improving cohesiveness and performance within teams. This study also tested whether commitment to a virtual team can be manipulated to improve results similar to management literature findings. The third research question addressed in this study was:

> *RQ3: Do traditional FtF methods of increasing perceived cohesion in teams also work in a virtual environment, i.e., do they result in increased commitment in a virtual environment?*

1.4 Theoretical and Practical Importance

This research has significant theoretical and practical importance. Antecedents and outcomes of team commitment in a global, virtual setting are currently unknown.

From a theoretical perspective, the proposed research builds on previous team and commitment research by extending knowledge to a global, virtual setting. The relationship between team commitment and selected antecedents is tested. If findings are

not significant, it will, in part, imply that certain antecedents are not related to team commitment as conceptual work implies and organizational commitment research would lead us to believe. Thus, results in either direction will contribute to the understanding of team commitment in a global, virtual setting.

For practice, this research identifies whether team commitment affects performance outcomes. If findings are significant, it will imply that team commitment is important for better performance of the team and team members' satisfaction. The study also identified what antecedents were related to increased team commitment and whether these variables changed over the life of the team. Knowing this relationship, managers will be able to more effectively manage virtual teams to ensure team commitment. If team commitment does not lead to better performance or higher satisfaction, further research may be warranted.

1.5 Organization of the Dissertation

The dissertation is organized into seven chapters.

Chapter 2 provides a review and discussion of the relevant literature in management, information systems, psychology, and group communication. It further documents both the theoretical background for the study and previous empirical results on organizational and team commitment.

Chapter 3 presents the research model for the study. Research constructs are defined and research variables are detailed as part of the research model development. The experimental hypotheses investigated are developed within the context of the relevant literature. The research model provides a focus for the study of team commitment in a global, virtual environment.

Chapter 4 details the experimental method used to test the research hypotheses. This chapter describes the measurement of the independent, dependent, and control variables; the experimental design; the task; the research procedures, including subjects, timeframe, and software used; and the pilot testing of materials and procedures. The development and execution of the manipulation check is also discussed. The research method chapter provides a descriptive map of how the research was conducted.

Chapter 5 presents the results of the study. It also describes the statistical procedures which were used to test each hypothesis and descriptive data on the subject sample. The results chapter provides the evidence to support the interpretation of research findings.

Chapter 6 interprets the results of the study. The chapter discusses the implications of these results for both theory and practice.

The final chapter, Chapter 7, describes the strengths and limitations of this work along with specific suggestions for further research.

CHAPTER 2

2.0 PRIOR LITERATURE

The objective of this chapter is to examine and integrate concepts and research findings relevant to the formation of commitment in a virtual, asynchronous, and diverse team environment. Research on commitment will be reviewed along with research on teams. The commitment stream of research has been dominated by studies on organizational commitment (OC); team commitment has largely been ignored (McGrath and Hollingshead, 1994), and the research that has been conducted has used face-to-face (FtF) teams. Although research has found differences in OC and team commitment antecedents, there are commonalities. Similarly, research on teams has primarily looked at co-located teams, although some studies have used dispersed teams. Therefore, this research draws from both the team literature and the OC literature and extends it to a study on commitment in virtual teams.

2.1 Team Literature

This section reviews literature on face-to-face teams taken from the management literature and also examines research from both the Computer-Mediated Communication (CMC) and Group Support Systems (GSS) areas.

In the management literature, FtF teams have been broken into categories of work teams, parallel teams, project teams, and management teams (Cohen and Baily, 1997). For this research, literature on project teams is most relevant to a study on virtual teams. As defined by Cohen and Baily, project teams are time-limited; members are usually

drawn from a variety of departments and are chosen for their specific expertise. When the project is completed, team members return to their functional units. While virtual teams may exist as a work team, most virtual teams are created as project teams (Jarvenpaa et al., 1998). There has also been a tremendous amount of research done on computer-mediated teams in the GSS and CMC streams of research. The following sections focus on antecedents thought to affect team processes and outcomes of teams – both FtF and CMC teams. Following that is a section on team development. In each section, relevant literature is reviewed.

2.1.1 Antecedents Studied in Team, GSS, and CMC Literature

Antecedents that have been examined in team literature in the management field, as well as in GSS and CMC literature, can be broadly categorized into individual factors, task factors, and team factors.

Individual Factors

When examining individuals and individual characteristics of persons using CMC, gender has been found to affect outcomes (Lind, 1999; Savicki, Kelley, and Lingenfelter, 1996a). Specifically, female-only teams appear to be more satisfied, send more messages, and have higher team development than male-only teams or mixed-gender teams (Savicki, Kelley, and Lingenfelter, 1996b; Savicki, Kelley, and Oesterreich, 1998). In mixed-gender, virtual teams, women tend to be more satisfied, to perceive that team members help each other more, and to perceive that there is less conflict than do the men (Lind, 1999). Comparing women in mixed-gender, FtF teams with women in mixed-gender, virtual teams, the women on FtF teams were less satisfied with the team experience and felt conflict was "smoothed over" more than the women in the virtual teams (Lind, 1999).

Personality type has also been used as a variable in CMC and GSS research. CMC is reported to equalize participation between those with extroverted personalities and those with introverted personalities. In a GSS environment, introverts feel more comfortable in contributing ideas (Yellen, Winniford, and Sanford, 1995). Besides gender and personality, GSSs are reported to equalize individuals when certain cultural expectations would indicate differences among team members. The anonymity feature of a GSS allows a dominant Singaporean member to take control without direct confrontation of other members (Ho, Raman, and Watson, 1989). In a study using collectivistic Mexicans, groups in anonymous situations were better able to reach consensus than those teams in identified situations (Mejias, Lazeneo, and Vogel, 1996). Finally, individualistic cultures are more likely, and collectivistic cultures are less likely to challenge majority influence regardless of communication medium. A CMC can be used to reduce majority influence (Tan, Wei, Watson, Clapper, and McLean, 1998).

Task Factors

In the management literature, research on new product development has focused on how well the tasks performed by new product development teams have been a "fit" with team design or team processes. When there is a proper "fit," performance is high (Keller, 1994; Olson, Walker, and Reukert, 1995). McGrath (1984) categorized tasks on a circumplex, defining tasks as one of four types. Team effectiveness can be conditional on the interaction between type of task and team members.

In CMC and GSS literature, task characteristics, the team's understanding of the task, and the team's task focus can be affected by the type of technology being used. It has been noted that the success of task performance is related to the technology used

(Duarte and Snyder, 1999; Easton, George, Nunamaker, and Pendergast, 1990; El-Shinnawy and Vinze, 1998). Task type might affect information exchange and participation equality (Huang, Raman, and Wei, 1993) and subjects prefer tasks that relate to them rather than tasks that are future-oriented (Joyner and Tunstall, 1970). Research has also found that participants' understanding of the task is of vital importance. CMC teams have been found to have greater difficulty in understanding their work and have had to work harder than FtF teams (Galegher and Kraut, 1994). Decomposing tasks into manageable pieces has been found to improve performance for CMC teams (Dennis, Aronson, Heninger, and Walker, 1996; Dennis, Valacich, Connolly, and Wynne, 1996). Teams using CMC have also been found to be more task-focused than FtF teams (Chidambaram, Bostrom, and Wynne, 1990; Valacich, Paranka, George, and Nunamaker, 1993) although Walther (1995) found CMC teams became less task-oriented over time, possibly due to increased socialization.

Team Factors

Research investigating project teams in the management literature has examined team diversity and team processes as antecedents to effective team performance. Research on team diversity has differentiated between functional diversity and tenure diversity and results have been mixed. Eisenhardt and Tabrizi (1995) found functional diversity positively related to performance, but Ancona and Caldwell (1992b) found a negative relationship. However, when mediated by external communication, the relationship between functional diversity and performance was positive. Ancona and Caldwell (1992b) also found the direct relationship between tenure diversity and performance was negative, but when mediated by internal task processes, the relationship

was positive. Work processes followed by the team have generally been positively related to team outcomes. Cooperation in project teams has been positively related to both task and psychosocial outcomes (Pinto and Pinto, 1990), and is also positively related to team member satisfaction (Pinto, Pinto, and Prescott, 1993). A team's abilities to develop plans, define goals, and prioritize work were positively associated with perceptions of efficiency (Ancona and Caldwell, 1992a, b). External communication (communication with others outside the team) was found to be positively related to manager's ratings of the team (Ancona and Caldwell, 1992b; Keller, 1994) but negatively associated with the *team's* perception of performance (Ancona and Caldwell, 1992a, b) and cohesion (Ancona and Caldwell, 1992a).

In CMC and GSS literature, team size, team composition, team cohesion, and perceptions of work processes have been examined extensively. Research on team size has generally found that large CMC groups generate more ideas, more unique ideas, and higher quality ideas than small CMC groups and FtF groups (Hwang and Guynes, 1994; Valacich, Dennis, and Connolly, 1994; Valacich, Dennis, and Nunamaker, 1992; Valacich, Mennecke, Wachter, and Wheeler, 1994). Team composition research generally supports the notion that when using CMC, diverse teams outperform homogenous teams (Daily and Steiner, 1998; Daily, Whatley, Ash, and Steiner, 1996).

Research examining cohesion has found mixed results. Several studies suggest that FtF teams are more cohesive than CMC teams (Berdahl and Craig, 1996; Dennis, 1996; Straus, 1997; Warkentin, Sayeed, and Hightower, 1997). However, other studies have found CMC teams with greater cohesiveness than FtF teams (Chidambaram, 1996; Chidambaram et al., 1990; Mennecke, Hoffer, and Valacich, 1995). The difference

appears to be a function of time. Chidambaram (1996) found that CMC teams, given time, will exchange enough social information to develop strong relational links with each other. Similarly, Chidambaram and Bostrom (1993) found the ability to manage conflict and cohesiveness was initially higher in FtF teams, but after three sessions CMC teams caught up. Burke and Aytes (1998) and Burke and Chidambaram (1994) found no significant differences between FtF and CMC teams on cohesiveness.

Research on team process perceptions is similar to the research on cohesion. Some studies have found FtF teams are more satisfied with team processes (e.g., Galegher and Kraut, 1994; Mennecke et al., 1995; Straus, 1996; Warkentin et al., 1997) while other studies have found CMC teams are more satisfied with team processes (e.g., Anson, Bostrom, and Wynne, 1995; Chidambaram, 1996; Easton et al., 1990; Steeb and Johnston, 1981). Again, it appears that the difference can be attributed to the duration of the groups. While FtF teams initially have higher satisfaction with team processes, over time CMC teams catch up and exceed FtF teams in terms of satisfaction with team processes (Chidambaram, 1996). One aspect of team processes involves conflict. Miranda and Bostrom (1993-1994) found CMC teams had less interpersonal conflict, more constructive conflict, and more productive conflict than FtF teams. In addition, Burke, Chidambaram, and Locke (1995) found asynchronous CMC teams experienced lower levels of perceived conflict management than synchronous CMC teams. Another aspect of team processes is communication. Warkentin and Beranek (1999) found that teams given appropriate communication training reported increased perceptions of commitment.

2.1.2 Outcomes Studied in Team, GSS, and CMC Literature

Several studies have compared quality of performance between CMC teams and FtF teams and results have been mixed. Ocker and colleagues found asynchronous, CMC teams provided more creative solutions than synchronous or FtF teams (Ocker and Fjermestad, 1998; Ocker, Fjermestad, Hiltz, and Turoff, 1997; Ocker, Fjermestad, Hiltz, and Johnson, 1998). Studies finding CMC performance to exceed that of FtF teams include Sharda, Barr, and McDonnell (1988), Chidambaram and Jones (1993), and Massey and Clapper (1995). However, Burke and Chidambaram (1994, 1995) reported no differences in performance and Archer (1990) found CMC teams generated fewer alternatives than FtF teams. Related to performance, Archer (1990) found that CMC teams took longer to reach a decision and had fewer alternatives. Likewise, Siegel, Dubrovsky, Kiesler, and McGuire (1986) found CMC teams made fewer comments and took longer to reach decisions than FtF teams. However, CMC team members participated more equally in the discussions and exhibited more uninhibited behavior. Galegher and Kraut (1994) found CMC teams had to work harder and communicate more and were less satisfied with their work. Most studies that have examined satisfaction have found that either CMC teams are less satisfied than FtF teams, or there is no difference between the two groups (Archer, 1990; Beauclair, 1989; Burke and Aytes, 1998; Burke and Chidambaram, 1995).

2.1.3 Team Development Studied in Team Literature

One barrier found to hinder effectiveness of teams and their development is diversity. While there have been studies showing positive effects of team diversity (Bolman and Deal, 1992; Hoffman, 1979; McLeod and Lobel, 1992) such as creativity, innovation, and high quality ideas, more studies have highlighted the disadvantages of

team diversity. Numerous studies have shown that team diversity leads to reduced team cohesion and commitment. Differences in gender and racial makeup of a work-group were negatively related to psychological commitment to the group (Tsui, Egan, and O'Reilly, 1992). Other studies on work-group diversity have also shown that greater diversity leads to a greater tendency to leave the group (Jackson, Brett, Sessa, Cooper, Julin, and Peyronnin, 1991; O'Reilly, Caldwell, and Barnett, 1989). In addition, greater team diversity appears to reduce communication between team members (Lincoln and Miller, 1979; Triandis, 1960; Zenger and Lawrence, 1989). However, team diversity can encompass more than just demographic differences. Deeper level diversity involves team members' values, characteristics, and attitudes. We tend to like people whose attitudes and values appear to agree with ours, and dislike those who seem to disagree with us (Griffitt, 1974). Attitudinally similar teams have been found to have higher cohesion than dissimilar teams (Terborg, Castore, and DeNinno, 1976). Hill and Stull (1981) found that roommates who shared similar characteristics were more likely to like each other and want to stay together as roommates than roommates with dissimilar characteristics. In a study using students, teams that were formed through self-choosing had higher levels of communication, coordination, peer rating, team cohesion, and job satisfaction than teams that were formed based on ability by the instructor (Colarelli and Boos, 1992). Finally, Harrison, Price and Bell (1998) compared surface-level diversity (demographic diversity) with deep-level diversity (attitudinal differences) and found that over time surface-level diversity effects weakened while deep-level diversity effects strengthened.

Research has found, however, that when faced with diverse teams, individuals' perceptions can be altered through manipulations. By doing so, team effectiveness and development can be enhanced. In past work, team cohesion has been the primary factor that researchers have attempted to manipulate. In one study, cohesion in FtF teams was manipulated by having half the teams spend five minutes listing similarities and commonalities between team members and the other half of teams spend fifteen minutes listing dissimilarities and differences among members. This manipulation served to significantly affect cohesiveness within the teams (Turner, Pratkanis, Probasco, and Leve, 1992). Team cohesion has also been manipulated by telling half the FtF teams in a study that they were formed based on similarities to answers in a personality questionnaire, telling those same teams that they would be working on an important project with far-reaching consequences, and giving them positive group feedback to a warm-up task The subjects placed in the other half of the teams were told it had been impossible to place them in specially formed teams, and thus, they were randomly placed in their teams (Hoogstraten and Vorst, 1978). Giving FtF teams specific behavioral instructions to increase self-disclosure and increase information about fellow team members increased team cohesion, favorable attitudes, and frequencies of work-oriented interpersonal communications (Bednar and Battersby, 1976). Similarly, providing specific goals and feedback from management significantly improved product quality, team cohesion, and goal commitment over a similar FtF team who did not receive information on specific goals or feedback (Koch, 1979). Rotheram, LaCour, and Jacobs (1982) found that exchanging positive feedback, rather than negative feedback, early in the development of a FtF team can shape members' behavior and communication patterns. Finally, it has

been found that simply having the opportunity to predict a person's attitudes will substantially increase our liking for an initially dissimilar person (Aderman, Bryant, and Donelsmith, 1978). From research in the management literature, it appears that team development and effectiveness can be manipulated, even in diverse teams.

2.1.4 Summary of Team Literature

Research on teams suggests that characteristics of the individual team member, as well as task features and team functioning, can all affect satisfaction of team members and the performance of the team. In addition, research comparing FtF and CMC teams suggests that CMC teams have a more difficult time creating social relations, but that over time factors such as interpersonal communication, trust, and cohesion can reach the same level as in FtF teams. In addition, most research suggests that CMC teams produce equal or better quality work than do FtF teams, but conflict management is reduced, the time to reach a decision is longer, and team members are less satisfied than when in FtF teams.

2.2 Commitment Literature

As mentioned in Section 1.2, commitment is really a multi-focused construct. The components defined by Meyer and Allen (1991) are used in this study. Although their definition of the commitment construct refers to OC, this study will apply it to team commitment. The three components of commitment are affective, continuance, and normative. Most research on commitment has focused on OC and primarily the affective commitment construct. Meyer and Allen's multi-focused construct gives us a better understanding of commitment. Affective commitment refers to the level of identification, involvement, and enjoyment a person feels toward the team. Affective commitment has been found to have a positive relationship with intent to stay,

productivity, and satisfaction in the OC literature. Continuance commitment refers to the cost associated with leaving the team or how many options a person feels he/she has with regard to leaving. A person's perceptions of his or her alternatives to the present situation can be influenced by the person's skills, education, opportunities with the organization or team, tenure, investment in the current company's pension plan, or inability to relocate. Antecedents of continuance commitment to the organization have been found to be negatively related to performance and production. Normative commitment refers to a feeling of obligation; a person feels he/she *ought* to stay with the organization. People with high normative commitment believe they have a moral responsibility to remain with the organization. Normative commitment has been posited as developing because of early socialization experiences in the organization (Wiener, 1982) and because of reciprocity norms unique to an individual or culture (Meyer and Allen, 1997). Normative commitment is the most under-studied aspect of the three components of commitment. The following sections review findings from the commitment stream of research as it relates to antecedents and outcomes of commitment.

2.2.1 Antecedents of Commitment

Antecedents of commitment can be categorized into individual factors, team factors, and task factors.

Individual Factors

Little research was found that addressed the relationship between individual factors and team commitment. Kirkman and Rosen (1999) found that an individual's perceived empowerment of the team was positively related to both team commitment and OC. There is more research that examines the effect of individual factors on OC. Allen

and Meyer (1990) found that a "commitment norm" found in individuals in some cultures leads to normative commitment to the organization. Studies examining individualism/collectivism done by Hofstede (1980) support the cultural aspect of normative commitment. Coleman, Irving, and Cooper (1999) found that an individual's internal Locus-of-Control was related to his/her affective commitment and the external Locus-of-Control was related to continuance commitment. In a meta-analysis of OC, Mathieu and Zajac (1990) identified the following as significant variables related to OC: work ethic, initiative, age, gender, organization tenure, and education. Some of these individual factors may be significantly related to team commitment.

An individual's personality is also likely to influence commitment. No research work has been found that examines this particular relationship, but drawing on OC literature that finds work ethic and initiative (two traits related to personality) related to OC, a conclusion can be drawn that people with certain personality types may be more apt to commit to a team than others. The often-used NEO personality inventory is a five-factor measure of personality, including neuroticism, extroversion, openness to new experiences, agreeableness, and conscientiousness. Barrick, Stewart, Neubert, and Mount (1998) found both extroversion and emotional stability to be significantly related to team performance in a FtF team environment.

Task Factors

McGrath and Hollingshead (1994) stated that certain tasks may be better suited for virtual teams than others, but no empirical work has been conducted to test that hypothesis. Zaccaro and Dobbins (1989) found that an individual's liking for the task was significantly related to FtF team commitment. Research examining the relationship

between task features and OC has found perceived task competence, challenge, task autonomy, and satisfaction with the task (Mathieu and Zajac, 1990; Wech, Mossholder, Steel, and Bennett, 1998) to be significantly related to OC. Research in OC has found similar relationships between OC and perceived competence of others, supportiveness, and management receptiveness (Allen and Meyer, 1990; Mathieu and Zajac, 1990; Meyer and Allen, 1997).

Team Factors

Zaccaro and Dobbins (1989) examined the antecedents of team and organizational commitment and found significant support for the hypothesis that team commitment and OC could be predicted from satisfaction with team members and team work processes. These team work perceptions included aspects of confidence, trust, goal motivation, decision making, communication, adaptability, job competence, and helpfulness. Other factors found to be significantly related to OC, yet not examined in relationship to team commitment, include constructive conflict (Alper, Tjosvold, and Law, 1998; Wheelan and Hochberger, 1996), procedural justice/fairness (Allen and Meyer, 1990; Koorsgaard, Schweiger, and Sapienza, 1995), and substantive feedback (Allen and Meyer, 1990). Witt, Hochwarter, Hilton, and Hillman (1999) found the quality of social exchange among members of FtF teams and the perceived reciprocity of social exchange between team members was related to team commitment. In addition, Zacaro and Dobbins (1989) also found team cohesion to be a significant antecedent to FtF team commitment. Similarly, other studies have found a relationship between team cohesion and OC (Allen and Meyer, 1990; Klein and Mulvey, 1995; Mathieu and Zajac, 1990; Wech et al., 1998).

Finally, Steers (1977) found that one of the more important experiences affecting OC was a positive attitude among one's peers.

2.2.2 Outcomes of Commitment

Becker and his colleagues researched outcomes of team commitment. In Becker (1992), a positive relationship was found between team commitment and job satisfaction and a negative relationship between team commitment and intent to quit the organization. In Becker and Billings (1993), a distinction was made between locally committed employees (attached to the supervisor and/or team), globally committed employees (attached to top management and/or the organization), uncommitted employees (attached to neither local nor global foci), and committed employees (attached to both local and global foci); these categories were differentially related with intent to quit, job satisfaction, and organizational citizenship behaviors. Committed employees had the greatest job satisfaction and organizational citizenship behaviors and the lowest intent to quit. Uncommitted employees had the lowest job satisfaction and organizational citizenship behaviors and the highest intent to quit. Globally and locally committed employees did not differ on the three constructs of job satisfaction, organizational citizenship behaviors, and intent to quit, and fell between the committed employees and uncommitted employees. Klein and Mulvey (1995) found commitment mediated the effects of cohesion on team performance and Becker et al. (1996) found a positive relationship between internalization of supervisor's values and performance. Although empirical work supports a relationship between performance and commitment, Zaccaro and Dobbins (1989) suggest that this relationship might be moderated by the team's standards toward performance.

2.2.3 Summary of Commitment Literature.

Research on organizational commitment and FtF teams suggests that characteristics of the individual team member, as well as task features and team functions, can all affect an individual's commitment to his or her team. Based on the results of existing research, examining antecedents and outcomes of team commitment in a virtual environment will extend our knowledge of commitment and teams.

CHAPTER 3

3.0 RESEARCH MODEL AND HYPOTHESES

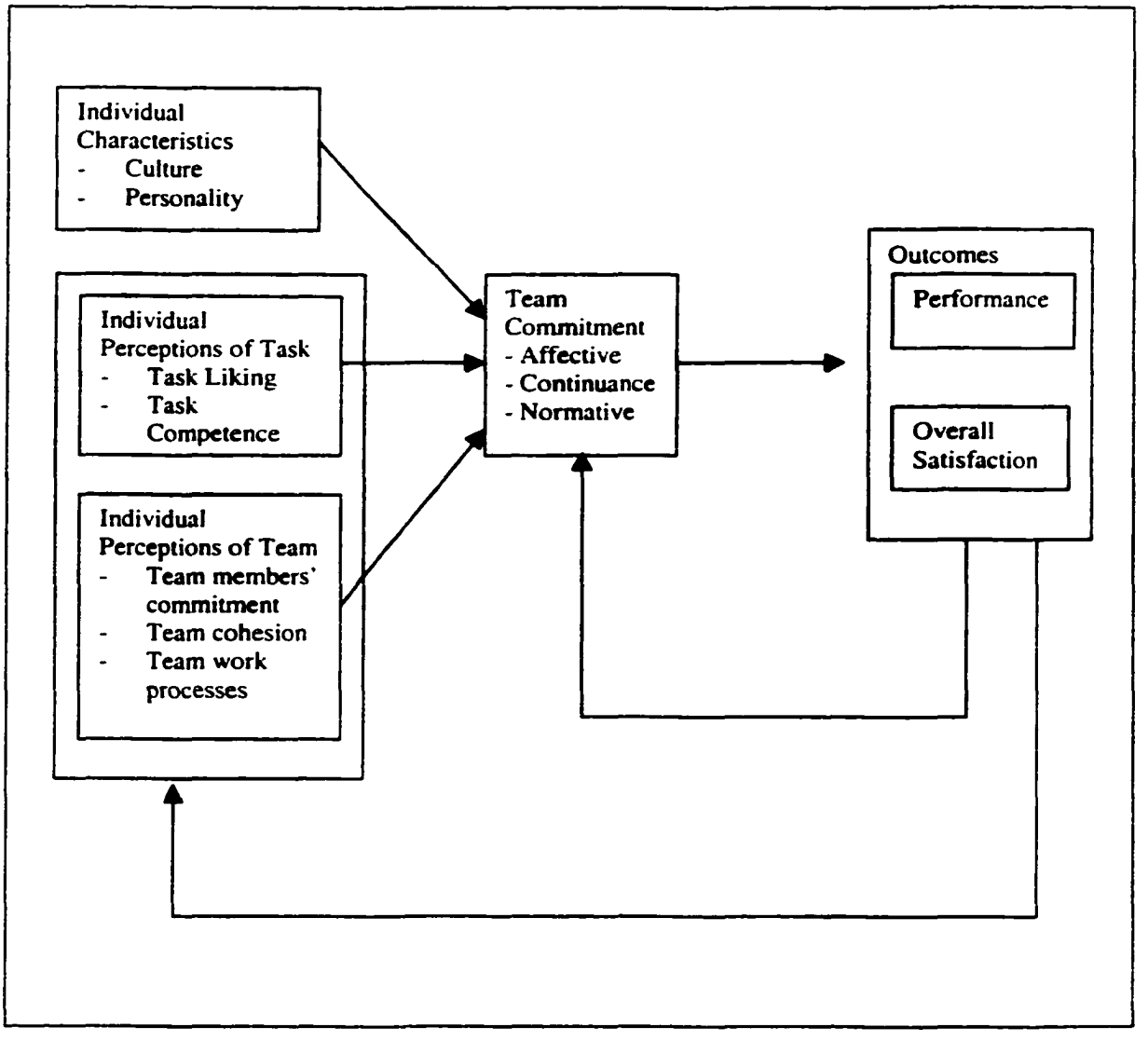
The purpose of this chapter is to define a research model, develop definitions of the relevant research constructs and variables, and develop testable hypotheses. The research model provides a conceptual framework that highlights the constructs of interest in the study.

The overriding theoretical framework for this study is the Input-Process-Output (I-P-O) model based on group interaction theories of McGrath (1984) and Hackman and Morris (1975). The I-P-O model is the model most commonly used by group researchers. Although not the only model that has been used in group research (Fulk and Collins-Jarvis, 1999), it will be used as the basis for this dissertation because this study specifically examines inputs and outputs of team commitment. Research on teams in general and commitment has found individual, task, and team variables to affect commitment to the team and outcomes.

3.1 General Research Model

Figure 1 provides the general research model for this study. Complete definitions of the constructs presented in the model are provided in Section 3.2, Research Constructs. The model illustrates a number of antecedents influencing team commitment, which in turn influences team outcomes. These outcomes may then affect perceptions and commitment over time. The model was developed based on research in organizational

Figure 1: Research Model



commitment (OC) and research on co-located teams that identified these variables as significantly explaining commitment variance. Importantly, examining changes in some antecedents and team commitment longitudinally will reveal whether team commitment changes with time, and if so, why. Based on research previously mentioned, it is posited that individual characteristics, self-perceptions related to the task, and self-perceptions of

team processes along with perceptions of others' team commitment influence one's commitment to a team. These are discussed in more detail below.

3.2 Research Constructs

The research constructs of primary importance to this study include various antecedents to team commitment: individual characteristics (culture and personality) that are likely invariant over time; self-perceptions related to the task (task liking and task competence) that may vary over time; self-perceptions of team functioning (team cohesion and team work processes) that may vary over time; and perceptions of other team member commitment, which likely also varies over time. In addition, outcomes of team commitment are examined including individual team members' satisfaction and team performance. Finally, the construct team commitment is both a dependent variable to antecedents and an independent variable affecting outcomes.

3.2.1 Antecedents

Individual construct antecedents include culture and personality. Culture is "the collective mental programming of the people in an environment" (Hofstede, 1980. p. 42). Culture is not considered a characteristic of an individual person, but rather it encompasses a number of people who were conditioned by the same life experience. Four dimensions of culture have been identified; one of those, individualism-collectivism, is examined in this study. Individualism is defined as the condition in which personal interests are accorded greater importance than the needs of a team, and collectivism is defined as the condition in which demands and interests of the group take precedence over the desires and needs of the individual (Wagner and Moch, 1986). Personality is defined broadly as the set of characteristics or qualities that distinguish an individual. Academic research has generally regarded personality as a five-factor

construct encompassing conscientiousness, openness to new experiences, agreeableness, neuroticism, and extroversion-introversion. Of these, three are examined in this study: conscientiousness - referring to an individual's level of responsibility, dependability, perseverance, and willingness to achieve; openness to new experiences - referring to an individual's level of curiosity, intelligence, originality, broad-mindedness, adventure seeking, and love of variety; and agreeableness – referring to an individual's courteousness, flexibility, good-nature, tolerance, and cooperativeness.

Constructs regarding perceptions of the task include task liking and task competence. Task liking is defined as the degree to which individuals like the project given to their team, as well as their liking for specific tasks within the project that are assigned to them by their team. Task competence refers to self-perceived ability to complete the project as well as ability to complete specific tasks assigned to the individual by the team.

Constructs regarding perceptions of the team include team cohesion, team work processes, and other members' commitment. Team cohesion addresses an individual's sense of belonging to, attraction to, and identity with a particular team. Team work processes is defined as perceptions of task-related team processes, which refer to how well the team worked together to complete its assignments and responsibilities. Other members' commitment is defined as a team member's perceptions of his or her other team members' commitment to the team.

3.2.2 Team Commitment

As discussed in Chapter 1, Team commitment is defined broadly as a "psychological bond" that ties the individual to the team. The three-component construct of commitment as defined by Meyer and Allen (1991) is used to define team

commitment: *affective* (emotional attachment, identification, involvement with team); *continuance* (awareness of costs associated with leaving the team); and *normative* (feeling of obligation to remain with the team).

3.2.3 Outcomes

Satisfaction reflects an individual's satisfaction with his or her team and the virtual team project. Performance is defined as how the team has performed the specific team task. Performance was measured at the individual level. First, performance was assessed at the team level, based on outcome quality. Outcome quality represents a subjective measure of quality of the team product as perceived by three different expert judges. Then, performance for each individual was calculated by using the team's outcome quality and peer ratings. Peer ratings were collected at the completion of the project. Students were asked to allocate points to each team member based on quality of contribution and participation in the virtual team project.

3.3 Research Hypotheses

The research model in Figure 1 permits the development of testable hypotheses concerning the impact of individual characteristics and perceptions of the virtual team and task on team commitment, and the impact of team commitment on outcomes of performance and satisfaction. Because it has been found that affective, normative, and continuance commitment at the organization level are differentially related to antecedents (Iverson and Buttigieg, 1999), the same is posited to occur at the team level. This section provides the rationale for the hypotheses as well as the specific hypotheses that were investigated. The discussion follows the organization of the research questions and first presents the hypotheses regarding outcomes, followed by hypotheses regarding the

antecedents of team commitment, and concludes with hypotheses regarding team development and team commitment.

3.3.1 Research Question 1 Hypotheses Regarding Outcomes

Research question 1 deals with outcomes of team commitment. Two outcomes were examined in this research – performance and individual satisfaction with the team. Becker (1992) researched outcomes of team commitment in a face-to-face (FtF) environment, finding a positive relationship between team commitment and job satisfaction. In addition, Becker et al. (1996) found a positive relationship between those committed to their supervisor and/or team and performance level. Affective and, to a lesser degree, normative OC have been found to be positively related to performance and satisfaction in the organization (Ashforth and Saks, 1996; Mayer and Schoorman, 1992; Meyer, Allen, and Smith, 1993), while continuance OC has been found to be negatively related to performance and satisfaction (Konovsky and Cropanzano, 1991; Meyer et al., 1993). Hypotheses 1 and 2 deal with the relationship between virtual team commitment and outcomes.

> *H1a:* There will be a positive relationship between affective team commitment and satisfaction.
>
> *H1b:* There will be a negative relationship between continuance team commitment and satisfaction.
>
> *H2a:* There will be a positive relationship between affective team commitment and performance.
>
> *H2b:* There will be a negative relationship between continuance team commitment and performance.

