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ABSTRACT

THE IMPACT OF CULTURAL DIFFERENCES IN TEMPORAL PERCEPTION ON GLOBAL SOFTWARE DEVELOPMENT TEAMS

**by
Richard William Egan**

This dissertation investigated the impact of cultural differences in temporal perception on globally dispersed software development teams. Literature and anecdotal evidence suggest that these temporal differences affect individual communication quality, which in turn will affect individual satisfaction and trust within global teams. Additionally, the temporal dispersion of the team was expected to affect an individual's sense of temporal disruption which, in turn, was expected to affect individual satisfaction and trust. Differences in temporal perception were expected to moderate this impact on perceived temporal disruption. A Fortune 100 Company that carried out software testing in Ireland, the United States, China and India provided the respondent population which resulted in all testing teams having global membership.

The research used two methods for data collection: survey and interviews. The survey instrument's constructs were developed via pilot tests conducted on student software development teams and through a card sorting task. Four temporal perception constructs were used: Future Orientation, Lateness Attitude, Temporal Rigidity and Temporal Urgency. Team members answered the temporal perception questions twice; once for how they felt their remote team members would answer the questions and once for how they felt their local team members would answer the questions. A gap analysis was performed on this data yielding temporal perception difference scores. A Gap Magnitude that looked at the size of the gaps was also calculated to provide measures of the size of

the cultural differences. Semi-structured interviews were carried out on fifteen percent of the respondent population to explore the temporal perception differences in more detail. Survey results only partially supported the hypotheses that cultural differences in temporal perceptions affect Individual Communication Quality. Specifically, it was found that group differences in the temporal perceptions of Sense of Urgency and Lateness Attitude significantly impacted Individual Communication Quality. Sense of Urgency also impacted Individual Trust. Follow-up interviews suggested that differences were recognized, but other factors such as an orientation to a future benefit by working hard now, the prestige of working with people in the Company's home country and possibly a sense of being a professional, may have outweighed the examined temporal differences. It also was found that Temporal Distance affected an individual's Temporal Disruption, that Individual Communication Quality affected Individual Trust, and Individual Satisfaction.

Gap Magnitude helped identify areas of potential problems that corresponded to areas identified by management, and mentioned by the employees in their interviews. Overall, the research suggests that certain Temporal Perceptions affect Individual Communication Quality, which in turn affects Trust and Individual Satisfaction. Communication, itself, seemed to be a large cause of problems, in part, because of the language differences, in part, because of the need to convey complex problems requiring detailed solutions, and, in part, because of the extreme temporal disruptions that time zone differences caused in a global team members working life.

**THE IMPACT OF CULTURAL DIFFERENCES IN TEMPORAL PERCEPTION
ON GLOBAL SOFTWARE DEVELOPMENT TEAMS**

**by
Richard William Egan**

**A Dissertation
Submitted to the Faculty of
New Jersey Institute of Technology
in Partial Fulfillment of the Requirements for the Degree of
Doctor of Philosophy in Information Systems**

Department of Information Systems

May 2008

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CHAPTER 1

INTRODUCTION

1.1 Background

Global software development is common business practice today, with companies developing software in multiple areas of the world to gain a competitive edge in the global economy by taking advantage of lower employee costs and a larger labor pool, and by being closer to markets they wish to enter (Carmel & Agarwal, 2001). Unfortunately, in the trade literature, there continue to be reports of problems with the globalization of software development (Avram, 2007). It has been suggested that software development requires close cooperation of people among team members, something that is difficult to obtain when the members have different cultural backgrounds (Herbsleb & Moitra, 2001). Research also shows that conflicts arise because cultures differ on such critical issues as the need for structure, observance of hierarchy, temporal perceptions, and communication practices.

Globally dispersed teams have the additional effect of time zone differences, referred to as “temporal distances.” Work within a time-zone band facilitates synchronous communication, but work across time-zone bands causes communication problems due to reduced overlapping of workdays, and the different wake-sleep schedules of the individuals in each time zone. Coordination becomes more difficult due to the difficulty in maintaining the tightly knit communication needed for software development. Communication is also affected by language barriers and differences in cultural norms (Avram, 2007; Carmel & Agarwal, 2001).

1.2 Research Questions

The research described in this dissertation focuses primarily on five areas of possible problems with dispersed development teams:

- Do differences in cultural time perceptions among members of a dispersed team impact Individual Communication Quality?
- Do differences in cultural time perceptions among members of a virtual team impact Individual Trust?
- Does Temporal Distance impact Individual Temporal Disruption?
- Does Individual Communication Quality impact Individual Satisfaction?
- Does Individual Temporal Disruption impact Individual Satisfaction?

The concept of Individual Communication Quality is how well the individual communicates with other members of the team (Cramton & Webber, 2003), while the concept of Individual Temporal Disruption is based on the idea that teams, which are dispersed, may have team members that are temporally distant from each other. This imposes adjustments to individual schedules when synchronous communication must occur, resulting in potential violations to one's private time (Zerubavel, 1979).

It is difficult to measure perception differences, therefore, the techniques used to do such measurement are important. One method for measuring differences in perception is gap analysis(Headley & Choi, 1992; Parasuraman, Zeithaml, & Berry, 1985), which researchers have traditionally used to measure the difference, or gap, between a customer and provider's sense of service. These measurements are then examined to discover where service could be improved.

In this work, gap analysis was used to assess the gap between how members in one culture perceive and evaluate temporally based issues compared to their perception of how members in a second culture perceive and evaluate those issues. The issues selected were typical work-related issues such as meeting deadlines, arriving at meetings at scheduled times, and deciding to either get the work done as quickly as possible versus doing work in such a way that it helps one to do future work better. It was hypothesized that if the gaps were large, individual members would not communicate as effectively nor trust their remote team members as much, and thus, would not be as satisfied with their work situation, nor would they work as effectively.

This research examined job satisfaction, perceived communication quality, trust and time-based cultural differences between individuals. It also looked at the effect the temporal distances had on temporal disruption and on perceived communication quality. This was accomplished with a survey constructed to support the use of gap analysis for the examination of temporal perceptions.

