Syracuse University

SURFACE

Virtual Teams Affect, Performance and Interpersonal Perception with Unexpected Leadership Change

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Virtual Teams

Affect, Performance and Interpersonal Perception with Unexpected Leadership Change

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Abstract

Traditional ways of doing business and communicating in the workplace are changing. With frequent mergers, shifting operational demands and underlying economic pressure, computer-mediated communication has been increasingly employed. To achieve greater flexibility in workforce configurations, working virtually is often more the norm than the exception. With continuously improving internet technologies, frequently work-teams are formed when members are not geographically co-located. Both internal and external pressures combine, in the corporate setting, to produce an unprecedented velocity of change which seems especially related to globalization. (Held, 2007) Just exactly how does the virtual team handle abrupt change? While many researchers focus on the differences between face-to-face teams and virtual environs (Olson & Olson 2000), formation of trust (Jarvenpaa & Leidner, 1999), leadership (Kayworth & Leidner , 2001/2002), emergent leadership (Wickham &Walther, 2007), status differences (Weisband, Schneider, & Connolly, 1995), knowledge integration (Hartmann, Piontkowski, Keil, & Laus, 2002) (Malhotra & Majchrzak, 2004) (Zakaria, Amelinckx, & Wilemon, 2004), crossing cultures (Gibbs, 2009) and innovation (Nemiro, 2002),there has been relatively less focus on how the virtual experience influences the emotional state, cognitive functioning, and metaperceptions of teams who work virtually. It would be assumed that instability would affect the virtual teams negatively; however, there could be something different about virtual teams that uniquely position them for better sailing in shifting winds. In the laboratory we simulated the workplace virtual team structure in a streamlined way, assembling 40 groups from the community. This study examined how a quick change of leadership influences the virtual team across measures of affect, cognitive performance, group process performance and evaluative concerns. The teams experiencing leadership change experienced lower positive affect and blunted positive metaperception. Cognitive performance, negative affect, evaluation, and perceptions of team processes were remarkably stable.

  Keywords: virtual teams, computer mediated communication, metaperception, online collaboration, affect, change management, human computer interaction

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Preface

Social communication within the context of virtual environments evokes a variety of theoretical concerns within a number of key disciplines. Different methods and standards in research design are employed. Developing a complete understanding of the virtual teams required an interdisciplinary approach. In order to gain a firm grasp on the world of virtual teams, sources from a variety of fields were consulted, not only organizational behavior and social psychology. As a researcher, I explored widely and managed sources with a critical eye. I sought multiple advisors from a variety of areas of expertise and kept an open mind. At the same time, I submitted to the rigors and standards which are necessary for research in the field of psychology.

In this "information age," technology has enabled us to work at a distance from one another. Communication in virtual realms is relatively new. Many disciplines are extending their existing research lines to this new world. New journals have sprung up. Specialists in e-collaboration, e-communication, and e-leadership abound. It should be no surprise that a number of sub-fields have large bodies of research devoted to this topic. Often a researcher will call for the disciplines to unify, but I have found that to understand virtual issues, one might better consult each specialty or discipline and listen to the unique strengths in each of the voices. Listening to researchers in this interdisciplinary way places one in a new frontier in order to gain understanding about how virtual teams are being employed and how they are sustained. Because theoretical frameworks are in the earliest stages, research findings can often present challenges and

contradictions. There is some urgency in each discipline to find keys and insights to behavior for a variety of purposes and ends. There is a danger of "fragmented adhockery" (Banville & Landry, 1989), but research and collaboration among disciplines will continue to be important. Virtual worlds move fast and often research is too slow to be of any value, but each discipline can offer insight without losing the "edge" that each field can uniquely contribute.

In social psychology, we adopt careful observation, methodological strictness and reliance upon statistical analysis. Insight comes from an empirically driven base, acquired over time. This experimental project was created within an established framework for social psychology or organizational psychology research. However, important work in communication, organizational development, management, anthropology and human computer interaction were heavily consulted.

Perhaps not so ironically, working in both face-to-face collaboration and in e-collaboration were strong features of my personal experience with this project. From the outset there were both strongly personal interactions and new technological adventures. First and foremost, my advisor, Alecia Santuzzi's perseverance and dedication were steady, even though she experienced a quick change in her own professional life, moving to Northern Illinois University. We worked exclusively virtually after that change. Her expert advice in research design choices, patient statistical lessons and overall responsiveness was remarkable. Leonard Newman was willing to give interested oversight and continued to extend the support of the Psychology Department in my direction

after Dr. Santuzzi was established at NIU. Dr. Jeff Stanton welcomed me to Syracuse University and was a willing conduit into the world of I/O Psychology. He gave generously of his time and talents. Dr. Tibor Palfai gave the use of his laboratory space. Whitney Styer added her touches to all of the early documents and measures. Without these grand efforts, combined with dozens of smaller but no less important ones, a project like this would never have come to fruition. The many details covered by so any supporters and willing participants were vital. Working face-to-face or virtually, I often sensed strong support from my official advisor in Chicago, an unofficial practitioner/mentor in London or New York and commentary from local Syracuse executives and advisors right here in Syracuse. Peripheral inputs and more central roles alike were essential to the whole.

Collaboration is both a simple, natural skill and a complex art form. I was practicing collaboration in both of these ways. Sometimes, I was able to naturally bring together simple advice from executives and practitioners in the course of life. At other times, I garnered support from the Psychology Department through the help of the wonderful staff to synchronize timely details. I gained wisdom from a wide range of students, graduate students and professors. Some professors and advisors extended themselves to me so very admirably, with special precision and gracefulness of thought, even at the end of very long days. This dedication to my education and the ultimate influence on this project has instilled a mounting thankfulness in me that cannot easily be expressed in words.

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The working team has been well established as traditional common business unit (Hackman & Walton, 1986). More recently, it is clear that working in specifically virtual teams is a fundamental competence in most enterprises. Questions about how people behave within the virtual environment, when a non-geographically located team must work together synchronously are the central focus of this project. Virtual environments resulted from technological changes, which were, in essence, developed from modernization in geopolitical, social and commercial realms.

Globalization has been characterized by economist, David Held (2007), as an historical process which "denotes the intensification of worldwide social relations and interactions…characterized by a *stretching* of social, political and economic activities." (pg. 3) There is a "growing magnitude of inter-connectedness in almost every sphere" at an accelerating velocity, with a "deepening enmeshment of the local and global" (pg. 3) with regard to collective consequences. These forces, in addition to worldwide economic concerns, have produced rapid change in commercial and non-commercial organizations of every kind. With technological advances in information systems, computers have become the communication tool of choice.

Because quick changes in team leadership are a frequent occurrence in both rapidly growing and destabilizing business conditions, we examined the virtual team facing an abrupt change in leadership. The history of research involving virtual teams has a wide interdisciplinary nature and a dearth of solid

theoretical bases (Schiller & Mandviwalla, 2007). While social psychologists scramble to unravel important issues of how people interact in cyberspace, groups and dyads are continually forming for business and personal reasons. Humans are spanning the globe with connectivity, changing the shape of how human interaction is experienced. The internationally networked personal computer and various extensions of virtual tools are constantly mediating human behavior.

The advantages of making use of virtual technologies are many. Specialists are accessed without regard to their geography. The time required for travel and the associated expense and stress is relieved. Modes of team formation vary greatly. And in just the same way, new key terms vary greatly in their attempt to name this new phenomenon. Using the virtual environment to communicate is called "computer mediated communication," "computer facilitated communication," "virtual communication," "online collaboration," "web-based conferencing," and "distance collaboration." A "virtual team" might also be called a "geographically dispersed team" that does "computer supported cooperative work" or "distributed collaborative work." As an emerging phenomenon, definitive terms are not very clear, but it is expected that successful organizations will move forward with modes of communication which are dynamically based in networked computer technologies.

While specific definitions of virtuality remained elusive in early investigations, researchers moved forward with concerns about moral, ethical, and prejudicial behaviors. There was intense anticipation that along with anonymity, antisocial behavior would come due to deindividuation. (Banerjee, Cronan, &

Jones, 1998; Leonard, Cronan, & Kreie, 2004; Leonard & Haines, 2007). However, more often practical matters were more urgently considered, especially with regard to best practices for management (Gibson & Cohen, 2003). Questions have been raised about how leaders emerge in virtual teams and how trust can be built over increasing globalized situations. Virtual teams are often examined to see how cultural norms, specific purposes, types of structure, and styles or individual personalities influence work. Modes of leadership, types of formation and levels of media richness have been found to influence various outcomes. Outcomes like cohesiveness, status salience, counter-normative behavior, communication styles and performance continue to be explored. Levels of "virtualness" are examined to see which methods and technologies should be employed to the greatest effect given the tasks and personnel. Research is fueled by an interest in both the processes experience by the virtual team and the performance of virtual teams relative to traditional face-to-face interaction. Significant findings have resulted in wide ranging fields such as human computer interaction, social psychology, management, human resources, organizational behavior, communications, education and even engineering.

Definitions

> The concept of virtual implies permeable interfaces and boundaries; project teams that rapidly form, reorganize, and dissolve when the needs of a dynamic marketplace change; and individuals with differing competencies who are located across time, space, and cultures (Mowshowitz 1997, Kristof et al. 1995). As companies expand globally, face increasing time compression in product development, and use more foreign-based subcontracting labor (Peters 1992, Stewart 1994), virtual teams promise the flexibility, responsiveness, lower costs, and improved resource utilization necessary to meet ever-changing task requirements in highly turbulent and dynamic global business environments (Mowshowitz 1997, Snow et al. 1996).
> *(Jarvenpaa & Leidner, 1999)*

Clark and Brennan (1991) (Table 1) have provided defining characteristics which help determine the nature of computer-mediated communication. "Virtual teams" are by definition distributed geographically. They do not occupy the same physical location; therefore, they do not have copresence. This characteristic is often referred to by the term "non-co-located." After this point, there are quite a number of distinctive characteristics which divide teams into types. Teams may work contemporaneously, meaning that they work with communication received at the approximate time it was sent. Teams may work with simultaneity, meaning that members can send and receive messages at exactly the same time. Virtual teams are frequently delineated into two types, either synchronous or asynchronous. When teams work sequentially, they are limited by the timing of communication (as in email or recorded messages which are accessed later in time than when they were provided). It should be noted here that, of course, teams may utilize both synchronous and asynchronous types of communication. The present study specifically examines synchronous activity. Team characteristics are influenced further by available technologies. Visibility and audibility are factors which influence how "media rich" the interactions will be, and these largely depend upon the technology choices employed.

Table 1

Characteristics of Face-to-Face and Mediated Environments

Type of environment	Media characteristics					
	Copresence	Visibility	Audibility	Cotemporality	Simulteneity	Sequentiality
Face-to-face	X	X	X	X	X	X
Real-time audio/video (video conference)		X	X	X	X	X
Audio-only (telephones, conference calls)			X	X	X	X
Real-time electronic dialogue, text only, (computer chat)				X	X	X
E-mail						

From "Grounding in Communication," by H. H. Clark & S.E. Brennan, in *Perspectives on Socially Shared Cognition,* L.B. Resnick, J. M. Levine, & S.D. Teasley (Eds). (page 142) Copyright 1991 by the American Psychological Association, Washington, D.C.