3.3.2 Research Question 2 Hypotheses Regarding Antecedents

Research question 2 deals with the antecedents of team commitment. Group theories suggest that combinations of group, task, technology, and organizational

contexts influence group processes. Organizational commitment studies have focused on personal characteristics, role states, job characteristics, team relations, and organizational characteristics as antecedents of OC. Hypotheses 3 through 8 test the influence of antecedents on team commitment.

At the individual level, culture is likely to play a part in commitment. One factor that has been found to differentiate cultures is level of collectivism (Hofstede, 1980). Highly collectivist cultures (e.g., Japan, Korea, Singapore) put the good of a team or family ahead of the individual. Highly individualist cultures (e.g., U.S., Great Britain, Australia) emphasize individual needs over those of the team or family. Normative commitment refers to a feeling of obligation to the group. Team members who put team needs and concerns over individual needs and concerns – a collectivist cultural trait – will have higher normative commitment to the team than those team members who put their own individual needs first.

> *H3:* Individuals who score high on the collectivist measure will have higher normative commitment to the virtual team than those who score low on the collectivist measure.

In addition, personality is a factor likely to affect commitment to a virtual team. A five-factor structure of personality has been developed and tested (Goldberg, 1993; McCrae, 1989; Digman, 1990). These five factors – extroversion (assertive, sociable); agreeableness (cooperative, trusting); conscientiousness (dependable, persistent); neuroticism (insecure, tense); and openness to new experiences (imaginative, intellectual) – are often called the "Big Five" (Costa and McCrae, 1985; Hogan, 1991). The three dimensions of the Big Five that are most often correlated to performance are conscientiousness, agreeableness, and extroversion. Of these, conscientiousness has

generally been found to be the strongest predictor of job-related criteria (Barrick and Mount, 1991, 1993; Hough et al., 1990), although other studies have found agreeableness to be the strongest predictor of job performance (Tett, Jackson, and Rothstein, 1991). Extroversion has been found to be important in jobs needing a high degree of social relationships (Barrick and Mount, 1991, 1993). While these studies all measure the personality–outcome relationship directly, a survey of teachers found personality was a significant predictor of affective commitment to teaching (Raju and Srivastava, 1994). Because of the leanness of technology, it is not expected that extroversion will influence team commitment. However, because working on virtual teams is still a relatively new experience for most people, openness to new experiences is posited to influence commitment to the virtual team. Therefore, it is posited that conscientiousness, agreeableness, and openness to new experiences will be positively related to affective team commitment. In addition, because the definition of conscientiousness refers to an individual's feelings of responsibility, it is also posited that conscientiousness will be related to normative team commitment.

H4a: Agreeableness will be positively related to affective team commitment.

H4b: Conscientiousness will be positively related to affective team commitment and normative team commitment.

H4c: Openness to new experiences will be positively related to affective team commitment.

Also at the individual level, perceived commitment of others was expected to have an impact on team commitment. Zaccaro and Dobbins (1989) state that standards of the group might mediate the relationship between commitment and performance. In the same way, the standards a team member perceives other team members to have may

affect his/her own commitment. If a team member perceives his/her teammates as being committed, he/she may feel an obligation to also be committed to the team. In addition, it is expected that individuals who perceive other team members as being committed will want to be committed to the team.

> *H5a:* An individual's perception of the commitment of other team members will be positively related to affective team commitment.
>
> *H5b:* An individual's perceptions of the commitment of other team members will be positively related to normative team commitment.

Task features of liking and competence were also investigated. Research on project teams has shown the importance of "fit" between task and team (Keller, 1994; Olson et al., 1995). Task liking has been found to be important in FtF teams, influencing affective commitment (Zaccaro and Dobbins, 1989). An individual's perception of his or her task competence has not been measured, but in studies of organizational commitment, job competence was found to be positively related to OC. Perceptions of task competence may be related to all three components of team commitment. Continuance commitment is related to the education and skills of an individual in a traditional organization. Individuals with lower educational and skill levels have been found to have higher continuance commitment (Allen and Meyer, 1990; Lee, 1992). Those with a perceived high level of competence may be more committed to the team because they want to work on a task where they are considered an expert. Individuals with a high level of perceived task competence may also experience higher normative commitment because of the belief that as an expert, they have an obligation to the team to complete the task or that other members are counting on them.

H6a: Task liking will have a positive relationship with affective team commitment.

H6b: Perceived task competence will have a positive relationship with affective team commitment.

H6c: Perceived task competence will have a negative relationship with continuance team commitment.

H6d: Perceived task competence will have a positive relationship with normative team commitment.

The functioning of the team was also expected to affect team commitment. Most studies on commitment, regardless of focus, have measured or discussed team cohesion as an important variable in the creation of commitment. Both organization studies (see, for example, Mathieu and Zajac, 1990) and FtF team commitment studies (see, for example, Zaccaro and Dobbins, 1989) have found a positive relationship between cohesion and commitment. While most research has looked at the relationship between cohesion and affective commitment, it has been found that an increase in work-group cohesiveness leads to feelings of greater involvement with the organization (Welsch and LaVan, 1981) and increased organizational citizenship behaviors (Kidwell, Mossholder, and Bennett, 1997). A perceived increase in work-group cohesiveness, along with increased organizational involvement and citizenship behaviors, is believed to be positively related to an individual's feeling that they *should* be committed to the organization (Wech et al., 1998). This same effect is posited as occurring in the measurement of team commitment.

H7a: An individual's perception of his or her team's cohesion will be positively related to affective team commitment.

H7b: An individual's perception of his or her team's cohesion will be positively related to normative team commitment.

The other aspect of team functioning is the work processes followed by the team. Prior research has shown that effective team interaction is a key ingredient in improving team outcomes such as satisfaction, idea quantity, and idea quality, as well as creativity (van de Ven and Delbecq, 1974). Chidambaram and Bostrom (1997) identified team processes of managing conflict, balancing socio-emotional and task requirements, communicating effectively, and being involved or committed to goals as well as being cohesive as important factors in creating a well-developed team, which in turn leads to a high-performing team. Finally, Steiner (1972) asserted that negative perceptions of team processes led to reduced motivation by team members to affiliate with the team and perform well. Based on this past research, the following hypotheses were developed.

> *H8a:* An individual's perception of his or her team's work processes will be positively related to affective team commitment.
>
> *H8b:* An individual's perception of his or her team's work processes will be positively related to normative team commitment.

3.3.3 Research Question 3 Hypotheses Regarding Team Development

Management literature has focused on team development since the 1950's. General consensus of the literature is that teams move through successive phases that can be described (Caple, 1978, Gersick, 1988). Most commonly described is a four-phase model of team development. These four phases include (1) issues of inclusion, identification of acceptable behavior, (2) a period of counterdependency and conflict, (3) development of trust, roles, and structure, and (4) work and productivity leading to termination of the team (Wheelan and Hochberger, 1996). These four phases have also been termed forming, storming, norming, and performing. In addition, several studies have found that computer-mediated teams begin with a task or production orientation, but

that as time goes on the teams show more cooperation and socialization leading to member-support and group well-being functions (McGrath, 1984; Walther, 1995). Based on team development research, it is expected that commitment to the team will change over time.

> *H9a:* Over the life of the team, individuals' affective commitment to the team will change.
>
> *H9b:* Over the life of the team, individuals' continuance commitment to the team will change.
>
> *H9c:* Over the life of the team, individuals' normative commitment to the team will change.

In addition, management literature has shown that team development and effectiveness can be manipulated through the use of certain techniques. This has been accomplished in a variety of ways. In some studies, teams were given additional specific behavioral instructions to increase self-disclosure among team members. Another manipulation had participants list similarities between members (for a high-cohesion treatment) or dissimilarities (for a low-cohesion treatment). To become effective, team members in a virtual environment need to trust that the other people on their team will be competent (Platt, 1999). In the same way that cohesion has been manipulated in FtF team environments, it is posited that team commitment can be manipulated in a global, virtual environment.

> *H10a:* Individuals on teams receiving a message that their teams were chosen based on characteristics associated with commitment will have higher affective commitment than those individuals who do not receive the message.
>
> *H10b:* Individuals on teams receiving a message that their teams were chosen based on characteristics associated with commitment will have higher normative commitment than those individuals who do not receive the message.

H10c: Individuals on teams receiving a message that their teams were chosen based on characteristics associated with commitment will have lower continuance commitment than those individuals who do not receive the message.

3.4 Chapter Summary

This chapter has presented the theoretical model guiding this research for investigating the impacts of individual characteristics, task, and team perceptions upon team commitment, and the impact of team commitment upon performance and satisfaction in a global, virtual environment. Drawing from empirical research on organizational commitment, as well as FtF team commitment, the antecedents and expected outcomes of team commitment in a virtual, global environment were identified. From empirical research in management, changes in commitment to the team over time were also hypothesized. A general research model was developed based on existing empirical research. Definitions of the research constructs were provided. Testable hypotheses regarding antecedents and outcomes of team commitment, as well as changes to team commitment over time, were developed. The following chapter discusses the research method used to examine the hypotheses. Additionally, measures of the various constructs are detailed.

CHAPTER 4

4.0 RESEARCH METHOD

This section discusses the research methodology that was used in this study. An experiment was designed to test the hypotheses. The experiment consisted of one task that was completed over the course of four weeks by global, virtual teams.

The study was conducted in two parts: (1) pilot testing and (2) the actual experiment. The pilot testing consisted of the development of the Lotus Notes technology forums and pre-testing of experimental procedures and questionnaire instruments.

This chapter describes (1) the research design; (2) questionnaire development and validation for the research variables (independent, dependent, and control variables); and (3) pilot testing of experimental materials and procedures. Actual questionnaire items can be found in Appendix A.

4.1 Research Design

This study used a repeated-measures design, capturing data from participants over a four-week period. One hundred twenty-six graduate students from six different universities in the United States, Europe, and Asia worked together on a project in virtual teams. Based on Hofstede's (1980) work, U.S. and European students were expected to be predominantly individualistic, while students from the Asian countries were expected to be predominantly collectivist. While team commitment has not been studied across cultures, organizational commitment (OC) theories developed in North America have

been found to be applicable in other countries (Buchko, Weinzimmer, and Sergeyev, 1998; Tao, Takagi, Ishida, and Masuda, 1998). Given that most virtual teams are project-based teams – teams that have zero history with just a small likelihood of working together again (Cohen and Baily, 1997; Jarvenpaa et al., 1998), the use of graduate students from various countries working together in teams is appropriate for the hypotheses tested in this study. A survey instrument was administered five times. Prior to any team interaction, cultural differences, personality, and propensity to commit to a team were measured. Perceived commitment of others, perceived team cohesion, perceived team work processes, and team commitment were measured at the end of every week during the four week project. Task liking, perceived task competence, and team outcomes were measured at the end of weeks two and four.

To manipulate commitment in half the teams, a message was sent to even-numbered teams before their first interaction with other team members. The message was worded to indicate that team members were placed together based on characteristics descriptive of committed team members.

4.2 Measurement of the Research Variables

The research model presented in Figure 1 and discussed in Section 3.2 contains independent and dependent variables. The independent variables include individual characteristics of culture and personality, perceptions of the task including task liking and task competence, and perceptions of the team including team cohesion, team work processes, and perceptions of other team members' commitment. Dependent variables include satisfaction with the team and performance. An individual's commitment to a team is both a dependent and independent variable depending on the hypothesis being

studied. In addition, certain variables were controlled in the study. The control variables included team make-up (size, culture-mix, gender-mix), technology, task, and whether a team received a manipulation message.

The unit of analysis was the individual. Subjective, self-report measures were taken to measure variables. Performance was calculated at the individual level, using both team performance and individual peer ratings to calculate an individual's performance rating.

Modification and development of questionnaire items followed steps outlined in prior MIS research on questionnaire development (Baily and Pearson, 1983; Moore and Benbasat, 1991; Straub, 1989). Questionnaire development was carried out in four stages: pretest, technical validation, pilot test, and full-scale administration. In the first stage, literature was searched for relevant measures. When possible, questionnaire items were taken from existing, tested measures; for some measures, additional items had to be created. During stage one, a Q-sort methodology was performed by colleagues at Indiana University to assess instruments on task liking, task competence, team cohesion, and team work processes. Their comments on item wording and meaning, along with descriptions of the constructs into which they placed cards, were used to improve the instruments. In technical validation, a subset of the study participants completed the survey (incorporating all constructs) in the researcher's presence. Participants were asked to comment on item wording and meaning, as well as survey length and ease of completion. During this stage, a sampling of non-U.S. students was used to assess ease of understanding by an individual whose first language is not English. The few problems that were identified were corrected. The students participating in the technical validation

stage did not participate in the pilot study or dissertation experiment. In the pilot test, another subset of the study participants was asked to complete the survey under realistic conditions (i.e., they were working in virtual teams to create a policy manual for the Global Associates Company). Reliabilities of the survey instruments for the pilot study were assessed using Cronbach's Alpha (Cronbach, 1951). Results of the pilot study are discussed in Section 4.3. Full-scale administration of the instruments occurred within the actual dissertation experiment.

4.2.1 Independent Variables

This experiment investigated the impact of seven antecedents on an individual's commitment to his or her team. All measures used a seven-point Likert scale ranging from Strongly Disagree to Strongly Agree. This section discusses the variables measured in this study, including definitions, operationalizations, and reported psychometric properties of scales from past research (if applicable).

Collectivism/Individualism

Collectivism/individualism was measured using a twenty-eight item measure taken from Wagner (1995), Triandis, Bontempo, & Villareal, (1988), and Earley (1993). While each of the three measures were found to have good reliability in the studies in which the measure was presented, reliability results could not be duplicated by others in subsequent studies. Because of the unreliability of all three of these scales, a combination of items was used to create the measure for this study. Although it was expected that the majority of Asian students would score high on collectivism while U.S. and European students were expected to score low on collectivism, this measure was

intended for individual measurement of collectivism/individualism rather than country measures.

Personality

Goldberg's (1999) International Personality Item Pool was used to obtain measures for conscientiousness, agreeableness, and openness to new experiences. In prior research, reliability Alphas of .81, .77, and .80, respectively, have been reported. Conscientiousness is a ten-item measure from the Neuroticism, Extroversion, and Openness Personality Inventory (NEO) (Costa and McCrae, 1985). A conscientious person is characterized as being responsible, organized, dependable, planful, willing to achieve, and persevering. Agreeableness is a ten-item measure from the NEO scales. An agreeable person is characterized as being courteous, flexible, trusting, good-natured, cooperative, forgiving, softhearted, and tolerant. Openness to new experiences was created for this study. In the NEO scale's measurement of Openness, a person open to new experiences is characterized as being imaginative, cultured, curious, intelligent, original, artistically sensitive, and broad-minded. Items in the NEO scales to measure openness to new experiences are geared heavily toward measuring interest in art appreciation and political leanings. For this study, a combination of the 'Adventurousness' scale (from the NEO scales) and the 'Variety-seeking' scale (from Cloninger's Temperament and Character Inventory (TCI) (Goldberg, 1999)) was used for the openness to new experiences measure. These two scales are more indicative and descriptive of the construct sought for this study. Reliabilities of .77 and .80 for adventurousness and variety-seeking, respectively, have been found. For the combined ten-item measure of openness, six items were taken that appear in both the NEO scale

and the TCI scale, two items came from just the NEO scale, and two items came from just the TCI scale.

Task Liking

A thirteen-item scale was derived to measure task liking. One item was taken from Zaccaro and Dobbins (1989), three items were taken from Wagner and Morse (1975), and the final nine items were added by the researcher to more fully measure the task-liking construct. Task liking included not only liking for the overall task itself, but also liking for specific tasks that an individual may have been assigned to do by his or her team members.

Perceived Task Competence

Task competence was measured using seven items from the Wagner and Morse (1975) competence scale, as well as two additional items created specifically for this study by the researcher. Reliability for the full Wagner and Morse scale was .96. However, this full scale was not used in this research for two reasons: (1) Some items did not fit with a team-based, virtual, asynchronous environment, and (2) some items were removed after feedback from the Q-sort and technical validation steps of the questionnaire development process indicated the item-wording was confusing. Task competence included perceptions of competence to complete the task overall along with competence to complete specific tasks assigned to the team member by his or her team members.

Perceived Commitment of Other Team Members

Developed by the researcher for this study, perceived commitment of other team members was measured with a three-item scale. Team members rated each of their team

members' commitment based on their own perceptions. In addition, peer evaluations at the end of the project were used to assess perceived commitment of team members.

Team Cohesion

Team cohesion was measured using items primarily from Dobbins and Zaccaro (1986), Stokes (1983), and Wech et al. (1998). Items were taken from all three scales based on applicability to an asynchronous team format. A fourteen-item scale was used to measure perceived team cohesion. Five items were taken from Dobbins and Zaccaro (1986), five items from Stokes (1983), and three items from Wech (1998), although some items could be found on more than one of the above scales. In addition, one item was added to this scale based on Q-sort results. This one item came from Taylor and Bowers (1972).

Team Work Processes

Work processes were measured using six items from Taylor and Bowers' Measures of Group Process (1972). In addition, three items from the cohesion scales listed above were added to the work process measure because of Q-sort results. Finally, four items were added by the researcher to create a thirteen-item measure.

4.2.2 Dependent Variables

Two outcome variables, plus team commitment, were investigated as dependent variables in this study. All measures used a seven-point Likert scale ranging from Strongly Disagree to Strongly Agree.

Team Commitment

Team commitment was measured using the Meyer and Allen (1991) measure of commitment. It is an eighteen-item scale, with six items each for normative commitment, continuance commitment, and affective commitment. Several studies have used this

three-component measure of commitment. Median reliabilities for the affective, continuance, and normative commitment scales are .85, .79, and .73, respectively. In almost all cases, reliabilities of over .70 have been reported (Meyer and Allen, 1997). Again, it should be noted that an individual's commitment to his or her team will be explored as both a dependent and independent variable, depending on the hypothesis being evaluated.

Overall Satisfaction

Overall satisfaction will be measured with an eleven-item measure. Four items were taken from the Hackman and Oldham (1980) scale with seven items added by the researcher. Overall satisfaction included questions about satisfaction with the team, the project, and the form of technology used.

Performance

Performance was measured at the individual level. Team level performance was first evaluated based on a qualitative performance rating designed by Burke and Chidambaram (1999) specifically for the task used in this research. The performance rating form designed by Burke and Chidambaram was also evaluated by corporate executives in Human Resource departments and found acceptable. Each section of the policy document created by the teams was rated on creativity of ideas, realism/practicality, comprehensiveness, positive tone, and clarity/content. For this experiment, three expert judges rated each team's policy document using the performance rating form developed by Burke and Chidambaram. Inter-rater reliability was 83.5% using the average item-total correlation method. Individual performance was then calculated by multiplying the team's performance score by the subject's peer rating score.

Peer rating scores were calculated at the end of the project. Each team member was given 100 points to allocate to all team members. No two team members were to receive the same number of points and the total for the team had to equal 100. After all team members had entered their peer ratings, ratings were added up for each subject to determine their peer rating score.

4.2.3 Control Variables

The four control variables in this study were team composition, technology, task, and manipulation message. They are described in more detail below.

Team Composition and Subjects

Past research examining differences between computer-mediated teams and face-to-face (FtF) teams has found proximity, diversity, and size can affect outcomes (Burke and Chidambaram, 1995; Chidambaram and Kautz, 1993; Daily and Steiner, 1998; Fjermestad et al., 1995; Galegher and Kraut, 1994; Savicki et al., 1998). For this reason, these three factors were controlled across all teams.

Graduate students in business from the six participating schools were assigned to four- or five-member, fully dispersed teams. In addition to dispersion, an objective of team assignment was to have, as much as was possible, a balanced representation of individualism/collectivism and a balanced representation of gender. Participants included 61 students from Brunel University in Great Britain (31 female, 30 male), 30 students from City University in Hong Kong (12 female, 18 male), 21 students from Indiana University in the United States (13 female, 8 male), 15 students from Chun-Yuan Christian University in Taiwan (3 female, 12 male), 11 students from Hebrew University in Israel (5 female, 6 male), and 3 students from Yonsei University in Korea (2 female, 1

male) for a total of 141 students (66 female, 75 male). Students were enrolled in graduate courses in management or information systems.

Teams were randomly assigned. Because of the large number of students participating from Brunel University (BU) in Great Britain, 30 of the 31 teams had two members from BU (the 1st team had just one BU member). Participants from BU were instructed that all contact with team members (including their fellow Brunel team member) must be through Lotus Notes only. This was reiterated throughout the course of the project. Examination of the actual message content posted in team discussion forums along with feedback from the pilot study indicates that team members from Great Britain followed this rule and did not meet with their Brunel team member in a FtF manner.

Team member one on each team was a BU female. Team member two on each team was a BU male. Team member three was a student from City University in Hong Kong. Team member four was either a student from Chun-Yuan Christian University in Taiwan or Yonsei University in Korea. Team member five was a student from either Indiana University in the US or Hebrew University in Israel. Although randomly assigned, team members three through five were assigned so that each team would have at least two females. Because there were not enough students to make 31 five-person teams, some teams had only four members. For example, since there were only 30 BU men, the first team had only four members; they did not have a team member two. Because there were 30 Hong Kong students, one team did not have a team member three. Teams were originally set up so that each team had four or five members. Because of students dropping courses prior to the project actually beginning, but after teams were formed, the actual number of participants in the project was 126 (60 female, 66 male).

The use of student subjects in research has been debated for many years (see, for example, Gordon, Slade, & Schmitt, 1986; Locke, 1986; Greenberg, 1987). The major issues brought up in arguing against using student subjects include: (1) low generalizability of the findings to actual work settings; (2) students' lack of motivation to perform well; and (3) whether students have the necessary knowledge to perform real organizational tasks. It is believed that in this study, while there may be some justification for external validity concerns, these concerns are minor. First, research on point one has found that student subjects can be used to provide adequate information on organizational topics (Bettenhausen, 1991; Dipboye and Flanagan, 1979; Hughes & Gibson, 1991; Schwenk, 1982). Second, the lack of motivation on the part of students was offset by ensuring that the virtual team project accounted for between five and fifteen percent of the student's grade in class. Finally, by using graduate students rather than undergraduates, it was assumed that the majority of the students participating in the project would have work experience, and thus the necessary knowledge to complete the task.

Task

Some task types (as defined by McGrath, 1984) may be better suited for virtual work. The type of task undertaken by a team can affect both the team interaction and outcomes (Benbasat & Lim, 1993; Dennis & Gallupe, 1993; McGrath, 1984). Because team commitment could possibly be influenced by type of task (Lipnack and Stamps, 1997), this study will employ only one type of task across all teams. When choosing a task for this study, care was taken to select first, a task that would be appropriate for a virtual, asynchronous environment, and second, a task that participants would find salient

to their learning process. Relevant characteristics of tasks for measuring the impact of various antecedents on team commitment in a virtual, asynchronous environment included the following:

1: The task needed to be challenging enough for graduate students, yet would not require any special skill or prior preparation to complete.

2: The task should be relevant to the participants to ensure active participation and motivation, as well as to enhance realism.

3: The task should be easily understandable by the intended student population taking into account that several students would be non-US students whose first language is not English.

4: The task should be longitudinal with repeated decision making involved.

5: The task should be one that had to be completed collaboratively rather than a task that could easily be broken into separate pieces for team members to work on individually.

6: The task should be easily broken into four deliverables and lengthy enough to be spread over four weeks. Each of the four deliverables should build on the previous deliverable rather than being four independent deliverables.

The Global Associates Case (Burke and Chidambaram, 1999) was chosen. In the case, each team develops a policy manual, "the purpose of which is to introduce newly hired managers to the organizational culture and to the standards of practice employed throughout the organization" (Burke and Chidambaram, 1999). This task may be described as falling in Quadrant 2 of McGrath's Task Circumplex (1984), i.e., a decision-making task with no right answer. A deliverable was due at the end of each of the four weeks of the project. For the first deliverable, teams decided on a list of issues that needed to be addressed in their final document. In the second deliverable, students decided the best way to present the information (in outline form). In the third week, students began to "flesh out" the outline. The final deliverable was the completed policy

document. The Global Associates case, as well as the time line for deliverables and survey dates can be found in Appendix B.

Technology

The technology used by the teams in this study was Lotus Notes®. Teams met only through Lotus Notes®. Lotus Notes® is "a combination document creator and indexer, database generator and manager, and messaging platform. It enables asynchronous collaboration by introducing a measure of structure that passively facilitates the process of sharing, organization and navigating information through an interactive electronic space that serves as a common repository for contributions" (Vandenbosch and Ginzberg, 1996-1997, pg. 67). Each team had a discussion database which facilitated team discussion through the use of several structuring mechanisms. A categorization scheme allowed discussion by topics and subtopics and was recorded through headings and subheadings by Lotus Notes®. Responses to messages from others could be attached to the original message through another structuring mechanism. Messages could be sorted by author, date, or topic. Each message posted to the Lotus Notes® discussion automatically included the date, time, and author of the message.

In addition to the team discussion forum, each individual also had access to a dropoff forum for purposes of completing surveys.

Access to the Lotus Notes discussion and dropoff forums was via the World Wide Web for all participants. Instruction manuals were given to all participating students to provide directions on how to access and use both forums. Instructions given to the students in the Lotus Notes Packet can be found in Appendix B.

Manipulation

To assess whether commitment to a team could be manipulated, members of half the teams received a message at the start of the virtual team project. This message reinforced aspects of commitment and suggested that fellow team members possessed characteristics found in a committed individual. The message read:

> Greetings Team n!
>
> Welcome to the virtual team project. Several businesses have expressed an interest in the results of this study and will be receiving summaries of the work processes followed by some teams. To facilitate this, your team has been carefully selected based on your responses in the Intro Survey. Members of this team were placed together because of apparent similarities in your values, beliefs, and loyalties, and the likelihood that you share similar goals. It is believed that you all will work well together and form a cohesive unit as a model team. Have fun with the project.

Although the message indicated students' teams were carefully selected, in reality all team assignments were random (as described in Section 4.2.3). In past research in social psychology, it has been found that manipulations indicating increased similarities between team members could increase team cohesion (Aderman, Bryant, and Donelsmith, 1978; Hoogstraten and Vorst, 1978; Turner, et al. 1992). By comparing fellow team members favorably to characteristics associated with committed individuals, it was expected that commitment to the team could similarly be manipulated.

4.3 Pilot Study Results

The pilot study was conducted for four main purposes. The first was to have a preliminary run of the procedures to be used in the actual dissertation. The second was to further refine measurement scales. The third purpose was to have a preliminary look at model fit and examine the hypotheses in a preliminary manner. Finally, the last purpose

was to determine the appropriateness of the task for this study. The following sections describe the pilot in more detail and the results obtained.

4.3.1 Description of Pilot Study

The pilot study was conducted over three weeks. It involved students from two sections of Managing and Behavior in Organizations – a junior level class at Indiana University. Participation and quality of work in the pilot study project accounted for 10% of a student's course grade. Originally seventeen teams of four students and one team of five students were created. Because of three late drops, three of the four-person teams ended up with just three team members. A total of 70 students participated in the project. Because the project lasted only three weeks, the third deliverable (fleshing out the outline) was dropped for the pilot. The virtualness of this team project was emphasized to the students. Although students were on teams with class members that they might see each day in class, they were instructed that all discussion regarding this project was to take place through the Lotus-Notes forums *only* and that in-person or phone meetings were forbidden.

Students were given a questionnaire before their teams were formed. This introductory survey measured collectivism/individualism, propensity to commit, and demographic data (age, gender, year in school, nationality). An attempt was made to place one foreign student in each team. However, because of the low number of foreign students, it was not possible for every team to have a foreign student. Sixty-six students completed the introductory survey. In the pilot study, no manipulation occurred.

After students were placed in teams, they had one week to complete deliverable one. At the conclusion of deliverable one, they filled out survey one. Sixty-four students

completed survey one. The students then had one week to complete deliverable two. At the conclusion of deliverable two, they filled out survey two. Sixty-one students completed survey two. Students then had one week to complete the policy document. At the conclusion of the project, students filled out survey three. Fifty-nine students completed survey three. Forty-six students completed the introductory survey and all three of the subsequent surveys.

Two weeks after the project ended, a focus group session was conducted to obtain student reaction to their virtual team project. Students were assured that their responses in the focus group session would not be reported to their instructor and that responses could not alter their grade in any way. Among other things, it was determined that the students had taken the virtualness of the project seriously and no one reported meeting with team members in person or by phone. This proved important for the actual dissertation study when it became obvious that two Brunel University students would be on each virtual team. Students also reported feeling the task was a collaborative task and only two of the eighteen teams reported splitting the work between the four individual team members and then pasting results together at the end.

4.3.2 Results

Procedures

The first purpose of the pilot was to have a preliminary run of the procedures involved. A few glitches were encountered with the software, but these were quickly fixed. These generally involved access problems and editing functions. For example, at the very beginning some students were "frozen out" and unable to access their team forums (even though they had been able to complete the introductory survey). Although

the cause of this problem was never found, it was fixed by "refreshing" all the teams through Lotus Notes. There was also some confusion about the actual contents of each deliverable. For example, some teams had almost completed the full document for deliverable one rather than just creating a list of ideas. For the actual dissertation experiment, a more detailed explanation of each deliverable was given in the Lotus Notes packet received by each participant. The actual timetable of deliverable and survey due dates worked well.

Scales

The second purpose of the pilot study was to validate existing and designed scales. From reliability results, items from scales could be deleted if they proved not to be reliable. The following section reviews changes to the scales as well as reliability alphas. Although items for pilot study analysis were deleted, all items in a scale were added back for the actual dissertation experiment. This decision was made because subjects in the pilot study and subjects in the actual dissertation experiment were from different populations.

Collectivism/Individualism: Measured only at time 0, an eight-item scale from Earley (1993) was used. This scale was chosen based on perceived balance between number of items asked and reliability. Reported reliability of the scale was .91 (Earley, 1993). However, the alpha for this measure was just .46 in the pilot study. One explanation for the low reliability is that survey respondents in the pilot study were primarily from the US (85% of respondents) and as undergraduates had little or no work experience. Upon further investigation, it was found that reliability when using the Earley (1993) scale has been low in several studies. Because of this, a new scale using a

combination of items from Wagner (1995), Triandis et al. (1988), and Earley (1993) was created for use in the actual dissertation experiment.

Personality: Personality was not added to the list of possible antecedents of team commitment until after the pilot study.

Task Liking: Originally a thirteen-item scale, six items were retained for analysis in the pilot study based on factor analysis and reliability tests. A full list of items removed from each scale can be found in Appendix C – Pilot Study Results. Reliability indices at times 1, 2, and 3 ranged from .947 to .957 for the six remaining items.

Task Competence: Originally a nine-item scale, two items were removed based on factor analysis and reliability tests to analyze results of the pilot study. Reliability indices for the three time periods ranged from .881 to .913 for the remaining seven items.

Team Cohesion: Originally a fourteen-item scale, three items were removed based on factor analysis and reliability testing. Reliability indices for the three time periods ranged from .890 to .936 for the remaining eleven items.

Team Processes: Originally a thirteen-item scale, three items were removed after factor analysis and reliability tests. Reliability indices for the three time periods ranged from .899 to .927 for the remaining ten items.

Team Commitment: Because these were established scales, no changes were made to them. Reliability indices at time three for normative, continuance, and affective commitment were .899, .692, and .852, respectively.

Overall Satisfaction: Originally an eleven-item scale, one item was removed based on results of factor analysis and reliability testing. Reliability indices ranged from .917 to .948 for the three time periods of the study.

Performance: Performance was measured using the Burke and Chidabaram (1999) qualitative performance rating by one person. In the pilot study, an individual performance scale was calculated by multiplying team score by peer evaluation score.

In addition to determining alphas for the scales, factor analysis was conducted to determine if scale items loaded as expected. Loadings, for the most part, were as expected -- these results can be seen in Appendix C.

Hypothesis Examination

The pilot study provided a preliminary test of the hypotheses. In particular, it was important to note if the OC measures developed by Meyer and Allen (1991) could be adapted to team commitment. Factor loadings were high and as expected for the commitment measures. Reliability for these measures was also high with the one exception of continuance commitment at time two.

In a preliminary look at hypotheses, some hypotheses were supported while others were not. Briefly, results indicated: Affective and normative commitment were positively related to satisfaction, and continuance commitment was negatively related to satisfaction. Task liking and team cohesion were positively related to affective commitment. Team cohesion and team work processes were positively related to normative commitment. Full results of the pilot are presented in Appendix C.