1.3 Benefits to the Field of Information Systems

An argument can be made that Information Systems management strategies, as developed in the Western World, are not likely to be applicable when applied to Eastern World cultures. For example, management may have to make explicit what a deadline means, how soft the deadline is, what types of interim deadlines exist, when people should call for help because of not being able to meet a deadline, etc. One culture may not know about the needs of another culture concerning these issues. As such, management from various cultures need to be trained so they understand what should be made explicit when

setting parameters. This also applies to responsiveness to communications, frequency of contact, and perceived urgency of contact. This dissertation addresses these cultural related issues under the general nomenclature of temporal perception differences. In addition, it is argued that Information Systems, by its very complexity, requires an intense amount of daily communication, much of which is supported by complex technology, e.g., problem report data bases, etc. (Hinds & Kiesler, 1995). However, the interaction of individuals with different culturally guided perceptions of time within western-based management technology had not been studied. This dissertation looked at these interactions and finds what effect the time-based cultural differences have on important team parameters such as trust and individual satisfaction.

An additional contribution of this dissertation is the creation of a measure called Gap Magnitude, created from the gap analysis. This measure, which is described in detail later, facilitates the comparison of groups of respondents, thereby identifying potential problem areas, where gap magnitudes between two cultures are large. This will allow companies to address these areas to obtain a favorable outcome, either through cultural sensitivity training or through the avoidance of certain combinations.

There are limitations in the results presented in this dissertation because the survey was administered at only one corporation with a limited number of respondents, fewer than 100. These limitations affect the generalizeability and robustness of the results, and point to the need for further exploration of both the impact of temporal perception differences and the use of the Gap Magnitude measure before the results can be of general use.

1.4 Organization of the Thesis

This dissertation is organized into nine Chapters.

- Chapter 1 introduces the original motivation for this research, and the outline for the dissertation, plus the general research questions that are explored.
- Chapter 2 explores and analyzes the literature relevant to answering the research questions posed in Chapter 1. It first presents studies of globally dispersed teams, which document the difficulties encountered, in particular, in the coordination and communication behavior of these teams. The literature reviewed is presented to illustrate the scope and nature of the problem. This Chapter then continues with a look at various time perception differences, which have been catalogued, both cross-culturally and for specific cultures. This work was used as the basis for developing measures of cultural time perception differences.
- Chapter 3 describes the pilot studies, which guided the design of the survey, the evaluation of the pilot survey results, and how the pilot results shaped the final survey.
- Chapter 4 presents the research questions that arose from the pilot study results and the literature review. It develops hypotheses from these research questions and postulates a model of how various variables affecting virtual software team performance interact with temporal perception differences to impact team performance.
- Chapter 5 describes the research methodology used to analyze the data collected in this research. This Chapter includes a description of the final constructs that were used, how the survey was delivered, an overview of the research population surveyed, and a presentation of the preparation of the data for analysis.
- Chapter 6 presents the results of 17 follow-up interviews, which were conducted with respondents from the corporation, CmpyA, who had completed the survey. These interviews were conducted to elicit more in-depth information about the cultural differences between team members and their work coordination, as well as any particular issues existing among members of the teams not covered by the survey.
- Chapter 7 presents the analysis of the survey data. This analysis was initially conducted using SPSS™ and the research model tested using SmartPLS™.
- Chapter 8 is a discussion of the findings, issues and problems with the research, additional post hoc analyses and finally, an overall summary of the important outcomes.

- Chapter 9 presents the contributions of this research and then discusses anticipated future research.

CHAPTER 2

A REVIEW OF THE LITERATURE

2.1 Introduction

Global software development is a common business practice today. Companies develop software in multiple areas of the world to compete in the global economy by taking advantage of lower employee costs, by improving productivity through a 24/7 work day, and by being closer to markets they wish to enter (Cramton & Webber, 2003; Damien & Zowghi, 2003; Dubé & Paré, 2004).

Unfortunately, problems with the globalization of software development still occur. Distance has a negative effect on communication which impacts coordination (Carmel & Agarwal, 2001). Different cultures have different needs for structure, attitudes towards hierarchical management, and sense of time (Herbsleb & Moitra, 2001). It has been suggested that teams need to build trust but that this trust can be fragile and temporal (Jarvenpaa & Leidner, 1999). Additionally, traditional management techniques may not apply to dispersed teams (Dubé & Paré, 2004).

In general, differences in such areas as communication practices, cooperation, the need for structure and hierarchy, coordination of communication, and coordination of tasks can cause misunderstandings and timing problems, which affect team performance, the quality of the software product delivered, or even its deliverance (Carmel, 1999, 2006). These problems can and do exist in co-located teams but are exacerbated by members being remote to each other (Jarvenpaa & Leidner, 1999).

Additionally, geographically dispersed teams rely in part on asynchronous technology to facilitate their communication but also adjust their workday to create an overlap in time to allow for synchronous communication. A key shortcoming of this dependence on technology is that often the technology itself does not facilitate awareness of a communication being received (Cramton, 2001). Even though asynchronous technology is commonly used in co-located teams, little is actually known about its dynamics or effectiveness in asynchronous global virtual teams, which do not have the additional synchronous channels of communication for resolving disputes, complex problems, etc. (Massey, Montoya-Weiss, & Hung, 2003).

Other researchers reported evidence of software project problems arising when cultures differ on such things as the need for structure, observance of hierarchy, time perceptions, and communication practices (Borchers, 2003; Damien & Zowghi, 2003; Herbsleb & Moitra, 2001; MacGregor, Hsieh, & Kruchten, 2005; Olson & Olson, 2003). These reports were derived from case studies of broad-based observations of software teams in action.

The researchers cited looked at differences in culture and how those differences might impact communication, trust, and satisfaction. As the universe of cultural differences is vast, the research for this dissertation was limited to cultural differences in temporal perceptions. Temporal perceptions were selected due to reports of their existence as a determinant of cultural differences in sociology and related fields, (Hall, 1959, 1969; Herbsleb & Moitra, 2001), and due to case studies, which found that differences in temporal perceptions affected interactions between different cultures. That this is a problem in business today was supported by conversations with industry

personnel who, with little prompting, described their time problem experiences working with teams in other countries. These conversations suggested there were differences in how people perceived and reacted to certain common business situations, primarily in the areas of schedules and deadlines. These people described frustration with the response, or, more accurately, the lack of response to approaching deadlines and the need for extra effort including overtime. One manager expressed it as “They just don’t get it, they don’t seem to sense the urgency of the situation. They do not seem to understand that we cannot be late with this...”