The taxonomy of virtual teams becomes less clearly defined the addition of more categories and characteristics. For example, the nature of a team's formation could be considered a defining characteristic. Virtual teams may be quickly assembled for a specific task or they may be formed from existing teams which have met and have already developed face-to-face relationships. Conditions such as these can be moderating factors influencing performance and/or processes (Driskell, Radtke, & Salas, 2003). Generally speaking, a team is considered to be "virtual" if the majority of communication is conducted via computers. In general, there are no commonly accepted uniform definitions, so specific definitions are provided within each researcher's work.

Virtual team research

Questions about how computers and related technologies would change human interaction patterns and behavior have arisen since the possibilities presented by modern advanced computing started. Few could have predicted the extensive nature of change the internet would bring. With utmost practicality, global corporations inspired research about virtual work because of the reality that these systems must be managed. Gathering information about how these groups could best function and how to best leverage their cost-saving possibilities became necessary. Dating back approximately two decades, work by Kayworth and Leidner (1991) are considered to be the first to bring virtual questions into the laboratory. Qualitative and quantitative data were collected to examine effective leadership in a virtual environment. During this time, Weisband, Schnieder, and Connolly (1995) examined communication and status salience and differences by conducting experiments with M.B.A. students in teams combining graduate and undergraduate students. They found "little evidence for the phenomenon of equalization through computer-mediated interaction." They found that labels had a greater effect than the condition of virtualness. Numerous studies followed examining racial or cultural implications of virtual environments, with mixed results. Krebs, Hobman and Bordia (2006) found that computer mediation may offer the potential to moderate status differences due to reduced social cueing. More specifically, it was found that differences of the country of origin were more positively associated with trust formation in computer mediated groups than in face-to-face groups, and that differences in age were more negatively associated

with trust formation in face-to-face groups than in computer mediated groups. It was also noticed that trust may take more time to develop in virtual environments. Demographic and cultural issues are relevant because of potential impact on roles within teams and implications for decisions regarding team formation.

Comparisons between virtual teams and face-to-face teams. Recent work has continued to determine the ways in which computer-mediated work differs from work accomplished in the traditional face-to-face format; however this focus naturally developed earlier. Frequently affecting the quantity of work results, the nature of virtual work in teams also created potentially new strains on relationships and required alterations in the work itself, or in the way in which collaboration techniques were employed. Warkentin, Sayeed, and Hightower (1997) found that face-to-face teams that were engaged in asynchronous work activities reported higher levels of satisfaction and better performance. These in turn would influence overall satisfaction. However, since teams often need to work synchronously, examining of behavior during interruptions by people or technology will give further insight about virtual team performance and feelings about the team process.

Olson and Olson (2000) in an article titled, "Distance Matters" examined "sociotechnical conditions." Relying heavily on field studies, Olson and Olson raised important issues which have strong implications about social conditions which arise when work is not carried out in a shared physical space, but accomplished within technically mediated confines. Feedback is reduced. Multiple channels of information may not flow simultaneously. Personally

identifying information is lost. Nuanced information may not cross the technological barriers due to subtle dimensions of gestures, either facial or bodily. Work team members may not share the local context of time, news, frame of mind, and mood which can be gained informally in the halls or other work and non-work zones. They proposed that boundaries and status differences are more difficult to navigate. They noted new behaviors emerging to compensate. More formal protocols, alteration of work schedules which especially affected "tight work." If a team would normally rely on each other for quick turnarounds and time-sensitive interactive work tasks, when working virtually, this "tightness" was altered to compensate for the remote team member. The Olsons' fieldwork covered wide-ranging areas involving cultural issues, characteristics of early adopters of distance technology, impression management when working virtually, and readiness for successful adjustment to distance collaborations. In the end, they argued that virtual communication would not totally replace face-to-face work and that "distance matters."   Their work became influential in business management circles. Recommendations for virtual leaders often cite Olson and Olson in their reasoning that some combination of face-to-face meetings and virtual work would be "best practice."

Trust. Handy (1995) and Jarvenpaa and Leidner (1999) raised the importance of trust in global teams as an emerging central focus. After extensively examining descriptive case studies, they concluded that "swift trust" can be formed, even internationally, through solely electronically mediated communication. Kuo and Yu (2009) have examined the effect of trust on

cohesiveness and communication. A portion of their study was concerned with the specifics of trust development over time. Having collected communications from teams assembled in online courses at a university in Taiwan, these statements were coded for the types of trust exhibited. A time series regression was applied and the finding determined that trust in virtual teams did not always develop in temporally sequenced linkages progressing from calculus-based, to knowledge-based to identification-based trust, as previously demonstrated according to Lewicki and Bunker's model (1996). Along with virtual team researchers in general, those focusing on trust often have findings which vary from the expectations based on more traditional team theory.

Other research. Not all researchers focused on the differences between face-to-face work and virtual work. With such comparisons obviously not far from mind, other researchers did not concern themselves with these cumbersome comparisons. Virtual work was quickly becoming prevalent, sometimes making comparisons to face-to-face groups a moot point.   Social identity theory (Short, Williams & Christie, 1976) and media-rich theory (Daft & Lengel, 1986) theorize that without the social cues available when people are physically present, social interaction would be dysfunctional or problematic. With less information available in the form of gestures, vocal inflections, and facial expression, communication becomes less rich. Acknowledgement can be muted, hindering the formation of basic understanding between parties. The decrease in contextual cues, it is assumed, provides less "richness" with regard to shared senses of belonging and general interaction. Following the logic of this theory, virtual

space should, then, alter these interactions downward. Without the opportunity to experience the others' personal presence, fewer socially relevant cues occur and as a result, the social experience is diminished.

Business communities became concerned with the quality of communication in work teams and the effects on a host of factors: cohesion, good decisions, overall performance, productivity, satisfaction and self identification with the group. The quick assumption was that deindividuation would interfere with the basic processes of human interaction by stripping individuals of personally identifying information. Most often, researchers found that face-to-face groups differed to some degree, but adapted quickly and could generally provide similar group dynamics and force social connections. Virtual team members could form a "common social identity," share a "subjective sense of togetherness," and create "we-ness" or "belongingness" through virtual means (Tajfel & Turner, 1986). Online groups as a phenomenon were debated as if they may not actually form a social group, but it was decided that they were "real." It was recognized that although the teams were qualitatively different, still they comprised the formation of true social units. Virtual leaders are more highly prototypical when physical characteristics are not as saliently present (i.e. age, race, appearance) and they emerge to develop and maintain group norms. (McKenna & Green, 2002).

Frequently, researchers were led by theoretical concerns (McGrath, 1984) to consider what kinds of tasks were best suited for virtual work or how varieties of tasks might manifest psychological phenomena in different ways, when virtual

scenarios provide such different contexts (Rico & Cohen, 2005). Griffith, Sawyer, & Neale (2003) propose a model stating that when teams communicate virtually, a triangle develops between the virtual team individuals, the organization and the technology. More specifically, they propose that synergistic systems which require specialization and credibility tend to require more coordination of tacit knowledge. They predict that while virtual teams may be improving in integrating implicit knowledge with their teams, at the same time, tacit knowledge may be lacking. This, in turn, might rob the organization of useable knowledge that would otherwise transfer back into the organization, influencing structures and routines toward optimal function.

Researchers remain concerned about social identity, group process and performance (Michiniov, Michiniov, & Toczek-Capelle, 2004; Gonzales, Burke, Santuzzi, & Bradley, 2003). Other themes include new product development (Schmidt, Montoya-Weiss, & Massey, 2001), interaction styles (Potter & Balthazard, 2002), group style differences (Branson, Clausen, & Sung, 2008), decision quality and attention (McNamara, Dennis, & Carte, 2008), anonymity and source credibility (Rains, 2007), synchrony and sensory modalities (Nowak, Watt, & Walther, 2005), innovation (Nemiro, 2002), communication medium (Hambley, O'Neill, & Kline, 2007), technology appropriateness (Walvoord, Redden, Elliott, & Coovert, 2008), and degrees of virtualness, knowledge-sharing, trust and interdependence (Staples & Webster, 2008).

Recent empirical research is exemplified by Robert, Dennis, and Ahuja, (2008). Shedding light on the types of social capital and how it impacts

knowledge integration, Robert et al. assembled virtual teams with specific social histories. Social capital (which is a set of resources which is ensconced within the relationships among the members of any given social connection) can be measured on structural, relational and cognitive dimensions. An elaborate set of hypotheses were tested, and they discovered that all three types of social capital impacted virtual team performance because of the effect on knowledge integration. Team history, they found, played in important role in social capital formation. The opportunities for social capital to develop in virtual team interactions later influenced performance via enhanced knowledge sharing among teams who not only worked together before, but were expecting to continue working together in the future.

One recent qualitative study provokes thought about the paradoxical nature of virtual teams (Dubé & Robey, 2008). In this article, the authors raise some philosophical questions about the inherent contradictions frequently found in virtual teams research. For example, when considering trust versus mistrust, the conceptualization by the individuals that the internet may be an unreliable source for rich and socially present information may influence on-line behavior. Trust establishment itself may become a primary goal, simply due to an assumed untrustworthy ambience. Because trust has been found to be highly important in the management of organizations, it is important to examine basic antecedents to trust formation.

Meta-perception and evaluation influence trust formation.   Meta-perception is simply the impression one has about how others view him/her.

Evaluation includes estimation about others. Trust is usually defined by willingness to be vulnerable with another party because they have been determined worthy of our confidence. When assessing interpersonal risk, there is heavy reliance upon the ability to accurately determine the motivations and actions of others. Similarly, one must rely heavily upon the ability to accurately assess the interior beliefs one has about the opinions that others have about us. Group members should be more likely to trust each other if the others seem to be motivated by good intentions and hold a positive regard for the members.

      e-leadership. Functioning leaders make or break an organization, and it comes as no surprise that many are curious about leadership within the confines of virtual space (Cascio, 2000; Zaccaro & Bader, 2002). It is thought that the e-leader coordinates knowledge, trust and other factors which may provide social structures otherwise absent in the virtual environment (Cascio & Shurygailo, 2002). Effective e-leaders exude a "presence" in the virtual space by utilizing multiple resources to enhance their communicative efforts (Zigurs, 2002). Emergent leadership versus assigned leadership was studied by Wickham and Walther (2007). Their results indicated that computer-mediated groups may perceive more than one leader, even if one leader was assigned. In 2009, Balthazard, Waldman and Warren found that personality characteristics which were important in face-to-face team leadership emergence were not predictive of leadership emergence in virtual teams. They further found that the "linguistic quality in one's written communication" (pg. 651) was more predictive of emergent leadership in virtual teams. These representative studies demonstrate the

major themes in current e-leadership research and especially highlight common twists found in virtual teams' behavior. Reasons for examining the patterns of emergent leadership are many. Obviously the leader plays a central role in establishing and maintaining structure, managing conflicts, and is often held responsible for results. Furthermore, some virtual teams may default to an emergent leader who seems more capable of managing the technology or has a more commanding e-presence than an assigned leader. Generally, though, it is important to examine assigned leadership because it is more frequently the case that e-leadership in organizations is assigned hierarchically.