Appropriateness of Task

From the results of the focus group session that took place two weeks after the completion of the virtual project team, the Global Associates, Inc. task is appropriate for this type of environment. The primary question asked of the teams was whether they simply broke the task up into individual sections for each person to work on or whether

there was true collaboration among team members to complete the task. The majority of teams reported that they felt their teams truly collaborated in creating the final document. Only two teams reported simply breaking up the task into pieces for each team member and then combining all pieces at the end. The majority of the teams also felt they made decisions as a team. As a collaborative writing task, it is believed that the Global Associates, Inc. task mimics tasks performed by virtual project teams in a working environment.

4.4 Chapter Summary

This chapter described the rationale underlying the research design, and the sample population, task, and information technology selected for the study. In addition, the methodology followed to develop the survey instruments for each construct was described in detail. Then the steps followed to validate the instruments were described and evidence about the reliability and construct validity of the instruments was provided. Besides independent and dependent variables, variables controlled in the study were described and the procedures taken to control variability of team composition, task, technology, and manipulation message were described. The chapter concluded with a description of the pilot study that was undertaken before the actual dissertation experiment. The pilot study section details the rationale for conducting the pilot study as well as results. The next chapter describes how the data were analyzed to answer the study's research questions and hypotheses.

CHAPTER 5

5.0 ANALYSIS

This chapter describes the analytical procedures used to evaluate the experimental data and reports the results from those analyses. The chapter begins by briefly describing characteristics of the subject population. In the following three sections, the methodology and results of the statistical analyses are presented. The Statistical Package for the Social Sciences (SPSS) program, version 9.0 for Windows, was used to conduct the primary statistical analyses for this study. First, the methods and results for the scale assessments are reported, including factor and reliability analyses for all scales used on the questionnaire. This section also includes descriptive data (means and standard deviations) of the variables measured for the experiment. Second, the methods and results of ANOVA testing on manipulated teams versus non-manipulated teams are provided. Third, the methods and results of the statistical analyses to investigate the hypotheses described in Chapter 3 are presented. Two analytical techniques were used in testing the hypotheses: hierarchical multiple regression and univariate analysis of variance. It is important to note that for most hypotheses, two or four periods of time were analyzed as part of this design. This section reports results for each time period in which data were collected. However, any conclusions drawn must recognize the broader picture by considering results from all time periods together. Chapter 6, Discussion, will take this broader perspective by integrating and interpreting the analyses across all time periods. Chapter 5 concludes with a summary.

5.1 Descriptive Data about Subjects

A total of 126 graduate students participated in the experiment. An Introductory Survey administered to subjects assessed their collectivism/individualism, personality traits, and perceived commitment to past teams in which they had participated. In addition, demographic data including work experience in months, age, and citizenship were collected. Gender data were collected from professors of the courses before the experiment began. The sample was almost evenly split among gender lines. Of the 126 graduate students participating, 47.6% were female (n=60) and 52.4% were male (n=66). Because some subjects dropped the course after being placed on a team, not all teams had four members. Six teams were comprised of three members, twelve teams were comprised of four members, and twelve teams were comprised of five members.

Table 5-1: Gender Data
(All participants gender provided)

Gender	n	Percent
Male	66	52.38%
Female	60	47.62%

One hundred twelve participants completed the Introductory Survey for a response rate of 88.9%. Work experience for the sample ranged from 0 months to 300 months. Average months worked was 55.7 months (or approximately 4 ½ years work experience). Thirty eight percent of the sample was under 25 years of age. the remaining 62% were 25 or older.

Table 5-2: Work Experience Data

(Mean = 55.48 months)
(five respondents from the Introductory Survey did not complete this question.)

Work Experience	n	Percent
Low (Less than 18 months)	34	31.78%
Moderate (18 months to 59 months)	36	33.64%
High (5 years or more)	37	34.58%

Table 5-3: Age Data

(one respondent from the Introductory Survey did not provide age data)

Age	n	Percent
Under 25	42	37.84%
25 or Over	69	62.16%

Citizenship data were collected, rather than only looking at the country in which the school is located, because students (particularly those in Europe) will often travel outside their own country to attend school. Of the 112 respondents to the Introductory Survey, 48 students (or 42.9%) were classified as citizens from the Far East (China, Taiwan, Hong Kong, Korea); 31 students (27.7%) claim European citizenship (Great Britain, France, Spain); fourteen students (12.5%) were classified as citizens from Eastern Europe or the Middle East (Israel, Greece, Bulgaria, Bahrain, Armenia); eighteen students (16.1%) were North American citizens (US); and one student was a citizen from Africa (Nigeria). Using Hofstede's (1980) collectivism-individualism scales, students from the US, Great Britain, France, Spain, and Israel are expected to be more

individualistic, while students from Greece, Bulgaria, Bahrain, Armenia, China, Taiwan, Hong Kong, and Korea are expected to be more collectivistic. Because African countries have not been included in collectivism-individualism research, the Nigerian student is difficult to place; however, by placing him based on his school (Brunel University in Great Britain), he is placed with the individualistic group.

Table 5-4: Number of Subjects at Participating Schools

School	n (M/F)	Percent
Brunel University (Great Britian)	53 (25/28)	42.06%
City University (Hong Kong)	26 (16/10)	20.63%
Indiana University (US)	21 (8/13)	16.67%
Chun-Yuan Christian University (Taiwan)	13 (10/3)	10.32%
Hebrew University (Israel)	10 (6/4)	7.94%
Yonsei University (Korea)	3 (1/2)	2.38%

Table 5-5: Citizenship Data

Citizenship	N
Great Britain	29
Hong Kong	22
United States	18
China	11
Taiwan	11
Israel	8
Korea	4
Greece	3
Armenia	1
Bahrain	1
Bulgaria	1
France	1
Nigeria	1
Spain	1

Table 5-6: Collectivism-Individualism Split Based on Country of Origin

Collectivism/Individualism	N	Percent
Collectivistic (Hong Kong, China, Taiwan, Korea, Greece, Armenia, Bahrain, Bulgaria)	54	48.21%
Individualistic (Great Britain, US, Israel, France, Nigeria, Spain)	58	51.79%

Finally, the response rates for each survey were satisfactory. As mentioned, 88.9% of participants (n=112) completed the Introductory Survey. Survey one, administered at the end of week one of the experiment, was completed by 111 students (or 88.1%). Surveys two, three, and four were administered at the end of weeks two, three, and four and had response rates of 110 (87.3%), 106 (84.1%), and 103 (81.7%), respectively.

5.2 Scales Assessment

This section reviews both the methodology and the results of scale analyses. The commitment scale used had been previously developed, but all other scales used were modified from existing scales or created specifically for this experiment. Although the pilot study indicated that some items could be removed to create a more robust scale, all items were included for the actual experiment. This was done because of the possibility that results from the pilot might not generalize to the experiment participants. The pilot study sample population was different from the sample population used in the actual experiment (one culture, undergraduates at one university versus multi-culture, graduates at several universities in several time zones).

5.2.1 Scale Methodology

Reliability analysis was used to assess the stability of scales developed, modified, or previously existing for this study. Cronbach's Alpha was used to assess scale reliability. For each variable, a scale item was removed if by doing so it would increase the reliability of the respective scale. This was done for each time period for which data were collected for the variable. After all time periods were assessed, a check was made to determine differences in the resulting scale items for each time period. If they differed, an overall determination was made to determine the "best" scale across all time periods. This was done by determining what combination of items provided the highest reliability for the scale across all four time periods.

Exploratory factor analysis (EFA) was used to assess construct validity for the variables considered in this research. Based on previous research that had used the same scales, as well as the pilot study results, it was anticipated that the scale items would load on the expected variables. Items deleted per the reliability analysis were not included when conducting the factor analyses. A criterion of .50 was used for factor loadings – items with a factor loading of .50 or greater (on a single factor only) were considered to be acceptable (Tabachnik and Fidell, 1995); any items failing that criterion were considered for deletion. Before deleting an item based on the results of the EFA, another reliability test was run. If reliability was adversely affected (reliability fell below .70 (Cronbach, 1951)), the item was not automatically deleted from consideration. This occurred only once, in the personality scale. As discussed later in this section, the decision was made to retain items to keep reliability above .70.

5.2.2 Scale Results

This section presents the scale results data. Both exploratory factor analysis (EFA) and reliability analysis were used to help validate the scales used in this study. Level of collectivism versus individualism and personality were measured at time 0 (Introductory Survey) only. These two attributes are unlikely to change over time. Other antecedents measured included task liking and perceived task competence, which were measured at times two and four only. Perceived team cohesion and perceived team work processes were antecedents measured at every time interval. These four antecedent variables were expected to change over time. Commitment to the team was measured at every time interval. The outcome factor of satisfaction was measured at times two and four only. Performance was measured at time four only. Factor analysis and reliability results are presented in tabular format in Appendix D.

Collectivism-Individualism

As indicated in Appendix A, the collectivism-individualism scale was comprised of 28 items. When factor analysis was run on these 28 items, eight factors had eigenvalues above one. Analyzing the results, it became evident that the first five factors were comprised of the 20 items from the Wagner (1995) collectivism-individualism scale; the other eight items made up the last three factors. Reliability analysis showed that the reliabilities of these last three factors were well below an acceptable range (.37 - .44). Because the Wagner (1995) scale has been used previously and because the last three factors were unreliable, the decision was made to begin analysis using the 20-item, five-factor Wagner scale. Further analysis showed that two of the five factors of the Wagner scale were relevant to this experiment. These two factors were given the same

names as those defined by Wagner: (1) espousal of norms about subordination of personal needs to team interests and (2) value attached to working alone versus working in a team. These two factors had high reliability (.82 and .77, respectively) and factor loadings were above .60 for all items. Factor analyses and reliability data are presented in Appendix D-1. Descriptive statistics on the collectivism-individualism scale (means and standard deviations) are also provided in Appendix D-1. In addition to descriptive data on all survey respondents, information on the sample receiving the manipulation message versus the sample not receiving the manipulation message is included.

Personality

Personality was measured using the ten-item NEO scales for agreeableness and conscientiousness. Openness to new experiences was measured with a ten-item scale that combined Cloninger's variety-seeking scale and the NEO adventurousness scale. Items were removed if, by doing so, reliability improved. Once the scales were parsed down from the original ten items each, factor analyses were run. Because some items did not load on their factor, more items were deleted, and reliability analyses were rerun. In the final iteration, conscientiousness was a seven-item scale (reliability = .78), agreeableness was a seven-item scale (reliability = .70), and openness to new experiences was an eight-item scale (reliability = .81). Two items in the agreeableness scale cross-loaded on both agreeableness and openness to new experiences, but by deleting those two items reliability fell to an unacceptable level of .65. Because a reliability of at least .70 is desired and the two items loaded equally well on the two scales, the decision was made to keep the two items in the agreeableness scale. Factor analyses, reliability data, and descriptive statistics are presented in Appendix D-2.

Task Liking

Task liking was measured using a thirteen-item scale derived from existing scales as well as new items added by the researcher. After running reliability tests, a five-item task liking scale was found to provide the highest reliability as well as being parsimonious. Factor analysis was run, and the five items loaded together on one factor. Factor analysis, reliability data, and descriptive statistics for task liking are presented in Appendix D-3.

Perceived Task Competence

Task competence was measured using seven items from a scale developed by Wagner and Morse (1975) and two items added by the researcher. After running reliability tests, a five-item task competence scale was found to provide the highest reliability. Factor analysis was run, and all five items loaded together on one factor. Factor analysis, reliability data, and descriptive statistics for perceived task competence are presented in Appendix D-4.

Perceived Team Cohesion

Team cohesion was measured using a fourteen-item scale derived primarily from three existing scales. Team cohesion was measured at all four time periods of the experiment. Reliability analysis was conducted at all four time periods and an eight-item scale was found to give consistently high reliability for all four time periods. Factor analysis was run, and the eight items loaded on one factor. Factor analysis, reliability data, and descriptive statistics are presented in Appendix D-5.

Perceived Work Processes

Work processes were measured using a modified version of the existing Taylor and Bowers (1972) measure with items added. Work processes were measured at all four time periods. Reliability analysis was conducted and a seven-item scale was found to provide consistently high reliability across all four time periods. Factor analysis was run, and the seven items loaded on one factor. Factor analysis, reliability data, and descriptive statistics are presented in Appendix D-6.

Antecedent Summary

Factor analyses were then run on the four antecedents of task liking, task competence, team cohesion, and work processes to determine if these were separate constructs. Because task liking and task competence data were collected at times two and four only, the factor analyses were run at these two time periods only. Results are shown in Appendix D-7. As can be seen, the items from these four antecedents did *not* load onto four factors. While the task liking and task competence items did load on their own factors, the team cohesion and work processes items loaded on one factor only. A factor analysis was run with just these two constructs for all four time periods, but the results were the same – the team cohesion and work processes items loaded together onto one factor. Two explanations are possible. It could be that participants in a virtual team are not able to distinguish between team cohesion and work processes in a virtual environment as they can in a face-to-face (FtF) environment. Another explanation could be that all questions pertaining to team cohesion and work processes emphasized the team aspect. Given that, participants may have focused on just the "team" aspect,

resulting in a single "teamwork" factor. It was decided to use only the construct of perceived work processes.

Perceived work processes were chosen over team cohesion for a variety of reasons. According to McGrath's (1991) TIP theory, teams serve three functions: production, member-support, and group well-being. All three functions are necessary for an effective team. Several studies have found that computer-mediated teams begin with a task or production orientation, but that as time goes on the teams show more cooperation and socialization leading to member-support and group well-being functions (McGrath, 1984; Walther, 1995). In addition, Chidambaram (1996) found that computer-supported teams needed a longer period of time to develop relations with their team. The level of interaction in virtual project teams that exist for only a short while does not reach the same level of interaction that occurs in FtF teams. This level of interaction could affect cohesion. Because these project teams had a duration of only four weeks and communicated only through the lean media of Lotus Notes, enough time may not have passed for team members to develop team cohesion in the virtual environment.

Commitment to the Team

Team commitment was measured using the eighteen-item scale developed by Meyer and Allen (1991). While this scale has been used extensively in FtF environments at the organizational level (see, for example, Meyer and Allen, 1997), it has not been used in an asynchronous, virtual, team environment. Commitment to the team was measured at all four time periods. Reliability analysis and factor analysis results are presented in Appendix D-8. Two results are worth noting. First, continuance commitment is best measured with a five-item scale, CONT6 not loading well or adding

to the reliability of the continuance commitment measure. Second, normative and affective commitment did not load separately, but instead loaded on the same factor. This indicates that in a virtual, asynchronous environment, team members cannot distinguish between a commitment based on liking or wanting to be with the team versus a commitment based on feelings of obligation to the team. In contrast, the results of commitment to a team in the Introductory Survey indicate that participants could distinguish between normative and affective commitment when thinking about prior teams on which they had worked. Normative, affective, and continuance commitment items loaded on three factors. Although item loadings were not perfect, results show a definite split between normative, affective, and continuance commitment. A post-hoc survey questionnaire indicated that prior to this experiment, 89% of the subjects had never participated in a virtual team before. Thus, when they considered their commitment to past teams, they were considering FtF teams. Results of commitment to the team from the Introductory Survey are also provided in Appendix D-8.

Satisfaction

Satisfaction was measured using an eleven-item scale from Hackman and Oldham (1980) with some items added. Satisfaction was measured at times two and four only. Factor analyses showed that the eleven-item satisfaction scale was measuring two aspects of satisfaction – a personal satisfaction and a satisfaction with the team. Interestingly, at time two, satisfaction with the team had the much greater eigenvalue, while at time four, personal satisfaction had the much greater eigenvalue. Reliability analyses showed that all eleven items contributed to reliability of the two-factor satisfaction measure solution, although at time two some team satisfaction items loaded on both the personal and team

satisfaction factors. Appendix D-9 presents the results of the reliability, factor analyses, and descriptive statistics of the satisfaction construct.

Performance

Performance was measured at the individual level. To determine individual performance, two measures were used. First, the team's performance on the policy manual task was measured using a standard form taken from Burke and Chidambaram (1999) and evaluated by three expert judges. Second, peer ratings were collected at the completion of the task. Each student rated each team member (including himself or herself) by allocating 100 points to team members. Students were instructed that no two team members could receive an equal number of points. For this performance ranking, each subject was then given a percent of the team's total performance score based on the percent of peer ratings they received. For example, in a four-person team, 400 points in total were allocated to the team. If team member A received 100 of those points, member A received 25% of the total team score. If team member B received 150 points, member B received 37.5% of the total team score. Using these two indicators, a better evaluation of each individual's performance toward the team deliverable was obtained. Appendix D-10 provides the range and mean of the performance scores for all subjects, the manipulated subjects, and the non-manipulated subjects.

5.3 Manipulation Assessment

This section describes the methodology used and results of the team manipulation. By random choice, the even-numbered teams received a manipulation message (described in Section 4.2.3). This section describes the steps taken to ensure that those

receiving the manipulation treatment were chosen randomly and that there were no initial differences between the two groups of people.

5.3.1 Manipulation Methodology

Univariate analysis using ANOVA was used to assess whether individuals receiving the manipulation treatment were significantly different from individuals *not* receiving the manipulation treatment. To ensure randomness of team placement, no differences should be detected in the descriptive data obtained from the Introductory Survey between individuals given the manipulation and those not receiving the manipulation. The manipulation did not occur until AFTER the Introductory Survey was completed.

Three assumptions are associated with the use of ANOVA: (1) random samples; (2) the dependent variable is normally distributed in each population; and (3) variance of the dependent variable is the same in each population (Kleinbaum, Kupper, and Muller, 1988).

Random Samples

Samples from the two groups should be drawn from independent populations. This was achieved by random assignment of the participants to teams and by random assignment of the manipulation treatment to half the teams. Of the 31 teams formed, all even numbered teams (n=15) received the manipulation message, while odd numbered teams (n=16) did not.

Dependent Variable is Normally Distributed

An analysis of histograms, with the normal curve superimposed on the graph, was done for each variable to ascertain that this assumption was generally met.

Equal Variance

Homogeneity of variance tests indicate whether two or more groups have been taken from populations with the same variance. The Levene statistic is used in SPSS to determine if two or more groups have the same variance across different independent variables. Results of the Levene statistic indicate that the independent variables of collectivism, personality, gender, and work experience between the manipulation group and the no-manipulation group had equal variances.

Table 5-7: Levene Statistic for Homogeneity-of-Variance

Null hypothesis: Two groups' variances are the same. When the difference between the variances of the two groups is not significant, you cannot reject the null hypothesis that the variances are the same.

Variable	Levene Statistic	Significance
Conscientiousness	1.408	.238
Agreeableness	.447	.505
Openness to New Experiences.	1.080	.301
Coll. - Teamwork	.966	.328
Coll. – Affective	.001	.979
Gender	.194	.661
Work Experience	.141	.708

5.3.2 Manipulation Results

After testing for assumptions was completed, ANOVAs were run on the initial independent variables measured in the Introductory Survey to determine if there were differences between the two treatment groups. Results of the ANOVA tests can be seen

in Table 5-8. From these results, it can be concluded that the two treatment groups were not significantly different from each other before the experiment began. This also provides further evidence of the randomness of the team assignments and treatment.

Table 5-8: Manipulation vs No-Manipulation - ANOVA Results

Null hypothesis: Two groups are the same. When the variable is not significant, you cannot reject the null hypothesis that the two groups are the same.

Variable	F	Significance
Conscientiousness	.466	.496
Agreeableness	.132	.717
Openness to New Experiences	.063	.803
Coll. – Teamwork	.329	.567
Coll. – Affective	.205	.652
Gender	.073	.788
Work Experience	.838	.362

5.4 Hypothesis Assessment

This section describes both the methodology and the results of hypothesis testing. Hierarchical regression was the primary analytical technique used to assess the overall model and the impact of each variable in determining team commitment. Hypotheses 1 through 8 were tested using hierarchical regression. Univariate analysis using ANOVA was done to test hypotheses 9 and 10. In the Hypothesis Methodology section, the rationale for selecting hierarchical regression is given as well as the statistical assumptions required for this technique. In the following section, Hypothesis Results, the results for each hypothesis are presented.

5.4.1 Hypothesis Methodology

In hierarchical regression, independent variables are added to the regression equation in a specified order. The variable with the greatest explanatory power to the regression model is added first. Additional variables are added as long as their partial correlation coefficients are statistically significant. As opposed to standard regression, which is considered a model-testing procedure, hierarchical regression is considered a model-building procedure and is used for testing explicit hypotheses (Tabachnick and Fidell, 1996). All of the regressions used stepwise variable entry and removal, requiring a probability of F of .05 to enter and .10 to remove. Of the three hierarchical regression methods (stepwise, forward selection, and backward deletion), stepwise is considered as the best option to find the best prediction equation (Tabachnick and Fidell, 1996).

Five assumptions are associated with the use of regression: (1) normality of error terms, (2) constant variance of error terms (homoscedasticity), (3) linearity of error terms, (4) independence of error terms, and (5) no collinearity of independent variables (Tabachnick and Fidell, 1996).

Normality, Homoscedasticity, and Linearity of Error Terms

The first three assumptions were tested by examining a scatterplot of residuals against predicted dependent variable scores. Examining the scatterplots of the dependent variables across all four time periods showed that none of the first three assumptions of regression were violated. While there are other methods of testing these assumptions, for example, the Goldfeldt-Quandt test or the White test, these alternatives are seldom used. A visual inspection of residuals is the most common method of checking for these assumptions (Kennedy, 1992).

Independence of Error Terms

This assumption was tested by requesting the Durbin-Watson statistic when running scatterplots of residuals. A Durbin-Watson statistic of two is expected. No significant differences from two were found.

Collinearity of Independent Variables

Collinearity of independent variables was tested by running collinearity statistics. Examining tolerance and Variance Inflation Factors (VIFs) of the independent variables shows the potential of one problem. When running stepwise regression, perceptions of team cohesion was not a significant variable, and had a large VIF. Because perceptions of team cohesion and perceptions of work processes had earlier been found to load on a single factor this result was not unexpected. It further validates the decision to use only the perceived work processes construct.

Table 5-9: VIF Results

High VIF signals high multicollinearity.

Variable	VIF (Tolerance) Time1	VIF (Tolerance) Time2	VIF (Tolerance) Time3	VIF (Tolerance) Time4
Collectivism-Teamwork	1.021 (.980)	1.117 (.896)	1.002 (.998)	1.028 (.973)
Collectivism-Affect	1.028 (.973)	1.005 (.995)	1.001 (.999)	1.009 (.991)
Openness to New Experiences	1.068 (.937)	1.071 (.934)	1.040 (.962)	1.060 (.943)
Agreeableness	1.343 (.744)	1.058 (.945)	1.051 (.952)	1.071 (.934)
Conscientiousness	1.077 (.929)	1.015 (.986)	1.009 (.991)	1.024 (.976)
Task Liking	not measured	1.558 (.642)	not measured	1.384 (.723)
Task Competence	not measured	1.330 (.752)	not measured	1.317 (.759)
Perceived Team Cohesion	4.321 (.231)	4.231 (.236)	4.279 (.234)	4.946 (.202)

Perceived Team Work Processes	1.021 (.980)	1.558 (.642)	1.001 (.999)	1.392 (.719)
Other Members' Commitment	1.869 (.535)	1.660 (.603)	1.980 (.505)	1.870 (.535)

To test hypotheses 9 and 10, ANOVA was used. The same assumptions were met as discussed in Section 5.3.1. Hypotheses 9 and 10 both looked at changes in the commitment variable over the life of the team project. ANOVA was used to determine if there were differences in commitment over the four time periods.

5.4.2 Hypothesis Results

This section presents the results of the statistical analysis for each hypothesis. Each hypothesis is presented individually, and results for each time period are also presented individually. Thus, for each hypothesis, two or four time periods are discussed (depending on the number of times the variable data were collected).

Test of Hypothesis 1

Hypothesis 1a states that there will be a positive relationship between affective commitment and satisfaction, and hypothesis 1b states that there will be a negative relationship between continuance commitment and satisfaction. That is, it is hypothesized that those with high affective commitment will also be highly satisfied, but those with high continuance commitment will have low satisfaction. Based on scale assessment results, affective commitment is not separate from normative commitment, so the two commitment scales were combined to create one Normative-Affective (NA) commitment factor. In addition, satisfaction was determined to actually be two factors: personal satisfaction and teamwork satisfaction. Accordingly, one regression was run using the dependent variable of personal satisfaction with the predictor variables

including NA commitment and continuance commitment. A second regression was run using the dependent variable of teamwork satisfaction with the predictor variables of NA commitment and continuance commitment. These two regressions were run for both time period two and time period four – the two time periods when satisfaction information was collected.

The results of the regression (presented in Appendix E-1) partially support hypothesis 1. Hypothesis 1a is supported at both times two and four for both satisfaction factors. NA commitment entered the regression equation and was significant at the .01 level at both time periods two and four. The direction of the relationship was as expected, with higher NA commitment significantly related to higher personal satisfaction and higher teamwork satisfaction. However, hypothesis 1b is not supported. Although the direction was as anticipated, i.e., continuance commitment and satisfaction (both personal satisfaction and teamwork satisfaction) were negatively related, the relationship is *not* significant at the .05 level of significance at either time period.

Test of Hypothesis 2

Hypothesis 2a states that there will be a positive relationship between affective commitment and performance. Hypothesis 2b states that there will be a negative relationship between continuance commitment and performance. Because normative and affective commitment loaded together, the combined NA commitment average was used as an independent variable along with continuance commitment. Performance was the dependent variable. This regression was run only at time four, because performance was calculated only at the completion of the task.

The results of the regression (presented in Appendix E-2) do not support hypothesis 2. Not only do neither NA commitment nor continuance commitment to the team predict performance scores, but results were in the opposite direction from expected.

Tests of Antecedents of Commitment

Only one hypothesis (H6c) uses continuance commitment as a dependent variable. For this one regression, continuance commitment was used as the dependent variable and perceived task competence was the only independent variable used. Continuance commitment scores were obtained by averaging each individual's responses on the five-item continuance commitment scale. Hypotheses 3 through 8 (except for H6c) posit that different independent variables will have an effect on affective or normative commitment. Because affective and normative commitment loaded on one factor, variables thought to influence either one were used in the stepwise regression list. For these tests, NA commitment was the dependent variable. The independent variables used included collectivism-teamwork, collectivism-affect, conscientiousness, agreeableness, openness to new experiences, perceived work processes, and other members' commitment at all four time periods. In addition, task liking and perceived task competence were used in the stepwise list at times two and four. NA commitment scores for each individual were obtained by averaging the responses on the twelve items of normative and affective commitment. Results of this regression test are shown in Appendix E-3; more detailed results are presented in the following sections.

Test of Hypothesis 3

Hypothesis 3 posits that individuals scoring high on collectivism will have higher normative commitment to their team than individuals scoring high on individualism. Results (presented in Appendix E-3) show that this hypothesis is partially supported.

The collectivism scores used in the regression were the average of the subject's item scores for each factor. The collectivism-teamwork score was an average of the individual's responses to items 16, 17, 18, and 19 in the collectivism measure. The collectivism-affect score was an average of the individual's responses to items 13, 14, and 15 in the collectivism measure.

At time one, collectivism-teamwork enters the equation as significant ($R^2 = .431$, $p < .01$), although collectivism-affect does not. Direction is as expected: Those with higher teamwork collectivism have higher NA commitment at time one. At time two, neither collectivism factor enters the regression equation as significant. At times three and four, only collectivism-affect enters the equation (time three: $R^2=.370$, $p < .01$; time four: $R^2=.527$, $p < .05$). Again, direction is as expected: Those with higher affective collectivism (individuals who prefer to work in a team rather than by themselves) have significantly higher NA commitment to their teams.

Results of running regressions using the six-item normative commitment scale and the six-item affective scale individually (rather than combined) show that the dependent variables of collectivism are related more to normative commitment than to affective commitment. In stepwise regressions using only the average of the six-item normative commitment scale as the dependent variable, the two collectivism factors are significant at the same time periods as in the overall results. When conducting a stepwise

regression using only the six-item affective commitment scale as the dependent variable, neither collectivism factor was significant at any time period. Although normative and affective commitment loaded on the same factor in this study, it is noteworthy that when the two are split apart, collectivism scores are significantly related to the normative measure rather than the affective measure, as one would expect based on past research.

Test of Hypothesis 4

Hypotheses 4a, 4b, and 4c posit that the personality factors of conscientiousness, agreeableness, and openness to new experiences will be positively related to affective commitment. In addition, hypothesis 4b posits that conscientiousness will also be positively related to normative commitment.

Using the dependent variable NA commitment, the three personality factors were entered in the stepwise regression along with other individual variables posited to affect affective and/or normative commitment. The results (presented in Appendix E-3) of the regression show that hypothesis 4 is *not* supported. None of the three personality variables are significantly related to NA commitment to the team at any time period.

Finally, when regressions were run splitting apart normative and affective commitment, at only one time period did one of the personality factors significantly predict a commitment factor. At time one, openness to new experiences was significantly related to the six-item affective commitment measure.

Test of Hypothesis 5

Hypotheses 5a and 5b posit that an individual's perceptions of his or her teammates' commitment to the team will be positively related to his or her own normative and affective commitment to the team. Because normative and affective

commitment were combined into one factor, these two parts of hypothesis 5 are simply collapsed into one hypothesis.

Results (presented in Appendix E-3) of the regression show that hypothesis 5 is *not* supported. At none of the four time periods is the perception of other team members' commitment significantly related to an individual's own NA commitment to the team.

In addition, when normative and affective commitment measures were split apart and regressions run, other team members' perceived commitment was never a significant independent variable explaining either normative commitment or affective commitment.

Test of Hypothesis 6

Hypothesis 6 addressed perceptions of the task. Hypothesis 6a and hypothesis 6b posit that task liking and perceived task competence are positively related to affective commitment. Hypothesis 6d posits that perceived task competence is positively related to normative commitment. Hypothesis 6c posits that perceived task competence is negatively related to continuance commitment. Because hypothesis 6c uses a different dependent variable than the others, it will be considered in the next section.

Results of the regression are presented in Appendix E-3. Because task liking and perceived task competence information was gathered at times two and four only, only time periods two and four show the variables task liking and perceived task competence.

Hypothesis 6a is supported. Results show that task liking is significantly and positively related to NA commitment. At time two, task liking enters the equation second ($R^2 = .624$, up .097 from the first variable, $p < .01$). At time four, task liking is the most important predictor of NA commitment ($R^2 = .428$, $p < .01$). Of particular interest, when task liking is added to the regression equation (times two and four) the R^2 is significantly

higher (.624 and .527, respectively, for times two and four versus .431 and .370, respectively, for times one and three).

Note also that when normative and affective measures are separated and regressions are run on the two commitment constructs individually, task liking is significant in predicting affective commitment but not normative commitment. This result would be expected based on the hypothesis and past literature.

Hypotheses 6b and 6d are *not* supported. Perceived task competence is not significantly related to NA commitment at either time two or time four. Interesting to note is that the beta score is negative, indicating a negative relationship. In other words, although not significant, those with high perceived task competence had lower NA commitment at both times two and four. Similarly, when normative and affective measures are broken apart and separate regressions run, perceived task competence is not a significant predictor of either normative commitment or affective commitment.

Test of Hypothesis 6c

Hypothesis 6c was the only hypothesis involving continuance commitment as the dependent variable. For this regression, perceived task competence was entered into a regression equation as the independent variable with continuance commitment as the dependent variable. Results (shown in Appendix E-4) show that this hypothesis is *not* supported. Perceived task competence did not significantly explain continuance commitment to the team at times two or four. Interestingly, although not significant, the direction was again in the opposite from that expected. A negative direction was expected, but results indicate a positive direction, i.e., those with higher perceived task competence had higher continuance commitment.

Test of Hypothesis 7

Based on results of scale analysis (see Section 5.2.2), the hypotheses regarding perceived team cohesion were not tested.

Test of Hypothesis 8

Hypotheses 8a and 8b posit that perceptions of the team's work processes are positively related to normative and affective commitment to the team. Because normative and affective commitments are combined into one factor, these two parts of hypothesis 8 are simply collapsed into one hypothesis.

Results (presented in Appendix E-3) show that hypothesis 8 is supported. In fact, perceptions of work processes can be considered the most important predictor of NA commitment to the team. Only at time four did work processes not enter the regression equation first. At time one, perceptions of work processes accounted for .371 of the R^2 by itself. R^2 for work processes alone was .527 at time two and .312 at time three. At time four, perceived work processes added an additional .074 to the R^2. In all cases, direction was as expected: Those with more favorable perceptions of team work processes had higher NA commitment to their team.