Though the focus is on temporal perceptions, an understanding of teams, team interactions and other issues involved with teams is important to the understanding of this area. Therefore, this chapter first reviews existing work on teams and variables that affect teams.

2.2 Issues in Teams

Before examining specific issues that occur in teams, a look at some terminology is helpful for establishing common ground:

- *Coordination* is an activity focused on integrating tasks within an organizational unit or between organizational units to ensure the smooth functioning of the units in achieving a common goal. In common usage today, this meaning is extended to include integration of tasks performed by an organizational unit and external entities for achieving an organizational goal.
- *Controls* are the processes used to achieve the established goals including the policies, standards, and procedures that guide the efforts.
- *Communication* is a mediating factor that affects coordination and control. Ideally, the purpose of communication is to provide clear and unambiguous information so the teams understand what has to be done and how to get the work done (Carmel & Agarwal, 2001).

With this terminology established, the following sections look at issues concerning teams in general and then move to those issues, which concern dispersed teams specifically. The first issue is the general area of communication and coordination and can be considered the most common of activities among teams.

2.2.1 Communication and Coordination

Communication is an activity that encompasses many facets of a business organization's daily operation. Businesses communicate internally to advise employees of events or conditions that affect the business or the employees. Within a business, there are three basic types of communication: *hierarchical*, *lateral*, and *diagonal* communication (Hinds & Kiesler, 1995).

Hierarchical communication is the communication of an employee at one level to an employee at a different level, commonly a superior communicating to a subordinate. This type of communication assumes an authority structure and is considered *vertical* when the communication is within that authority structure.

The second type of communication is *lateral* communication between employees at the same level or those not in a superior/subordinate relationship. Lateral communication usually relies on informal channels of communication between people.

Finally, communication that is between people in different authority structures is referred to as *diagonal*. Diagonal communication is not as common as the other types of communication because it crosses authority lines. An example would be a vice president engaging in a communication with a manager in a different division to obtain information directly.

Hierarchical, or Vertical communication, supports a hierarchical management structure and is used for the distribution and exercise of control throughout the layers of supervision. This communication buffers management from unnecessary communication, which management may consider a benefit. In this respect, Vertical communication tends to constrain communication to the established authority structure, while Lateral communication tends to open communication across structures due to its reliance on informal lateral channels.

Lateral communication is common among technical workers not only due to the nature of their work, but also due to their training and organization, which is usually based on teams of equal peers interacting within a horizontal structure. A horizontal structure fosters collaboration and information sharing with consultation within informal lateral channels, improving an individual's ability to keep current and find new knowledge (Carmel, 1999; Hinds & Kiesler, 1995).

In terms of dispersed work, communication would tend to be Lateral, in that it helps the individuals perform their tasks and fosters the coordination needed. Vertical communication would be the more formal communication between management and the team members reporting to them.

Diagonal communication would be considered management's version of Lateral communication and is used for non-routine situations that involve communicating to upper management in other structures, normally to obtain information or resources not available in the person's own structure.

These communication structures have problems due to their inherent nature: vertical communication may insulate and prevent upper management levels from being told what is common knowledge several layers down, often due to the inability of a lower level person to go over his boss's head. In the context of dispersed teams, Vertical communication may act to isolate the remote teams from higher management, including team leadership, due to the remote team not being physically co-located with the leadership. A remote team and its members then must be pro-active in ensuring management knows about them and their accomplishments.

Lateral communication often has a problem of finding the right source, that is, one of knowing with whom to talk to for help in resolving a particular situation. Lateral communication can be thought of in terms of a social network - whom does that person know and of what value can it be to me? Once a contact has been made and accepted, the new individual becomes an additional channel of information with the reciprocal situation also being true. In a co-located situation there may be greater knowledge of whom is the expert in an area, but even if there is no greater knowledge there is greater possible access to that person because of the co-location (Armstrong & Cole, 2002; Hinds & Kiesler, 1995; Kiesler & Cummings, 2002).

At this point, the type of media used for communication has not been mentioned. A medium may be categorized by its synchronicity, ability to support synchronous or asynchronous exchanges, and may be further divided into various degrees of 'richness'. Thus, communication media varies by its ability to process rich information such as facial clues, body language and the like. Examples of media in decreasing richness order are: face-to-face, telephone, personal letters and memos, impersonal written documents, and

numeric documents (Daft & Lengel, 1986). Media of higher richness provides multiple cues through body language, tone of voice, immediate feedback, personalization and more. Media of lower richness provides fewer cues and restricts feedback, but is good for processing well-understood messages and standard data. The richness of the medium is important in situations where one is trying to resolve equivocal issues but also when establishing relationships and trust.

The basic premise of Daft and Lengel is that different types of communication media are appropriate for different types of communication needs. Therefore, in a situation of technical work involving tasks that are complex, contextual, and interdependent on other technical work, richer media is required, because technical work requires continual discussions about non-routine problems, ongoing coordination, and the need for specialized knowledge (Hinds & Kiesler, 1995).

Some of these assumptions, based on Daft and Lengel, have been questioned as there is more than just the richness of the media and it's appropriateness for the task, which needs to be looked at (Haythornthwaite & Wellman, 1998; Haythornthwaite, Wellman, & Mantei, 1994). Haythornthwaite et al. state that the ability of the medium to foster feedback and interaction is important, and they provide the example that email can be used spontaneously, like an unscheduled meeting, to obtain information and provide feedback, but it also allows the luxury of time in responding. One can craft a response without the pressure of needing to give an immediate response. Further, they state that there is an element of specification in the choice of media.

The assumption that a richer media is appropriate for all tasks is unwarranted, it is necessary to perform an analysis of "...the interplay between specific dimensions of work and different means of communication." (Haythornthwaite et al., 1994). It may be argued that being dispersed allows one to bring more tools to the process in compensation for the lack of face-to-face communication; an argument that is beyond the scope of this research.