Change Management

Leadership change is a central concern in this project. Due to the extensive and rapid change often required in organizations, the field of "change management" has developed. Accomplishing organizational goals may require drastic changes in the case of mergers or acquisitions, but often, even simply remaining competitive over time poses challenges requiring change initiatives. There is strong concern with facilitating change without sacrificing organizational commitment, job satisfaction and knowledge bases. Organizational researchers focus on four main themes including (1) the content of change, (2) the contextual issues in the internal or external environments, (3) the processes and responses to them, and (4) the assessment of employee affect and behavior during change efforts (Armenakis & Bedeian, 1999).

Change can represent positive elements. Humans often seek novelty, exhibit the creative generation of ideas, and actively "play" (Huizinga, 1955) in

any given environment. "Play," when defined this way, involves experimentation, freedom to move outside established boundaries, and innovative expression. Corporations (and other entities) seek to develop climates which engender "positive turbulence" (Gryskiewicz, 2002). Excitement over new technologies and new social configurations in virtual space can be perceived as progressive advancement.

The downside of change is that it can be a direct occupational stressor. Negative side effects and real human costs are frequently observed (Gilmore, Shea, & Useem, 1997). The psychological reaction to change is most commonly interpreted as negative (Heath, Knez, & Camerer, 1993). There may be an inherent loss of control, ambiguity of roles, work pressure, or the perception of work pressure. People develop difficulty predicting career paths and difficulty investing in work that may quickly shift to others. With drastic changes, there is usually some degree of concern about remaining employed. These kinds of job strains have been clearly linked to negative health outcomes (Cesana, Sega, Rerrario, Choidini, Corrao & Mancia, 2003). Coping with the characteristic geographical and temporal distance in virtual teams creates work team interference which increases anxiety. (Sarker & Sahay, 2002).

Change is particularly disruptive in the ecological context of virtual teams because there are already obstacles in trust formation in the virtual environment. Yet, it is not only trust formation which may hinder a team effort. Emotion is difficult to convey virtually and nuances in communication are conveyed differently. Highly effective leaders in face-to-face meetings have not always

adjusted to the virtual demands to convey these key qualities in meaningful ways. Hierarchical distance and perceptual distance between leaders and group members can hinder collective cognition (Gibson, Cooper, & Conger, 2009). Factors outside the team's control are present. Given that technology may fail even the most seasoned team, causing further gaps in the dynamic nature of virtual team interactions, additional changes thrown at a team may interfere with establishment of basic procedural functions, the establishment of trust, and team integration for enhanced performance.

According to Armenakis and Bedeian's (1999) major themes, the virtual environment could present obstacles in implanting change, especially depending on the content and timing of the change itself. The milieu of virtuality imposes new and frequently changing skill sets on members of the organization. These include both interpersonal and technological alteration in work habits. Specific directions and ongoing resources to support change processes and the virtual team's response to these processes would be required. The resulting employee affect, cognitive performance and other behavior during change efforts may be more difficult to monitor given geographical dispersion.

As change managers come to understand processes, leadership, structures, reward systems, training, development and teamwork, they will prioritize methods to obtain peak organizational performance. To gain key insight into basic levels of virtual team function, key variables were examined: positive and negative affect, cognitive performance, group process performance, evaluation, and metaperception.

Conditions and Measures

Positive and Negative Affect

Affect refers to a construct comprised of emotion and/or mood. An emotion is more defined by a target and a brief duration; a mood is characterized by a more diffuse mental state of longer duration. Both contribute the more general phenomenon consisting of subjective feeling (Ashforth & Humphrey, 2005). Affect is thought not to be a simple continuum of positive to negative, but rather experienced distinctly as positive or negative. For example, low positive affect is not the same as high negative affect. (Watson & Clark, 1984; Watson & Tellegen, 1985). General workplace norms would dictate that negative affect is not displayed. Teams benefit greatly by higher positive affect. Barsade (2002) examined mood transfer among group members and found cooperation and task performance improves with higher positive affect. Furthermore, team processes are more efficient and more characterized by coordination depending on the leader's mood. (Sy, Cote, and Saveedra, 2005). Lower levels of positive affect led to lower levels of affective commitment to the team along with task and non-task effectiveness (Johnson, Bettenhausen, & Gibbons, 2009). While mood contagion and the influence of affect on work teams has been explored, the regulation of affect in virtual environs is less understood. Similarly, the emotional experiences of virtual teams as they face change have not been examined. Positive and negative affect are more elemental antecedents of elements which are important to virtual teams: sharing information, performance, trust formation, and efficiency of group processes.

Cognitive performance

Completing virtual work team goals requires team members to alternate between online team meetings and completing individual tasks offline. Many studies examine performance in terms of effective communication, effective coordination, or emergent mental models of the group. There are dozens of terms used to describe team cognitive performance, nevertheless, the basic conceptual frame is present. Cognitive states are important determinants of team performance (DeChurch & Mesmer-Magnus, 2010). We measured performance on cognitive tasks completed independently immediately after group task completion. Typically, if there is a stressor present (i.e. an abrupt change), it will divide concentration on cognitive task with intrusive thoughts or concerns and thereby may predict lower cognitive performance especially in the absence of compensatory strategies (Eysenck & Calvo, 1992; Eysenck, Derakshan, Santos, & Calvo, 2007).

Evaluation and Metaperception

One of the basic questions this project addresses is assessing how the team members scored each other's behavior or performance. Additionally, we asked team members to say how they felt other members would score them on the same list of adjectives. Social interaction usually involves scanning and evaluating our environment in a constant social process. In our personal and occupational lives, these conditions play out in salient ways. When the environment is virtual, we are stripped of many cues we rely upon. So, evaluative activities become hampered. The judgments made within the lean media available in virtual environments may

be qualitatively different.   For example, during face-to-face interactions, we utilize acknowledgement as a feedback channel, so that a group member recognizes that they are being understood. Typically, this validating process occurs in the form of positive head nods, the eyes "lighting up," or synchronous verbalizations such as "mm, hmm" (Driskel et al., 2003). There is an assumption that feedback is accepted from sources further away less readily (Ilgin, Fisher, & Taylor, 1979). Gaining clues about evaluation and metaperception in the virtual context will enhance our ability to understand how people form impressions about others and how they perceive others to be forming impressions about them.

Group Process Performance

How the virtual teams thinks and feels about the processes involved in the group experience which unfolds over time influences team satisfaction. An aggregation of factors comprises this construct. The personal commitment to the existence of the team in the first place, the agreement with the team's proposals, the assessed quality of the work done and the extent to which the work was done with good formation of a consensus are important to any work teams. Teams also like to believe that something greater was accomplished than the sum of individual efforts. Based on well validated research about team satisfaction as assessed by Cooke and Lafferty, the questions posed to the virtual teams collected the immediate reflection of each member upon completion of the tasks. The Organizational Culture Inventory began development in 1983 and is still available from Human Synergistics International. Taken from Level V of this longer assessment tool, the questions reveal Cooke and Lafferty's theory of

organizational culture very specifically. Affective commitment and constructive team styles are emphasized.

Virtual team research in terms of methodology, construct definitions and outcomes of interest are very broad. (Powell, Piccoli, & Ives, 2004). Researchers have lamented the lack of specific attention to affective, cognitive and group processes in virtual teams (Martins, Gilson & Maynard, 2004). Evaluative and metaperceptive constructs are worth examining under the conditions of abrupt change of leadership in the virtual environment when compared to a team not experiencing this change. Virtual teams are likely to be integral for making clear how networks, in the broadest sense, are influencing organizational change. The social processes leading to trust formation include evaluative concerns within the virtual context and within the change context. This project combines these contexts and seeks to clarify team behaviors which should ultimately inform e-leaders and change managers toward the key performance in the virtual life of their organization.

Table 3
Conditions and Measures

Virtual Teams

Change in leadership

No change in leadership

| Positive affect | Negative affect | Cognitive Performance | Evaluation | Meta-perception | Group Process Performance |

Hypotheses

Hypothesis 1: Groups who underwent leadership change will be significantly lower in **positive affect.**

Hypothesis 2: Groups who underwent leadership change will be significantly higher in **negative affect.**

Hypothesis 3: Groups who underwent leadership change will be significantly lower in **cognitive performance.**

Hypothesis 4: Groups who underwent leadership change will be significantly different in **evaluation** of their team members.

Hypothesis 5: Groups who underwent leadership change will be significantly lower in positive **metaperception.**

Hypothesis 6: Groups who underwent leadership change will be significantly lower in **group process performance.**

Methods

Participants

Forty "virtual teams" were formed from the Central New York vicinity and from students attending Syracuse University. Participants (52 men and 99 women) formed synchronous groups of 3 or 4 who were not co-located while engaged in computer-mediated communication. The average reported age range was 26-35 years. The participants ranged widely in educational background. The race and ethnicity characteristics were: Caucasian=68%, Asian/Pacific Islander = 17%, Black=6%, Hispanic/Latino=2.6%, Other or Combination=4.6%. Occupations were recorded as follows: undergraduate students: 42.4%, graduate students: 5.3%, employed professionals and non-professionals (not students): 43.7%, unemployed: 3.3%, and retired individuals: 2%. Employed participants included a wide representation of occupations including lawyers, information technologists, business managers, teachers, scientists, program directors, librarians, administrative assistants, home health aides, dog groomers, clerks and lifeguards. Twenty of the student participants received course credit for their participation in the study. The remaining participants were offered a $20 gift card as compensation for participating. Participants were recruited through online announcements, posters placed on campus and word-of- mouth.

Procedures

The participants' arrival was treated like a common business situation, with a comfortable waiting area provided. The researcher escorted each individual to his or her randomly assigned computer station. Each computer

station was in a separate room, keeping participants isolated by walls and doors so that they could not hear or see each other. Following a uniform script, the researcher obtained written informed consent and oriented the individual to the computer station. Each area included bottled water, six paper folders with documents for completion, pens, a timer, a headset with a microphone attached, and the computer terminal itself. The computers were previously logged on to a Windows Desktop platform, and instructions for the participants appeared on the screen in a word processing (Microsoft Word) document. Also, a computer mediated audio conferencing interface (Skype) was already open and connected with the other computer stations, ready to begin the session. Skype was chosen after expert consultation, because it is reliable, free, easy to use and popular with large and small businesses. (Appendix H)

Participants were asked to use the identity of Person A, B, C, or D, according to the randomly assigned computer station assignment. While the participants waited for the remaining team members to assemble, they filled out an informational questionnaire (Appendix A). Participants shared common personal, social and economic information so that gender, race and SES could be determined. In addition, participants answered questions about their "tech savvy" ways. They were asked, for example, how long they have been using the internet, how frequently they use email and what percentage of their day they spend at a computer. They were asked to specify types of activities and locations they use computers during their typical day.