In addition, when running normative and affective commitment as two separate dependent variables, perceived work processes was an important predictor of both. With just the six-item normative commitment measure as the dependent variable, perceived work processes entered the regression equation first at all four time periods. With just the six-item affective commitment measure as the dependent variable, only task liking (at times two and four) was more important than perceived work processes. During the two

time periods when task liking data were not collected, perceived work processes entered the regression equation first.

Test of Hypothesis 9

Hypothesis 9 posits that an individual's commitment (affective, continuance, and normative) will change over the life of the team. Because normative and affective commitment were collapsed into one factor, hypotheses 9a and 9c were collapsed into one hypothesis. To test this hypothesis, the ANOVA statistical method was used to compare changes between time periods. Results (shown in Appendix E-5) partially support this hypothesis. Continuance commitment scores did change over the course of the four weeks, but none of the changes were significant. NA commitment also changed over the course of the four weeks, but only two time periods had significant changes. Between time periods three and four, there was a negative change that approached significance ($p = .075$). Between time periods one and four, NA had a negative change that was significant at the .05 level ($p = .042$).

In addition, an additional ANOVA was run to compare subjects receiving the manipulation and those not receiving the manipulation. These results are also shown in Appendix E-5. Results for the non-manipulated subjects show that there was no significant change between any time period for NA commitment or continuance commitment. For those subjects in the manipulation group, NA commitment had a negative change that approached significance at the .10 level ($p = .098$) between time periods one and two.

Test of Hypothesis 10

Hypothesis 10 posits that those individuals receiving the manipulation note will have higher affective and normative commitment to their teams, and lower continuance commitment. This hypothesis was tested using ANOVA. Again, because normative and affective commitment were collapsed into one factor, hypotheses 10a and 10b were collapsed into a single hypothesis. ANOVA was run to compare the manipulated group with the non-manipulated group at all four time periods.

Results (Appendix E-6) show that this hypothesis is partially supported. Hypothesis 10c (continuance commitment) is *not* supported at any of the four time periods. It is interesting to note that the manipulated subjects felt greater rather than less continuance commitment in three of the four time periods. Hypothesis 10a/10b (NA commitment) was partially supported. At time one, the manipulated group had significantly higher NA commitment to their team than the non-manipulated group ($p < .05$). At the other three time periods, differences were not significant, although the difference approached significance at time four ($p < .10$). As expected, the manipulated group had higher NA commitment to their team than the non-manipulated group in all four time periods.

Summary of Hypothesis Testing

Table 5-10 summarizes the results of testing the research hypotheses. Predictions regarding the relationship between commitment to the team and satisfaction were partially supported. Predictions regarding the relationship between commitment to the team and performance were not supported. Predictions regarding the relationship between different antecedents and commitment to the team had mixed support:

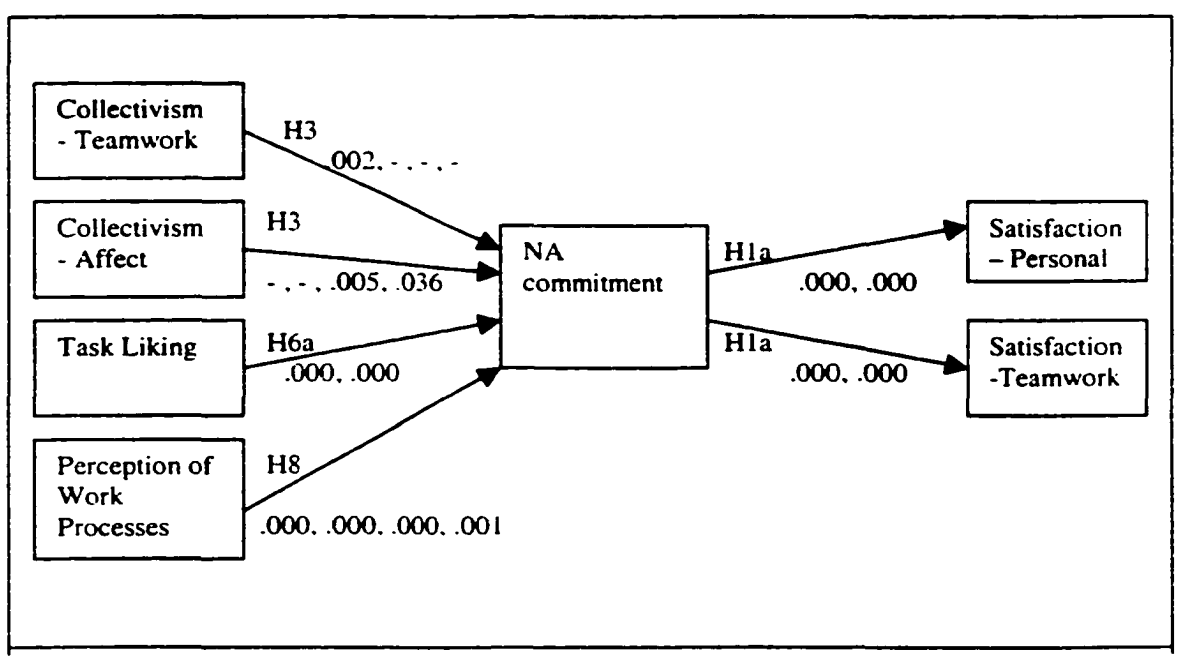
Table 5-10: Summary Results of Hypotheses

Variable(s) of Focus	Hypothesis	Support
Satisfaction	H1a: NA -> Personal Satisf. NA -> Team Satisf. H1b: Cont -> Personal Satisf. Cont -> Team Satisf.	Supported at times 2 & 4 Supported at times 2 & 4 Not Supported Not Supported
Performance	H2a: NA -> Performanc H2b: Cont -> Performance	Not Supported Not Supported
Collectivism	H3: Coll-Teamwork -> NA Coll-Affect -> NA	Supported at time 1 only Supported at times 2, 3, & 4
Personality traits	H4a: Agr -> NA H4b: Con -> NA H4c: Open -> NA	Not supported Not supported Not supported
Perception of other team member's commitment	H5ab: Others' Commitment -> NA	Not supported
Task Liking	H6a: Task Liking -> NA	Supported at both times 2 & 4
Task Competence	H6b/d: Task Compet. -> NA H6c: Task Compet. -> Cont	Not supported Not supported
Cohesion	H7	Not tested
Perceived Team Work Processes	H8a/b: Work Processess -> NA	Supported at all time periods
Commitment over Time	H9ac: Time -> NA H9b: Time -> Continuance	Partially supported Not supported
Commitment between manipulated group vs non-manipulated group	H10ab: NA difference H10c: Continuance difference	Supported at time 1 only Not supported

Collectivism, task liking, and perceived work processes were supported in the majority of time periods; personality factors, other team members' commitment, and task competence were not supported. Predictions regarding the effect of time and the manipulation on commitment to the team were also mixed. Time did not seem to affect changes in commitment to the team. Manipulated team members showed significantly higher NA commitment at time one, but not during subsequent weeks. They showed no difference in continuance commitment at any of the four time periods.

Figure 2 summarizes the results of statistical analyses. The figure, which is based on Figure 1 presented earlier in the dissertation, includes all hypothesized paths *that turned out to be significant*. The numbers on each path represent the associated p-values. The first number corresponds to time one, the second to time two, the third to time three, and the last to time four. For task liking and satisfaction paths, the first number refers to time two, and the second number refers to time four.

Figure 2: Significant Research Results



5.5 Chapter Summary

The purpose of this chapter was three-fold. First, the scales employed in this study were validated using factor analyses and reliability tests. Any modifications of the scales based on these results were presented. The randomness of the manipulation was checked, and the two groups were found to be similar before the start of the experiment. Finally, results of the testing of the hypotheses presented in Chapter 3 were presented and summarized. The next chapter will provide a broader discussion of the findings of the hypothesis results.

CHAPTER 6

6.0 DISCUSSION

This chapter provides discussion and interpretation of the results of the experiment as presented in Chapter 5. The general goal of this research was to gain an understanding of how commitment to a virtual team develops, what antecedents are important in the development of team commitment over time, and the outcomes of team commitment. The overall expectations of the study were that two forms of commitment to a team (normative and affective) would be positively related to outcomes and one form of commitment to a team (continuance) would be negatively related to outcomes. Further, it was generally expected that certain antecedents would influence team commitment and that traditional management methods of manipulating cohesion in Face-to-Face (FtF) teams could be applied to virtual teams to manipulate team commitment.

For this research, three specific research questions were addressed:

1) Does team commitment in a virtual setting affect outcomes of virtual team meetings, i.e., overall satisfaction and performance?

2) What factors influence the development of team commitment in a global, virtual environment and do they change over time?

3) Do traditional FtF methods of increasing perceived cohesion in teams also work in a virtual environment, i.e., do they result in increased commitment in a virtual environment?

Specific hypotheses were created for each research question and were tested in the actual dissertation experiment.

The next section will interpret the results presented in Chapter 5 for each of the three research questions as well as some additional analyses of interest. Following that, overall conclusions of the study are presented. Then, Section 6.3 discusses the implications of this research for both theory and practice. A chapter summary concludes the chapter.

6.1 Interpretation of Research Results

This section will address the findings for each research question and will consider both significant and non-significant findings from the specific hypotheses.

6.1.1 Outcomes of Team Commitment (RQ1)

The hypotheses related to outcomes of team commitment were derived from previous empirical work on organizational commitment (OC) and FtF team commitment. Outcomes tested included satisfaction and performance.

Satisfaction

Significant relationships were found between normative-affective (NA) commitment and both satisfaction with the team and personal satisfaction. This finding is completely in line with the expectations stated in hypothesis 1a. This leads to the conclusion that commitment to the team is important when considering team member satisfaction. If a team member likes being a part of the team or feels a loyalty to the team, he or she will be more satisfied with the team itself and will have greater feelings of personal satisfaction from participating on the team. However, no significant relationship was found between continuance commitment and either satisfaction with the team or personal satisfaction. This finding is contrary to what was expected from hypothesis 1b. It was expected that there would be a negative relationship between

continuance commitment to the team and satisfaction. The nature of the present experiment may help explain this result. First, because this was a project team, a team that had a definite, short-term end-date, subjects may not have truly experienced continuance commitment – a commitment based on feeling trapped in the situation with few or no alternatives out. Second, given the lower reliability of continuance commitment in this experiment compared to reliabilities reported in empirical research in an organizational setting, it may be that students in a classroom assignment do not experience the effects of continuance commitment in the same way as an employee of an organization. Those employed in an organization generally have a longer term commitment to the organization than a student has to a class that will end in a semester.

Performance

While satisfaction is important, performance of a team is what really counts. Contrary to expectations, results from the analysis show that neither normative-affective commitment nor continuance commitment to the team is a significant predictor of individual performance.

However, upon examination of a scatterplot of performance scores and normative-affective commitment to the team, it was found that there were seven individuals who were outliers. These seven had very high performance scores but very low NA scores. When these seven individuals were removed from the calculation, NA commitment did significantly predict performance (Appendix F-1), although continuance commitment to the team was still insignificant. Based on research in OC and FtF teams, this result was expected (e.g., normative-affective commitment was positively related to performance). Those individuals who were more committed to their teams because they

liked the team or felt like a part of the team were more likely to work harder and receive higher performance ratings. This finding was as expected based on hypothesis 2a. However, similar to the results on satisfaction, hypothesis 2b was still not supported even after removing outliers. Continuance commitment was not significantly related to performance. These results can be attributed to the same reasons as those given in the satisfaction section: The setting of the experiment - classroom versus organization - may have affected the results, or the limited duration of the project task may have resulted in the insignificant results.

Closer examination of the seven outliers provides a rationale for the initial insignificant results. Four of the seven outliers were on teams where only two members contributed to the task project and one of the seven completed the entire task project on her own. As a result, these individuals received the bulk of the peer evaluation score, which inflated their performance score. However, because these members were working with only one other person (or alone), rather than an entire team, their commitment to the team as a whole was low. Also interesting to note is that six of the seven outliers were on non-manipulated teams. As a whole, manipulated teams were more likely to have participation from every team member; if a team had more than one non-participating team member, it was more likely to be a non-manipulated team.

6.1.2 Antecedents of Team Commitment (RQ2)

Several hypotheses related to antecedents of team commitment were developed based on existing empirical research in OC and FtF team commitment. The majority of these antecedents were expected to influence normative or affective commitment.

Antecedents that were examined in relation to the normative-affective commitment construct included collectivism constructs of teamwork and affect; personality constructs of agreeableness, conscientiousness, and openness to new experiences; task constructs of task liking and perceived task competence; and team constructs of other team members' perceived commitment and team work processes. Of these, collectivism-teamwork, collectivism-affect, task liking, and team work processes were significant in explaining normative-affective commitment at some time during the project. In contrast, agreeableness, conscientiousness, openness to new experiences, perceived task competence, and perceptions of other team members' commitment were not significant in explaining normative-affective commitment at any time period.

Only one variable was examined as an antecedent to continuance commitment – perceived task competence. As noted in Chapter 5, this relationship was not significant.

Significant Findings

Hypothesis 3, which stated that individuals scoring high on collectivism would have higher normative commitment to the virtual team, was partially supported. At time one, individuals who believe team interests should come before personal needs had higher normative-affective commitment to their teams than did those individuals who scored low on the collectivism-teamwork construct. At times three and four, those individuals who indicated a preference for working in teams over working individually had higher normative-affective commitment to their teams than did those individuals who scored low on the collectivism-affect construct. It is surprising that collectivism-teamwork was significant at only time one, rather than throughout the life of the project, but a possible explanation lies in the virtual, asynchronous setting of the experiment.

Those individuals who scored high on the collectivism-teamwork measure believe that their own personal needs should be set aside for the good of the team. However, in a virtual, asynchronous setting, the feeling of teamwork or team camaraderie may have been lacking compared to what the subjects had previously encountered in FtF teams. Because many of the social impacts and cues from working on a FtF team are missing in a virtual environment, the collectivism construct that ended up being significantly related to normative-affective commitment toward the end of the project was collectivism-affect. Those individuals who simply prefer working on a team had higher normative-affective commitment to their team at times three and four.

As expected, hypothesis 6a, which stated task liking would have a positive relationship with affective team commitment, was supported. Research in OC strongly supports the idea that employees who like their jobs are also more committed to their jobs. Results of this experiment confirm that the same can be said in a virtual, asynchronous team setting: Liking the task appears to be one of the two main predictors of normative-affective commitment to a team.

Perceived team work processes was also a strong predictor of normative-affective commitment to the team. Work processes entered the prediction equation first (using stepwise regression) for three of the four time periods. Work processes combined with task liking explained 62.4% and 50.2% of normative-affective commitment at times two and four, respectively. Given the type of setting, this is not surprising. Results indicate that perceptions of team work processes are crucial to commitment in a virtual, asynchronous team setting. Lacking visual cues from team members, and lacking specific meeting times and places, the work processes in a virtual environment must be

better defined and understood by team members to keep the project progressing. In addition, because team members can't be verbally reprimanded or "hunted down" if they are not pulling their weight, non-adherence to work processes in a virtual setting is likely to stand out as a problem and affect commitment to the team.

Insignificant Findings

Personality variables, perceived task competence, and other team members' commitment were not significantly related to normative-affective commitment as expected. In addition, contrary to posited results, perceived task competence was not significantly related to continuance commitment.

A possible explanation of the lack of significance for the personality variables could again be the setting of the experiment. Without FtF contact with team members and the socialization of team members that goes along with FtF contact, personality of individuals may be a less important aspect for the formation of team commitment in the virtual environment.

A possible explanation of the lack of significance for task competence is the task itself. The task was not difficult, although coordination in a virtual setting was expected to make it more difficult. However, coordination difficulty is part of the work processes construct rather than task competence. Because the subjects were all graduate students, they were expected to be able to complete the task. Examining the descriptive statistics for task competence supports this explanation. At time two, less than 20% of the respondents felt they had average task competence scores under four (scores of one to three signify perceptions of incompetence, scores of five to seven signify perceptions of competence). At time four, only 12% of the respondents felt they had average task

competence scores under four. This indicates that the vast majority of the students felt competent to complete the task. Mean values of the perceived task competence scores were significantly higher than mean values of other construct scores and these other variables, unlike task competence, had bell-shaped curves indicating a greater range of responses from the subjects.

Finally, perception of other team members' commitment was not significant in predicting normative-affective commitment. Interestingly, this relationship, although not significant, was in the opposite direction from that expected. One explanation for this lack of significance could be that without the FtF nature of the task, risk of non-participation was seen as lower. A participant may have decided that if the other team members were committed to getting the project done, there was no need for him or her to be highly committed to the project. An alternative explanation could be that the measure did not sufficiently capture the construct. One question was asked about each team member's commitment, then these responses were averaged to get one score for perceptions of others' team commitment. The averaging of these numbers could have given strange results. For example, Subject A was a member in a five-person team who perceived four teammates (including himself) as being slightly committed (score=five) and one team member not committed at all (score=one). The average score for this person was 4.2. Subject B was on a four-person team, but only two were active participants in the team. Subject B gave the four members of the team scores of seven, seven, one, and one. The average is four. Although the two averages for Subject A and Subject B are similar, it would be expected that Subject A would have higher normative-affective commitment because he/she was able to work with three other team members.

Subject B was able to work with only one other person – a dyadic relationship rather than a team relationship. However, statistically the two had similar perception scores so no difference would be detected.

6.1.3 Influence of Team Development on Team Commitment (RQ3)

Hypotheses 9 and 10 examined the influence of team development on team commitment over time. Hypotheses were developed based on empirical work from the management literature regarding FtF team development.

Examining the fluctuation of commitment to these virtual, asynchronous teams over time reveals interesting findings. According to popular management literature, FtF teams go through four distinct stages, commonly referred to as: forming, storming, norming, and performing. From the data, it appears that virtual, asynchronous teams follow this format to some extent. Appendix F presents graphs of the responses to commitment over time.

Looking first at NA commitment, individuals initially had a high level of NA commitment to their team, which was then followed with a drop in NA commitment at the end of week two (Appendix F-2). Given the four stages, this is expected if commitment to the team is influenced by team development as posited. Although this initial drop for all participants was not significant between times one and two, the drop *was* significant for those subjects in the manipulated group (Appendix F-3). This too was expected. Those in the manipulated group would be expected to go into the project with higher expectations, so the second week, which would be characterized by more dissension among team members, would more adversely affect the manipulated group than the non-manipulated group. Although a statistically significant increase was not

found, NA commitment did rise at the end of the third week. This too was expected given management literature. Once teams have "worked out the kinks", they are able to better work within team boundaries. What was unexpected was the drop in NA commitment by the end of the fourth week. It was expected that an increase in NA commitment would occur at the end of the fourth week as teams accomplished their goals; instead, a marginally significant ($p < .10$) decrease for all participants was found.

One explanation of the drop in NA commitment at the completion of the project might have been that the lower performance of the non-manipulated teams brought down their commitment, bringing down the average as a whole. However, looking at both manipulated and non-manipulated groups separately, even the manipulated group had a drop in NA commitment at the completion of the project (although their drop was not as much as the drop for the non-manipulated group) (Appendix F-3). A better explanation is that given the setting of the project – a relatively short-term project with team members with no history of working together before and virtually no chance of working with each other again in the future – commitment won't be highest at the end of the project. In fact, it makes sense that once the project is over, commitment to that team – while not disappearing completely - would be lowered. 'The job is done, it's time to move on' type of attitude could be influencing the lower commitment scores at the end of the project.

Finally, hypothesis 10 showed that although NA commitment was higher for the manipulated group at all four time periods, it was not significantly higher than the non-manipulated group except at time period one and marginally at time period four. It was expected that the manipulated group would have higher NA commitment throughout the project rather than just at time period one. The significance at time one only may be

because the effects of the message received by the manipulated group "wore off" after the first week. However, although differences were not significant between the two groups, manipulated subjects did show higher NA commitment to their team throughout the entire project.

Looking next at continuance commitment, neither hypothesis 9 nor 10 were significant at any time period with regard to the development of continuance commitment. Continuance commitment did not change significantly between time periods, and there was not a significant difference in continuance commitment between the manipulated group and the non-manipulated group. However, it is interesting to note that contrary to expectations, those in the manipulated group felt greater continuance commitment than did those in the non-manipulated group. A possible explanation is that because subjects in the manipulated group were told they were "carefully selected" because of "similar values, beliefs, and goals" and that the team was expected to "work well together", these subjects may have felt more pressure of 'having to perform' than those in the non-manipulated group.

6.1.4 Additional Analyses of Interest

Additional analyses of interest were carried out although not specifically detailed in hypotheses for this study. In particular, the effect of some of the demographic data was investigated to determine if any demographics had an effect on commitment to the team. Other analyses included: level of collectivism by citizenship, results from a post-hoc survey of manipulated subjects only, differences in quantity of messages posted by manipulated and non-manipulated teams, and correlations of quantity of messages, peer evaluations, and NA commitment to the team.

Demographic Data

Age and work experience had no effect on NA commitment or continuance commitment. OC literature would lead us to believe that a higher age and greater work experience would result in greater NA commitment and lower continuance commitment; in the environment of the present study, however, it is not surprising that these results were not found. OC literature has looked at actual employees where those with greater age and more work experience (particularly with the same company) would be expected to be more committed (otherwise they would have left the company). In a four-week, project-based, virtual, classroom setting it is not surprising that these two variables did not influence commitment. However, gender did have an effect. As would be expected based on empirical results from the OC literature, females were more likely to be NA committed to their teams, particularly at time one ($p < .05$). No significant differences between genders were found for continuance commitment.

Table 6-1: Gender and Commitment

	Time 1	Time 2	Time 3	Time 4
Female – NA Commitment	5.13	4.91	5.01	4.88
Male – NA Commitment	4.72	4.53	4.90	4.46
F	4.178	2.642	.230	3.057
Sig.	.044	.107	.633	.084

Collectivism and Citizenship

Collectivism scores were captured, but with the hypothesis analyses it did not matter what the citizenship of the individual was or the expectation of how "collectivist"

or "individualist" the country of origin was. The hypothesis analyses only examined the relationship between collectivism and NA commitment to the team. However, examining collectivist scores with citizenship offered an interesting and unexpected result. As noted before, Table 5-6 showed that the subjects were from an almost even mix of collectivist countries and individualist countries. Breaking these two groups apart, it was expected that those subjects from the collectivist countries would score higher on the collectivist measures. Interestingly, there was no difference between the two groups on the measure of collectivism–affect, and those from the collectivist countries actually scored slightly lower for collectivism (4.71 for subjects from individualist countries, 4.61 for subjects from collectivist countries). Even more surprising are the differences in the collectivism–teamwork scores. Subjects from individualist countries scored significantly higher on the collectivist measure than did those from the collectivist countries (5.66 for subjects from individualist countries, 5.10 for subjects from collectivist countries). While no further analysis was done, it is an area for future research. It is possible that graduate students from collectivist countries are "different" in their approach to work than the country as a whole, or it may be that subjects from collectivist countries responded to the survey differently, knowing that they would be participating with students from western, individualist countries.

Table 6-2: Collectivism and Citizenship

	Citizens of Collectivist Nations	Citizens of Individualist Nations	F	Sig
Collectivism - Teamwork	*5.10*	*5.66*	*8.20*	*.005*
Collectivism – Affect	4.61	4.71	.214	.644

Post-hoc Survey of Manipulated Subjects

A post-hoc survey was administered to subjects in the manipulated group. The results from the hypotheses, particularly those that showed a difference between the manipulated group and the non-manipulated group, was one check that the manipulation was effective. The post-hoc survey was done as an additional check to determine if the manipulation was effective. Results indicate that while manipulated subjects did not think the message inspired them to put more effort into the project, they did indicate that after reading the message they were more excited about the project. Several students indicated that the message gave them preconceived notions about what their teammates would be like. These preconceived notions were all positive and associated with adjectives used to describe committed individuals (i.e., committed, responsible, effective, engaged, hard-working, conscientious).

Table 6-3: Post-hoc Survey of Manipulated Subjects

Question:			
Do you remember seeing the manipulation message?	YES 81%	NO 19%	
After reading the message, how did you feel about participating in the global, virtual team project?	MORE EXCITED 62%	NEITHER MORE NOR LESS EXCITED 38%	LESS EXCITED 0%
After reading the message, how did you feel about "meeting" your future team members?	MORE COMFORTABLE 43%	NEITHER MORE NOR LESS COMFORTABLE 57%	MORE APPREHENSIVE 0%

After reading the message, did it change the effort you felt should be put into the project?	I SHOULD PUT MORE EFFORT IN 33.3%	IT DIDN'T CHANGE THE WAY I FELT 66.6%	I FELT I COULD PUT LESS EFFORT IN 0%
After reading the message, did you have any preconceived notions about what your team members might be like?	YES 38%	NO 62%	
If above question yes, list adjectives describing how you thought your team members would act in the team forum.	committed, conscientious, effective, engaged, enthusiastic, hard-working, high energy, reliable, responsible, serious, bright, intelligent, caring, collaborative, listening, mature, open-minded, positive		

Quantity of Messages

Looking at the quantity of messages posted, the interesting result was the substantial difference in the number of messages posted by the manipulated group versus the number of messages posted by the non-manipulated group. One of the manipulated teams (the last one shown in Table 6-4a) is an outlier. This team chose to work synchronously, and so their message quantity was much higher than teams who worked asynchronously. But even removing the outlier team from analysis shows a significant difference in message postings ($p < .005$) (Table 6-5). On average, manipulated teams posted twice as many messages each week as the non-manipulated teams posted (Table 6-6).

Table 6-4a: Quantity of Postings – Manipulated Teams

TIME 1	TIME 2	TIME 3	TIME 4	TOTAL FOR TEAM
5	7	8	6	26
15	7	6	3	31
6	10	9	7	32
9	6	10	14	39
12	10	14	5	41
11	11	12	11	45
10	12	18	12	52
10	14	15	16	55
21	22	7	9	59
12	15	18	22	67
17	23	12	17	69
17	17	26	10	70
19	25	22	22	88
23	19	20	33	95
33	50	36	35	154

Table 6-4b: Quantity of Postings – Non-Manipulated Teams

TIME 1	TIME 2	TIME 3	TIME 4	TOTAL FOR TEAM
1	0	2	0	3
1	1	1	1	4
5	2	3	2	12
1	2	6	3	12
0	8	3	2	13
6	5	1	2	14
7	3	2	3	15
5	3	7	1	16
5	9	9	3	26
5	10	8	8	31
13	6	6	6	31
8	7	10	9	34
13	6	11	6	36
10	11	11	6	38
14	13	22	10	59
16	16	13	16	61

Table 6-5: ANOVA Results: Difference in Quantity of Postings Between Manipulated Teams and Non-Manipulated Teams
(Does not include outlier team).

	F	Sig.
TIME 1	12.029	.002
TIME 2	11.461	.002
TIME 3	11.282	.002
TIME 4	14.067	.001

Table 6-6: Average # of Messages Posted to Team Forums
(NOTE: Manipulated team average and All Team average does NOT include outlier team.)

	All Teams	Manipulated Teams	Non-Manipulated Teams
TIME 1	9.90	13.36	6.88
TIME 2	10.00	14.14	6.38
TIME 3	10.40	14.07	7.19
TIME 4	8.33	13.36	4.88
ENTIRE PROJECT	39.13	54.93	25.31

In addition to posting more messages, manipulated teams also started posting messages to their team forum more quickly once the project began. It may be that the message welcoming them to the team served as an ice-breaker so that no one member on the team had to be the first to post a message. Finally, it can also be noted that team performance scores of manipulated teams were significantly higher than team performance scores of non-manipulated teams ($p = .000$). Examining *why* this is so is beyond the scope of this study, but effects of the manipulation message or the communication quantity of the team are both likely reasons.

Table 6-7: Team Performance Scores

	Average (Range)
Manipulated Teams	253.90 (233.5 – 280.0)
Non-Manipulated Teams	222.84 (195.5 – 269.5)
F	26.670
Sig.	.000

Message Quantity, Peer Evaluations, and NA Commitment

Quantity of messages posted to team forums by individuals was found to be significantly correlated with an individual's NA commitment to the team ($p < .01$. Pearson correlation = .324). Quantity of messages posted to team forums by individuals was also found to be significantly correlated with peer evaluation received ($p < .01$. Pearson correlation = .381). Finally, peer evaluations were also correlated with NA commitment to the team. For individuals in the manipulated group, this was a positive correlation ($p < .05$, Pearson correlation = .220), i.e., those with higher peer evaluation scores were also more committed to their team. However, in the non-manipulated group, there was a significant *negative* correlation between peer evaluation received and NA commitment to the team ($p < .05$, Pearson correlation = -.332). In other words, those individuals on the non-manipulated teams who did the majority of the work were *less* committed to their team. A simple explanation for this is that in non-manipulated teams it was more common for one or two members of the team to have done the entire task themselves, and thus they felt less committed to a team where half the members never provided input. In contrast, high performing subjects in the manipulated teams were more likely to have three or four team members sharing the workload, so they became more committed to their team.

6.2 Overall Conclusions from the Research Study

This research provides support to the basic premise that commitment to a virtual team can influence outcomes and is influenced by certain variables. In addition, it appears possible to manipulate commitment to a virtual team, at least in the short run. At the same time, the commitment construct as defined by Allen and Meyer (1990) was not completely supported throughout the life of the project. Normative and affective commitment were not distinguished by the subjects, although numerous research studies on OC have found the two types of commitment to be separate constructs. In addition, the continuance commitment construct does not appear to by a useful construct when looking at virtual teams in a classroom environment.

Given the strength and consistency of the relationships between task liking and work processes with normative-affective commitment, it is likely that these two attributes will be of primary interest if trying to build commitment to a virtual team. Relationships between normative-affective commitment and outcomes were also significant throughout all time periods measured. Those subjects with high normative-affective commitment to their team were more satisfied, and, when outliers were removed, subjects with high normative-affective commitment also performed better. Results from this experiment also showed that commitment to the team could be manipulated somewhat. Again, continuance commitment did not seem to be affected by the manipulation, but normative-affective commitment was. Those subjects in the manipulation group had higher normative-affective commitment at all four time periods, communicated with their team members more, and had better performance.

In summary, much of the work that has been shown to hold true for OC and commitment in FtF teams can be applied in a virtual setting. However, there are differences between a FtF team and a virtual team, as well as differences in commitment between an organization setting and a classroom setting. This study has expanded OC research and FtF commitment research by studying global, virtual, asynchronous teams.

6.3 Implications of the Research Results

The results of this study have important implications for both theory and practice.

6.3.1 Implications for Theory

Previous research on commitment has concentrated on OC and FtF team commitment. That research showed certain variables to be instrumental in developing commitment and that certain kinds of commitment (normative, affective) had positive, significant relationships with outcomes such as satisfaction and performance, while another kind of commitment (continuance) had no effect on satisfaction and performance. The results of this study extend findings on commitment to a virtual, asynchronous team environment.

This study confirmed the importance of certain types of commitment to enhance positive outcomes. In addition, this study has shown that some of the same variables that are important in developing OC or FtF team commitment are also instrumental in developing commitment to a virtual, asynchronous team, but that some variables found important in OC research are not as important in the virtual environment.

The leanness of the virtual environment may explain why normative commitment and affective commitment were not distinguishable to subjects. In OC literature and FtF team commitment literature, these two commitment constructs have consistently been

found to be separate constructs. In this study, subjects were unable to distinguish between feelings of obligation or loyalty to their team and feelings of liking for their team. Similarly, perceptions of team cohesion and team work processes could not be distinguished from one another. This result could be a result of the relatively short four-week time period used in the study. Future studies using actual organizational employees working in long-term virtual team projects may provide additional information on understanding these two constructs.

6.3.2 Implications for Practice

Knowledge that commitment to the team does affect both satisfaction and performance, and that commitment to the team can be manipulated, can help organizations and managers deal more effectively with virtual teams.

Team members on teams that received a manipulation message showed greater NA commitment to the team throughout the life of the project. Manipulated subjects had more favorable perceptions of their team's work processes, higher liking for the task, and better outcomes than did non-manipulated subjects. Manipulated subjects had higher personal satisfaction, expressed greater satisfaction with their team, and, when compared to non-manipulated subjects participating in full teams (i.e., after removing outliers), had significantly higher performance scores. These findings have important implications for managers of virtual teams. If better performance is a goal, the results from this study suggest that managers of virtual teams will want to emphasize the aspects of the team that enhance NA commitment to the team from the earliest stages. Because work processes and task liking significantly influenced NA commitment over and above the other

antecedents tested. these two variables are the ones on which managers of virtual teams should concentrate.

In summary, the results of the present study suggest that practitioner attention be given to developing methods to increase commitment to virtual teams with special attention being placed on identifying and communicating work processes for team members to follow. Additionally, practitioners are encouraged to identify individuals whose abilities are a good fit for the task at hand, thereby increasing the potential that team members on virtual teams will like the task given them.