There are varying avenues and types of communication within an organization and the organizational structure, which may facilitate or hinder these communication modes. However, more than just organizational structure is of concern, there is also the problem of possessing information about other technical teams, e.g., their existence, their skill sets, the type of work they are doing, etc.

While this discussion has been primarily at the organizational level, communication at the team and individual level, as mentioned, tends to be lateral, which implies that problems of access may be eliminated due to members being on the same team. This implication though may not be true with dispersed teams in that distance makes the coordination of communication difficult, but it also raises the possibility that dispersed teams may not know the other members skill levels and therefore, the expertise that these members possess. It further raises the question of intercultural communication, how skilled the individuals may be at it and their comfort level with the dominant language.

Research has shown that a factor in coordinating work is ensuring the mutual knowledge of the players; that not 'knowing' what the other person or group knows is a problem. If some knowledge is not known by all players, or unevenly known, it can

cause conflict, with distance only exacerbating the problem (Cramton, 2001). Therefore, if one group does not know the level of knowledge of another group, the first group can try to overcome the problem by reducing the complexity of the task to a level where there is little need for any special knowledge, and by implication, little need for one to know the level of knowledge of the other individual or group.

The practice of reducing the complexity of the tasks is common within large scale projects because it is impossible to define all the pieces needed beforehand and therefore detailed communication is required to fill in the gaps (Cramton & Webber, 2003). In well-managed, large-scale projects, this takes place by an iterative effort to define requirements closer to when they are needed, thereby accommodating changing conditions by helping to reduce the complexity of the definition. This though, can leave members not knowing the larger picture, frustrated by this lack of knowledge, and without a way to obtain it.

Mutual knowledge is less of a problem in co-located projects because there is the luxury of lateral communication's informal channels. Thus co-located conversations, referred to as the water cooler effect because of serendipitous encounters at the water cooler, facilitate discovering what others know and do not know and help transfer knowledge.

In dispersed situations, a reduction of the complexity of a task reduces the need for collaboration, thereby overcoming the loss of these important informal channels but the gap in knowledge still remains (Cramton, 2001). While reducing the need for collaboration is an important goal for dispersed teams, it cannot be totally achieved

because reducing the complexity of the task does not completely eliminate the need for collaboration or mutual knowledge.

Dispersed teams can have communication misunderstandings and coordination problems due to their lack of knowledge about each other's holidays and potentially not receiving responses to emails which were sent (Suprateek Sarker & Sahay, 2002, 2004). For example, knowledge of July 4th in America or Bastille Day in France may be fairly common, but how many people know about re-unification day in Germany? This lack of knowledge can lead to the perception that an individual has not replied to a communication in a timely fashion, causing miscommunication and possible attribution of negative motives.

Though attribution is an important factor in dispersed teams, it is a reaction to a violation of the "norms," both organizational and group. These differences in holidays or 'standard' days off become important when there may be expectations to work on those holidays, i.e., the ones, which are important or 'sacred' to the individuals. Culturally, few Americans would opt to work on Thanksgiving, yet these same Americans may think nothing of working on Veteran's Day.

In addition, Kiesler and Cummings state that there is a tendency by remote groups to create local spaces that may interfere with their identification with the larger group. The shared space of dispersed groups most likely is different, and may even conflict with the shared space of other groups (Kiesler & Cummings, 2002).

Within Hall's work, there is the concept of two different types of communication. These types are *High-* and *Low-context* which Hofstede equated to his own concept of *Collectivism* and *Individualism* (Hofstede, 1980). High-context communication

represents collectivism, which implies that little needs to be said because most of the information required is contained in the context. Low-context communication corresponds to individualism, in that there is a need for most, if not all, information to be explicit. Thus, cultures that are collectivist in communication are likely to have difficulties communicating with cultures that are individualist and vice versa, due to the mismatch of their communication styles.

Trompenaars addresses this concept, by noting that companies have a mode of working, which is potentially at odds with local cultures (Trompenaars & Hampden-Turner, 1998). He writes: "Integrated technologies have a logic of their own which operates regardless of where the plant is located. Cultures do not compete with or repeal these laws. They simply supply the social context in which the technology operates."

Hofstede's work, based on the premises of Hall and Trompenaars, looked at cultural differences of a large number of individuals and cultures in a single global company, in which he identified and measured a set of cultural differences, which existed and affected communication and coordination in work. In part, he showed that, although a uniform corporate culture can be developed, it exists within a larger social context that guides communication exchanges and social behaviors, effectively modifying the corporate culture, which in turn, modifies the societal culture.

The final factor is language, which is the recognition by companies that working with people who have weak or non-existent skills in English presents problems, (Anglo perspective), which will compound all other factors mentioned earlier: diversity in cultures means that there will be multiple languages to deal with. Often this is handled by picking the common language, but non-native speakers of that language may feel at a

disadvantage (Carmel, 1999; Carmel & Agarwal, 2001; Suprateek Sarker & Sahay, 2002, 2004).

2.2.2 Norms

Research has found that there exist rhythms of interaction or *timing norms* which are “shared, expected patterns of paced activity” (Ancona, Goodman, Lawrence, & Tushman, 2001). The phrase, ‘shared, expected patterns’, is key in that these shared patterns allow the coordination of behavior by people and from that, creation of the products of coordination. In this work, the authors were concerned with how people recognize these timing norms, the underlying process for their creation, meaning, and the resulting consequences to the organization and individuals.

Anaconda et al.’s discussion of Roy’s 1959 article, “Banana Time”, concluded that the workers had created daily timing norms with breaks and they personalized these breaks with names. When an event did not occur at the prescribed times, the worker’s routines were disrupted. The fact that the workers themselves created this norm, and only they shared the norm, does not negate that norm in the context of the greater organization. Instead, it reinforces the notion that timing and other norms are social constructs as well as formal organizational constructs.

In a larger context an organization can experience problems when an organizational norm violates a local or social norm (Trompenaars & Hampden-Turner, 1998).