The researcher was available to answer questions and settle each participant into his/her respective computer terminal area, preparing for the 90-minute session. Efforts were made to minimize personal contact before the study began and most of the participants did not meet each other upon arrival. Once the group assembled, a conference call was initiated by the "virtual team researcher" through Skype from a laptop computer in another room. Scripted instructions ensured that each person was connected to the conference call, was audible and understood how to use Skype. Carefully following scripted instructions, the researcher described how the session would be conducted for the group. The group would proceed through the assignments in each of the folders labeled #2, #3 and #4 together. After these, they would move on to Folders #5 and #6 on their own. Having completed Folder #1, the researcher would inform them that they would go on to Folder #2, taking about 10 minutes to decide together what the "new" Seven Wonders of the World should be. This simple yet engaging task was designed as an ice breaker.

Before releasing the group to function on its own, the researcher reiterated the time limits and established the leader of the group. The leader was always seated in the seat of Person C and because the initial seating was randomized, it was explained to the group that the leader was chosen at random. It was explained that the virtual team researcher would not be a part of the discussions, but would remain connected for logistical reasons. The sessions were recorded. For emergency purposes, each virtual team member was told the location of the virtual team researcher and that while it was hoped members would remain at

their computer stations for the remainder of the session, they were free to leave the room or ask for help in the event that they became ill or felt uncomfortable in any way.

Instructions prior to team interaction

Participants were told that we were studying "communication" in "virtual teams." They were not told anything about leadership issues, and they were not anticipating any changes. The researcher thanked them for their time upon arrival and encouraged a polite workplace ambience. In summary, participants were greeted, assigned a computer station, given written consent and some live instruction and reassurance by the researcher. Then the team was brought into the virtual space by the team researcher, as she initiated the conference call and gave further instructions regarding the session, ensuring both initial and ongoing technological success with the communication (Skype). Remarkably, this process of assembling took only ten to fifteen minutes and proceeded comfortably for each session. Participants were reassured that this assembling time was accounted for in the total session time, so that they would not be held longer than 90 minutes in any case.

Leader change manipulation

The first task was designed to encourage teams to initiate interpersonal communication and develop cohesive dynamics. The group was allowed ten minutes to decide the new Seven Wonders of the World. One half of the groups experienced a leadership change when the virtual team researcher interrupted the team. About five minutes into the conversation, the researcher abruptly re-entered

the conference call to inform them that Person C would no longer be the leader, but person D would now be responsible for leading the discussion and making final decisions for the group.   When a leader change occurred, the group was told that the choice of new leader was randomly made. The team then completed the tasks assigned under new leadership if they were in the experimental group. If they were in the control group, no change of leadership was initiated and there was no interruption.

        After completing the cohesion-development interaction, the group was asked to remain on the conference call while taking a few moments to complete the Positive and Negative Affect Scale (PANAS) (Appendix B) to assess their emotional status (mood) at that point in the session. The PANAS, developed by Watson, Clark and Tellegen (1988) from earlier work by Zevon and Tellegen (1982), is a widely used, internally valid scale. Affect is assessed by participants assigning a number on a five point Likert scale (where 1 = very slightly or not at all and 5 = very much) when presented with a list of both positive and negative emotions. Ten positive and ten negative words were used. Mixed in with the PANAS were three words (uncertain, self conscious, evaluated) which measured additional relevant feelings. The scores on the positive adjectives were summed to create a score for positive affect; negative item scores were summed to create a score for negative affect.

Group task

        Continuing on the conference call through Skype, the team leader convened the group to complete a murder mystery task (Appendix G), solving the

murder together in 30 minutes. The task involved reading 15-20 pages of text which included a newspaper account, a handwritten note, maps and dialogue of investigative interviews. Developed by abbreviating Stasser's original "hidden profiles" murder mystery task; interdependence was carefully maintained in the task design. Using hidden profiles necessitates that information be shared among group members because each individual is not provided with the same clues (Stasser & Stewart, 1992). In order to promote a sense of engagement with the activity, McGrath's circumplex of tasks was consulted. The Stasser task was found to be a conceptually driven task involving intellective problem solving, with an assumed correct answer that could be ascertained only via cooperation. The task design provided stronger engagement than other types of tasks which might be considered, due to the inherent interdependence required (McGrath, 1984). It has been empirically validated (Straus, 1999) especially examining computer mediated communication in groups.

Once the group formed consensus, the leader was required, at that time, to communicate with the virtual team researcher via instant messaging about the team's conclusion. When the result was reported, the conference call was ended. All the teams ended within the time allowance.

Individual cognitive task

Directly following the end of the conference call, each member completed a timed test of cognitive skills, involving visual logic, figural similarities, verbal similarities and differences. Published by Critical Thinking Company, Inc., these are common tests used in elementary and secondary schools to assess intelligence

or aptitude for academic work (Appendix C). Participants were given

approximately ten minutes to complete 26 questions. The number of questions

completed was noted along with the raw scores. The test took place at the

computer station to which they were assigned and was not supervised. Meant to

simulate workday activities, when one might be doing solitary tasks after having

attended a virtual meeting, the worksheets were similar to many common IQ tests

questions, but less intimidating. Reminiscent of school workbooks, the tasks were

arranged in four pages. The first required basic logic to make decision about

coordinating correct clothing items and shoes, when the matching information had

been given on the same page. On the second page, participants were asked to

decide how a geometric figure had been rotated by checking off the directional

information from a given list. The third page asked participants to complete

sequential patterns with cubes which had numbers on each face. The last page

directed the participants to select antonyms and synonyms for a given word by

choosing from a list and marking the choices with S and A. Responses were

made in pen and placed in Folder #5 when completed.

Post-task perceptions

Eleven key ratings about how the team member understood the virtual

team experience were included in Folder #6 (Appendix D). These perceptions

were measured via "group process performance" questions (Cooke and Lafferty,

1983), which measured the thoughts and feelings about the experience of forming

consensus. Each participant used a five-point Likert scale (1 = not at all and 5 = to

a great extent) to describe the extent to which he/she:

- was personally committed to the solution proposed by the team

- thought the solution generated by the group was better than the one the respondent might have developed on his/her own

- felt that the solution had been reached on a consensus basis

- thought the group came up with the best possible solution, given time and technology constraints

- thought the members of the group worked together effectively.

Additional measures included round robin ratings of each team member on five-point rating scales. These measures of perception asked the participant to evaluate the characteristics of each team member. Then, the participant was asked to report how he/she felt others rated him/her on these same characteristics.[1] The characteristics were given in positive and negative terms. Each participant was asked to rate each of the other team members regarding these positive and negative words. Then, each participant was asked to determine how he/she felt the other team members would rate him/her on the very same words (Appendix E). Thus, individual evaluations and meta-perceptions were obtained. Upon completion of these measures, participants were debriefed, and the incentives were given. At the start, participants were told that the focus of the study was "communication" in "virtual teams." Since they were not expecting a leadership issue, they did not foresee the change. At the end, the researcher informed the participants about the goal to determine the extent to which a change

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[1] Due to the complexity of the analyses of these round-robin ratings, further examination of these ratings will be completed by Alecia M. Santuzzi, PhD and presented in a separate written work.

in leadership might impact the virtual group experience or the performance. The researcher also gave a brief definition of meta-perception. An informational handout page with similar debriefing information as was presented orally, the principal investigator's contact information and key citations which might be of general interest those participants who are more curious about virtual teams. (Appendix F).

Results

Coding and Analyses

Behavior in groups is qualitatively different if the group members are acquainted or share friendship. Shared information may influence the way individuals think and form impressions (Ruscher, Santuzzi, & Hammer, 2003). Therefore, the researcher noted any group which had at least two members who already knew each other before arrival. In some cases, there were dyadic pairs, but also in some cases the members were married, related, or had longstanding friendships. Seven of the forty groups were eliminated.

Participants interacted in groups; therefore statistical analysis was conducted at the group level (Michinov, Michinov, & Toczek-Capelle, 2004). For each of the dependent measures, group averages were aggregated and the group mean was determined for use in subsequent analysis.

T –tests were performed to test the hypotheses. Virtual teams which underwent a change in leadership averaged a PANAS score on only positive words equal to 29.69, with SD = 3.793. Teams without the change scored higher: M = 33.42, SD 5.669. Statistical analysis indicated that those who underwent a

change in leadership were significantly lower in **positive affect** than the groups

which experienced no change in leadership: t(31) =2.174, p = .037, r^2= 13.2%.

Virtual teams who underwent a change in leadership averaged a PANAS

score on only negative words equal to 13.08, with SD = 3.08. Teams without the

change scored marginally lower: M=12.69, SD=2.152. Statistical analysis

indicated that those who underwent a change in leadership were not significantly

higher in **negative affect** than the groups which experienced no change in

leadership: t(31) = -.419, p = .678, r^2= 0.56%.

Virtual teams which underwent a change in leadership averaged a

cognitive score of 16.58, with SD = 2.36. Teams without the change scored

marginally lower: M=16.40, SD=3.781. Statistical analysis indicated that those

who underwent a change in leadership were not significantly higher in

performance on the **cognitive skills** test than the groups which experienced no

change in leadership: t(31) = -.158, p = .875, r^2= .08%.

Virtual teams which underwent a change in leadership **positively**

evaluated other members with an average score of 3.93, with SD = 0.34. Teams

without the change scored marginally higher: M=4.16, SD=.429. Statistical

analysis indicated that those who underwent a change in leadership did not differ

significantly from those teams which experienced no change in leadership: t(31)

=1.71, p = .097, r^2=8.36%.

Virtual teams which underwent a change in leadership scored an average

of 3.78 when they reported how they felt others would rate them on positive

words (**meta-perception**), with a SD = 0.272. Teams without the change scored

higher: M=4.00, SD= .366. Statistical analysis indicated that those who underwent a change in leadership differed significantly from those teams which experienced no change in leadership: t(31) =1.937, p = .062, r^2=10.79%.

Virtual teams which underwent a change in leadership scored, on average, a group process score of 4.22, with S.D.= .344. Teams without the change scored marginally lower: M=4.19, SD .431. Statistical analysis was performed. The **group process performance** measure was developed from the Organizational Culture Inventory developed by Cooke and Lafferty (1983). On this measure, T-tests found no statistically significant differences between groups which experienced change and groups which did not: t(30) = -.244, p = .809.