6.4 Chapter Summary

This chapter has interpreted the statistical results presented in Chapter 5. While not all hypotheses were supported, both significant and insignificant results provide a greater understanding of team commitment in a virtual, asynchronous team environment. The results indicate that normative-affective commitment to the team has a positive relationship to outcomes of satisfaction and performance. In addition, the results indicate the particular antecedents that are significant in predicting normative-affective commitment to the team. Continuance commitment does not seem to be a significant predictor of outcomes in a virtual project team, nor do the antecedents explored appear to have an impact on the prediction of continuance commitment. A manipulation to increase commitment to the virtual team had a significant effect on team members early in the project life, and, although not significantly different from non-manipulated subjects, subjects in the manipulated groups continued to have higher NA commitment to their teams throughout the entire project.

The findings, both significant and insignificant, suggest new insights on what affects commitment to a virtual, asynchronous team, and on the outcomes of that commitment. The implications of these results for theory and practice were also presented in this chapter.

Chapter 7 will detail important limitations for interpreting and generalizing these results to other contexts. It also describes strengths of the research study and future research directions for studying commitment in virtual, asynchronous teams.

CHAPTER 7

7.0 DISSERTATION SUMMARY

This chapter describes some of the strengths of the study as well as the important limitations of the study that should be considered when interpreting the results. The third section presents future research directions for this topic, and the final section provides some overall conclusions.

7.1 Strengths of the Study

The strengths of this study include: (1) the use of an experiment to control certain key variables; (2) a simulation of longitudinal experiences in actual work teams; and (3) the study's reliance on a programmatic research base.

Advantages of experiments. Experiments provide the researcher with a large degree of control over some variables, thereby reducing confounding influences from external factors (Cook and Campbell, 1979). An experiment allowed for significant control over the setting, task, technology, and subjects – variables especially important in early investigations of technology effects on team interaction (McGrath, 1984).

Simulation of longitudinal experiences. Past research on organizational or team commitment measured commitment to the team or organization at only one point in time. This study examines how commitment to a team changes over time. It also provides information on the dynamics of the team process including variables that influence commitment at different points in time of the team's life.

Programmatic research base. This study fits neatly into the larger research stream of commitment. Several studies have focused on commitment to the organization, but fewer have examined commitment to the team despite evidence that the two are separate constructs. This study extends commitment research into both the team environment and the virtual environment.

7.2 Limitations of the Study

There are also important limitations specific to this study that should be noted and considered when generalizing these results to other contexts. The limitations of this study include: (1) self-report measures; (2) the use of student subjects; (3) the technology used; (4) the variables measured; and (5) the sample size.

Self-report measures. The most significant limitation of this study is that the measures of both independent variables and dependent variables were self-reported. This may give rise to both social desirability and common method variance problems. With social desirability problems, subjects may inflate their answers to commitment questions, knowing that a "committed" team member is considered more favorably than an uncommitted team member. Common method variance problems may arise when the same person provides the values for all variables. To alleviate and check for this problem, students also scored all team members on both perceived commitment to the team and an overall assessment of contribution. These measures provided measures of commitment in addition to the self-report measures. In addition, the quantity of messages posted by individuals to their team forums is used as an additional measure of their commitment. Additional testing using these measures indicated that there was a significant correlation between number of postings to the team forums by each individual

and his or her normative-affective (NA) commitment to the team ($p < .01$, Pearson correlation = .324). In addition, peer evaluations were found to be significantly correlated to number of postings to the team forum by individuals ($p < .01$, Pearson correlation = .381); thus, it can be concluded that team members who contributed the most postings were perceived by other team members to be the most committed to the team.

Use of student subjects. There is no guarantee that the behavior of student subjects working on an academic project will generalize to employees working on an organizational project. Several assumptions were made about the students. One assumption is that the course requirements and course grade sufficiently motivated the student subjects to generate the necessary effort to perform the research task. To further ensure equal motivation, the percentage of course grade for this project was approximately equal for all students. Participating professors were instructed that the experiment should account for 5-15% of the students' course grade. It is also assumed that the student subjects had the knowledge and skills to reasonably perform the task and use the technology required. Regarding the design of the research, it was assumed that the random assignments to teams distributed any important individual subject differences that were not measured or controlled in this study. Finally, it is expected that using graduate students with an average of 4 ½ years work experience, rather than undergraduates, increased the generalizability of this study.

Technology used. The completely electronic means of communicating that this study employed may not be the usual mode by which virtual teams communicate in an organizational setting. Because of time zone differences, subjects in this study were

almost forced to work asynchronously and were given only one medium for communication with team members. In an actual organizational setting, virtual team members are more likely to have several options. If virtual team members are closer geographically than the subjects in this study, team members will have more opportunities to work together synchronously. In addition, virtual team members may communicate with each other through a variety of technologies rather than only one form alone. With desk-top conferencing becoming more widespread, it is likely that at least some virtual team members will be able to see and speak to each other through same-time different-place technology. Depending on the type of work involved at different points in time, virtual team members may choose to communicate with each other with different media.

Variables measured. Another limitation of the study is the exclusion of variables that could potentially have a primary or contributing causal relationship to virtual team commitment. Some of these variables are described in Section 7.3 on Future Research Directions.

Sample size. A total of 126 graduate students combined to form 31 teams participated in the study. This number was limited by (1) the ability to find professors in a variety of countries willing to assign 5-15% of their course grade to this dissertation project and (2) the need to keep the numbers manageable given the technology and time constraints. While 126 was sufficient for standard regression statistics, a larger number would have made results more generalizable. In addition, it should also be recognized that team size was three to five members. Results from this study may not be generalizable to larger team sizes.

7.3 Future Research Directions

The findings from this dissertation should prove useful in steering the direction of a research program in virtual team commitment. This section will consider six directions in which such research could move: (1) field research in an organizational setting; (2) other variables of interest; (3) task type; (4) team type; (5) technology; and (6) outcome manipulation. Research in any of these directions can build on the results found here.

Field research. It may be that motivation in an organizational setting is different enough from motivation in a classroom setting that this study should be replicated in an organization. This would permit comparison of the results of this study to actual employees working in virtual teams. A richer, though less controlled, explanation of commitment to a virtual team may emerge from this type of research.

Other variables of interest. Several variables that were not included in this study may have a primary or causal relationship to team commitment. For example, gender differences have been found in organizational commitment (OC) literature, as well as in computer self-efficacy. Women tend to have higher commitment to an organization than men, but their computer self-efficacy is lower. How would the interaction of these variables affect team commitment in a virtual setting where members communicate through technology? Another variable that could be considered in future research is leadership in virtual teams. In this dissertation, all teams were leaderless, with no appointed leader. Will having a leader change the relationships between input variables and virtual team commitment, and what will change? A third variable that could be examined is goals. If individuals have conflicting goals with the team or organization, what will be the effect on commitment and outcomes?

Other unmeasured variables include cultural differences – other than collectivism – as defined by Hofstede (1980). Several studies have examined the relationship of collectivism/individualism on different variables; fewer studies have looked at the other dimensions identified by Hofstede (1980) – differences in power distance (extent to which a society accepts the fact that power in organizations is distributed unequally), uncertainty avoidance (extent to which a society feels threatened by uncertain and ambiguous situations), and degree of masculinity/femininity (extent to which a society's dominant values are assertiveness, acquisition of money and things, and not caring for others, the quality of life, or people). Future research could examine more of the cultural differences to determine if commitment to a virtual team is influenced by the other dimensions, and, if so, what managers can do to lessen the influence of variables negatively affecting team commitment and accentuate those variables positively affecting team commitment.

Task Type. All teams in this research completed the same task. This task fit in quadrant two of McGrath's Task Circumplex (1984) and was a decision-making task where team members decided on issues with no right answer. Lipnack and Stamps (1997) make the argument that some types of tasks may be better suited for virtual teams than others. Future research can examine this argument, determining if there are differences in performance depending on the type of task and if commitment is affected when trying to perform different types of task in a virtual setting.

Team Type. All teams in this study were project-based teams. A project-based team is characterized by team members who have no history of working together before, little to no chance of working together again, and meet for a short time period to

accomplish a specific task. Several other types of teams, such as work teams, parallel teams, and management teams, are also found in an organization (Cohen and Baily, 1997). Coleman, Slonaker, and Wendt (1997) also differentiated between "true" teams and "tag" teams. Differences in team membership, length of time together, number of members in the team, and goals are found between these types of teams. Future commitment research can examine how the type of team affects or is affected by commitment to the team.

Technology. In this study teams interacted via Lotus Notes only. With desk-top conferencing becoming more widespread (Lipnack and Stamps, 1997), virtual teams in the future may have several more options when working together. Future research can examine differences in commitment and commitment growth for virtual teams using alternate forms of media or a mix of different media types for team interaction.

Outcome Manipulation. Another area for future research involves examining causality between commitment and success. This study does not examine how success or perceived success of the project influenced a person's team commitment. It may be that someone who perceived his or her team as successful became more committed to the team. A study can be conducted where teams are randomly told they are either performing in the top half or bottom half of the class in order to examine what impact this has on commitment to the team.

7.4 Conclusion

In today's wired world, organizations are more global and more dependent on technology than ever before. Employees in today's organizations are much more likely to work in virtual teams - teams where members never meet face-to-face - than in the

past. Many questions about the effects of this change to "virtualness", including both performance and psychological effects on the individual, have been raised and yet never examined in research studies. While there is a strong body of research investigating an individual's commitment to his/her organization, research on commitment to a team, and especially commitment to a virtual team, is almost non-existent.

This study detailed an experiment designed to investigate the antecedents and consequences of team commitment in a virtual setting. The study was grounded in research from the literature on organizational commitment, computer-mediated teams, and communication. Using existing models of team processes as a base, this research built a more complete model of the dynamic nature of teams over time, concentrating specifically on virtual teams.

Even when all results are not as expected, a well-designed research study provides a significant contribution to research and practice. Results from this study are useful in better understanding the dynamic nature of team commitment in a virtual setting. Because of the lack of previous research in this area, both confirming and disconfirming results contribute to our knowledge about team commitment in a virtual setting.

This study's findings suggest that a team in a virtual, asynchronous environment can be manipulated to increase commitment, at least in the short run. Further, findings from this study indicate that team members with high levels of commitment at the beginning of the project continue to have higher commitment throughout the life of the project than those individuals who did not receive manipulation messages to increase commitment. This suggests that a carefully planned initial briefing for team members by their manager can increase feelings of commitment to the team as well as perceptions of

team processes. Managers should stress the similarities of the team members, the reasons each member was chosen, and the specific value each member will bring to the team. From the results of this study, it appears that such messages will increase excitement about participating in the team and will result in positive images of fellow team members.

Perhaps because of the leanness of the media by which subjects communicated, they were unable to distinguish between perceptions of team cohesion and perceptions of team work processes. Similarly, subjects were not able to distinguish between normative commitment to their team (a feeling of obligation to the team) and affective commitment (a feeling of liking toward the team) as has been found in both OC research and face-to-face (FtF) commitment research. While a combined normative-affective commitment to the team was found to influence satisfaction with the team and performance, continuance commitment had no effect on outcomes in the virtual environment of this experiment.

Unlike results from OC research and FtF research, personality, task competence, and other members' commitment to the team did not predict commitment to the team. However, task liking, level of collectivism, and perceived work processes were predictors of commitment to the team. In fact, the perception of team work processes was incredibly important for developing commitment to the team, which in turn improved both performance and satisfaction. Managers in charge of virtual teams would be wise to set specific guidelines up-front for team members in virtual, asynchronous teams to follow. By having work processes defined and clarified before beginning the project, probability of success and high performance of the team is increased.

In conclusion, the findings from this study provide an excellent starting point for examining future research issues related to team commitment in virtual, asynchronous settings.

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APPENDIX A - SCALES

* All items will be measured on a 7-point Likert scale with 1 labeled Strongly Disagree and 7 labeled Strongly Agree (unless otherwise indicated).
* ® signifies a statement that is reverse coded.

COLLECTIVISM/INDIVIDUALISM (High score indicates collectivism)
Pilot Study questions used are in Appendix C.

Dissertation experiment questions:
28-item measure by Wagner (1995), Triandis et al., (1988), Earley (1993)

1. Only those who depend on themselves get ahead in life. ®
2. To be superior a person must stand alone. ®
3. If you want something done right, you've got to do it yourself. ®
4. What happens to me is my own doing. ®
5. In the long run, the only person you can count on is yourself. ®
6. If a team is slowing me down, it is better to leave it and work alone. ®
7. In most cases, to cooperate with someone whose ability is lower than oneself is not as desirable as doing the thing on one's own. ®
8. Winning is everything. ®
9. I feel that winning is important in both work and games. ®
10. Success is the most important thing in life. ®
11. It annoys me when other people perform better than I do. ®
12. Doing your best isn't enough; it is important to win. ®
13. I prefer to work with others in a group rather than working alone.
14. Given the choice, I would rather do a job where I can work alone rather than doing a job where I have to work with others in a group. ®
15. Working with a group is better than working alone. ®
16. People should be made aware that if they are going to be part of a team then they are sometimes going to have to do things they don't want to do.
17. People who belong to a team should realize that they're not always going to get what they personally want.
18. People in a team should realize that they sometimes are going to have to make sacrifices for the sake of the team as a whole.
19. People in a team should be willing to make sacrifices for the sake of the team's well-being.
20. A team is more productive when its members do what they want to do rather than what the team wants them to do. ®
21. A team is most efficient when its members do what they think is best rather than doing what the team wants them to do. ®
22. A team is more productive when its members follow their own interests and concerns. ®
23. Employees like to work in a team rather than by themselves.
24. One does better work working alone than in a team. ®
25. I would rather struggle through a personal problem by myself than discuss it with my friends. ®
26. An employee should accept the team's decision even when personally he or she has a different opinion.
27. Problem solving by teams gives better results than problem solving by individuals.
28. The needs of people close to me should take priority over my personal needs.

PERSONALITY

For the following phrases describing people's behaviors, please use the rating scale below to describe how accurately each statement describes *you*. Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence. Please read each statement carefully, and then fill in the bubble that corresponds to the number on the scale.
Response Options: **1**: Very Inaccurate, **2**: Inaccurate, **3**: Slightly Inaccurate, **4**: Neither Inaccurate nor Accurate, **5**: Moderately Accurate, **6**: Accurate, **7**: Very Accurate

Conscientiousness (NEO scale)

PCON1. I am always prepared.
PCON2. I waste my time. ®
PCON3. I pay attention to details.
PCON4. I find it difficult to get down to work. ®
PCON5. I get chores done right away.
PCON6. I do just enough work to get by. ®
PCON7. I carry out my plans.
PCON8. I don't see things through. ®
PCON9. I am exacting in my work.
PCON10. I avoid my duties. ®

Agreeableness (NEO scale)

PAGR1. I have a sharp tongue. ®
PAGR2. I have a good word for everyone.
PAGR3. I cut others to pieces. ®
PAGR4. I believe that others have good intentions.
PAGR5. I suspect hidden motives in others. ®
PAGR6. I respect others.
PAGR7. I get back at others. ®
PAGR8. I accept people as they are.
PAGR9. I insult people. ®
PAGR10. I make people feel at ease.

Openness to New Experiences (combined Variety-Seeking and Adventurousness scales)

POPEN1. I prefer variety to routine.
POPEN2. I prefer to stick with things that I know. ®
POPEN3. I love to think up new ways of doing things.
POPEN4. I dislike changes. ®
POPEN5. I like to visit new places.
POPEN6. I don't like the idea of change. ®
POPEN7. I like to begin new things.
POPEN8. I am a creature of habit. ®
POPEN9. I enjoy hearing new ideas.
POPEN10. I am attached to conventional ways. ®

TASK LIKING

(Taken from Zaccaro and Dobbins. 1989 and Wagner and Morse, 1975)

1. I have a strong interest in the project and what I'm learning from participating in it.
2. I liked working on this project.
3. If the project were only more interesting. I would be motivated to perform better. ®
4. I am very much involved personally in this project.
5. I have a strong interest in the project and tasks prescribed to my team.
6. If given the chance. I would choose to do a different project for this class. ®
7. Mastering the requirements of this project means a lot to me.
8. This project offers subjective rewards; the tasks are valuable to me for no other reason than I like to do them.
9. I did not like the tasks specifically assigned to me by the team. ®
10. I have found the time spent working on this project enjoyable.
11. Working on this project has been fun.
12. This project makes me tense and anxious. ®
13. This project was not a worthwhile assignment. ®

TASK COMPETENCE

(modified from Wagner and Morse, 1975 with items added)

1. This project is manageable and any problems encountered tend to be optimally solved.
2. I meet my own personal expectations for expertise in doing this project.
3. I do not know as much as my teammates do concerning this project. ®
4. I can find answers to questions that arise about this project.
5. This project offers me a chance to test myself and my abilities.
6. Considering the time I've spent on this project, I feel thoroughly familiar with the tasks assigned to me.
7. I honestly believe I have all the skills necessary to perform this project well.
8. I am able to effectively complete tasks specifically assigned to me by the team.
9. I provide productive input for the completion of the team project.

PERCEIVED TEAM COHESION

(from Dobbins and Zaccaro, 1986; Stokes, 1983; and Wech et al., 1998)

1. There is a high spirit of teamwork among my teammates.
2. Members of my team take a personal interest in one another.
3. If I had a chance to do the same kind of project for the same credit with other teammates, I would still stay with my current teammates.
4. Members of this team like each other.
5. Members of this team fit what I believe to be "ideal" team members.
6. The members of my team will readily defend each other from criticism by outsiders.
7. I look forward to communicating with the members of my team each day.
8. The members of my team get along well together.
9. If most of my team decided to dissolve the team by leaving, I would try to dissuade them.
10. I enjoy belonging to this team because I am friends with many team members.
11. Compared to other teams in the course, our team works well together.
12. All members of the team are included in the team's activities.
13. The team that I belong to is a close one.

TEAM WORK PROCESSES

(1-6 Taylor and Bowers; also used some cohesion measures based on sorting.)

1. Team members plan together and coordinate their efforts.
2. While working on the project, my team had a difficult time making good decisions and solving problems. ®
3. Everyone in the team understands what they are to do and how to do it.
4. Information about important events and situations is NOT always shared with team members. ®
5. As a team, we are dedicated to meeting our objectives successfully.
6. My team has trouble adapting and responding to unusual project demands. ®
7. Team members have worked hard to provide substantive and timely feedback on ideas and work presented.
8. Some team members appear to be doing the majority of the work, while others are doing less. ®
9. Differences of opinion are encouraged in my team.
10. For the most part, team members have confidence and trust in other team members.
11. My team is usually aware of important events and situations.
12. My team does not communicate with each other enough. ®
13. People in my team are never afraid to speak their minds about issues and problems that affect them.
14. The people on my team make my job easier by sharing their ideas and opinions with me.

PERCEIVED COMMITMENT OF OTHER TEAM MEMBERS

For the most part, how committed is each team member?

For this scale, consider your team members (including yourself) in alphabetical order. So, for example, Joe Anderson is team member 1, Mary Boyd is team member 2, Rico Lopez is team member 3, and Sooyong Soo is team member 4.

(1-7 scale, not committed at all to very committed)

Team member 1 _____
Team member 2 _____
Team member 3 _____
Team member 4 _____

COMMITMENT MEASURE (taken from Meyer, Allen, and Smith, 1993).

Normative Commitment

1. I do not feel any obligation to remain with my current team. ®
2. Even if it were to my advantage, I do not feel it would be right to leave my team now.
3. I would feel guilty if I left my team now.
4. This team deserves my loyalty.
5. I would not leave my team right now because I have a sense of obligation to the people in it.
6. I owe a great deal to my team.

Continuance Commitment

1. It would be very hard for me to leave my team right now, even if I wanted to.
2. Too much of my life would be disrupted if I decided I wanted to leave my team right now.
3. Right now, staying with my team is a matter of necessity as much as desire.
4. I believe that I have too few options to consider leaving this team.
5. One of the few negative consequences of leaving this team would be the scarcity of available alternatives.
6. If I had not already put so much of myself into this team, I might consider quitting.

Affective Commitment

1. I would be very happy to spend the rest of the course in my team.
2. I really feel as if this team's problems are my own.
3. I do not feel like "part of the family" with my team. ®
4. I do not feel "emotionally attached" to this team. ®
5. This team has a great deal of personal meaning for me.
6. I feel a strong sense of belonging to my team.

SATISFACTION

(from Hackman and Oldham, 1980; with some items added)

1. I am satisfied with the amount of personal growth and development I get from this project/team.
2. I am satisfied with the way the team works together toward a goal.
3. I am satisfied with the degree of respect and fair treatment I receive from my teammates.
4. I am satisfied with the attitude of the team toward the project.
5. I am satisfied with the level of participation among team members.
6. I am satisfied with the quality of work done by the team.
7. I am satisfied with the feeling of worthwhile accomplishment I get from working on this project.
8. I am satisfied with the amount of challenge in the project.
9. I am satisfied with my ability to use the technology effectively.
10. I am satisfied with the means of communicating with my teammates.
11. Overall, I am satisfied with having participated in this team.

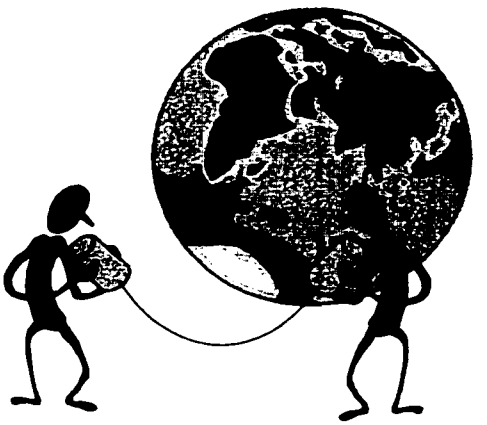
PERFORMANCE

This measure was taken from Burke and Chidambaram (1999). Each section of the completed policy manuals is evaluated based on creativity of ideas, realism/practicality, comprehensiveness, positive tone, and clarity/content.

APPENDIX B – INSTRUCTION MANUAL

Appendix B contains the instruction manual given to all subjects. It includes a timeline of due-dates, explanations of deliverables, the case itself, instructions on how to access and use Lotus Notes, and frequently asked questions (FAQ).

Virtual Team Exercise



Packet of Materials

CONTENTS

Virtual Manager Contact Information:

If you have any problems, please contact me immediately!

Anne Powell

anpowell@indiana.edu

Virtual Team Exercise

BACKGROUND

"The virtual firm, work-where-you-live not live-where-you-work option is about to become reality. In the age of cellular and satellite communications, the Internet, and wide-band, high-speed telecommunications, the "office" may no longer be relevant. Whether you're in Telluride or Camden, all customers and all staff are, or should be, considered truly equidistant." (Zuboff and Maxmin, "The Changing Nature of Work," The Camden Conference on Telecommunications, 1997).

More organizations are using synchronous (e.g., desktop videoconferencing) and asynchronous (e.g., Lotus-Notes) applications to enable individuals to overcome boundaries of time and space. Instead of flying employees back and forth between sites, organizations are creating "virtual teams" to solve problems via telecommunications applications (Business Week, April 6th, 1998). While integrated voice, video, and data networks are not yet widely available, increasingly applications such as Lotus-Notes are being used to enable dispersed organizational work. A recent Computerworld (February 9th, 1998) poll of managers in organizations that use Lotus-Notes indicates that firms are using Notes for more than just email. Lotus Notes is being used for project team discussions.

But what is the "reality" of meeting in a "virtual meeting space"? In this exercise, you will be exposed to some of the challenges and opportunities associated with asynchronous virtual teams communicating via Lotus-Notes. *YOU DO NOT NEED ANY KNOWLEDGE OF LOTUS-NOTES TO PARTICIPATE!!* Each student will be assigned to a 4-person virtual team. Each team will be assigned its own Lotus-Notes discussion forum where the team can meet, discuss, and prepare their assigned deliverables.

KEY POINTS:

1. All students will be accessing the Lotus Notes forums via a Web browser (e.g., Netscape, Explorer). A Lotus-Notes client is not needed for this exercise.
2. Your Username and Password have been supplied to you either through email or through your professor. If you have not received your Lotus Notes username and password, please contact Anne Powell (contact information on first page).
3. All discussions about this case should take place over Lotus Notes ONLY!! This is to give you experience with a virtual team so you will be able to intelligently discuss the opportunities and pitfalls of virtual teams.

FORUMS:

1. **Survey Forum**: The purpose of this forum, called "dropoff", is to provide a central location for you to complete your surveys. The URL for the Survey forum is:

   http://gsob3.bus.indiana.edu/VTP/dropoff.nsf

2. **Team Forums:** Each team is assigned to a specific team forum, based on your team # (e.g., Team2). This forum is where your team will "meet" to develop the team deliverable. In addition, there will be a separate area within this forum for working on the deliverable. While working on the deliverable, it is considered in "draft" form, when your deliverable is completed, you will change the status to "Final Version". The URL for the Team forum is: **http://gsob3.bus.indiana.edu/VTP/team#.nsf** (where # = your team's number, e.g. 2)

KEY DELIVERABLES AND DATES!

To make it easy, all deliverables are due at the same time. This time is: 11:00am (US), 4:00pm (Great Britain), 6:00pm (Israel), midnight (Hong Kong "HK" and Taiwan), and 1am (Korea).

1. The Introductory survey is due Tuesday, October 26. The Introductory survey part of the dropoff.nsf forum will close at that time. You can fill out the Introductory survey anytime between Monday, October 18 and Tuesday, October 26.
2. The team discussion forums (i.e., team#.nsf) will open for team use Tuesday, October 26. Openings are at 11am-US; 4pm-Great Britain; 6pm-Israel; midnight-Taiwan & HK; 1am-Korea. So remember, if you're from the US and begin working as soon as the forum opens, your teammate from Taiwan may be fast asleep – don't expect contributions until the next day.
3. Deliverable 1 is due Friday, October 29. Your team may change the deliverable status from "Draft" to "Final Version" anytime between Tuesday, October 26 and Friday, October 29. On Friday, October 29 the system will automatically retrieve your deliverable 1 marked "Final Version".
4. Survey 1 is due on Monday, November 1. You may submit your survey any time between Friday, October 29 and November 1. (Observe times listed above).
5. Deliverable 2 is due Friday, November 5. Your team may change the deliverable status to "Final Version" anytime between November 1 and Friday, November 5. On Friday, November 5, the system will automatically retrieve your deliverable 2 marked "Final Version". (At times listed above).
6. Survey 2 is due Monday, November 8. You may submit your survey any time between Friday, November 5 and Monday November 8. (Observe above times).
7. Deliverable 3 is due Friday, November 12. Your team may change its deliverable status to "Final Version" anytime between Monday, November 8 and Friday, November 12. On Friday, November 12, the system will automatically retrieve your Deliverable 3 marked "Final Version". (Remember the system will automtically take it at the time listed above).
8. Survey 3 is due Monday, November 15. You may submit your survey any time between Friday, November 12 and Monday, November 15. (Observe above times).
9. Deliverable 4 is due Friday, November 19. Your team may change its deliverable status to "Final Version" anytime between Monday, November 15 and Friday, November 19. On Friday, November 19, the system will automatically retrieve your Deliverable 4 marked "Final Version". (still the same time frames).
10. Survey 4 is due Monday, November 22. You can submit your survey any time between Friday, November 19 and Monday, November 22. (Still the same time frames).

Visual Table of Due Dates/Times:

	Monday	Tuesday	Wed	Thurs	Friday
Week 1		Intro Survey Due			Deliv. 1 DUE Team Forum closes
Week 2	Survey 1 DUE Team Forum reopens				Deliv. 2 DUE Team Forum closes
Week 3	Survey 2 DUE Team Forum reopens				Deliv. 3 DUE Team Forum closes
Week 4	Survey 3 DUE Team Forum reopens				Deliv. 4 DUE Team Forum closes
Week 5	Survey 4 DUE				

Note to students from Korea, and teams with Koreans:

The Korean due time is 1am. Therefore, the actual DUE "day" is one day AFTER everyone else. For example, the Intro Survey is due on Tuesday at 11am for the US; 4pm for Great Britain; 6pm for Israel; midnight for Taiwan and Hong Kong; and 1am (which is actually Wednesday) for Korea. The Intro Survey Due date for Korea is NOT 1am Tuesday. These times are the same for everyone, i.e. at 11am in the US, it is 4pm in Great Britain, 6pm in Israel, midnight in Taiwan and Hong Kong, and 1am the next day in Korea.

GENERAL INSTRUCTIONS FOR THE EXERCISE

You are asked to act as a member of a global management team at the fictitious Global Assoicates Corporation. Your team is made up of four individuals. All communications with your team must take place via Lotus Notes. The purpose of this exercise is to simulate team decision-making in a virtual environment. While the case that you will be working on contains only a limited amount of information, it should be sufficient to make a good decision.

This exercise consists of four parts that will be conducted over the next four weeks. For each deliverable, your task is to evaluate information provided in the case and make decisions that will lead to a completed policy manual. The quality of your manual is important; the final document should read in a consistent, flowing document NOT like a document put together piece-meal by four individuals.

Introductory Survey

Due Tuesday, October 26.
US: 11am
Great Britain: 4pm
Israel: 6pm
Hong Kong & Taiwan: midnight
Korea: 1am (Wed morning)

Please complete the introductory survey at the following URL site:

http://gsob3.bus.indiana.edu/VTP/dropoff.nsf

Your username and password should have been supplied to you. If you have not received it by October 22, please contact Anne Powell (contact information on page 1) immediately!

Deliverable 1: ISSUES LIST

Due on Friday, October 29th.
US: 11am
Great Britain: 4pm
Isreal: 6pm
Taiwan & Hong Kong: midnight
Korea: 1am (Saturday morning)

When creating the document for eventual turn-in, click on Deliverable at the following URL site:
http://gsob3.bus.indiana.edu/VTP/team#.nsf *(where # = your team's number)*

When you are ready to submit your team's final decision, you MUST change the status from "Draft" to "Final Version".

DELIVERABLE 1 (2 parts):

Part 1:
For your first deliverable, your team should brainstorm ideas that you might like to include in the policy manual. Your deliverable is a list of the issues you plan to incorporate into the policy manual – at this time (it can be modified throughout the project).

Part 2:
Decide as a team how you will coordinate work efforts. At the least, you should decide who will be in charge of submitting each deliverable before its due date. As a team, you can create additional rules for teammates to follow as you see fit.

REMEMBER: all contact is through Lotus Notes!

IMPORTANT:
Part 1 of this deliverable is simply a LIST!!! DON'T do more work than necessary at this time. This is a list of ideas. Nothing more, nothing less. DO NOT work ahead! It does not have to be in "paper" form – just a list!

Survey 1

Due Monday, November 1st.
US: 11am
Great Britain: 4pm
Isreal: 6pm
Taiwan & Hong Kong: midnight
Korea: 1am (Tuesday morning)

Please complete survey 1 at the following URL site:

http://gsob3.bus.indiana.edu/VTP/dropoff.nsf

Deliverable 2
DOCUMENT OUTLINE

Due Friday, November 5th.
US: 11am
Great Britain: 4pm
Israel: 6pm
Hong Kong & Taiwan: midnight
Korea: 1am (Saturday morning)

When creating the document for eventual turn-in, click on Deliverable at the following URL site:
http://gsob3.bus.indiana.edu/VTP/team#.nsf *(where # = your team's number)*

When you are ready to submit your team's final decision, you MUST change the status from "Draft" to "Final Version".

DELIVERABLE 2:

Now that you have an idea of the issues you want to include in your final document, your team should now begin work on an outline of the final document. Within the outline, include the issues you decided on in Deliverable 1. You can add or discard ideas if needed. Your deliverable is to turn in your document outline. Think of it as a way to better organize your thoughts of Deliverable 1.

What is an outline? Just like the ones you did in grade school. i.e.

I. Mission Statement
   A. First Item
      1. Some detail about that
      2. Some more detail
   B. Second Item
      1. Some detail about that

II. Corporate Values
   A. First item.
   Etc.

Survey 2

Due Monday, November 8th.
US: 11am
Great Britain: 4pm
Isreal: 6pm
Taiwan & Hong Kong: midnight
Korea: 1am (Tuesday morning)

Please complete survey 2 at the following URL site:
http://gsob3.bus.indiana.edu/VTP/dropoff.nsf

Deliverable 3
POLICY MANUAL – ROUGH DRAFT

Due Friday, November 12th.
US: 11am
Great Britain: 4pm
Israel: 6pm
Hong Kong & Taiwan: midnight
Korea: 1am (Saturday morning)

When creating the document for eventual turn-in, click on Deliverable at the following URL site:
http://gsob3.bus.indiana.edu/VTP/team#.nsf *(where # = your team's number)*

When you are ready to submit your team's final document, you MUST change the status from "Draft" to "Final Version".