Hall provides an example of the force of social norms, with the description of an incident during World War II, wherein, the military was trying to get locals to do some large task, but were not able to gain cooperation because they had not gone through the

Elders of the village. Norms being partially social constructs means they cannot be imposed by an organization, and that there has to be an agreement for their use. In examining the impact of timing norms within the context of work, one must expand beyond the official norms of the organization because the official norms acknowledge only part of the picture.

A question raised by Anacona et al., which is important to us: do these socially created timing norms exert more control over people's behavior than the formal organizational ones? Anacona et al.'s question also suggests that one must go beyond the organizational scope when considering the situation of global teams. The situation of globally dispersed teams may require the integration of norms of individuals who are from different organizations and cultures.

This research is interested in assessing such a situation, but realizes that norms by themselves are not the sole influence; organizational influences may be as strong as cultural norms. Within the context of organizations, norms have been referred to as genres. Genres are similar to norms in that they guide behavior and actions but are derived from an organizational context instead of a social context.

The work of Anacona et al. relates to the work on genres (Orlikowski & Yates, 1998, 2002; Yates & Orlikowski, 1992) in that an organizational genre is a communicative act that is socially defined and has a recognized communicative purpose with regard to its audience. Note the phrase 'recognized communicative purpose' in that sentence. To be considered a genre, the communicative act must be recognized as such by the members of the organization or group and serve to communicate in a particular

fashion. This does not necessarily mean the members are consciously aware of the genre; however if the genre were mentioned in a discussion, they would recognize it.

It was found that the genre repertoire is created when the group is formed, that it is largely implicit not explicit, and that it is based on prior experience of work and interaction. This thought recognizes that genres can change, but that there is an implicit process for doing this. The change happens by an individual or sub-group modifying the generally accepted form and that new form being adopted by others within the larger group. This raises an issue for remote teams in that the use of the changed form may not be communicated, resulting in impeded communication between the teams.

A new team formation can explicitly determine norms, which will govern their interactions, as is sometimes done when forming co-located teams through team-building exercises, and with openly written and posted “Rules of Behavior”. Anecdotal evidence suggests this type of team building is not common practice among dispersed teams as a whole and may be limited to those members who are co-located, though it is advocated for both (Carmel, 1999). It is also possible that genres could be built locally within subsets of dispersed teams with the likelihood that the entire team would not share them. Genres that are not shared can prevent dispersed teams from viewing themselves as a single team due to both a mutual knowledge problem (Cramton, 2001) and not sharing the same mental models (Mortensen & Hinds, 2002).

In common practice, different people or groups on a project are brought into the project schedule at differing times. The later additions will then not know about any unwritten ‘rules’, they do not have the shared mental models of the earlier members of the team. Genres, shared mental models, and norms are important from the cultural

viewpoint because people bring the genres, mental models and norms of their culture with them to the workplace (Mortensen & Hinds, 2002).

The magnitude of the problem is illustrated in the following. An American scholar was giving a series of lectures in Japan, since he did not understand the Japanese language he used an interpreter and was later discouraged to learn the audience felt insulted by this act. The scholar did not know that in Japan, a sign of an educated man is the ability to speak English. The audience felt they had lost face because the scholar was implying they were un-educated (Hall, 1959).

Cultural distance is the degree of difference between the two entities, usually in terms of organizational and national culture (Carmel & Agarwal, 2001). Organizational culture is about internal processes, including the organization's norms and values. However, there may be different cultures within that company if teams are built from members that are located in different countries. In such situations, there would be different national cultures and some degree of difference in their perceptions would be expected.

Genres can be considered a particular form of cultural distance in that groups within a company develop their own styles and modes of communication (Orlikowski, 1998; Orlikowski & Yates, 1994). In this way, the genres become a shared mental space for that particular group, one that is not shared by other groups, thus creating a distance between them.

Genres are not just about processes, but also about the timing of processes. A person new to the group must learn those genres to be able to fit in with the group. In the situation where organizational genres exist, and there are dispersed members, individuals

distant from the center may not be aware of the existing genres and their timings, without having any practical way to gain that awareness because of their distance. In co-located groups, "...shared social settings in physical space affects the similarity of people's expectations and experiences and influences the likelihood of shared territory"(Kiesler & Cummings, 2002). Physical distance among workers means that "shared space" is usually abstract or symbolic because the workers do not share that same physical space. Virtual shared spaces can be created but companies must be aware of the need and then act to create them.

This section has primarily discussed questions as to how one knows about existing norms and genres, but an important aspect of norms and genres is that not understanding them or their importance, can lead to further misunderstandings and more serious problems in communication. It is that they are shared and known that allows communication to flow.

2.2.3 Organizational Distance

Poltrock and Grudin published a paper discussing the results of two participant-observer studies in which the investigators joined the interface teams of each of the projects (Poltrock & Grudin, 1994). The researchers joined the interface teams because they were interested in obstacles to interface design, however, their findings have general applicability to dispersed teams and the idea of organizational distance.

In the first study, a super designer who had originally supported the product at a distant site led the project. While supporting the product, the super designer had customized the product for the customer, and so had a thorough understanding of the customer's needs. This particular set of circumstances was the key to the eventual

success of the effort. The super designer knew exactly what he wanted to do and how to achieve it, “he hand-picked developers... assigned them tasks and then reviewed their progress and problems daily.” Further, the reports showed that the product was a success, but the procedures he followed were abandoned when his Vice-President left, and he also was expected to leave. The close working of the super designer, who also acted as project manager for the development team, was required for success and serves as an example of a well-formed team.

In the second study, a development group was to take a successful application developed for a client by field service and make a more generic product to resell to a larger population. This effort was unsuccessful with a manager quoted as saying that the lack of success was due to organizational requirements and procedures that slowed development and disconnected it from user input. Field Service knew their customer’s needs and therefore could quickly respond to customer requests, which was not the case with the subsequent development team. The team in this case cannot be described as well formed.

A key statement from Poltrock and Grudin was that the driver in the successful case was “close user contact” *coupled with close communication within the development groups (emphasis added)*. A key to success was close cooperation within the development groups, which then becomes an important consideration in dispersed efforts.