Table 2

Means and Standard Deviations for Each Measure by Teams with Change vs. Teams with No Change

Measures	Change		No Change		p (from t test)	r^2
	M	SD	M	SD		
Positive Affect	29.69	3.793	33.42	5.669	**.037**	13.2%
Negative Affect	13.08	3.080	12.69	2.152	*ns*	---
Cognitive Performance	16.58	2.36	16.40	3.781	*ns*	---
Evaluation	3.93	0.34	4.16	0.340	*ns*	---
Metaperceptions	3.78	0.272	4.00	0.366	**.062**	10.79%
Group Process Performance	4.22	.344	4.19	0.431	*ns*	---

Summary of results. In general, there was no support for the hypothesis that the abrupt change in leadership had any significant relationship with cognitive performance, group process performance, negative affect, or evaluation.

This means that the change in leadership did not significantly disrupt mental performance, create negative moods, engender an environment where people felt differently about the way the group was functioning or even change the way people evaluated other team members in this sample. There were two instances where there were significant differences between the groups. There was a greater incidence of team members registering higher meta-perceptive scores when there was no change in leadership. That is, participants believed the other team members would rate them more positively when the group did not experience change. In addition, we found that participants had significantly higher scores for positive affect when the team did not experience a change of leader. In essence, without the change, their positive mood was more positive. Negative mood was not influenced by the change.

Discussion

The change in team leadership was initiated in an abrupt and businesslike manner. The idea was to simulate a change in leadership in an office setting, such as when a new team leader is assigned or a different work team transition occurs. An expectation was that this experience would set a work team on a bad footing in some way. Basic engagement with the tasks was consistently observed. People displayed a genuine interest in "whodunit?" and seemed to settle in for the sessions in a similar manner than people would settle into a work assignment. In current business environments, the computer-mediated conference call is the most commonly used synchronous method of team work. Almost every participant was able to access Skype with no additional instruction from the researcher.

Generally, our teams behaved very similarly whether they had their leader changed by the researcher or not. Very little of the variances we measured were influenced by this change. Remarkably, the statistical analysis demonstrated that negative moods, performance on thinking-related tasks, positive evaluation of others and the group experience on the whole were so close to the same, that is, that there was almost no variation if there was a change thrust upon them or not. Groups were consistent in behavior both as noted in the self-reported measures and in the overall picture gained from observation. People behaved so uniformly that one might even write a script from the most common phrases recorded in the sessions. Frequently, team members used the exact same verbiage when the change occurred or when first assembling on-line.

Normally, people would introduce themselves by name on an everyday business virtual team meeting, but in this research the decision to ask the participant to submit to the assignment of a letter as their designation was meant to enhance deindividuation and depersonalization in the groups. The intention was to help reduce tendencies toward emergent leadership and the tendency to focus on status. Upon observation, these decisions seemed effective and likely enhanced the focus on the tasks themselves.

Surprising and contradictory results are not unusual when examining social phenomena in virtual environments. For example, when examining "interpersonal sensitivity" in dyads, Boucher et al. (2009) found that, depending on the context, the degree of clarity about other's perceptions was not diminished in virtual environments, but that under some conditions status differences seemed

to be enhanced. Their finding contradicts established theory which attempts to characterize computer mediated communication as less rich in opportunity for trust formation. Indeed, virtual teams pose many contradictions. While noted for efficiency, they may develop inefficient work styles. While teams may be innovative and dynamic, they may be inclined toward miscommunication. Though virtual teams are, by definition, so "high tech," still there are technological challenges. Immersed in these ironies, leadership plays a key role in managing dysfunctional conflict, performance and development of progressive work teams. (Gibson & Cohen, 2003)

Conditions of leadership change have not been examined previously. Our assumption that the picture would be more strongly negative was not founded. Cognitive performance and the evaluation of others were steady. Negative feelings were not generated. The change did cause a blunting of positive feelings and created a diminished sense that that others thought positively toward each team member. So the happy mood was not as happy and the sense that "others thought well of you" was not as strong. Stripping participants of the physical presence of the other people in the group, we created a challenge with regard to evaluation and forming ideas about how others would evaluate them. Metaperceptive patterns, on the group level, in this virtual environment differed substantially when the leader was abruptly changed.

Limitations

The study used zero-history teams completing a contrived task in an artificial laboratory setting. This was not the participants' workplace, not their

boss who has various forms of social power over them, and not a project in which they have heavy investment over time. They would not be working with each other in the future. Some work teams do form ad hoc and also disband fairly quickly, enhancing generalizability to the workplace. Other simple confounding factors might be at play. For example, further analysis may be required to tease out reasons for the effect that the change in leadership produced. Perhaps the interruption, the change in roles, or the change in leader influenced results in different degrees. Another example of a simple confound may be the weather. The participants experienced an unusually picturesque view of the campus and city environs upon arrival through large windows, perhaps influencing affect due to this "hallway" experience. The weather could be easily ascertained and became an obvious aspect of the "hallway" conversation.

Suggestions for further research

It should be noted that the data in this project were analyzed at the group level. Individual fluctuations might have been hidden in the reported analyses. Further analysis of this data set, using multilevel statistical techniques, might clarify the impact of leadership change at the individual level of analysis. In addition, the present study could be extended. According to dual process theory proposed by Winquist and Larsons (1998), the nature of group decisions involves previously unshared information impacting discussions more than previously shared information. Seeking to substantiate the dual process model, Hartman et al. (2002) have found that attentional focus improves decision-making in virtual

teams. Coding our recorded sessions for attentional focus and interdependence could corroborate those findings.

In order to re-create work environs more closely, groups could be formed over longer time spans, and changes could be enforced upon the group at later times in the processes when the group is more established. Some have suggested that the use of "verbal immediacy" through extra attention to pronouns like "we" and "us" and "our" is a adaptive technique that causes virtual groups to overcome the lack of physical presence (Witt, 2004). This study could be coded for this and for other measures which may demonstrate replacement behaviors for traditional face-to-face interaction cues. Other factors related to team performance could be examined utilizing existing data. Accuracy, speed, and the quality of solutions could be assessed.

Reviewing research in general, it is noteworthy that, often, variables being measured lack richness. There is too much reliance upon self-report instruments and underdeveloped indicators for phenomena. More nuanced methods for measuring team member satisfaction, team viability and organizational commitment would yield more complete results. Researchers should uncover methods for assessing more engaging variables such as agility and adaptivity (Alberts, 2002; Alberts & Hayes, 2003), responsiveness, robustness, innovativeness, flexibility, adaptability, and resiliency. In light of group membership change, questions of gender, status, size, task orientation, personality, leadership style and types of performance measures have largely been under-examined. Collective knowledge, interpersonal processes and operational

systems are all influenced by the constant changes in partial turnovers or enmeshments so characteristic of mergers. Organization type may also be a mediating factor.

Team size and formation are yet other issues that may impact findings more than are accounted for in current studies. We examined a simple role change within a recently established group. Teams, more often undergo leadership changes over longer periods with contextually less arbitrary actions. Members are more frequently changed due to turnover, promotion, and transfer in and out of already established teams. Questions should be addressed concerning how virtual teams handle changes in the composition of their teams: recognizing strengths and weaknesses, coordinating activities and developing shared understandings (Lewis, Belliveau, Herndon, & Keller, 2007).

Implications

As our virtual teams faced change, the tasks which required cognitive attention to basic work tasks remained intact. The change did not provoke bad moods, and teams were able to carry out instructions equally well in both conditions. The groups seemed largely resilient in the virtual setting. This understanding could improve elemental understandings of the robust social nature of computer-mediated environments. Information about muted positive moods and the lowered positive metaperception could inform "best practices" for enacting change in virtual teams. Improved e-leadership could maximize both performance and the experience of working virtually under changing conditions.

In addition, such information may improve training for virtual team leadership

(Rosen, Furst, & Blackburn, 2006).

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Appendices

Appendix A

Demographic Questionnaire with "Computer Savvy" Questions

Folder #1
Questions about You

Participant #_____
Participant Letter_____

What is your age?
- ☐ 18-25
- ☐ 26-35
- ☐ 36-45
- ☐ 46-55
- ☐ 56-65

What is your gender?
- ☐ Female
- ☐ Male

Do you speak English fluently?
- ☐ Yes
- ☐ No

What is the highest level of education you have completed?
- ☐ Grammar school
- ☐ High School or Equivalent
- ☐ Vocational or Technical School
- ☐ Some college
- ☐ Bachelor's Degree
- ☐ Master's Degree
- ☐ Doctoral Degree
- ☐ Professional Degree
- ☐ Other_____

How would you best classify your race/ethnicity?
- ☐ Asian/Pacific Islander
- ☐ Black
- ☐ Caucasian
- ☐ Hispanic/Latino
- ☐ Native American
- ☐ Multiracial
- ☐ Would rather not say
- ☐ Other:_____

What is your current marital status?
- ☐ Single
- ☐ Married
- ☐ Living together with someone
- ☐ Separated
- ☐ Divorced
- ☐ Widowed
- ☐ Would rather not say

What is your current annual household income?
- ☐ Under $10,000
- ☐ $10,000 – $29,000
- ☐ $30,000 - $49,000
- ☐ $50,000-$75,000
- ☐ $75,000-$99,000
- ☐ $100,000- $150,000
- ☐ Over $150,000

What is the setting of your current residence?
- ☐ Urban
- ☐ Suburban
- ☐ Rural

How many children live in your home?

_____

What is your occupation?

_____

How long have you been using the Internet?

_____

How often do you write text messages from your cell phone?
- ☐ Frequently throughout the day
- ☐ A couple of times per day
- ☐ Once a day
- ☐ A few times per week
- ☐ Once a week
- ☐ Once a month
- ☐ I have created a text message
- ☐ I have never tried to write a text message
- ☐ I don't use a cell phone

How often do you use Instant Messaging (IM)?
- ☐ Frequently throughout the day
- ☐ A couple of times per day
- ☐ Once a day
- ☐ A few times per week
- ☐ Once a week
- ☐ Once a month
- ☐ I have tried IM
- ☐ I have never used instant messaging
- ☐ I don't use a computer regularly

How often do you use e-mail?
- ☐ Frequently throughout the day
- ☐ A couple of times per day
- ☐ Once a day
- ☐ A few times per week
- ☐ Once a week
- ☐ Once a month
- ☐ I have tried email
- ☐ I have never used email
- ☐ I don't use a computer regularly

In which of the following computer activities have you ever participated?
Select as many as apply.

- ☐ Google
- ☐ MySpace
- ☐ Facebook
- ☐ LinkedIn
- ☐ Twitter
- ☐ Skype
- ☐ News and Weather
- ☐ Second Life
- ☐ Virtual conference meeting
- ☐ Database work
- ☐ Art, music or design creation
- ☐ Video Conferencing
- ☐ Online role playing games
- ☐ Online card or board games
- ☐ YouTube
- ☐ Ebay
- ☐ Online Shopping
- ☐ iTunes (or other MP3)
- ☐ Other:_____

Where are you most likely to access the Web?