DELIVERABLE 3:

Now that you have an outline to work with, begin to flesh out your ideas and write the policy manual. You do not have to complete it, but you should have a rough draft completed. Your final document will be graded on creativity of ideas presented, practicality of ideas, and comprehensiveness in dealing with issues. Your deliverable is the final document.

REMEMBER: All contact is STILL through Lotus Notes! Communication with team members should NOT occur in any other way!

Survey 3

Due Monday, November 15th.
US: 11am
Great Britain: 4pm
Israel: 6pm
Taiwan & Hong Kong: midnight
Korea: 1am (Tuesday morning)

Please complete survey 3 at the following URL site:

http://gsob3.bus.indiana.edu/VTP/dropoff.nsf

Deliverable 4
POLICY MANUAL

Due Friday, November 19th.
US: 11am
Great Britain: 4pm
Israel: 6pm
Hong Kong & Taiwan: midnight
Korea: 1am (Saturday morning)

When creating the document for eventual turn-in, click on Deliverable at the following URL site:
http://gsob3.bus.indiana.edu/VTP/team#.nsf *(where # = your team's number)*

When you are ready to submit your team's final document, you MUST change the status from "Draft" to "Final Version".

DELIVERABLE 4:

Complete your policy manual. Your final document will be graded on creativity of ideas presented, practicality of ideas, and comprehensiveness in dealing with issues. Your deliverable is the final document.

REMEMBER: All contact is STILL through Lotus Notes! Communication with team members should NOT occur in any other way!

Survey 4

Due Monday, November 22nd.
US: 11am
Great Britain: 4pm
Israel: 6pm
Taiwan & Hong Kong: midnight
Korea: 1am (Tuesday morning)

Please complete survey 4 at the following URL site:

http://gsob3.bus.indiana.edu/VTP/dropoff.nsf

CASE

Global Associates, Inc. (GAI) Task Background

Global Associates, Inc. is a multinational consulting firm which specializes in helping large U.S. firms establish their first international operation. Their consultants are experts in a variety of multinational business areas such as marketing, finance, and international strategy. Global Associates, however, is unique in the area of international consulting because of their expertise in *cultural awareness training*. A large number of Global Associates' clients are from the U.S. In the course of operations, however, GAI has also established and maintained commercial and political connections in many Pacific Rim countries.

Consultants work in teams and all have considerable management education and experience. Teams are formed such that each member, in addition to their general background, also brings some specialized functional skills to the team. For example, if the team manager determines that a critical concern for the client will be the establishment of a marketing strategy appropriate for a specific market, then a consultant with the necessary marketing knowledge is assigned to that team. Similarly, if a situation exists requiring sophisticated financial expertise in a foreign country, the team manager will acquire a financial expert for the consulting team.

Cultural sensitivity: Mr. Robertson, the President and CEO firmly believes that GAI's competitive advantage is a result of its practice of hiring only those consultants who demonstrate cultural sensitivity. All consultants are required to take a series of cultural awareness courses and follow up with periodic refreshers. Mr. Robertson feels that the failure of many U.S. companies in countries such as Hong Kong, Japan, and Taiwan is primarily due to their failure to understand the customs and cultural practices of the countries in which they operate. To provide the necessary cultural expertise for all of their clients, GAI trains its consultants in various international customs and cultures.

Integrity: One of the major problems which foreign investment consulting firms face is a negative public image. Several cases have been publicized recently suggesting that the entire industry engages in unethical business practices. These alleged practices range from fraud to the use of payoffs to governments in foreign countries to get a "foot in the door" for their client. In countries where it is traditionally "accepted" to do business in such a way, GAI seeks ethical solutions to the logistical and political problems which confront client firms. GAI has discovered that a better understanding of local cultural practices usually provides legal and ethical alternatives to improper practices.

Fairness: A central belief at Global Associates is that every customer has the right to be treated with respect and be given the service they want at a fair and reasonable price. GAI senior management will not compromise on this essential value. If a client does not feel they were treated fairly, Global Associates will do WHATEVER it takes to set things right with that client. Consequently, Global Associates enjoys an excellent reputation and is an industry leader in revenues.

The Problem: Because of the growing number of clients, Global Associates has stepped up hiring and training of consultants. More team managers must be hired to supervise the growing staff. Team managers must have excellent educational credentials and work references before they are considered for hire. In order to obtain managers with the necessary experience, GAI is forced to hire candidates from other firms whose objectives, standards, and overall corporate cultures are frequently very different from those at Global Associates. Global's main concern in this context is

that, entering team managers must be made aware of the importance of conducting business in accordance with the values and philosophy of the company.

Your team's task is to prepare an "orientation" type policy statement to be given to each new manager. This document should illustrate the culture at Global Associates (but don't simply repeat information already given you) and explain the necessity for new managers to adopt the objectives, values, and attitudes which make Global Associates the industry leader it is. This document will be the most important part of a new manager's training at GAI.

Your team's orientation statement should spell out what is expected of the managers in terms of behavior, practice, and ethical standards for themselves and their subordinates and the importance of their role as representatives of Global Associates in helping GAI attain its objectives. The document should also address potential consequences for failure to adopt and demonstrate the corporate culture as outlined.

Section headings have already been established for the document. A listing of these sections and the information your team should develop in each area follow. Within these sections, **be creative** with your ideas and descriptions. The final document should not just be a listing of items; it should contain **detailed descriptions** of the points you are including.

1. Mission statement: the reason the organization exists, goals.

2. Corporate values: an explanation of the values which you feel motivate and compel GAI in the conduct of their business.

3. Policies: statement of how the managers are expected to act so as to reflect GAI's mission and values.

4. Unacceptable behaviors: description of specific behaviors considered inappropriate relative to the stated mission and values.

5. Consequences for failure: explanation of the various consequences a manager can expect in the event of his or her failure to represent GAI in the manner the firm feels is appropriate.

6. Conclusion: brief summary of the GAI's basic objectives and how the company expects this document to aid the organization in realizing those goals.

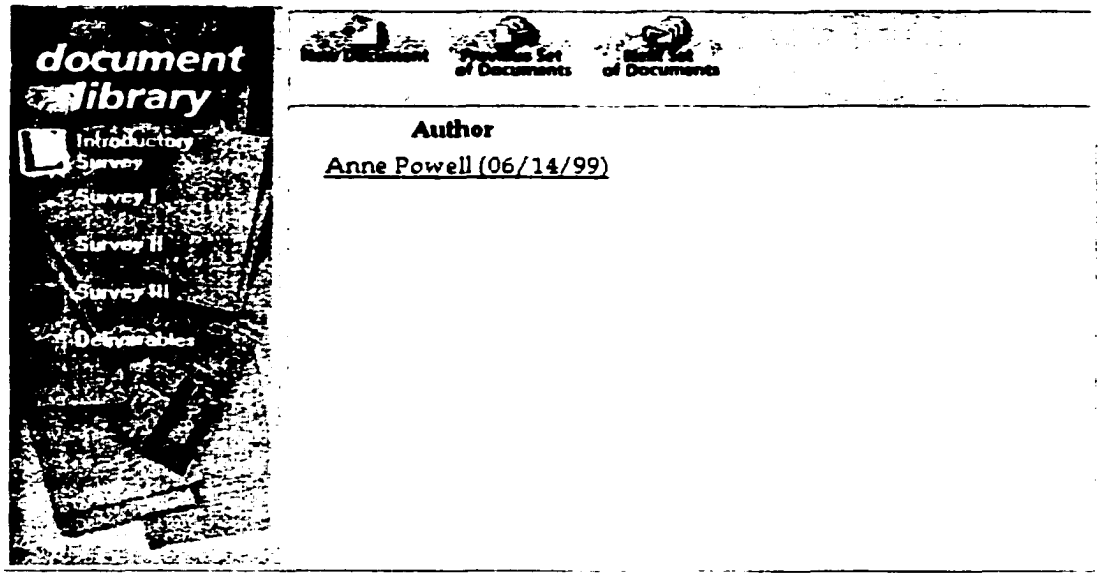
Remember, your objective is to produce a statement which **defines and describes in detail** the values and standards you feel must be conveyed to new managers.

INSTRUCTIONS ON USING LOTUS NOTES FORUMS

In this exercise you will be using Lotus-Notes for your team discussions and survey responses. An area within the team forum has been created for you to work on your team deliverables. These forums are accessible through a Web-based browser interface. Simply type in the appropriate URL (i.e., http://... website address) and enter the username and password provided to you.

A. dropoff.nsf URL: **http://gsob3.bus.indiana.edu/VTP/dropoff.nsf**

This is where you will post your survey responses. The Introductory Survey is due Tuesday, October 26 and must be completed to qualify for prizes (page 21). It has been completely automated for ease-of-use.

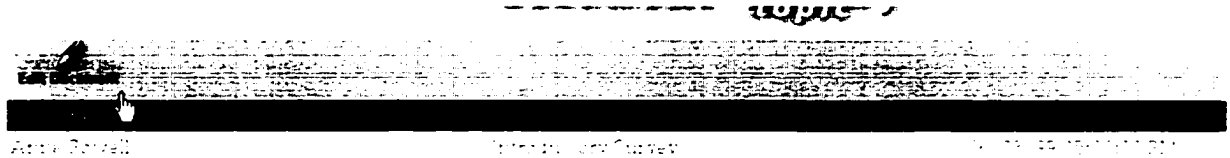


1. To complete the survey, go to the URL address.
2. Click on the survey you are to complete (in the left bar) to highlight it to yellow.
3. Click on "New Document" at the top of the screen.
4. Complete the survey. At the end, submit your survey by clicking on the Submit button.

NOTE: Your actual dropoff will also have a Survey IV showing in the left bar.

5. NOTE: It is possible for you to begin the survey, and complete it at a later date. If you want to postpose completion:
   a. Fill out as much as you want.
   b. Click Submit.
   c. At a later point, enter the forum again, and follow the following directions:
      1. Click on the Survey you wish to complete (in the left bar) to highlight it to yellow.
      2. Click on your name under Author in the white box. This will bring up the survey.
      3. To edit the survey, Click on Edit Document (in the upper left corner of the screen).
      4. Complete the document, and click on Submit again.

   NOTE: You will still need to complete the entire survey by the due date!!



Document Title: Virtual Team Introductory Survey

Survey Instructions:

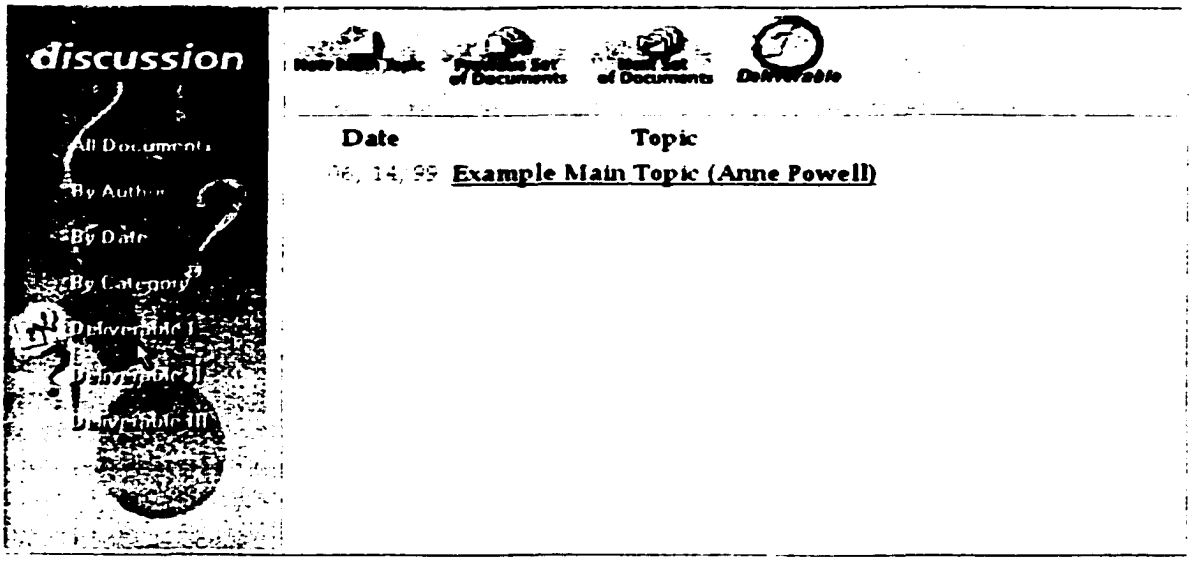
Please respond to each of the statements based on your beliefs and perceptions. Some of the statements may seem similar, that is OK, just answer with your first reaction. You should mark the number that best represents how you feel about the statement.

For each question, mark 1 number that best corresponds to your feelings.

All answers are strictly CONFIDENTIAL! No data will be shared with your instructor or anyone other than the researcher. No data will be reported on individually, all data will be aggregated for research purposes.

B. Team Discussion Forums URL: http://gsob3.bus.indiana.edu/VTP/team#.nsf (where # is your team #).
These forums are where each team will meet to discuss the case and prepare the team deliverable. Below is an example interface. You may view postings by all documents, by author, by date, by category, or by deliverable. The screen below shows one posting to Deliverable 1.

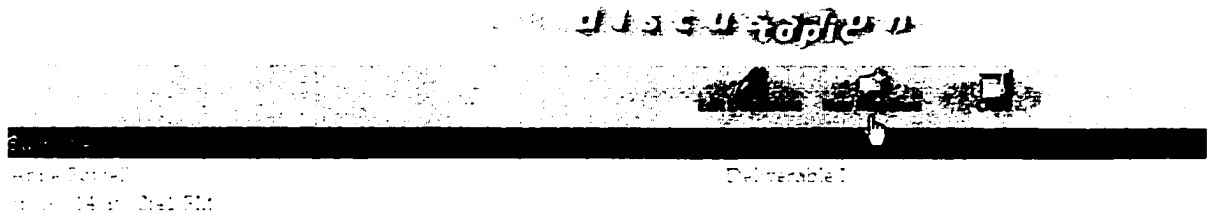
1. To post a new comment, click on the "New Main Topic" button at the top.



2. Write in a title under Document Title.
3. Write your message in the "message context" box.
4. When done, click on Submit.

NOTE: In your team discussions you will also see a Deliverable IV in the left bar.

5. To view a posting, click on it. For example, by clicking on Anne Powell's "Example Main Topic" you would see the following:



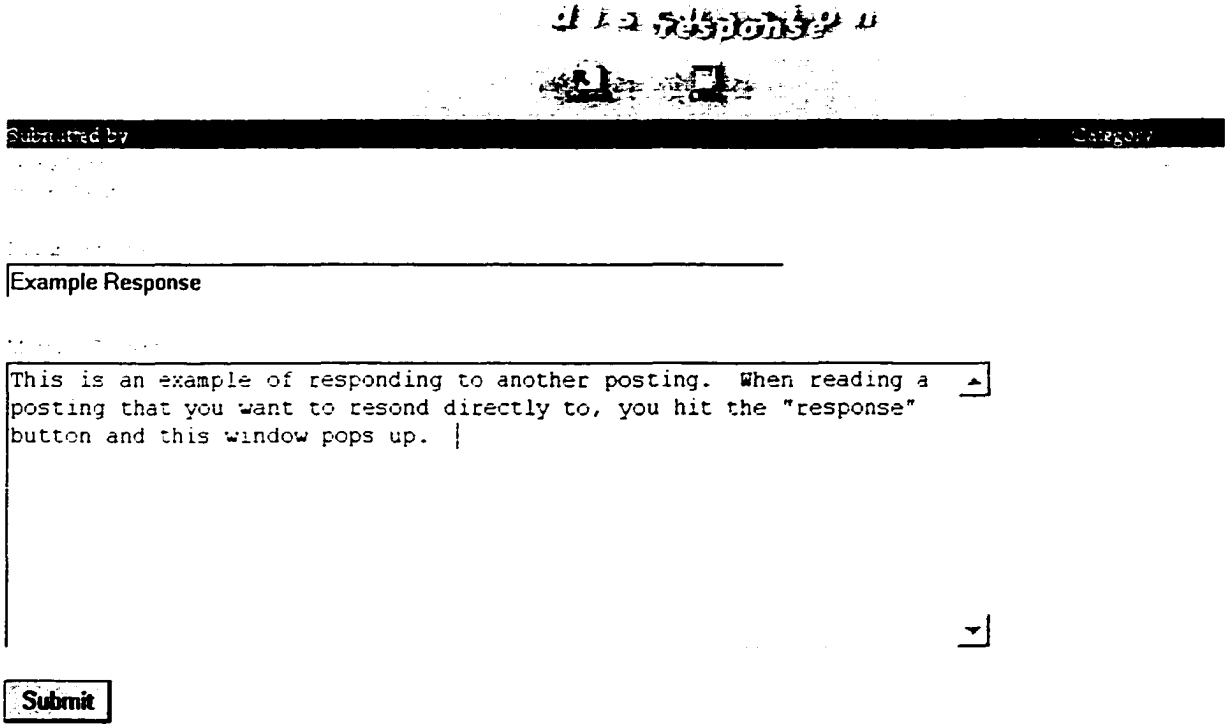
Example Main Topic

This is an example of a main topic.

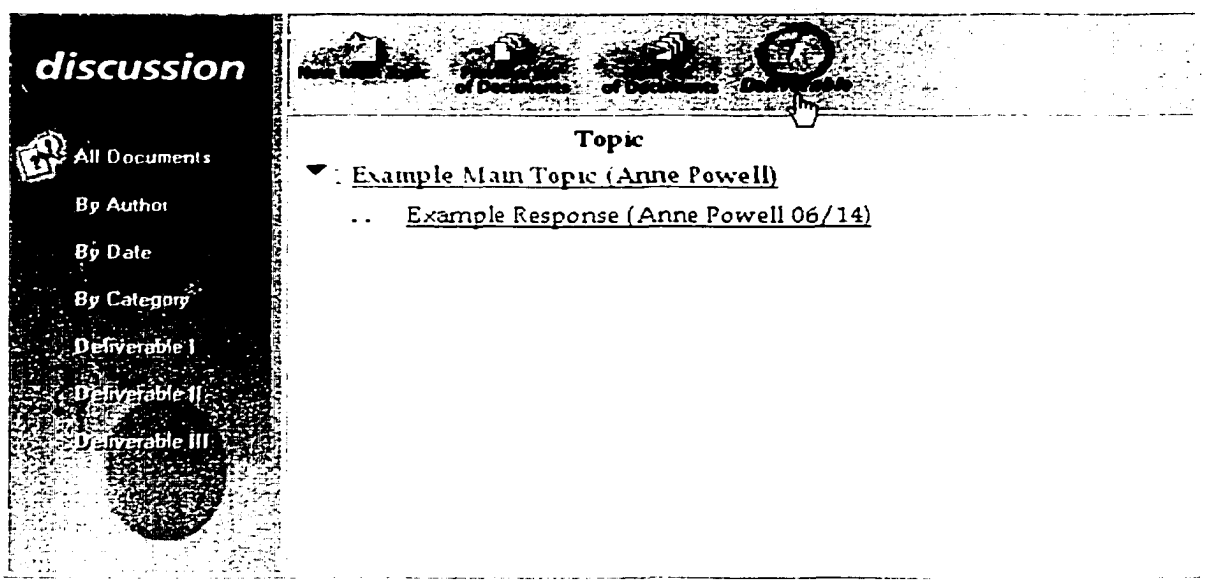
[Previous Main Document]
● **Example Main Topic (Anne Powell)** ●
[Next Main Document]

All Documents *(Expanded)*, *(Collapsed)* | **by Category** | **by Author** | **Help**

6. If you are reading a posting such as the "Example Main Topic" above and want to respond directly to it, click the "New Response" button at the top of the interface (see above picture). An interface like the one below will appear. This is the way **"threaded discussions"** are created. Threaded discussions are simply visually organized team thoughts.



Now we have some main postings and responses shown below.



The Team Discussion interface is easy-to-use. Remember the following four points to help your team communicate:

1. **Always identify the subject of your posting (i.e., the "Document Title"), even if it is a response. This will help team members when they come to the forum.**
2. **The value of the discussion forum is the ability to thread discussions through the response function. In this manner your team can emulate a "virtual conversation". So use the response function when appropriate.**

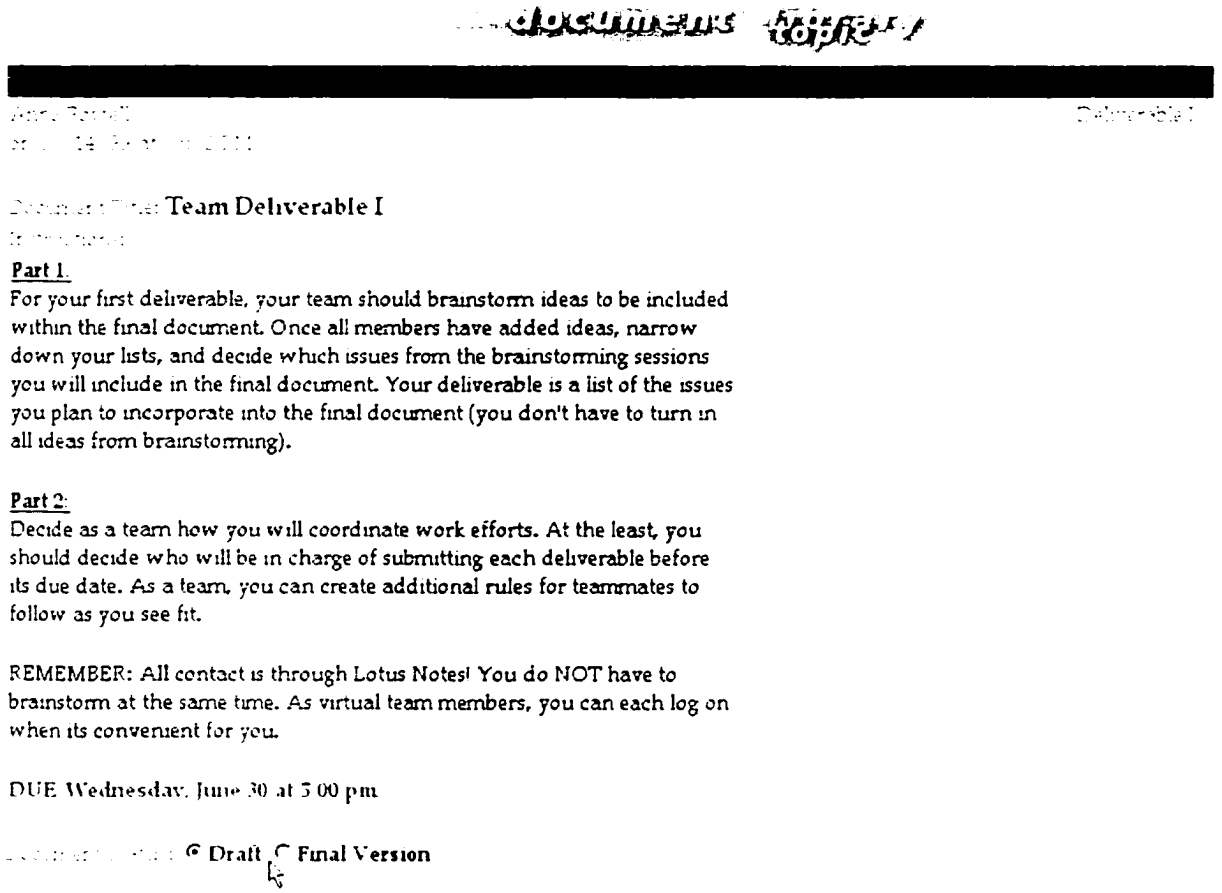
3. **If you are responding to team member's topic, use the response function. If you are beginning a new line of thinking or discussion, use the New Main Topic function. Either way, always make sure to fill in Document Title so your team members know what your entry is about.**

4. **You can respond to a comment also. When writing a response, make sure you're responding to what you want to respond to – the main topic brought up, or someone else's comment to it.**

C. TEAM DELIVERABLE (same URL as team discussion forum).

1. If you are ready to begin work on the actual deliverable, *click on the Deliverable button* (see on picture on previous page). You will note a radio button to mark "Draft" or "Final Version" (see below). Versions are defaulted to "Draft" mode. You can have several "Draft" versions at once. When you have completed a "Draft" version and are ready to share it with your teammates, click Submit, and it will be posted to your forum.

2. When a "Draft" is complete for the deliverable, click on "Final Version" for that draft. You can continue to edit this document until the due date of the deliverable. If NO deliverable is marked "Final Version" at the due date time, nothing will be submitted for your team. If more than one deliverable is marked "Final Version", the one with the latest creation date will be taken as your team's submission.



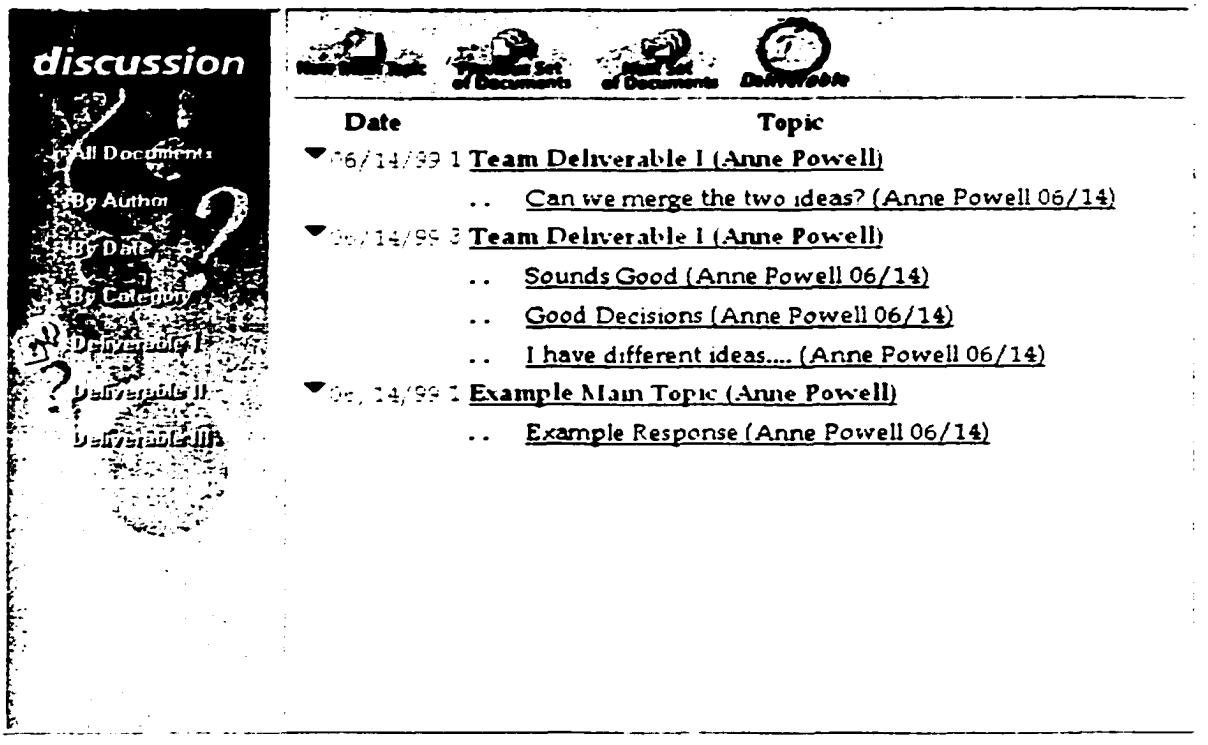
3. Responding to a Deliverable is done the same way as responding to a New Main Topic. You can have threaded discussions with each deliverable also.

4. If the team has been doing deliverable work in the team forum, you can cut-and-paste the work into the deliverable section.

Below shows two deliverables have been submitted for the team to review, along with responses to them. Your team's responses will, of course, be from 4 different people.

Make sure to change "Draft" to "Final Version" when you have your final version complete!!!! And never close out of a deliverable without hitting SUBMIT. If you don't hit SUBMIT, you will lose everything you've entered since the last SUBMIT.

Remember: if you have more than one "Draft" that you're working on, make sure to note which is the "Final Version" for submission. If you forget to mark a "Final Version", that deliverable will NOT be turned in for your team. If your team marks more than one draft as a "Final Version", the system will automatically take the "Final Version" with the latest creation date.

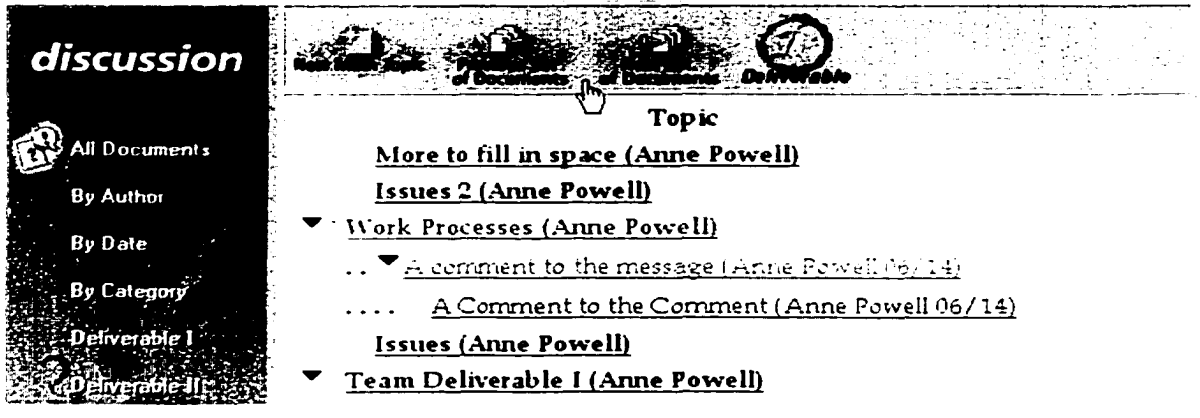


D. Other things to note:

1. In the team discussion forum, you can edit your own documents, but not your teammates. Click on your document you wish to edit, then at the top of the page, click on "Edit Document". *However, in the deliverable section, everyone can edit all documents!!!* This was implemented for ease of use in creating the document. **What you must be careful of is that two people aren't working on the same document at the same time! If this occurs, the changes the 1st person makes will be erased when the 2nd person posts his or her changes.** ***This is only a problem if two people are editing the same version!!***

Team Deliverable I

2. Your team's comments will soon fill the screen. To view earlier or later documents, click on the "Previous Set of Documents" or "Next Set of Documents".



3. You can comment a comment (see above). When writing a response, make sure you're responding to what you want to respond to – the main topic brought up, or someone else's comment to it.

FREQUENTLY ASKED QUESTIONS:

Answers to most of these questions can be found in the packet. However, they are listed here for quick reference.

1. Our team created all of deliverable one in the team forum – different people supplying different ideas. Now how do we get all our ideas to the deliverable forum?
ANSWER: Use cut-and-paste. Make SURE to SUBMIT the deliverable EVERY time you exit out of it – otherwise what you've just pasted will be erased. Then, when you're ready to cut-and-paste the next person's input, edit the document you originally cut-and-paste to.

2. I can't get to our team's deliverable page.
ANSWER: Make sure you highlight the Deliverable button on the left first. (See page 17 of packet).

3. How do I know if our team's deliverable has been turned in?
ANSWER: Once you mark your deliverable as "Final", you will notice a sun icon next to it. This means the system will pick up this deliverable when the due date/time arrives. And remember, when the due date time arrives, your access to the team forum is SHUT OFF!!!

4. Our team has more than one document with a sun next to it. What will happen?
ANSWER: The system will accept the document with the latest date.

5.I need to make an adjustment to our final document – but somebody else in the group already turned it in. I don't think he will make another adjustment before the due time. So, I was wondering if I could just turn in another final draft – and then this would be the one that is graded.
ANSWER: Yes, this is fine, as long as it is OK with the team. The system will just take the final version with the latest date/time.

6. Our team has finished deliverable 1, but only 3 members of the team worked on it. Where's our fourth person?
ANSWER: Good question. Your fourth person may not have figured out how to get started, may be a procrastinator, or may have a valid reason for not participating yet. Just be patient and wait and see. The project can be completed by a team of two, as well as three or four.

7. I wanted to edit some of my teammate's ideas in the discussion forum, but can't get access to it.
ANSWER: That's right. Only the teammate who posts an idea in the discussion forum can edit it. However, all team members can edit the deliverable.