From the preceding it is seen that organizational structure, in part, affects the success or failure of a project due to the organization imposing a structure on formal vertical communication, which influences its frequency and quality (Curtis, Krasner, & Iscoe, 1988). In the context of global development, this can mean communication is

routed through a formal structure composed of layers of managers. There is also a reduction of informal or lateral communication, which is due in part to the difficulty of overcoming physical and temporal distance. In stating that the success of the project was in part due to the close coordination, there is the suggestion that there is an organizational distance component in communication.

Organizational distance is the idea that people who are responsible for different aspects of the interface or project are far apart organizationally. The practice of having different groups responsible for different aspects of the project distances the customers from the developers, because the customers do not work directly with the developers. Developers may be distant from the testers, with the distance, again usually in layers of managers, resulting in information being filtered or colored by the interpretations of the intervening layers.

The second case was a violation of the first and second principles of design (early focus on users and early and continual user testing) and the distance and multiple layers between users and developers exacerbated the situation. While these are design principles, they are also, at the most fundamental level, principles about communication and coordination and directly impact dispersed teams who suffer from both physical and organizational distance.

2.3 Issues in Dispersed Teams

Research has suggested that global software development requires close cooperation of people with different cultural backgrounds, something that is difficult to obtain (Herbsleb, Mockus, Finholt, & Grinter, 2001; Herbsleb & Moitra, 2001). Conflicts arise

because cultures differ on such critical things as the need for structure, observance of hierarchy, time perceptions, and communication practices. This suggests a few of the issues that dispersed teams may face, which will be looked at next.

2.3.1 Temporal Distance

Working in different time zones presents a coordination and control problem depending on the amount of overlap between the individuals, if any (Carmel & Agarwal, 2001). This working across time zones is referred to as the temporal distance between people, and is expressed in the number of hours apart. Work that is not co-located may have the benefits of synchronous communication if the individuals are located within a single time zone, a temporal distance of zero, or if they are located in a time zone that allows an overlap of working hours. Working across time zones therefore presents problems due to a reduced number of overlapping hours for synchronous communication.

If people are six time zones apart, they only have a two-hour overlap during an eight-hour workday. This shortfall or lack of overlap requires some other means be used to facilitate the communication including individuals and or teams adjusting their working hours to create an overlap. Such adjustments may affect the temporal patterns of a particular culture, for example in cultures that have well-established family times, meetings are likely to transgress those times. Globally dispersed software development would be affected by reduced or no overlap due to its need for direct communication and coordination. Carmel and Agarwal state the negative effects of distance affects communication, which in turn affects coordination. It is argued that such things as email, voice mail, online discussions, and other similar tools do not supply the communication effectiveness provided by impromptu meetings so that any type of distance between

individuals or groups loses the spontaneous support of communication (Carmel, 1999; Carmel & Agarwal, 2001).

While the temporal cost of reduced overlap has been mentioned, i.e., the adjusting of workday schedules, there is also a monetary cost associated with it. These costs are such things as delay, rework, and set-up, all of which sounds manufacturing related, but actually apply to any coordinated work. Delay cost is caused by the wait that must occur because some unit has not started their day yet. Rework is due to misunderstandings that require the work to be re-done. Set-up in this context refers to the need for training or re-learning tasks that were delayed or deferred.

For example, someone in the United States originates a problem that is assigned to a person in India. The person cannot duplicate the problem and needs clarification from the originator. That person must wait until they can discuss the matter with the originator who may have already left the office because there is about an 11-hour difference in their days. This will delay the work by at least one day (Carmel, 2006).

It is said that temporal distance is important because if the number of hours (time zones) apart is large, there will be little or no overlap of the workday schedule resulting in the need to use asynchronous communication or shift one's work schedule. From the earlier example, a person in the same time zone as another person, has a temporal distance of zero. Therefore, New York to Florida would be a zero temporal distance, because it is within the same time zone, while New York to Munich, Germany would be a six hour distance due to the time zone difference of six hours. Temporal Distance then is an indication of how much over-lap exists in the workday, and also an indication of the likelihood of a delay.

If two people needed to resolve a misunderstanding or small problem, using face-to-face communication, the problem often can be dealt with quickly. If they are in the same time zone, but not co-located, having to speak on the telephone increases the communication difficulty because there is some coordination required, but since they have an over-lapping day, this coordination can usually be accomplished; therefore, they can synchronously deal with the problem at hand.

The issue is one of the “contactability” of a person; what effort is involved in making this contact? For example, if one person is in New York and the other person is in Germany, they can communicate without one or the other staying late or coming in early because part of their day overlaps. It may not be easy to coordinate, but it can be done by knowing when the workdays overlap.

For those who do not have over-lapping days, such as when the second person is in India, having a time zone difference of 11 hours from the United States, then either adjustments must be made to the work day to allow synchronous communication, or problems must be dealt with in some asynchronous manner, such as e-mail or telephone messages. If the inherent contactability of the people is low, it requires a greater effort to make that contact. Low contactability implies that the back and forth discussion potentially could take days.

Asynchronous communication can hinder and/or complicate problem resolution. For Carmel et al., reducing temporal distance is the goal of minimizing time zone differences with a zero difference as the best and gradually degrading as the difference closes in on eight hours and beyond (Carmel & Agarwal, 2001). It is not though, just the

over-lap that is important, but how the time distance impacts temporal structures that one culture has versus another.

2.3.2 Attribution

When something goes right, who gets the credit? When something goes wrong, who gets the blame? This is a psychological concept called *attribution*, which is the result of people's inferences about the causes of events and thereby factors into trust. Attribution Theory (Jones & Harris, 1967; Kelly, 1973; Ross, 1977) is concerned with how people explain or "attribute" the behaviors of others. Within this theory, Fundamental Attribution Error is the default assumption that a person's actions are based on what type of person they are, rather than looking to the environmental or societal factors which may be present. As implied by the name, this assumption can lead to false explanations as to the actions of a person or why an event occurred, which then can influence subsequent actions, feelings, and thoughts.