- ☐ Home
- ☐ Work
- ☐ School
- ☐ Library
- ☐ Laptop with wireless connection
- ☐ Other:_____

Approximately what percentage of your average day is spent in front of a computer? (work and non-work combined)

- ☐ 0%
- ☐ 10%
- ☐ 20%
- ☐ 30%
- ☐ 40%
- ☐ 50%
- ☐ 60%
- ☐ 70%
- ☐ 80%
- ☐ 90%
- ☐ 100%

Rate your level of comfort with each of the following activities:

	Not at all Comfortable ------------------------------Very Comfortable			
Public speaking	1	2	3	4
Performing on a stage	1	2	3	4
Meeting new people	1	2	3	4
Talking on the phone	1	2	3	4

Appendix B

The PANAS

Folder #3
How Are You Feeling Right Now?

Instructions: Please rate **how you are currently feeling** using the following scale. Record your answers on the provided lines.

1 = very slightly or not at all   *2* = a little   *3* = moderately   *4* = quite a bit   *5* = very much

1) ____ Enthusiastic		13) ____ Upset
2) ____ Interested		14) ____ Distressed
3) ____ Determined		15) ____ Jittery
4) ____ Excited		16) ____ Nervous
5) ____ Inspired		17) ____ Ashamed
6) ____ Alert		18) ____ Guilty
7) ____ Active		19) ____ Irritable
8) ____ Strong		20) ____ Hostile
9) ____ Proud		21) ____ Uncertain
10) ____ Attentive		22) ____ Self-conscious
11) ____ Scared		
12) ____ Afraid		23) ____ Evaluated

Appendix C

Tests of Cognitive Skills

Dressing Logic

DIRECTIONS: Agnes, Barbara, Catherine, and Diana are going to a party. Below are the true statements they made about what they would wear. Decide what blouses they wear to the party, based on the illustration at the bottom of the page.

Agnes: "I will wear _____ and/or _____ ."

Barbara: "I will wear _____ and/or _____ ."

Catherine: "I will wear _____ and/or _____ ."

Diana: "I will wear _____ and/or _____ ."

Based on the shoes the girls chose to wear, which blouse or blouses could each girl wear and still make her statement true? (The girls always tell the truth.)

Agnes   Barbara   Catherine   Diana
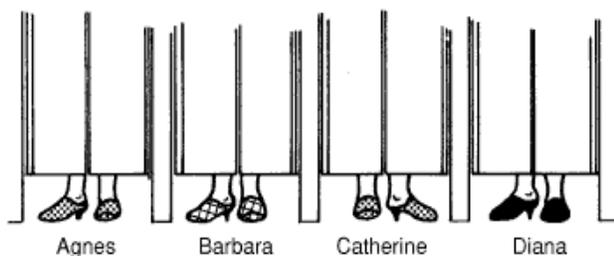
Agnes: _____   Catherine: _____

Barbara: _____   Diana: _____

EXPLAINING ROTATION OR REFLECTION

Examine the figures below. Decide how the first figure has been rotated or reflected to make the second one. Mark the directions on the right to explain the change. Mark the axis **V** for vertical, **H** for horizontal, or **D** for diagonal.

B-103
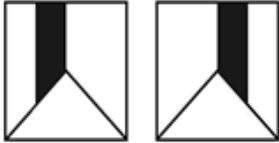
Rotated? Yes _____ No _____
  Number of positions: _____
  Direction: Right _____Left _____
Reflected? Yes _____ No _____
  Axis: V _____ H _____ D _____

B-104
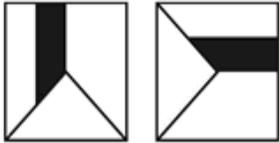
Rotated? Yes _____ No _____
  Number of positions: _____
  Direction: Right _____ Left _____
Reflected? Yes _____ No _____
  Axis: V _____ H _____ D _____

B-105

Rotated? Yes _____ No _____
  Number of positions: _____
  Direction: Right _____ Left _____
Reflected? Yes _____ No _____
  Axis: V _____ H _____ D _____

B-106

Rotated? Yes _____ No _____
  Number of positions: _____
  Direction: Right _____ Left _____
Reflected? Yes _____ No _____
  Axis: V _____ H _____ D _____

B-107

Rotated? Yes _____ No _____
  Number of positions: _____
  Direction: Right _____ Left _____
Reflected? Yes _____ No _____
  Axis: V _____ H _____ D _____

ROTATING CUBES—SUPPLY

Examine the changes in position of the first three cubes.
Decide how the cube is rotating. Mark the last cube as it should
look to continue the rotation sequence.

SYNONYMS AND ANTONYMS—SELECT

Read the first word in each line and think about what it means. One of the next four words means the **opposite** of the first. Circle the opposite word and mark it **A** for **antonym**.

One of the words is **similar** in meaning to the first word. Circle the similar word and mark it **S** for **synonym**.

SIMILARITIES

		S			A
EXAMPLE:	stoop	(a. bend)	b. crawl	c. relax	(d. stretch)
A-122	aged	a. ambitious	b. elderly	c. healthy	d. youthful
A-123	wreck	a. attempt	b. construct	c. destroy	d. direct
A-124	glance	a. gaze	b. glimpse	c. gloss	d. glow
A-125	contrary	a. changeable	b. exact	c. opposite	d. similar
A-126	boring	a. dull	b. lengthy	c. stimulating	d. tragic
A-127	clasp	a. agree	b. grasp	c. release	d. select
A-128	awkward	a. clumsy	b. graceful	c. steady	d. straight
A-129	essential	a. basic	b. distinct	c. terminal	d. unnecessary
A-130	omit	a. direct	b. edit	c. include	d. overlook
A-131	liberal	a. financial	b. generous	c. possessed	d. stingy
A-132	keen	a. dull	b. even	c. extra	d. sharp
A-133	retreat	a. advance	b. establish	c. prepare	d. withdraw
A-134	rival	a. associate	b. guest	c. opponent	d. subject

Appendix D

Group Process Performance /Consensus

Folder #6
About Your Virtual Team Experience
The Overall Experience

On a scale from 1 to 5, please circle the number which best describes your opinion.

Describe the extent to which you were personally committed to the solution proposed by the team.

1--------------------2---------------------3---------------------4------------------------5
Not at all   To a great extent

Describe the extent to which you thought the solution generated by the group was better than the one you might have developed on your own.

1--------------------2---------------------3---------------------4------------------------5
Not at all   To a great extent

Describe the extent to which you felt that the solution had been reached on a consensual basis.

1--------------------2---------------------3---------------------4---------------------5
Not at all   To a great extent

Describe the extent to which members of the group worked together effectively.

1--------------------2----------------------3---------------------4------------------------5
Not at all   To a great extent

Describe the extent to which the group came up with the best possible solution, given time and technology constraints.

1--------------------2---------------------3--------------------4---------------------5
Not at all   To a great extent

Instructions: Please rate **YOUR GROUP AS A WHOLE** on each of the following characteristics. Circle your response.

Our group came to a satisfactory consensus about the new "Seven Wonders of the World"

	Yes	No
Our group solved the "Murder Mystery."	Yes	No
Our group had difficulty communicating via computers.	Yes	No
Overall I felt this group activity was a pleasant experience.	Yes	No
Overall I felt this group activity was a frustrating experience.	Yes	No
Did your group experience a leadership change?	Yes	No

Appendix E

Round Robin Measures

Folder #6
About Your Virtual Team Experience
Rate Your Team

Instructions: Please **RATE EACH PERSON IN YOUR GROUP** on each of the following characteristics. Circle the number that corresponds to your response. A separate form is provided for each group member.

Instructions: Please rate **PERSON** _____ on each of the following characteristics. Circle the number that corresponds to your response.

Self-controlled

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Mature

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Optimistic

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Broad-minded

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Wise

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Clear-headed

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Understanding

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Purposeful

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Considerate

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Generous

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Alert

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Reasonable

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Self-conscious

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Anxious

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Folder #6
About Your Virtual Team Experience
How do you think your team rated you?

Instructions: Please **RATE** **HOW YOU THINK PERSON _____ RATED YOU**
on each of the following characteristics. Circle the number that corresponds to
your response.

Self-controlled

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Mature

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Optimistic

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Broad-minded

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Wise

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Clear-headed

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Understanding

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Purposeful

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Considerate

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Generous

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Alert

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Reasonable

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Self-conscious

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Anxious

1	2	3	4	5
Very little or not at all	A little	Moderately	Quite a bit	Very much

Appendix F

Debriefing Form

Virtual Teams

The study is now complete. At the beginning, you were told that the study was concerned with how individuals communicate information and form impressions of each other in a professional environment. We would like to give you some additional information about what we are studying.

Traditional ways of doing business and communicating in the workplace are changing. To achieve greater flexibility in the way people work, communicating virtually is often more the norm than the exception. Frequently work-teams are formed when members are not geographically co-located.

In this research we are examining how the virtual team handles abrupt change. Our goals are to find the extent to which a change of leadership would negatively impact the group experience or the group performance. In addition we are interested in how people perceive others in a computer-mediated environment, as well as how people think others perceive them. We are examining how change affects people in a work environment.

Do you have any questions about the research or what we hope to accomplish?

We would appreciate it if you would not discuss this study with anyone else who may be participating. If participants know ahead of time what we are studying, our data will be affected. Now that the experiment is over, if for any reason you do not wish to have your responses used in our data analysis, please inform the experimenter before you leave. We expect to continue collecting data for this project until the end of December 2009. If you would like to learn more about this research, or you would like to be informed of the results when they become available, please contact the primary researcher:

Dr. Leonard S. Newman
Department of Psychology
Syracuse University
Phone: (315) 443-4633
Email: lsnewman@syr.edu

Thank you for your participation!

If you would like to do some reading on this type of research, here are a few good references:

▪▪▪
Arvind Malhotra, Ann Majchrzak, and Benson Rosen. (2007). Leading Virtual Teams. *Academy of Management Perspectives* , 60-72.

Gibson, Cristina B. and Susan G. Cohen. (2003). *Virtual Teams that Work: Creating Conditions for Virtual Team Effectiveness*

Arvind Malhotra*,* Ann Majchrzak, and Benson Rosen *Conditions for Virtual Effectiveness.* San Francisco, CA: Jossey-Bass.

Olson, G. M., & Olson, J. S. (2000). Distance Matters. *Human-Computer Interaction*, online publication

APPENDIX G

The Stasser Task

The Case of the Fallen Businessman
 by Dr. Garold Stasser, Miami University, Oxford, Ohio

Murder mystery experiment
In the murder mystery experiment the participants are tasked to identify the guilty murderer from a group of three suspects. There is a total of 24 information pieces, from which 9 give crucial information (also called clues), which are required to correctly identify the suspect. Every group member receives a booklet describing the setting and a different set of information pieces, requiring the group to communicate their information to each other. Therefore the task is, according to the media richness theory, characterized by high uncertainty (the missing information pieces of the other group members) and low equivocality (the task can be completed by exchanging all information).