8. I went to the website to complete survey 2, but it won't let me access the survey 2 new document. What should I do?
ANSWER: Wait until the system "opens" that forum. Survey 2 won't be "up" until November 5 at (11am for US, 4pm for Great Britain, 6pm for Israel, midnight for Taiwan & Hong Kong, and 1am November 5 for Korea). If you are from Taiwan, and trying to access survey 2 at 10:00pm, you won't be able to get in for another 2 hours.

9. I'm trying to complete Survey 2, but I keep getting the message "No Documents Found". What's wrong?

ANSWER: Nothing's wrong. You haven't created the document yet, that's why there isn't one found. See page 12 of this packet. First, click on Survey 2 to highlight it, then click on New Document to bring the survey up. After completing the survey, click on Submit. Then, when you go into the dropoff.nsf forum, you'll see your entry for the survey.

10. I completed the survey, but now I don't see it out there anymore. Did you get it?
ANSWER: More than likely. Once the due date/time comes, the system will automatically take your survey and deposit it to a different forum that only the virtual team manager has access to. You will no longer see your survey on your forum after the due date/time.

11. There are so many messages, is there any way that I can see our team's messages that relate just to Deliverable 2?
ANSWER: Yes, in the left bar, just click on Deliverable 2 so that its highlighted. Then you'll see messages for just Deliverable 2.

12. This morning I was working on Deliverable 2 and I put it in the deliverable forum under draft version, closed it, and then just went back after an hour and nothing was there. So, does this mean that I have to type everything over again? Or am I doing something wrong?
ANSWER: Yes, you did something wrong, and yes, you'll have to type everything in over again. ***Before closing anything you want to save, make sure to hit the SUBMIT button – or you lose it all!!***

13. I was just wondering when Survey 3 would be up on the web. Its 2:00pm here in the US, and it was supposed to be up at 11am.
ANSWER: It is up. Remember that once you highlight Survey 3 (in the left bar), you then have to click on New Document to see the survey.

14. Is there any way that I can edit the survey without doing the whole thing over again?
ANSWER: Yes. Go to the dropoff.nsf forum. Click on the current survey in the left bar. Click on your document. Then, when it opens, you'll see an 'Edit Document' in the upper left corner, click on it. You should then be able to edit just the portion of the survey you want to. Don't forget to click Submit at the end again – or your edits won't be saved!!!

15. My team has a deliverable in draft version. I went out and was editing it, when unknown to me, another team-member went out, and started editing the same version. I submitted my changes, and 5 minutes later, the other team-member submitted his. Now my changes aren't out there. What should I do?
ANSWER: Your changes are gone. You can take the version your team-member submitted and reenter your changes. A suggestion so this doesn't happen again: when you begin to edit an existing deliverable, send a note to the team's discussion forum giving the date and time when you begin editing. When done, send another note saying you're done. Before you begin editing a deliverable, check the team discussion forum, to make sure no other team-member is editing the version. Of course, you can always CREATE a new draft version without having to do this.

16. I'm completing a survey. US English is not my first language and I have run across a question that I'm not sure I understand completely. Is there anything I can do?
ANSWER: Click on SUBMIT. Then email Anne Powell (address on first page) and ask her your question. When you receive an answer, you'll be able to go out and edit your survey so you won't have to redo the whole thing. (Just make sure you hit SUBMIT every time you leave the forum!). Directions for editing a survey are on page 13 of this document.

APPENDIX C – PILOT STUDY

Appendix C includes all pilot results. Appendix C-1 presents a timeline of the three-week pilot study. Appendix C-2 shows the items that were retained after reliability tests and used for analysis in the pilot study. Appendix C-3 presents factor analysis and reliability results for scales already developed (commitment and collectivism) used in the pilot study. Based on these results, the researcher has determined that the Meyer and Allen (1991) commitment measure is appropriate for virtual teams, and therefore, appropriate to use in the actual dissertation. The collectivism measure did not provide the results expected, and based on these results, the collectivism measure was changed for the actual dissertation. Appendix C-4 presents factor analyses and reliability results for instruments that were modified for use in the pilot study (task liking, task competence, team cohesion, team work processes). Appendix C-5 presents regression analyses for the output variables (satisfaction and performance) used in this study. Appendix C-6 presents regression analyses for the input variables (culture, task liking, task competence, team cohesion, team work processes, and others' commitment) used in this study.

APPENDIX C-1: Time Line

Friday, June 18		Survey Forum opened for Introductory Survey Students receive Lotus Notes packet of instructions
Tuesday, June 22	5:00pm	Students notified of their team number
Wednesday, June 23	5:00pm	Survey Forum is closed Team Forums are opened
Wednesday, June 30	5:00pm	Deliverable 1 is due Team Forums are closed Survey Forum is opened
Friday, July 2	5:00pm	Survey 1 is due Survey Forum is closed Team Forums are opened
Wednesday, July 7	5:00pm	Deliverable 2 is due Team Forums are closed Survey Forum is opened
Friday, July 9	5:00pm	Survey 2 is due Survey Forum is closed Team Forums are opened
Wednesday, July 14	5:00pm	Deliverable 3 is due Team Forums are closed Survey Forum is opened
Friday, July 16	5:00pm	Survey 3 is due Survey Forum is closed

This timeline proved adequate for the pilot study. One week was sufficient for teams to complete each deliverable.

APPENDIX C-2: Pilot Study Measurement Items

All items will be measured on a 7-point Likert scale with 1 labeled Strongly Disagree and 7 labeled Strongly Agree.

® signifies a statement that is reverse coded.
Alpha reliabilities are from pilot study.

COLLECTIVISM/INDIVIDUALISM 8-item measure by Earley (1993)
Reliability: Alpha = .46

1: Employees like to work in a team rather than by themselves.
2: If a team is slowing me down, it is better to leave it and work alone. ®
3: To be superior, a man must stand alone. ®
4: One does better work working alone than in a team. ®
5: I would rather struggle through a personal problem by myself than discuss it with my friends. ®
6: An employee should accept the team's decision even when personally he or she has a different opinion.
7: Problem solving by teams gives better results than problem solving by individuals.
8: The needs of people close to me should take priority over my personal needs.

TASK LIKING Alpha (for 6 items): .9476 (t1); .9516 (t2); .9570 (t3)
1: I have a strong interest in the project and what I'm learning from participating in it.
2: I have a strong interest in the project and tasks prescribed to my team.
3: Mastering the requirements of this project means a lot to me.
4: I have found the time spent working on this project enjoyable.
5: Working on this project has been fun.
6: I liked working on this project.

TASK COMPETENCE Alpha (7 items): .8885 (t1); .9133 (t2); .8810 (t3)
(modified from Wagner and Morse, 1975 with items added)
1: This project is manageable and any problems encountered tend to be optimally solved.
2: I meet my own personal expectations for expertise in doing this project.
3: I can find answers to questions that arise about this project.
4: Considering the time I've spent on this project, I feel thoroughly familiar with the tasks assigned to me.
5: I honestly believe I have all the skills necessary to perform this project well.
6: I provide productive input for the completion of the team project.
7: I am able to effectively complete tasks specifically assigned to me by the team.

COHESION Alpha (11 items): .8907 (t1); .9368 (t2); .9280 (t3)
(from Dobbins and Zaccaro, 1986; Stokes, 1983; and Wech et al., 1998)
1: There is a high spirit of teamwork among my coworkers.
2: Members of my work group take a personal interest in one another.
3: If I had a chance to do the same kind of work for the same rewards in another work group, I would still stay here in this work group.
4: Members of this team like each other.
5: Members of this team fit what I believe to be "ideal" team members.
6: The members of my team will readily defend each other from criticism by outsiders.
7: I look forward to communicating with the members of my team each day.
8: The members of my team get along well together.

9: For the most part, team members have confidence and trust in other team members.
10: Compared to other teams in the course, our team works well together.
11: The team that I belong to is a close one.

TEAM WORK PROCESSES Alpha: .9025 (t1); .8999 (t2); .9270 (t3)

(1-6 Taylor and Bowers; also used some cohesion measures based on sorting.)

1: Team members plan together and coordinate their efforts.
2: While working on the project, my team had a difficult time making good decisions and solving problems. ®
3: Everyone in the team understands what they are to do and how to do it.
4: As a team, we are dedicated to meeting our objectives successfully.
5: My team has trouble adapting and responding to unusual project demands. ®
6: Team members have worked hard to provide substantive and timely feedback on ideas and work presented.
7: Differences of opinion are encouraged in my team.
8: My team is usually aware of important events and situations.
9: People in my team are never afraid to speak their minds about issues and problems that affect them.
10: The people on my team make my job easier by sharing their ideas and opinions with me.

PERCEIVED COMMITMENT OF OTHERS

For the most part, how committed are your team members?

(1-7 scale, not committed at all to very committed)

Team member 1 _____
Team member 2 _____
Team member 3 _____
Team member 4 _____

COMMITMENT MEASURE (taken from Meyer, Allen, and Smith, 1993).

Normative Commitment Alpha: .8594 (t1); .8837 (t2); .8993 (t3)

1: I do not feel any obligation to remain with my current team. ®
2: Even if it were to my advantage, I do not feel it would be right to leave my team now.
3: I would feel guilty if I left my team now.
4: This team deserves my loyalty.
5: I would not leave my team right now because I have a sense of obligation to the people in it.
6: I owe a great deal to my team.

Continuance Commitment: Alpha: .6375 (t1); .3234 (t2); .6921 (t3)

1: It would be very hard for me to leave my team right now, even if I wanted to.
2: Too much of my life would be disrupted if I decided I wanted to leave my team right now.
3: Right now, staying with my team is a matter of necessity as much as desire.
4: I believe that I have too few options to consider leaving this team.
5: One of the few negative consequences of leaving this team would be the scarcity of available alternatives.
6: If I had not already put so much of myself into this team, I might consider quitting.

Affective Commitment: Alpha: .6010 (t1); .5473 (t2); .8521 (t3)

1: I would be very happy to spend the rest of the course in my team.
2: I really feel as if this team's problems are my own.
3: I do not feel like "part of the family" with my team. ®
4: I do not feel "emotionally attached" to this team. ®
5: This team has a great deal of personal meaning for me.
6: I feel a strong sense of belonging to my team.

SATISFACTION. Alpha: .9175 (t1); .9341 (t2); .9488 (t3)

1. I am satisfied with the amount of personal growth and development I get from this project/team.
2. I am satisfied with the way the team works together toward a goal.
3. I am satisfied with the degree of respect and fair treatment I receive from my teammates.
4. I am satisfied with the attitude of the team toward the project.
5. I am satisfied with the quality of work done by the team.
6. I am satisfied with the feeling of worthwhile accomplishment I get from working on this project.
7. I am satisfied with the amount of challenge in the project.
8. I am satisfied with my ability to use the technology effectively.
9. I am satisfied with the means of communicating with my teammates.
10. Overall, I am satisfied with having participated in this team.

PERFORMANCE.

This measure will be taken from Burke and Chidambaram (1999). Each section is evaluated based on creativity of ideas, realism/practicality, comprehensiveness, positive tone, and clarity/content.

APPENDIX C-3: Factor analysis and reliability of existing measures.

Table C-3.1 presents questionnaire items (grouped by commitment component) and the factor loadings, eigenvalues, and reliabilities associated with the commitment scale.

Table C-3.1 Factor Analysis, Promax Rotated Solution for Commitment

Factor 1: Normative Commitment (Eigenvalue = 7.462; Alpha = .899)	**Loadings**
I do not feel any obligation to remain with my current team ®	.896
Even if it were to my advantage, I do not feel it would be right to leave my team now.	.909
I would feel guilty if I left my team now.	.908
This team deserves my loyalty.	.610
I would not leave my team right now because I have a sense of obligation to the people in it.	.896
I owe a great deal to my team.	.501
Factor 2: Continuance Commitment (Eigenvalue = 1.726; Alpha = .692)	**Loadings**
It would be very hard for me to leave my team right now, even if I wanted to.	.282
Too much of my life would be disrupted if I decided I wanted to leave my team right now.	.503
Right now, staying with my team is a matter of necessity as much as desire.	.562
I believe that I have too few options to consider leaving this team.	.775
One of the few negative consequences of leaving this team would be the scarcity of available alternatives.	.766
If I had not already put so much of myself into this team, I might consider quitting.	.527
Factor 3: Affective Commitment (Eigenvalue = 2.564; Alpha = .852	**Loadings**
I would be very happy to spend the rest of the course in my team.	.706
I really feel as if this team's problems are my own.	.626
I do not feel like "part of the family" with my team. ®	.627
I do not feel "emotionally attached" to this team. ®	.800
This team has a great deal of personal meaning for me.	.920
I feel a strong sense of belonging to my team.	.772

As shown in the table, the commitment scales which have been used in previous research produced acceptable factor loadings (with one exception) and reliabilities. The one exception, question one in the continuance scale, actually loaded on the normative scale (.839). For the dissertation, this question may be slightly reworded because of these

results. The factor analysis results were run at Time 3. Table C-3.2 presents eigenvalues and the percentage of variance explained for each factor.

Table C-3.2. Factor Analysis Summary

Factor	Eigenvalue	% Explained	Cumulative %
Normative	7.462	41.45	41.45
Affective	2.564	14.25	55.70
Continuance	1.726	9.59	65.29

Table C-3.3 presents questionnaire items and the factor loadings, eigenvalues, and reliabilities associated with the collectivism scale.

Table C-3.3 Factor Analysis, Promax Rotated Solution for Collectivism

Collectivism (Eigenvalue = 1.863; % explained: 23.29% Alpha = .461)	Loadings
People like to work in a team rather than by themselves.	.343
If a team is slowing me down, it is better to leave it and work alone.	.279
To be superior, one must stand alone.	.671
One does better work working alone than in a team.	.521
I would rather struggle through a personal problem by myself than discuss it with my friends.	.617
A teammate should accept the team's decision even when personally he or she has a different opinion.	.462
Problem solving by teams gives better results than problem solving by individuals.	.593
The needs of people close to me should take priority over my personal needs.	.027

Loadings for collectivism were low for three of the eight items. However, in the pilot study, 85% of the subjects were U.S. citizens. The other 15%, although from other countries, have chosen to attend college in the U.S., and may have adopted many American habits. Based on results from the pilot study and prior research using this scale, a new measurement was created for use in the dissertation experiment.

APPENDIX C-4: Factor Analysis and Reliabilities of modified instruments

This appendix presents the analysis of the other instruments which were modified from existing scales for this study. Table C-4.1 presents questionnaire items (grouped by factor) and the factor loadings and reliabilities associated with each scale.

Table C-4.1 Factor Analysis, Promax Rotated Solution for Other Scales

Factor 1: Task Liking (Eigenvalue = 14.864; Alpha = .957)	**Loadings**
I have a strong interest in the project and what I'm learning from participating in it.	.925
I like working on this project.	.917
I have a strong interest in the project and tasks prescribed to my team.	.925
Mastering the requirement of this project means a lot to me.	.838
I have found the time spent working on this project enjoyable.	.916
Working on this project has been fun.	.946
Factor 2: Team Work Processes (Eigenvalue = 4.566; Alpha = .927)	**Loadings**
Team members plan together and coordinate their efforts.	.795
While working on this project, my team had a difficult time making good decisions and solving problems.	.751
Everyone in the team understands what they are to do and how to do it.	.827
As a team, we are dedicated to meeting our objectives successfully.	.771
My team has trouble adapting and responding to unusual project demands. ®	.725
Team members have worked hard to provide substantive and timely feedback on ideas and work presented.	.857
Differences of opinion are encouraged in my team.	.587
My team is usually aware of important events and situations.	.827
People in my team are never afraid to speak their minds about issues and problems that affect them.	.621
The people on my team make my job easier by sharing their ideas and opinions with me.	.745
Factor 3: Team Cohesion (Eigenvalue = 3.157; Alpha = .928)	**Loadings**
There is a high spirit of teamwork among my teammates.	.815
Members of my team take a personal interest in one another.	.629
If I had a chance to do the same kind of project for the same credit with other teammates, I would still stay with my current teammates.	.773
Members of this team like each other.	.667
Members of this team fit what I believe to be "ideal" team members.	.836
The members of my team will readily defend each other from criticism by outsiders.	.543
I look forward to communicating with the members of my team each day.	.715
The members of my team get along well together.	.768
For the most part, team members have confidence and trust in other team members.	.520
Compared to other teams in the course, our team works well together.	.800
The team that I belong to is a close one.	.631

Factor 4: Task Competence (Eigenvalue = 1.539, Alpha = .881)	Loadings
This project is manageable and any problems encountered tend to be optimally solved.	.656
I meet my own personal expectations for expertise in doing this project.	.712
I can find answers to questions that arise about this project.	.714
Considering the time I've spent on this project, I feel thoroughly familiar with the tasks assigned to me.	.800
I honestly believe I have all the skills necessary to perform this project well.	.809
I am able to effectively complete tasks specifically assigned to me by the team.	.811
I provide productive input for the completion of the team project.	.840

As can be seen from the factor loadings, items loaded on the factor expected. Alpha levels were high also, so these items will be used in the dissertation with one exception. Question nine in cohesion was originally a work team processes item. Based on Q-sort results, the item was moved to cohesion. However, in the pilot study, the item loaded highly on both cohesion (.520) and work team processes (.811). For this reason, question nine, "For the most part, team members have confidence and trust in other team members," will be used as a work team process item rather than a cohesion item.

Table C-4.2 presents eigenvalues and the percentage of variance explained for each factor.

Table C-4.2. Factor Analysis Summary

Factor	Eigenvalue	% Explained	Cumulative %
Task Liking	14.864	43.717	43.717
Team Work Processes	4.566	13.431	57.148
Team Cohesion	3.157	9.286	66.434
Task Competence	1.539	4.528	70.961

APPENDIX C-5: Relationship of Commitment to Outcomes

TIME 1:

Relationship of Commitment to Satisfaction

R	R2	Adj R2	Std. Error of the Estimate	F	Sig.
.672	.452	.423	7.6711	15.675	.000

	Unstandardized Coefficients		Std. Coeff.		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	26.211	6.079		4.312	.000
Normative Comm	**.517**	**.185**	**.360**	**2.789**	**.007**
Continuance Comm	**-.451**	**.194**	**-.242**	**-2.326**	**.024**
Affective Comm	**.827**	**.246**	**.416**	**3.363**	**.001**

TIME 2:

Relationship of Commitment to Satisfaction

R	R2	Adj R2	Std. Error of the Estimate	F	Sig.
.742	.551	.527	8.2097	22.924	.000

	Unstandardized Coefficients		Std. Coeff.		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	5.637	7.013		.804	.425
Normative Comm	**.498**	**.196**	**.298**	**2.541**	**.014**
Continuance Comm	-.217	.286	-.079	-.757	.452
Affective Comm	**1.360**	**.261**	**.567**	**5.203**	**.000**

TIME 3:

Relationship of Commitment to Satisfaction

R	R2	Adj R2	Std. Error of the Estimate	F	Sig.
.790	.624	.601	7.8365	26.554	.000

	Unstandardized Coefficients		Std. Coeff.		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	18.726	5.210		3.594	.001
Normative Comm	**.619**	**.202**	**.401**	**3.056**	**.004**
Continuance Comm	-.199	.221	-.095	-.902	.372
Affective Comm	**.849**	**.193**	**.510**	**4.404**	**.000**

TIME 4:

Relationship of Commitment to Performance

R	R2	Adj R2	Std. Error of the Estimate	F	Sig.
.291	.085	.029	8.7942	1.510	.224

	Unstandardized Coefficients		Std. Coeff.		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	87.830	5.842		15.035	.000
Normative Comm	**-.413**	**.227**	**-.369**	**-1.820**	**.075**
Continuance Comm	.396	.247	.261	1.607	.115
Affective Comm	.077	.216	.064	.357	.722

APPENDIX C-6: Relationship of Antecedents to Commitment

TIME 1:

Relationship of Antecedents to *Normative Commitment*:

R	R2	Adj R2	Std. Error of the Estimate	F	Sig.
.685	.470	.405	5.5437	7.236	.000

	Unstandardized Coefficients		Std. Coeff.		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	2.888	7.742		.373	.711
Coll/Indv	-.016	.147	-.013	-.112	.911
Task Liking	.040	.141	.047	.286	.776
Task Comp.	-.105	.158	-.111	-.665	.509
Cohesion	**.302**	**.173**	**.356**	**1.746**	**.087**
Work Processes	**.323**	**.168**	**.393**	**1.926**	**.060**
Other's Commitment	-.038	.299	-.015	-.127	.899

Relationship of Antecedents to *Continuance Commitment*:

R	R2	Adj R2	Std. Error of the Estimate	F	Sig.
.287	.082	-.030	5.3888	.732	.626

	Unstandardized Coefficients		Std. Coeff.		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	22.906	7.526		3.044	.004
Coll/Indv	.176	.143	.184	1.236	.222
Task Liking	.096	.137	.150	.701	.487
Task Comp.	-.200	.154	-.287	-1.303	.199
Cohesion	.089	.168	.143	.532	.597
Work Processes	-.120	.163	-.199	-.740	.463
Other's Commitment	.042	.291	.022	.144	.886

Relationship of Antecedents to *Affective Commitment*:

R	R2	Adj R2	Std. Error of the Estimate	F	Sig.
.777	.604	.555	3.3985	12.439	.000

	Unstandardized Coefficients		Std. Coeff.		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	16.583	4.746		3.494	.001
Coll/Indv	**-.246**	**.090**	**-.268**	**-2.736**	**.009**
Task Liking	**.206**	**.086**	**.336**	**2.388**	**.021**
Task Comp.	-.035	.097	-.052	-.359	.721
Cohesion	**.387**	**.106**	**.642**	**3.646**	**.001**
Work Processes	-.037	.103	-.006	-.036	.972
Other's Commitment	-.280	.183	-.155	-1.530	.133

TIME 2:

Relationship of Antecedents to *Normative Commitment*:

R	R2	Adj R2	Std. Error of the Estimate	F	Sig.
.743	.552	.500	5.0229	10.486	.000

	Unstandardized Coefficients		Std. Coeff.		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	10.730	6.981		1.537	.130
Coll/Indv	.060	.123	.048	.492	.625
Task Liking	**.455**	**.121**	**.542**	**3.771**	**.000**
Task Comp.	**-.551**	**.161**	**-.514**	**-3.427**	**.001**
Cohesion	-.055	.109	-.091	-.509	.613
Work Processes	**.435**	**.139**	**.596**	**3.123**	**.003**
Other's Commitment	.242	.253	.116	.957	.343

Relationship of Antecedents to *Continuance Commitment*:

R	R2	Adj R2	Std. Error of the Estimate	F	Sig.
.563	.317	.237	3.8352	3.952	.003

	Unstandardized Coefficients		Std. Coeff.		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	15.032	5.330		2.820	.007
Coll/Indv	-.033	.094	-.043	-.357	.722
Task Liking	**.315**	**.092**	**.606**	**3.416**	**.001**
Task Comp.	-.128	.123	-.193	-1.042	.302
Cohesion	**-.176**	**.083**	**-.471**	**-2.126**	**.038**
Work Processes	.095	.106	.210	.892	.376
Other's Commitment	**.452**	**.193**	**.350**	**2.339**	**.023**

Relationship of Antecedents to *Affective Commitment*:

R	R2	Adj R2	Std. Error of the Estimate	F	Sig.
.820	.672	.634	2.9866	17.451	.000

	Unstandardized Coefficients		Std. Coeff.		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	11.299	4.151		2.722	.009
Coll/Indv	-.000	.073	.000	-.003	.998
Task Liking	**.331**	**.072**	**.567**	**4.616**	**.000**
Task Comp.	-.120	.096	-.161	-1.253	.216
Cohesion	**.216**	**.065**	**.513**	**3.343**	**.002**
Work Processes	-.096	.083	-.189	-1.158	.252
Other's Commitment	.214	.150	.148	1.426	.160

TIME 3:

Relationship of Antecedents to *Normative Commitment*:

R	R2	Adj R2	Std. Error of the Estimate	F	Sig.
.759	.576	.501	5.4009	7.689	.000

	Unstandardized Coefficients		Std. Coeff.		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	6.196	10.907		.568	.574
Coll/Indv	-.075	.172	-.056	-.439	.663
Task Liking	.144	.168	.160	.855	.398
Task Comp.	-.099	.212	-.073	-.469	.642
Cohesion	**.463**	**.154**	**.649**	**3.006**	**.005**
Work Processes	-.035	.154	-.048	-.225	.823
Other's Commitment	.144	.413	.062	.348	.730

Relationship of Antecedents to *Continuance Commitment*:

R	R2	Adj R2	Std. Error of the Estimate	F	Sig.
.467	.218	.084	5.9822	1.623	.170

	Unstandardized Coefficients		Std. Coeff.		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	16.574	12.022		1.379	.177
Coll/Indv	-.121	.188	-.109	-.643	.524
Task Liking	.011	.186	.015	.059	.953
Task Comp.	.005	.233	.005	.022	.982
Cohesion	**.304**	**.170**	**.514**	**1.794**	**.081**
Work Processes	-.249	.163	-.420	-1.532	.134
Other's Commitment	.402	.431	.213	.933	.357

Relationship of Antecedents to *Affective Commitment*:

R	R2	Adj R2	Std. Error of the Estimate	F	Sig.
.808	.653	.594	4.4295	10.994	.000

	Unstandardized Coefficients		Std. Coeff.		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	8.697	8.901		.977	.335
Coll/Indv	-.198	.139	-.160	-1.420	.164
Task Liking	**.395**	**.137**	**.479**	**2.876**	**.007**
Task Comp.	-.118	.173	-.099	-.684	.499
Cohesion	.154	.126	.235	1.230	.227
Work Processes	.166	.120	.252	1.378	.177
Other's Commitment	.029	.319	.014	.091	.928

APPENDIX D – SCALE ITEM RESULTS

Appendix D presents data from factor analyses and reliability tests for the different scales. Appendix D is comprised of ten appendices (D1-D10) each of which presents the results of a different variable.

Appendix D-1: Collectivism – Individualism Scale

Item No.	Factor Loadings – Varimax rotated solution (Reliability)	
	Factor 1 (.82)	Factor 2 (.77)
16	**.705**	-.047
17	**.829**	-.040
18	**.911**	.062
19	**.788**	.043
13	-.028	**.788**
14	-.093	**.832**
15	.140	**.869**
Eigenvalue	2.667	2.075

Factor Names:

Factor 1 (Teamwork): Espousal of norms about subordination of personal needs to team interests.

Factor 2 (Affective): Value attached to working alone versus working in a team.

Descriptive Statistics

Higher score indicates collectivism over individualism.

	Mean (Standard Deviation)		
	Entire Sample	Manipulated Subjects	No-Manipulation Subjects
Coll – Teamwork	5.39 (1.06)	5.34 (.99)	5.46 (1.17)
Coll – Affective	4.66 (1.16)	4.62 (1.15)	4.72 (1.18)

Appendix D-2: Personality Scale

Item No.	Factor Loadings – Varimax rotated solution (Reliability)		
	Factor 1 (.81)	Factor 2 (.78)	Factor 3 (.70)
POPEN1	**.632**	.115	-.093
POPEN2	**.572**	.030	-.085
POPEN4	**.750**	.052	.077
POPEN5	**.639**	.208	.030
POPEN6	**.711**	.121	.148
POPEN7	**.586**	.216	.151
POPEN8	**.628**	-.133	-.232
POPEN10	**.620**	-.078	-.045
PCON1	-.103	**.724**	-.047
PCON2	.036	**.550**	.083
PCON4	.146	**.607**	-.072
PCON5	-.033	**.709**	-.072
PCON7	.323	**.698**	.110
PCON9	.055	**.699**	.201
PCON10	.379	**.454**	.284
PAGR2	-.223	.005	**.625**
PAGR3	.470	.083	**.438**
PAGR4	-.019	.030	**.774**
PAGR5	-.088	-.134	**.590**
PAGR6	.292	.453	**.563**
PAGR8	.097	.230	**.558**
PAGR9	.491	.178	**.465**
Eigenvalue	5.304	2.824	2.081

Descriptive Statistics

	Mean (Standard Deviation)		
	Entire Sample	Manipulated Subjects	No-Manipulation Subjects
Openness to New Experiences	4.88 (.87)	4.89 (.77)	4.85 (1.00)
Conscientiousness	4.98 (.89)	5.03 (.82)	4.91 (.98)
Agreeableness	4.93 (.80)	4.96 (.75)	4.90 (.87)

Appendix D-3: Task Liking Scale

TIME 2

Item No.	Factor Loadings – Varimax rotated solution	Mean (Standard Deviation)		
		Entire Sample	Manipulated Subjects	No-Manipulation Subjects
TL1	.897	4.51 (1.27)	4.45 (1.19)	4.59 (1.36)
TL2	.934			
TL5	.892			
TL10	.893			
TL11	.906			
Eigenvalue	4.089			
Reliability	.944			

TIME 4

Item No.	Factor Loadings – Varimax rotated solution	Mean (Standard Deviation)		
		Entire Sample	Manipulated Subjects	No-Manipulation Subjects
TL1	.920	4.73 (1.36)	4.75 (1.28)	4.70 (1.48)
TL2	.933			
TL5	.912			
TL10	.918			
TL11	.913			
Eigenvalue	4.227			
Reliability	.954			

Appendix D-4: Perceived Task Competence Scale

TIME 2

Item No.	Factor Loadings – Varimax rotated solution	Mean (Standard Deviation)		
		Entire Sample	Manipulated Subjects	No-Manipulation Subjects
TC3	.751	4.95 (1.08)	4.81 (1.02)	5.14 (1.15)
TC6	.701			
TC7	.798			
TC8	.844			
TC9	.849			
Eigenvalue	3.125			
Reliability	.847			

TIME 4

Item No.	Factor Loadings – Varimax rotated solution	Mean (Standard Deviation)		
		Entire Sample	Manipulated Subjects	No-Manipulation Subjects
TC3	.609	5.26 (1.09)	5.22 (1.04)	5.32 (1.17)
TC6	.840			
TC7	.826			
TC8	.906			
TC9	.869			
Eigenvalue	3.332			
Reliability	.860			

Appendix D-5: Perceived Team Cohesion Scale

TIME 1

Item No.	Factor Loadings – Varimax rotated solution	Mean (Standard Deviation)		
		Entire Sample	Manipulated Subjects	No-Manipulation Subjects
Coh1	.863	4.25 (.99)	4.41 (.83)	4.01 (1.16)
Coh3	.766			
Coh4	.717			
Coh5	.830			
Coh6	.669			
Coh8	.776			
Coh11	.786			
Coh13	.814			
Eigenvalue	4.863			
Reliability	.906			

TIME 2

Item No.	Factor Loadings – Varimax rotated solution	Mean (Standard Deviation)		
		Entire Sample	Manipulated Subjects	No-Manipulation Subjects
Coh1	.811	4.15 (1.03)	4.25 (1.04)	4.02 (1.02)
Coh3	.774			
Coh4	.765			
Coh5	.829			
Coh6	.716			
Coh8	.820			
Coh11	.731			
Coh13	.757			
Eigenvalue	4.821			
Reliability	.903			

TIME 3

Item No.	Factor Loadings – Varimax rotated solution	Mean (Standard Deviation)		
		Entire Sample	Manipulated Subjects	No-Manipulation Subjects
Coh1	.884	4.18 (1.09)	4.34 (1.03)	3.96 (1.14)
Coh3	.760			
Coh4	.765			
Coh5	.829			
Coh6	.716			
Coh8	.820			
Coh11	.731			
Coh13	.757			
Eigenvalue	4.602			
Reliability	.891			

TIME 4

Item No.	Factor Loadings – Varimax rotated solution	Mean (Standard Deviation)		
		Entire Sample	Manipulated Subjects	No-Manipulation Subjects
Coh1	.861	4.18 (1.22)	4.32 (1.14)	4.00 (1.31)
Coh3	.875			
Coh4	.746			
Coh5	.868			
Coh6	.745			
Coh8	.756			
Coh11	.789			
Coh13	.769			
Eigenvalue	5.159			
Reliability	.920			

Appendix D-6: Perceived Work Processes Scale

TIME 1

Item No.	Factor Loadings – Varimax rotated solution	Mean (Standard Deviation)		
		Entire Sample	Manipulated Subjects	No-Manipulation Subjects
WP1	.821	4.54 (1.25)	4.74 (1.05)	4.24 (1.46)
WP3	.768			
WP5	.899			
WP7	.894			
WP10	.726			
WP11	.858			
WP14	.897			
Eigenvalue	4.939			
Reliability	.923			