In work across dispersed locations, there is a reduction of the situational knowledge people have about each other (Cramton, 2002). The reduction in situational knowledge affects the formation of in-groups and out-groups based on location. Some of the reduction in situational knowledge can be attributed to the process of exchanging information; those who need to have certain information do not always get it (Armstrong & Cole, 2002; Mortensen & Hinds, 2002). Cramton also notes that computer mediated communication is subject to time lags and possibly a disordering of messages. For example, failures of communication may be attributed to some negative aspect of the other group, a lack of ability or cooperation, when in fact it may only be due to failures of the communication system or some local condition such as a holiday (Cramton, 2002).

A study of student teams located in two countries mentions the inability to verify physically the actions of a remote member, which caused negative attribution and frustration. The members could not tell if a remote member received the electronic communication and so felt that they were being ignored (Suprateek Sarker & Sahay, 2002).

The causes of attribution can be condensed into three challenges to overcome: limited human connection, ineffective communication, and suspicion arising from the inability to verify the actions of remote others (Suprateek Sarker & Sahay, 2004). Suspicion is a major factor in their findings in that seven of the eight teams had a sense of suspicion about the work habits of their remote partners due to the lack of verifiability or transparency, as they put it. Other work states that there are three generic temporal patterns inherent in any group activity: temporal ambiguity, conflicting temporal interests and requirements, and scarcity of temporal resources (Montoya-Weiss, Massey, & Song, 2001). Attribution and suspicion influences how one perceives a temporal conflict and how one approaches its resolution.

Referencing a variety of work (Jarvenpaa, Knoll, & Leidner, 1998; Ocker, Hiltz, Turoff, & Fjermestad, 1995-96; Turoff, Hiltz, Bahgat, & Rana, 1993), Montoya-Weiss et al., state that typical conflict resolution behaviors are avoidance, accommodation, competition, collaboration, and compromise. They point out that conflict can result in communication and coordination difficulties, which have the potential for creating more conflict and must be managed effectively to avoid bad consequences.

2.3.3 Task Context

Literature concerning the problem of mutual knowledge was mentioned earlier and this problem will be examined in more depth at this time (Cramton, 2001). Teams are inherently made up of people with varying amounts of knowledge and talent. As such, assumptions one person has about the knowledge of another person within the group can be wrong and lead to misunderstandings and conflicts. In a co-located situation, these assumptions can be relatively easy to check with checking resolving any discrepancies. In the context of virtual teams, as the distance increases, so does the complexity of the mutual knowledge problem.

The concept of mutual knowledge is similar to Orlikowski and Yates' concept of genres in that genres are implicit and those who are not members of the group (or culture) have limited means to discern what the genres are and how they operate. This is the same limitation as discerning the mutual knowledge of remote members.

There is another factor involving the area of mutual knowledge; in an early work, it was suggested that there are many reasons for resisting change or not cooperating fully, noting that data is not just an intellectual commodity but also a political resource from which an individual or group can derive power (Keen, 1981). Having knowledge that others do not have can put one in a position of power that would not be possible if the knowledge were shared.

One can easily imagine a situation involving a person who is a domain expert and thus can have considerable prestige or power among those who do not have such knowledge. This would not cause a problem by itself, but if that knowledge was not

shared (à la Keen) or not easily obtainable due to temporal distance (à la Cramton), it could not only affect team performance but also put the team into conflict.

2.3.4 Team Conflict

Two terms have been coined to distinguish different types of virtual teams: *Geographically Virtual*, teams who are not physically co-located; *Temporally Virtual*, teams who span time zones. The term Temporally Virtual implies that those teams are also geographically virtual (Hinds & Bailey, 2000).

Hinds and Bailey state that the performance of a team will vary by the type of conflict, *affective* or *task*. Affective conflict detracts from performance due to the resulting anxiety, hostility, time, and energy consumption associated with emotional disagreements. Task conflict enhances performance because it increases the alternatives being considered, resulting in a better solution. Virtual teams are likely to have higher affective conflict and task conflict for the following two reasons.

Virtual teams experience two consequences of their being virtual; mediated communication and unshared context. Mediated communication reduces the interpersonal relationships because it is a depersonalized interaction with the message having the focus instead of the interaction. This reduction in interpersonal relationships becomes a factor in conflict. Unshared context also adds to the potential for conflict as suggested by Hall's work (Hall, 1959, 1969).

Overall, Hinds and Bailey suggest that due to mediated communication and unshared context, virtual teams are more likely to experience affective and task conflicts and so models of team processes and performance need to be re-examined and modified to account for these conflicts. This idea is important to this research because it is

assumed that factors affecting communication would in turn affect trust and satisfaction. Temporal perceptions, due to cultural differences, could be one of the unshared contexts.

Other work also reinforces the idea that distributed groups experience conflict due to misunderstandings of communication (Armstrong & Cole, 2002). It was found that communication was often fragmented and that virtual team members had problems forming groups and maintaining ties. They also found that the lines of conflict, or how the group was divided by the conflict, revealed the physical location boundaries of the group. The basic premise was you could put people together but that does not make them a team; teams or groups have to be actively formed in distributed environments.

Armstrong and Cole had some good news about virtual teams. They found that over time groups showed developmental changes if they had supportive managers who actively worked to integrate the members into a group. This implies that building trust among members of the team is an important aspect of team management. However, a focus on team management issues is beyond the scope of this research.

2.3.5 Knowledge Transfer

A look at virtual systems development teams and the implications of time and space for knowledge transfer was performed and reported over the course of several publications (Joshi & Sarker, 2006; Joshi, Sarker, & Sarker, 2004; Suprateek Sarker & Sahay, 2002, 2004; Saonee Sarker, Sarker, Nicholson, & Joshi, 2003). The study was based on work done with students in the US and Norway. In the study, Sarker and colleagues tried to determine what affects Information Systems Development Teams, which are separated by time and space. They found several important items affected the teams:

- The inability to verify the actions of a remote member caused negative attribution and frustration.
- Diversity in cultures meant there were multiple languages to deal with. Often this was handled by picking the common language but non-native speakers of that language felt at a disadvantage.

This study also brought to the forefront differences in communication styles and terminology, for instance, “prototype” to the US members meant the first release of a working system, while to the Norwegians it meant a series of interconnected screens without functionality. Temporality (or the state of being in one’s own time milieu) was considered a factor in the difficulties experienced.