Murder mystery experiment
The murder mystery experiment requires the transmission of 9 critical information pieces (out of 24 given clues) to identify the murderer without fail. These clues are in the form of several pages of suspect interviews, maps and letters. All group members received a full set of the non-critical clues. 3 group members also received 3 additional critical clues, which were the critical information pieces and which were not available to any other member.

• **Major Characters**

Robert Guion: The victim
Mary Guion: The victim's wife
Lt. Mark Moody: Detective in charge of the investigation
Sgt. Cassini: Police officer assisting in the investigation
**Eddie Sullivan: Handyman who worked for the Gills
**Billy Prentice: Yardman who worked for the Gills
**Mickey Malone: Owner of MM Auto Parts; business associate of the victim
Sam Nietzel: Parts manager for Gill Lincoln/Mercury
Dave Daniels: Owner of Dave's Quick Stop in the Eastwood Shopping Center

** The ONLY suspects under consideration are:

Mickey Malone
Billy Prentice
Eddie Sullivan

• **Team Objective: Collaborate on the detailed murder information and develop a team consensus on who killed Mr. Guion**

• **Summary**:

Robert Guion, a prominent local businessman was found dead behind his Crestview home this morning. Detective Lt. Mark Moody of the Hilltown precinct reported that Mr. Guion had apparently been assaulted when leaving his home to play golf early this morning. He was struck on the head over the left eye and fell down a flight of stairs leading from a second story deck at the rear of the house. The preliminary coroner's report concluded that death was caused by injuries sustained from the fall and not from the blow to the head. The report estimated that Mr. Guion's death occurred between 6:30 and 7:00 AM. Lt. Moody would neither confirm nor deny rumors that Mr. Guion had been robbed. "We're following all leads. That's all I have to say for now," said Lt. Moody.

The note:
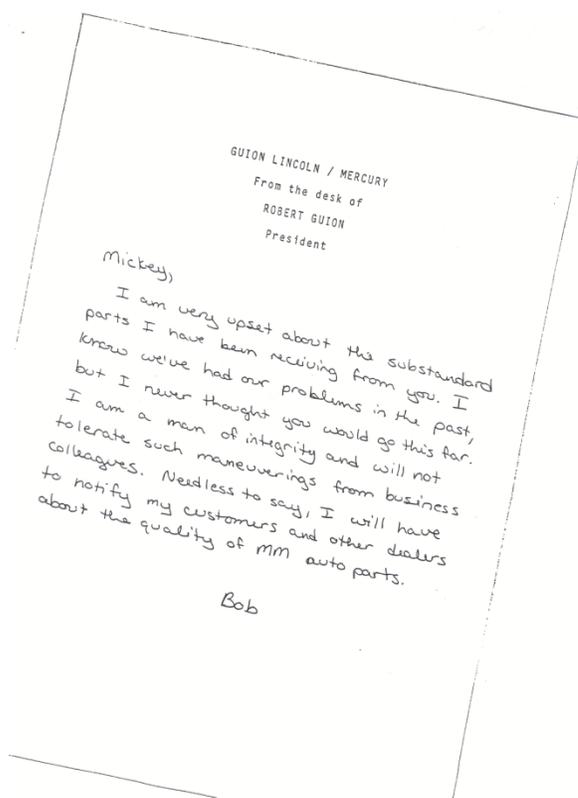
GUION LINCOLN / MERCURY
From the desk of
ROBERT GUION
President

Mickey,

I am very upset about the substandard parts I have been receiving from you. I know we've had our problems in the past, but I never thought you would go this far. I am a man of integrity and will not tolerate such maneuverings from business colleagues. Needless to say, I will have to notify my customers and other dealers about the quality of mm auto parts.

Bob

The maps:

GUION' S ACREAGE AND HOUSE
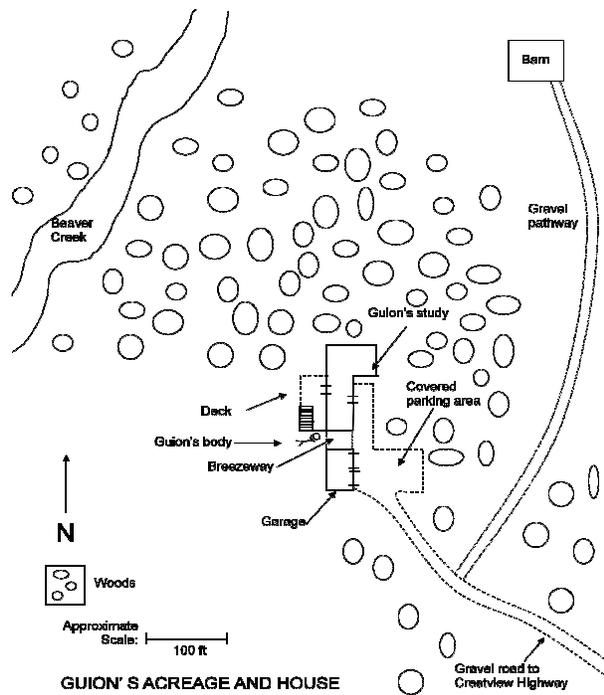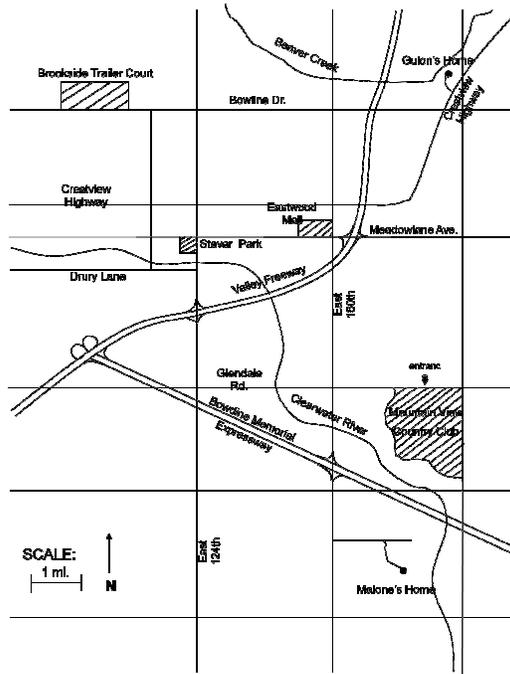
Sample Dialogue

Excerpts from
Sgt. Cassini's (Sg. C) Interview with
Eddie Sullivan (Ed. S), The Handyman

Sg. C: Mr. Sullivan, you said that you arrived at Mr. Guion's about 6 Sat. morning. You were tearing down a barn for him, I believe.

Ed. S: Yeah.. about 6… the sun was just coming up. I like to get my work done early before it gets real hot.

Sg. C: Did you notice anything unusual when you arrived?

Ed. S: No… The light was on in Mr. Guion's study, but that wasn't unusual. He is always up when I get there in the morning. He was a hard worker. He earned his money; it wasn't given to him.

Sg. C: How did you happen to notice Mr. Guion's body?

Ed. S: I went back to my truck to get my crowbar. I left it laying next to the truck. When I got there, the crowbar was gone. I looked around… that's when I saw Mr. Guion laying in the grass through the breezeway. At first, I thought it was Billy.. you know Billy… ah … Prentice, he cuts the grass on Saturdays. He's always there bright and early and I thought maybe he had hurt himself. Anyway, I ran back there. I was shocked to see Mr. Guion. I didn't think he was even there 'cause he plays golf on Saturday morning. He leaves at 6:30, regular as clockwork, and is never back til about noon.

Sg. C: OK, so you ran over to Mr. Guion…

Ed. S: Yeah, like I say I was shocked. He looked real bad… blood on his head and laying there real awkward. I ran up the stairs and pounded on the patio door. I started to open it and then I saw Mrs. Guion coming in from the living room. I thought I shouldn't alarm her too much so I just said, "Call an ambulance. There's been an accident." She started to run past me like she knew it was bad but I stopped her and said, "It's alright, just call the ambulance." I never told her it was Mr. Guion. I didn't know he was dead til I got back down the stairs.

Sg. C: Did you ever find the crowbar?

Ed. S: What?… Oh… no. I never did. I never looked again. I was real upset. I didn't even go back to the barn. I just left after the ambulance came. By that time, Mrs. Guions' sister and her husband were there and I didn't figure that I could do anything.

Sg. C: You said at first you thought it was Billy Prentice lying there in the grass instead of Mr. Guion. Was Billy there Saturday morning?

Ed. S: You know I don't know… come to think of it his car wasn't there and none of the yard tools -- or the lawn mower -- was out.   But I thought I heard his station wagon earlier.

Sg. C: When was that?

Ed. S: I can't say for sure. I just remember hearing a car with a loud muffler and thinking, "That's Billy." None of Guion's cars would ever sound like that. I'd guess around 7.

Sg. C: Did you hear anything else? Did you hear anything like a fight or, perhaps, Mr. Guion falling?

Ed. S: No, can't say as I did. You know the barn is quite a piece from the house… probably 200 or 300 yards. And there's a woods between there too.

Sg. C: You said you went back to pick up your crowbar by your truck. Where was your truck?

Ed. S: It was in the carport beside Guion's pickup.

Sg. C: Why didn't you drive it down to the barn where you were working?

Ed. S: Well… it had rained the night before, and I didn't want to get it stuck down there. There's a gravel path but it's not wide enough. Besides Mr. Guion didn't want me making ruts in the grass.

Sg. C: Eddie, did you and Mr. Guion get along?

Ed. S: Yeah… I always like him… He was real fair when it came to business… paid well… easy to work for.

Sg. C: Your daughter worked at Guion's car dealership, didn't she? Did they get along?

Ed. S: Yeah… She was his bookkeeper for several years. All of a sudden she quit. I didn't ask her about it. She seemed upset, but I figured that that was their business. You know what I mean?

Sg. C: Sure, if you think of anything else that I should know, give me a call. I'll be in touch.