TIME 2

Item No.	Factor Loadings – Varimax rotated solution	Mean (Standard Deviation)		
		Entire Sample	Manipulated Subjects	No-Manipulation Subjects
WP1	.872	4.53 (1.19)	4.63 (1.09)	4.40 (1.31)
WP3	.713			
WP5	.873			
WP7	.830			
WP10	.856			
WP11	.847			
WP14	.850			
Eigenvalue	4.894			
Reliability	.925			

TIME 3

Item No.	Factor Loadings – Varimax rotated solution	Mean (Standard Deviation)		
		Entire Sample	Manipulated Subjects	No-Manipulation Subjects
WP1	.852	4.54 (1.25)	4.68 (1.09)	4.34 (1.43)
WP3	.759			
WP5	.808			
WP7	.852			
WP10	.813			
WP11	.843			
WP14	.793			
Eigenvalue	4.681			
Reliability	.915			

TIME 4

Item No.	Factor Loadings – Varimax rotated solution	Mean (Standard Deviation)		
		Entire Sample	Manipulated Subjects	No-Manipulation Subjects
WP1	.890	4.53 (1.36)	4.64 (1.29)	4.37 (1.45)
WP3	.801			
WP5	.874			
WP7	.842			
WP10	.869			
WP11	.822			
WP14	.824			
Eigenvalue	5.017			
Reliability	.933			

Appendix D-7: 4-Antecedent Factor Analysis Summary

TIME 2

Item No.	Factor Loadings – Varimax rotated solution (Reliability)		
	Factor 1 (.953)	Factor 2 (.944)	Factor 3 (.847)
Coh1	**.834**	.108	.209
Coh3	**.771**	.081	-.055
Coh4	**.678**	.318	.049
Coh5	**.802**	.170	-.128
Coh6	**.617**	.342	.035
Coh8	**.756**	.250	.137
Coh11	**.723**	.065	-.028
Coh13	**.697**	.140	-.229
WP1	**.833**	.172	.042
WP3	**.700**	.012	.175
WP5	**.791**	.265	.247
WP7	**.813**	.272	.031
WP10	**.762**	.218	.226
WP11	**.750**	.235	.194
WP14	**.775**	.246	.054
TL1	.267	**.826**	.236
TL2	.302	**.824**	.274
TL5	.264	**.790**	.309
TL10	.243	**.849**	.217
TL11	.309	**.824**	.213
TC3	-.066	.191	**.743**
TC6	.041	.475	**.540**
TC7	.186	.160	**.775**
TC8	.081	.156	**.817**
TC9	.016	.305	**.776**
Eigenvalue	11.371	3.964	1.503

TIME 4

Item No.	Factor Loadings – Varimax rotated solution (Reliability)		
	Factor 1 (.960)	Factor 2 (.954)	Factor 3 (.860)
Coh1	**.848**	.186	.066
Coh3	**.818**	.274	-.163
Coh4	**.653**	.280	.097
Coh5	**.818**	.272	-.235
Coh6	**.662**	.274	.041
Coh8	**.749**	.152	.185
Coh11	**.783**	.157	.139
Coh13	**.701**	.253	-.123
WP1	**.870**	.098	.145
WP3	**.801**	.163	-.051
WP5	**.837**	.158	.082
WP7	**.845**	-.039	.160
WP10	**.805**	.158	.129
WP11	**.765**	.180	.193
WP14	**.779**	.221	.090
TL1	.213	**.860**	.214
TL2	.305	**.852**	.177
TL5	.194	**.844**	.343
TL10	.249	**.821**	.316
TL11	.331	**.843**	.179
TC3	-.237	.004	**.670**
TC6	.236	.297	**.767**
TC7	.155	.187	**.789**
TC8	.128	.253	**.847**
TC9	.075	.345	**.784**
Eigenvalue	11.864	4.181	1.790

Appendix D-8: Commitment to the Team Scale

TIME 1

Item No.	Factor Loadings – Varimax rotated solution (Reliability)	
	Factor 1 (.901)	Factor 2 (.744)
NORM1	**.641**	-.036
NORM2	**.739**	.264
NORM3	**.685**	.287
NORM4	**.729**	-.014
NORM5	**.737**	.287
NORM6	**.685**	.287
AFF1	**.473**	-.075
AFF2	**.597**	.261
AFF3	**.641**	-.036
AFF4	**.739**	.264
AFF5	**.729**	-.014
AFF6	**.737**	.287
CONT1	.323	**.702**
CONT2	.354	**.685**
CONT3	.124	**.662**
CONT4	-.044	**.651**
CONT5	-.097	**.674**
Eigenvalue	6.618	2.046

Descriptive Statistics

	Mean (Standard Deviation)		
	Entire Sample	Manipulated Subjects	No-Manipulation Subjects
Normative + Affective	4.97 (1.03)	5.14 (.96)	4.71 (1.09)
Normative	5.02 (1.10)	5.18 (1.02)	4.79 (1.20)
Affective	4.91 (1.02)	5.10 (.96)	4.63 (1.04)
Continuance	4.18 (1.01)	4.22 (.95)	4.12 (1.10)

TIME 2

Item No.	Factor Loadings – Varimax rotated solution (Reliability)	
	Factor 1 (.947)	Factor 2 (.849)
NORM1	**.862**	.081
NORM2	**.821**	.130
NORM3	**.803**	.188
NORM4	**.827**	.151
NORM5	**.837**	.068
NORM6	**.803**	.188
AFF1	**.592**	.078
AFF2	**.684**	.243
AFF3	**.814**	.080
AFF4	**.832**	.129
AFF5	**.803**	.159
AFF6	**.834**	.058
CONT1	.251	**.851**
CONT2	.255	**.843**
CONT3	.209	**.615**
CONT4	.010	**.823**
CONT5	-.042	**.725**
Eigenvalue	8.377	2.653

Descriptive Statistics

	Mean (Standard Deviation)		
	Entire Sample	Manipulated Subjects	No-Manipulation Subjects
Normative + Affective	4.77 (1.15)	4.85 (1.02)	4.66 (1.30)
Normative	4.82 (1.22)	4.90 (1.10)	4.71 (1.37)
Affective	4.72 (1.12)	4.80 (.99)	4.62 (1.27)
Continuance	4.16 (1.06)	4.30 (.85)	3.97 (1.27)

TIME 3

Item No.	Factor Loadings – Varimax rotated solution (Reliability)	
	Factor 1 (.953)	Factor 2 (.878)
NORM1	**.846**	.138
NORM2	**.864**	.269
NORM3	**.808**	.288
NORM4	**.837**	.190
NORM5	**.868**	.068
NORM6	**.808**	.288
AFF1	**.634**	-.027
AFF2	**.757**	.180
AFF3	**.721**	.101
AFF4	**.729**	.316
AFF5	**.808**	.132
AFF6	**.902**	.142
CONT1	.258	**.853**
CONT2	.282	**.857**
CONT3	.252	**.737**
CONT4	.015	**.807**
CONT5	.031	**.729**
Eigenvalue	8.985	2.609

Descriptive Statistics

	Mean (Standard Deviation)		
	Entire Sample	Manipulated Subjects	No-Manipulation Subjects
Normative + Affective	4.94 (1.13)	5.01 (1.00)	4.84 (1.30)
Normative	5.00 (1.21)	5.08 (1.08)	4.89 (1.37)
Affective	4.89 (1.10)	4.95 (.97)	4.80 (1.26)
Continuance	4.22 (1.21)	4.21 (1.34)	4.24 (1.03)

TIME 4

Item No.	Factor Loadings – Varimax rotated solution (Reliability)	
	Factor 1 (.959)	Factor 2 (.848)
NORM1	**.784**	.058
NORM2	**.817**	.219
NORM3	**.810**	.325
NORM4	**.896**	.161
NORM5	**.856**	.340
NORM6	**.810**	.325
AFF1	**.703**	.126
AFF2	**.720**	.254
AFF3	**.865**	.079
AFF4	**.855**	.233
AFF5	**.814**	.076
AFF6	**.754**	.230
CONT1	.312	**.859**
CONT2	.274	**.881**
CONT3	.423	**.570**
CONT4	.053	**.780**
CONT5	.035	**.636**
Eigenvalue	9.482	2.179

Descriptive Statistics

	Mean (Standard Deviation)		
	Entire Sample	Manipulated Subjects	No-Manipulation Subjects
Normative + Affective	4.65 (1.19)	4.84 (1.11)	4.40 (1.27)
Normative	4.66 (1.29)	4.89 (1.18)	4.36 (1.39)
Affective	4.64 (1.16)	4.79 (1.12)	4.44 (1.21)
Continuance	4.01 (1.12)	4.05 (1.05)	3.95 (1.23)

TIME 0 (Introductory Survey)

Item No.	Factor Loadings – Varimax rotated solution (Reliability)		
	Factor 1 (.729)	Factor 2 (.769)	Factor 3 (.577)
NORM1	**.530**	-.089	.266
NORM2	**.728**	.288	-.075
NORM3	**.787**	.188	.042
NORM4	**.515**	.547	-.056
NORM5	**.772**	.084	.209
NORM6	**-.127**	.674	.141
AFF1	.378	**.432**	-.055
AFF2	.213	**.542**	-.040
AFF3	.337	**.619**	-.076
AFF4	.125	**.633**	.290
AFF5	-.018	**.681**	.282
AFF6	.302	**.671**	.127
CONT1	.143	.006	**.814**
CONT2	.301	.271	**.271**
CONT3	.653	.160	**-.108**
CONT4	.035	.229	**.637**
CONT5	-.072	.076	**.828**
Eigenvalue	4.949	2.128	1.581

Descriptive Statistics

	Mean (Standard Deviation)		
	Entire Sample	Manipulated Subjects	No-Manipulation Subjects
Normative	5.12 (.85)	5.22 (.78)	4.98 (.92)
Affective	4.62 (.86)	4.70 (.86)	4.50 (.87)
Continuance	4.43 (.78)	4.44 (.78)	4.42 (.79)

Appendix D-9: Satisfaction Scale

TIME 2

Item No.	Factor Loadings – Varimax rotated solution (Reliability)	
	Factor 2 Personal Satisfaction (.896)	Factor 1 Team Satisfaction (.938)
SAT1	**.627**	.510
SAT7	**.727**	.492
SAT8	**.823**	.217
SAT9	**.825**	.013
SAT10	**.678**	.422
SAT11	**.579**	.647
SAT2	.320	**.876**
SAT3	.383	**.715**
SAT4	.146	**.917**
SAT5	.143	**.884**
SAT6	.323	**.822**
Eigenvalue	1.414	6.777

Descriptive Statistics

	Mean (Standard Deviation)		
	Entire Sample	Manipulated Subjects	No-Manipulation Subjects
Personal Satisfaction	4.68 (1.17)	4.80 (1.06)	4.54 (1.30)
Team Satisfaction	4.34 (1.43)	4.51 (1.36)	4.10 (1.51)

TIME 4

Item No.	Factor Loadings – Varimax rotated solution (Reliability)	
	Factor 1 Personal Satisfaction (.913)	Factor 2 Team Satisfaction (.907)
SAT1	**.842**	.294
SAT7	**.721**	.492
SAT8	**.833**	.074
SAT9	**.818**	.097
SAT10	**.662**	.447
SAT11	**.824**	.375
SAT2	.387	**.808**
SAT3	.441	**.678**
SAT4	.197	**.916**
SAT5	.047	**.832**
SAT6	.276	**.805**
Eigenvalue	6.476	1.671

Descriptive Statistics

	Mean (Standard Deviation)		
	Entire Sample	Manipulated Subjects	No-Manipulation Subjects
Personal Satisfaction	4.87 (1.30)	5.02 (1.11)	4.67 (1.51)
Team Satisfaction	4.50 (1.45)	4.75 (1.34)	4.16 (1.54)

Appendix D-10: Performance Scale

TIME 4

Performance calculation:
(Team score * Peer Rating Percent)

	All participants	Manipulated Group	Non-Manipulated Group
Range	0-194	3-128	0 – 194
Mean	57.78	55.15	60.91

APPENDIX E – RESULTS OF STATISTICAL ANALYSES OF HYPOTHESES

Appendix E presents the results of the hypothesis testing. Appendix E-1 provides results of the statistical testing of hypothesis 1. Appendix E-2 provides the results of the statistical testing of hypothesis 2. Appendix E-3 provides the results of the statistical testing using NA commitment as a dependent variable (hypotheses 3 – 8). Appendix E-4 provides the results of the statistical tests using continuance commitment as a dependent variable (hypothesis 6c). Appendix E-5 provides the results of the statistical testing of hypothesis 9. Appendix E-6 provides the results of the statistical testing of hypothesis 10.

The following abbreviations for the variables were used:

COLTWAVG: Collectivism Teamwork
COLAFFAV: Collectivism Affect
PAGR: Personality – Agreeableness
PCON: Personality – Conscientiousness
POPEN: Personality – Openness to New Experiences
TLnAVG: Task Liking (where n = time period measured)
TCnAVG: Perceived Task Competence (where n = time period measured)
TCMnAVG: Other Team Members' perceived commitment (where n = time period measured)
WPnAVG: Perceived Work Processes (where n = time period measured)

NAnAVG: NA commitment (where n = time period measured)
CONTnAVG: Continuance commitment (where n = time period measured)

PERSSAT: Personal satisfaction
TEAMSAT: Teamwork Satisfaction

PERF: Performance

APPENDIX E-1: Results of Hypothesis 1

TIME 2

Influence of NA commitment and Continuance commitment on Personal Satisfaction.

Model Summary

R	R Square	Adj R Square	Std. Error of the Estimate
.737	.543	.539	.7963

ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	80.556	1	80.556	127.040	.000
Residual	67.848	107	.634		
Total	148.404	108			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	1.084	.328		3.303	.001
NA2AVG	*.754*	*.067*	*.737*	*11.271*	*.000*

Excluded Variable

	Beta In	t	Sig.	Partial Correlation	Collinearity Stats / Tolerance
CONT2AVG	-.041	-.591	.556	-.057	.886

TIME 2

Influence of NA commitment and Continuance commitment on Teamwork Satisfaction.

Model Summary

R	R Square	Adj R Square	Std. Error of the Estimate
.612	.375	.369	1.1390

ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	83.311	1	83.311	64.214	.000
Residual	138.822	107	1.297		
Total	222.133	108			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	.670	.469		1.427	.156
NA2AVG	*.767*	*.096*	*.612*	*8.013*	*.000*

Excluded Variable

	Beta In	t	Sig.	Partial Correlation	Collinearity Stats / Tolerance
CONT2AVG	-.146	-1.811	.073	-.173	.886

TIME 4

Influence of NA commitment and Continuance commitment on Personal Satisfaction.

Model Summary

R	R Square	Adj R Square	Std. Error of the Estimate
.658	.433	.428	.9792

ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	74.097	1	74.097	77.272	.000
Residual	96.850	101	.959		
Total	170.947	102			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	1.547	.390		3.962	.000
NA4AVG	*.715*	*.081*	*.658*	*8.790*	*.000*

Excluded Variable

	Beta In	t	Sig.	Partial Correlation	Collinearity Stats / Tolerance
CONT4AVG	-.064	-.735	.464	-.073	.733

TIME 4

Influence of NA commitment and Continuance commitment on Teamwork Satisfaction.

Model Summary

R	R Square	Adj R Square	Std. Error of the Estimate
.566	.321	.314	1.2013

ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	68.797	1	68.797	47.673	.000
Residual	145.753	101	1.443		
Total	214.550	102			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	1.296	.479		2.705	.008
NA4AVG	*.689*	*.100*	*.566*	*6.905*	*.000*

Excluded Variable

	Beta In	t	Sig.	Partial Correlation	Collinearity Stats / Tolerance
CONT4AVG	-.135	-1.417	.159	-.140	.733

APPENDIX E-2: Results of Hypothesis 2

TIME 4

Influence of NA commitment and Continuance commitment on Performance.

Model Summary

R	R Square	Adj R Square	Std. Error of the Estimate
.177	.031	.012	32.5260

ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	3431.024	2	1715.512	1.622	.203
Residual	105793.81	100	1057.938		
Total	109224.83	102			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	65.996	14.226		4.639	.000
NA4AVG	-5.026	3.153	-.183	-1.594	.114
CONT4AVG	5.160	3.349	.177	1.541	.127

APPENDIX E-3: Results of Hypothesis 3 – 8: NA Commitment

TIME 1

Variables Entered
WP1AVG
COLTWAVG

Model Summary

Model	R	R Square	R Square Change	Adj R Square	Std Error of the Estimate	F change
WP1AVG	.609	.371	.371	.365	.8243	57.223
COLTWAVG	.656	.431	.060	.419	.7883	10.053

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	45.131	2	22.566	36.313	.000
Residual	59.655	96	.621		
Total	104.786	98			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	1.507	.465		3.239	.002
WP1AVG	*.480*	*.065*	*.574*	*7.377*	*.000*
COLTWAVG	*.234*	*.074*	*.247*	*3.171*	*.002*

Excluded Variables

Model	Beta In	T	Sig.	Partial Correlation	Collinearity Stats/Tolerance
COLAFFAV	.144	1.867	.065	.188	.973
PAGR	.112	1.253	.213	.128	.744
PCON	.069	.858	.393	.088	.929
POPEN	.127	1.612	.110	.163	.937
TCM1AVG	.128	.264	.792	.027	.535

TIME 2

Variables Entered
WP2AVG
TL2AVG

Model Summary

Model	R	R Square	R Square Change	Adj R Square	Std Error of the Estimate	F change
WP2AVG	.726	.527	.527	.522	.7914	104.893
TL2AVG	.790	.624	.097	.616	.7092	24.052

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	77.788	2	38.894	77.334	.000
Residual	46.773	93	.503		
Total	124.561	95			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	.957	.309		3.094	.003
WP2AVG	*.483*	*.078*	*.493*	*6.223*	*.000*
TL2AVG	*.356*	*.073*	*.389*	*4.904*	*.000*

Excluded Variables

Model	Beta In	T	Sig.	Partial Correlation	Collinearity Stats/Tolerance
COLTWAVG	.038	.567	.572	.059	.896
COLAFFAV	.108	1.713	.090	.176	.995
PCON	-.005	-.076	.940	-.008	.986
PAGR	.035	.540	.591	.056	.945
POPEN	.021	.314	.754	.033	.934
TC2AVG	-.005	-.062	.951	-.006	.752
TCM2AVG	-.148	-1.832	.070	-.188	.603

TIME 3

Variables Entered
WP3AVG
COLAFFAV

Model Summary

Model	R	R Square	R Square Change	Adj R Square	Std Error of the Estimate	F change
WP3AVG	.558	.312	.312	.304	.8937	41.175
COLAFFAV	.608	.370	.058	.356	.8599	8.305

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	39.027	2	19.513	26.393	.000
Residual	66.541	90	.739		
Total	105.568	92			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	1.812	.483		3.748	.000
WP3AVG	*.467*	*.071*	*.549*	*6.557*	*.000*
COLAFFAV	*.222*	*.077*	*.241*	*2.882*	*.005*

Excluded Variables

Model	Beta In	T	Sig.	Partial Correlation	Collinearity Stats/Tolerance
COLTWAVG	.084	1.006	.317	.106	.998
PCON	-.029	-.341	.734	-.036	.991
PAGR	-.081	-.942	.349	-.099	.952
POPEN	-.009	-.104	.917	-.011	.962
TCM3AVG	-.032	-.272	.786	-.029	.505

TIME 4

Variables Entered
TL4AVG
WP4AVG
COLAFFAV

Model Summary

Model	R	R Square	R Square Change	Adj R Square	Std Error of the Estimate	F change
TL4AVG	.655	.428	.428	.422	.9041	66.726
WP4AVG	.709	.502	.074	.491	.8487	12.999
COLAFFAV	.726	.527	.025	.510	.8322	4.527

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	67.041	3	22.347	32.268	.000
Residual	60.251	87	.693		
Total	127.292	90			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	.736	.477		1.542	.127
TL4AVG	*.419*	*.075*	*.485*	*5.588*	*.000*
WP4AVG	*.273*	*.078*	*.305*	*3.505*	*.001*
COLAFFAV	*.161*	*.076*	*.158*	*2.128*	*.036*

Excluded Variables

Model	Beta In	T	Sig.	Partial Correlation	Collinearity Stats/Tolerance
COLTWAVG	.019	.256	.799	.028	.973
PCON	.034	.456	.649	.049	.976
PAGR	-.094	-1.230	.222	-.131	.934
POPEN	.061	.796	.428	.086	.943
TC4AVG	-.032	-.380	.705	-.041	.759
TCM4AVG	-.111	-1.103	.273	-.118	.535

APPENDIX E-4: Results of Hypothesis 6c: Continuance Commitment

TIME 2

Model Summary

Model	R	R Square	Adj R Square	Std Error of the Estimate
	.133	.018	.008	1.0487

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2.101	1	2.101	1.910	.170
Residual	116.585	106	1.100		
Total	118.686	107			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	3.499	.475		7.368	.000
TC2AVG	.130	.094	.133	1.382	.170

TIME 4

Model Summary

Model	R	R Square	Adj R Square	Std Error of the Estimate
	.123	.015	.005	1.1200

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.931	1	1.931	1.540	.218
Residual	126.702	101	1.254		
Total	128.634	102			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	3.342	.548		6.105	.000
TC2AVG	.126	.102	.123	1.241	.218

APPENDIX E-5: Results of Hypothesis 9

ALL PARTICIPANTS:

	TIME 1	TIME 2	TIME 3	TIME 4
NA Commitment	4.97	4.77	4.94	4.65
Continuance Commitment	4.18	4.16	4.22	4.01

Time Period 1 to 2:

	F	Sig
NA Commitment	1.808	.180
Continuance Commitment	.022	.883

Time Period 2 to 3:

	F	Sig
NA Commitment	1.250	.265
Continuance Commitment	.174	.677

Time Period 3 to 4:

	F	Sig
NA Commitment	*3.198*	*.075*
Continuance Commitment	1.765	.185

Time Period 1 to 4:

	F	Sig
NA Commitment	*4.193*	*.042*
Continuance Commitment	1.365	.244

MANIPULATION GROUP:

	TIME 1	TIME 2	TIME 3	TIME 4
NA Commitment	5.14	4.85	5.01	4.84
Continuance Commitment	4.22	4.3	4.21	4.05

Time Period 1 to 2:

	F	Sig
NA Commitment	*2.781*	*.098*
Continuance Commitment	.262	.609

Time Period 2 to 3:

	F	Sig
NA Commitment	.820	.367
Continuance Commitment	.199	.656

Time Period 3 to 4:

	F	Sig
NA Commitment	.828	.365
Continuance Commitment	.580	.448

Time Period 1 to 4:

	F	Sig
NA Commitment	2.668	.105
Continuance Commitment	.960	.329

NO-MANIPULATION GROUP:

	TIME 1	TIME 2	TIME 3	TIME 4
NA Commitment	4.71	4.66	4.84	4.40
Continuance Commitment	4.12	3.97	4.24	3.95

Time Period 1 to 2:

	F	Sig
NA Commitment	.037	.849
Continuance Commitment	.361	.550

Time Period 2 to 3:

	F	Sig
NA Commitment	.457	.501
Continuance Commitment	1.235	.269

Time Period 3 to 4:

	F	Sig
NA Commitment	2.686	.105
Continuance Commitment	1.360	.247

Time Period 1 to 4:

	F	Sig
NA Commitment	1.550	.216
Continuance Commitment	.424	.517

APPENDIX E-6: Results of Hypothesis 10

TIME 1

	Manipulated Average	Non-Manipulated Average	F	Sig
NA Commitment	*5.14*	*4.74*	*4.867*	*.029*
Continuance Commitment	4.22	4.12	.289	.592

TIME 2

	Manipulated Average	Non-Manipulated Average	F	Sig
NA Commitment	4.85	4.66	.719	.398
Continuance Commitment	4.30	3.97	2.733	.101

TIME 3

	Manipulated Average	Non-Manipulated Average	F	Sig
NA Commitment	5.01	4.84	.577	.449
Continuance Commitment	4.21	4.24	.009	.925

TIME 4

	Manipulated Average	Non-Manipulated Average	F	Sig
NA Commitment	*4.84*	*4.40*	*3.532*	*.063*
Continuance Commitment	4.05	3.95	.171	.680

APPENDIX F – FURTHER ANALYSES

Appendix F presents the results of further analysis of some hypotheses. Appendix F-1 provides results of stepwise regression using commitment as the independent variables and performance as the dependent variable. These results are with seven outliers removed. Appendices F-2 and F-3 graphically show the rise and fall of normative-affective commitment and continuance commitment over the four-week period. Appendix F-2 graphs all respondents, while Appendix F-3 divides subjects in the manipulated group from subjects not in the manipulated group.

Appendix F-1: Results of Hypothesis 2 – Outliers Removed

TIME 4

Influence of NA commitment and Continuance commitment on Performance – seven outliers removed.

Model Summary

R	R Square	Adj R Square	Std. Error of the Estimate
.243	.059	.049	26.2282

ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	4072.807	1	4072.807	5.920	.017
Residual	64664.526	94	687.920		
Total	68737.333	95			

Coefficients

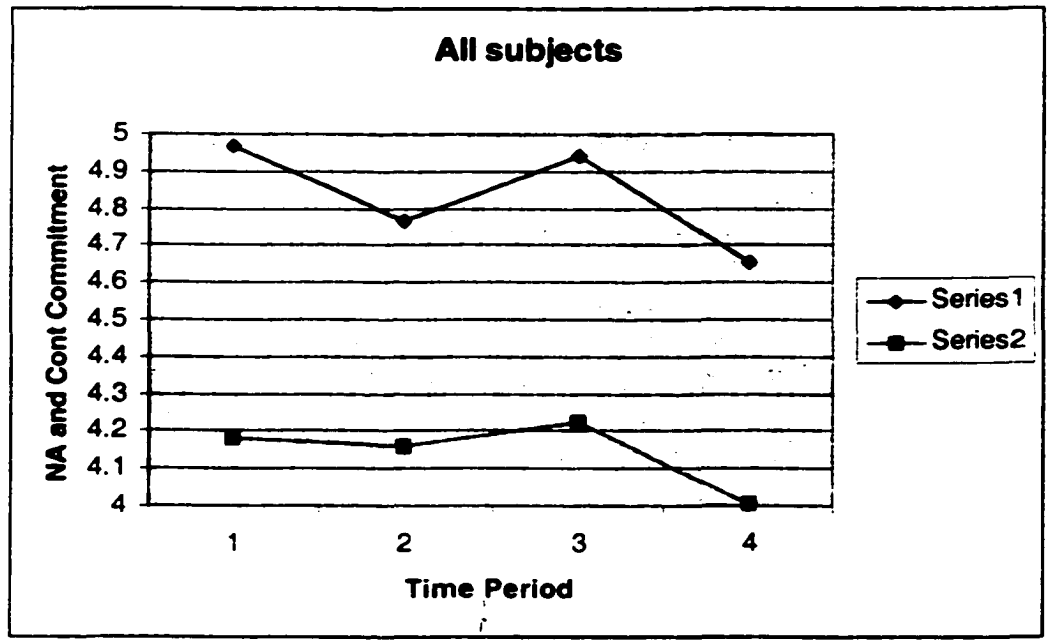
	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	28.041	12.868		2.179	.032
NA4AVG	*6.350*	*2.610*	*.243*	*2.433*	*.017*

Excluded Variables

Model	Beta In	T	Sig.	Partial Correlation	Collinearity Stats/Tolerance
CONT4AVG	.169	1.535	.128	.157	.812

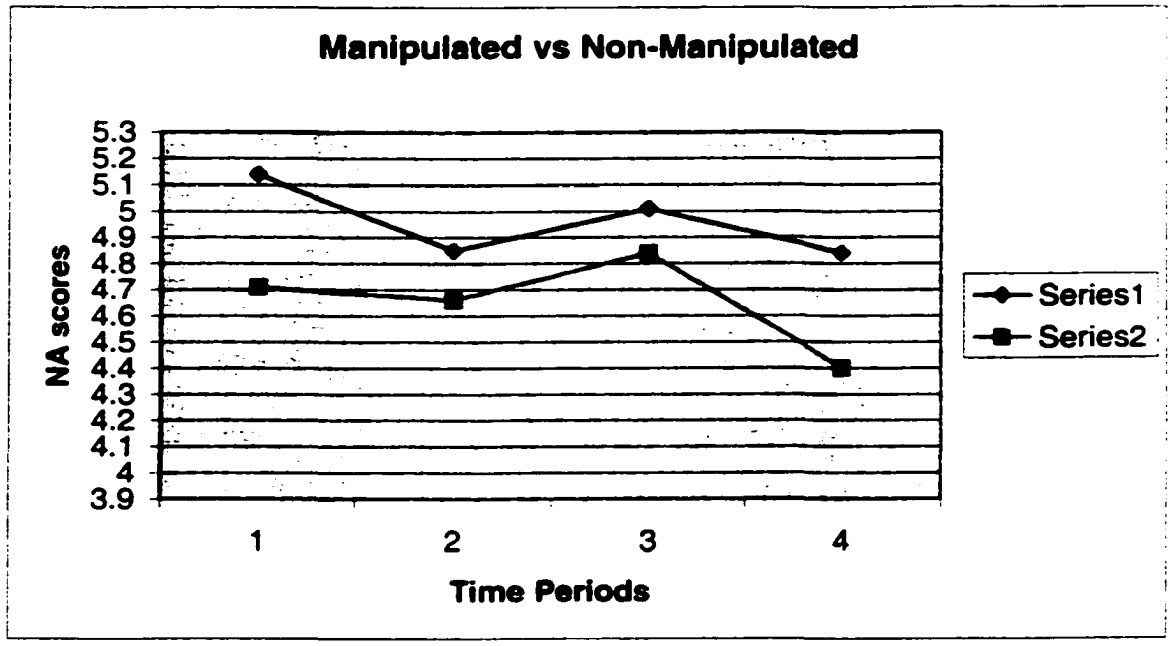
Appendix F-2: Development of Commitment over Time (All respondents)

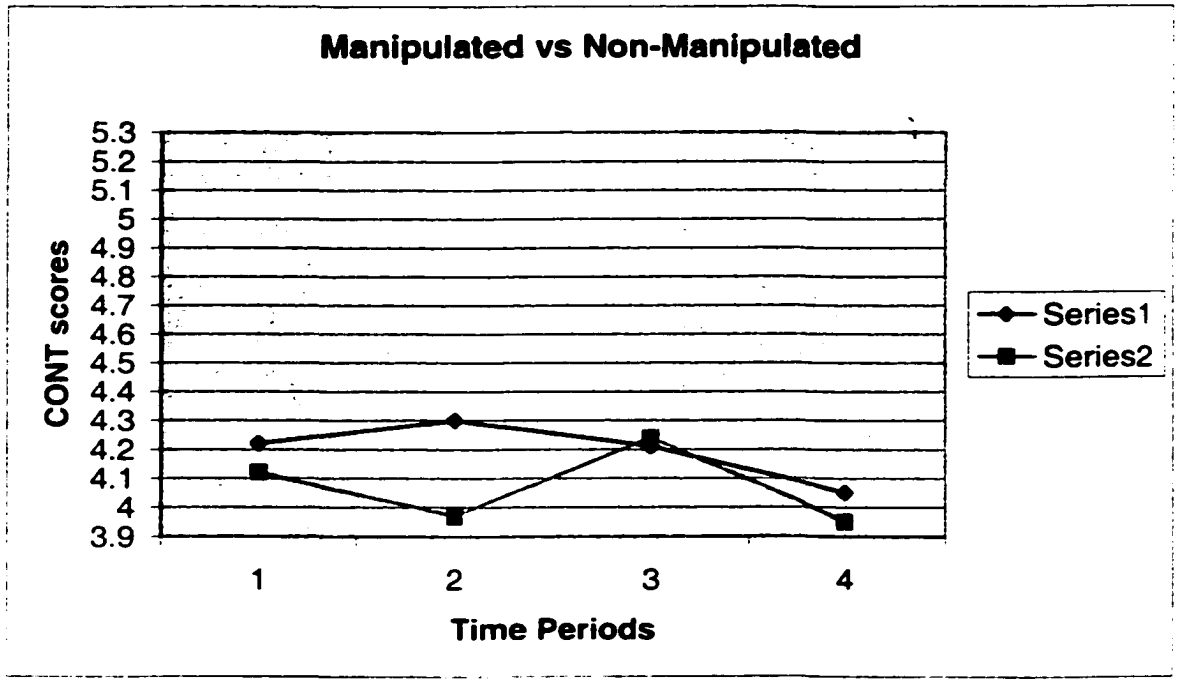
Series 1: Normative-Affective Commitment
Series 2: Continuance Commitment



Appendix F-3: Development of Commitment over Time (Manipulated versus Non-Manipulated)

Series 1: Manipulated Group
Series 2: Non-Manipulated Group





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