Appendix H
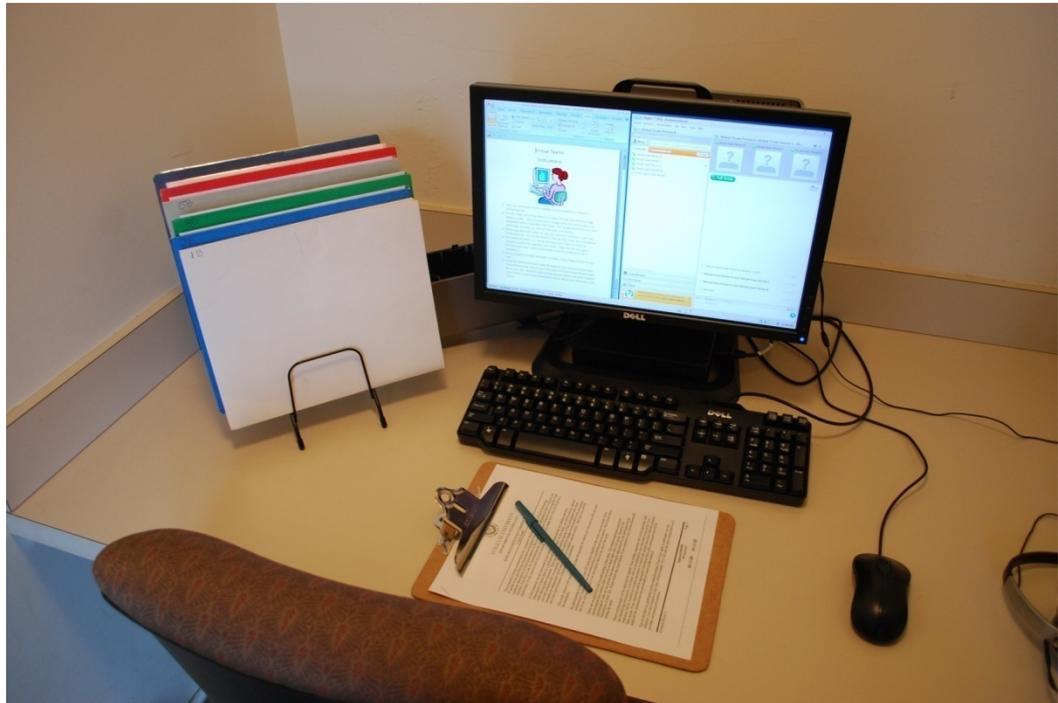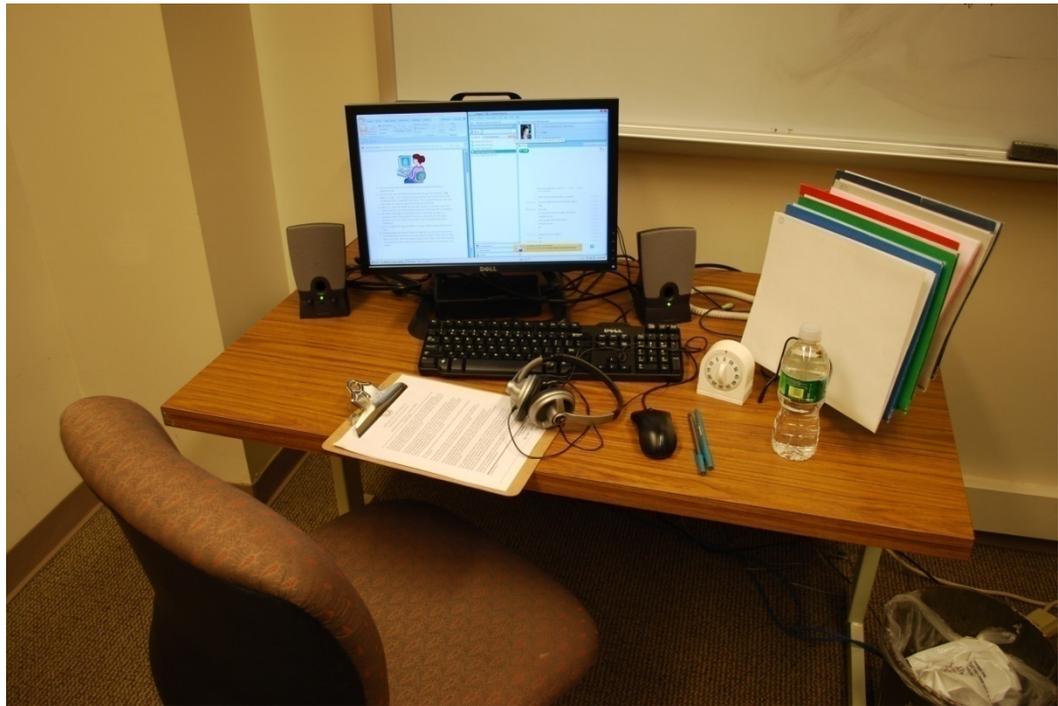
Capstone Summary

Traditional ways of doing business and communicating in the workplace are changing. With frequent mergers, shifting operational demands and underlying economic pressure, computer-mediated communication has been increasingly employed. To achieve greater flexibility in workforce configurations, working virtually is often more the norm than the exception. With continuously improving internet technologies, frequently work-teams are formed when members are not geographically co-located. In a corporate setting, there is unprecedented velocity of change which combines with internal and external pressures. Just exactly how does the virtual team handle abrupt change? It would be assumed that the teams would have even greater difficulty during instability because there are already so many challenges in the virtual environment. However, there could be something different about virtual teams that uniquely position them for better sailing in shifting winds.

The working team has been well established as traditional common business unit. More recently, it is clear that working in specifically virtual teams is a fundamental competence in most enterprises. Questions about how people behave within the virtual environment, when a non-geographically located team must work together synchronously are the central focus of this project. Because quick changes in team leadership are a frequent occurrence in both rapidly growing and destabilizing business conditions, we examined the virtual team facing an abrupt change in leadership.

The history of research involving virtual teams has a wide interdisciplinary nature and a dearth of solid theoretical bases. Theoretical bases

underpinning the project were drawn from social psychology, organizational psychology, communication, organizational development, management, anthropology and human computer interaction. While social psychologists scramble to unravel important issues of how people interact in cyberspace, groups and dyads are continually forming for business and personal reasons. Humans are spanning the globe with connectivity, changing the shape of how human interaction is experienced. The internationally networked personal computer and various extensions of virtual tools are constantly mediating human behavior.

The existing research offers many c*omparisons between virtual teams and face-to-face teams.* Frequently cited, Olson & Olson 2000 in "*Distance Matters"* examined "sociotechnical conditions." The authors were determining the ways in which computer-mediated work created strain on relationships and required alterations in the work itself or in the way in which collaboration techniques were employed. Relying heavily on field studies, Olson and Olson raised important issues which have strong implications about conditions which arise when work is not carried out in a shared physical space. Feedback is reduced. Multiple channels of information may not flow simultaneously. Personally identifying information is lost. Nuanced information may not cross the technological barriers due to the subtle dimensions of gestures, either facial or from the body. Work team members may not share the local context of time, news, frame of mind, mood which can be gained informally in the halls or other work and non-work zones. They proposed that boundaries and status differences are more difficult to navigate. They noted new behaviors emerging to compensate, such as more

formal protocols or the alteration of work schedules which especially affected

"tight work."

Virtual team researchers are interested in "e-leadership" because effective

e-leaders exude a "presence" in the virtual space by utilizing multiple resources to

enhance their communicative efforts.

Change can represent positive elements. Humans often seek novelty,

exhibit creative generation of ideas, and actively "play" (Huizinga, 1955) in any

given environment. Corporations (and other entities) seek to develop climates

which engender "positive turbulence." The downside of change is that it can be a

direct occupational stressor. Negative side effects and real human costs are

frequently observed. The psychological reaction to change is most commonly

interpreted as negative. There may be an inherent loss of control, ambiguity of

roles, work pressure, or the perception of work pressure. People develop

difficulty predicting career paths and difficulty investing in work that may quickly

shift to others. With drastic changes, there is usually some degree of concern

about remaining employed. These kinds of job strains have been clearly linked to

negative health outcomes.

Managers evaluate performance on a wide spectrum of formal and

informal factors. There are formal annual evaluations with common instruments

(such as 360^0 reviews), but there are informal assessments of personality, social

capital, influence, status, etc. Gaining clues about evaluation and metaperception

in virtual contexts will enhance our ability to understand how people form

impressions about others and how they perceive others are forming impressions

about themselves. As a part of assessing emotional, cognitive and social behavior, we examined both evaluative and metaperceptive function under the conditions of abrupt change of leadership in the virtual environment when compared with a team not experiencing this change. Affect, cognitive skills and group processes were also examined.

Methods

Forty "virtual teams" were formed from the Central New York vicinity and from students attending Syracuse University. Participants (52 men and 99 women) formed synchronous groups of 3 or 4 who were not co-located while engaged in computer mediated communication. The average reported age range was 26-35 years. The participants ranged widely in educational and occupational backgrounds.

The participants' arrival was treated like a common business situation with a comfortable waiting area provided. The researcher escorted each individual to his or her randomly assigned computer station. The computers were previously logged on to a Windows Desktop platform and instructions for the participants appeared on the screen in a word processor document (Microsoft Word). Also, the conference call interface (Skype) was already open and connected with the other computer stations, ready to begin the session. Skype was chosen after expert consultation because it is reliable, free, easy to use and popular with large and small businesses.   One half of the groups experienced an abrupt leadership change when the virtual team researcher interrupted the first task. The group continued on to solve a longer "murder mystery" task which was both engaging

and required integrated participation of all group members for successful consensus.

Results

The change in leadership did not disrupt mental performing, create negative moods, engender an environment where people felt differently about the way the group was functioning or even change the way people evaluated other team members. There was a greater incidence of team members registering higher meta-perceptive scores when there was no change in leadership. That is, participants believed the other team members would rate them more positively when the group did not experience change. In addition, we found that participants had significantly higher scores for positive mood when the team did not experience a change of leader. In essence, without the change, their positive mood was more positive, but a negative mood was not induced by the change.

Discussion

The change in team leadership was initiated in an abrupt and businesslike manner. The idea was to simulate a change in leadership in an office setting, such as when a new team leader is assigned or when a different work team transition occurs. An assumption of the hypothesis was that this experience would set a work team on a bad footing in some way. Basic engagement with the tasks was consistently observed. People displayed a genuine interest in "whodunit?" and seemed to settle in for the sessions in the same way people would settle into a work assignment. In today's business environments, the computer mediated conference call is the most commonly used synchronous

method of team work. Almost every participant was able to access Skype with no additional instruction from the researcher.

Generally our teams behaved very similarly whether they had their leader changed by the researcher or not. Very little of the variances we measured were influenced by this change. Remarkably, the statistical analysis demonstrated that negative moods, performance on thinking related tasks, positive evaluation of others and the group experience on the whole were so close to the same that there was almost no variation if there was a change thrust upon them or not. Groups were reliably consistent in behavior both as noted in the self reported measures and the overall picture gained from observation.

Surprising and contradictory results are not unusual in when examining social phenomenon in virtual environments. The change did cause a blunting of positive feelings and a created a diminished sense that that others thought positively toward oneself.   So the happy mood wasn't as happy and the sense that "others thought well of you" wasn't as strong.   Stripped of the physical presence of the other people in the group, we created a challenge for participants with regard to evaluation and forming ideas about how others would evaluate them. Metaperceptive patterns in this virtual environments differed substantially when the leader was abruptly changed.

Implications. As our virtual teams faced change, the tasks which required cognitive attention to basic work tasks remained intact. The change did not provoke bad moods and teams were able to carry out instructions equally well in both conditions. The groups seemed largely resilient in the virtual setting. This

understanding could improve elemental understandings of the robust social nature

of computer mediated environments. Information about muted positive moods

and the lowered positive metaperception could inform "best practices" for

enacting change in virtual teams. Improved E-leadership could maximize both

performance and the experience of working virtually under changing conditions.

In addition, such information may improve training for virtual team leadership.