A person’s sense of temporality is shaped by physiological urges and shared conventions that give structure within the immediate society. Dispersed teams are not within a single, immediate society and do not work the same ‘normal’ hours; they have different holidays and vacation times, which challenge the sense of temporality. Within dispersed teams adjustments are needed due to those differences in holiday, vacation, and other practices, but these differences are often not recognized and therefore adjustments not made by those who are remote to the differences (Suprateek Sarker & Sahay, 2002).

The problem can be further compounded as this ‘temporal order’ can become reordered through the mediation of Information and Communication Technology (ICT). This reordering is due in part to what Sarker and colleagues call the ‘timeless’ time, which is the ability of electronic media to blur distinctions of past, present, and future because messages may not follow a logical sequence due to time zone influences in the ordering (Suprateek Sarker & Sahay, 2002). For example, rules concerning date stamps on email and their order can be confusing when emails are produced in multiple time zones.

The above has shown that many things, including time zone differences, affect dispersed teams, mutual knowledge, knowledge transfer, and cultural differences, but there are processes that may help mitigate these effects.

2.3.6 Trust and Team Building

Face-to-face communication has advantages and disadvantages: face-to-face supports touch, shared activities including eating and drinking, informal communication, and attention management (Nardi & Whittaker, 2002). Its disadvantages include it being disruptive, expensive if it involves travel, and that it can take effort to make happen.

Nardi and Whittaker argue that the advantages of face-to-face are crucial for sustaining a social relationship that make distributed work possible, and given what is known about the advantages and disadvantages of face-to-face communication, one can design a mix of face-to-face and other media for distributed work that is likely to sustain social relationships, providing the underlying trust and relationship building that are necessary. Interviews, discussed later, mention these advantages and disadvantages. The interviewees stated that it is harder and takes longer to build relationships and trust without having face-to-face interactions, but they also state that the existence of a temporal distance allows them to control access to themselves. This is because they can decide when to respond to asynchronous communication.

An anecdote that speaks to the issue of trust in co-located and dispersed teams is based on the idea that management does not necessarily trust the people working for them, unless they, management, can see them (Handy, 1995). Handy gives the following example: he was talking to a writer at a daily paper and the person said that she could do all of her work from any location, not just the office. When asked why she did not, she

responded, "The truth is," she said, "they don't trust us." Handy, overall, questions whether there truly can be teams without the face-to-face interactions because "trust needs touch".

If trust is needed for teams to work well and trust is lacking from virtual teams this raises an interesting dilemma (O'Hara-Devereaux & Johansen, 1994) say that trust is needed to prevent geographic distances from turning into psychological distances and that face-to-face contact is needed for building and/or repairing trust, effectively agreeing with Handy.

Accordingly, trust and trust building can be summarized as:

- a good faith effort to respect commitments
- honesty in negotiations about commitments
- not taking unnecessary advantage
- shared norms, interactions and experiences
- anticipation of future association (Jarvenpaa & Leidner, 1999).

These factors operate in co-located teams, however the concern is that they are more difficult to accomplish in dispersed teams.

So far, most of the review has been concerned with issues with teams but has not looked at issues due to differences in culture. These are addressed next.

2.4 Differences in National Culture

This look at national culture will start with a review of a book that attempts to address the concerns the author had about Americans interacting with foreign cultures, based on the author's experiences beginning with World War II (Hall, 1959). The author, Edward T.

Hall, was specifically concerned that Americans seemed unaware that foreign cultures meant cultures different from the American culture, and that these differences affected interactions with foreign nationals. The book was written to show that rather than being an unfathomable mystery, cultures could be examined and understood, and in doing so, would allow one to understand what actions were acceptable, what were not, and what could possibly cause problems. Hall primarily did this by providing many illustrations of the differences in cultures and ways to help understand these differences.

To start the process, Hall described what culture means to an anthropologist such as himself. To the anthropologist, culture is "...the way of life of a people, the sum of their learned behavior patterns, attitudes and material things." Hall, does not limit himself to just that definition. To Hall, culture is all of this but it is especially about communication: how one communicates and interprets the communication of others. This is why Hall's work is important to the topic of dispersed teams. Dispersed teams will be affected by problems with communication.

Hall suggests that culture has three levels: *Formal*, *Informal* and *Technical*. The formal level is how one learns when a child: the unconscious absorption of knowledge and customs, usually as the result of observation. The informal level is what occurs later when told, just follow me and do what I do; it is learning by doing. The technical level is the process where some activity or facet of life is formally studied, analyzed and then broken down into its components or isolates so it can be taught to others.

The obvious point to this is that within a culture, much is learned as children, and what was learned then becomes a filter, unconsciously applied to one's daily life and the interactions that occur. All those within a culture have a similar, although not identical,

filter that allows its members to understand and interpret communication correctly, without conscious thought about the process.

When one moves beyond one's own culture to other cultures, this person starts informally learning about the new culture, a process that is fraught with difficulties because the person is interpreting another's communication through his or her own cultural filter, without effective guidance. If one is taught a new culture (the technical approach), the learning is done in a formal studied manner and time is needed to apply this conscious understanding of the new culture in a natural and seamless fashion in day-to-day communication.

Hall stated his books deal with "... the structure of experience as it is molded by culture. That is, those deep, common, unstated experiences which members of a given culture share, communicate without knowing, and which form the backdrop against which all other events are judged" (Hall, 1969) Notice that Hall is stating that culture is shared, but shared without explicitly knowing and without requiring conscious action. This description is similar in concept to norms and Orlikowski's genres and is where the problem of dealing with other cultures occurs.

Following this background description of Hall's writings, the work of Hofstede (Hofstede, 1980), can be examined. Hofstede describes culture differently than Hall and anthropologists, but this difference is primarily a difference of words. To Hofstede, culture is the mental programming that a person carries within him. It is the patterns of thinking, feeling and acting that were learned during a person's lifetime, primarily during their childhood. This mental programming is the result of the social environment that one grew up in, in addition to one's accumulated life experiences.

Other studies have built upon the work of Hall and Hofstede; one of interest is known as the Globe study (House, Hanges, Javidan, Dorfman, & Gupta, 2004). This study looked at culture, leadership and organization in 62 different societies around the world. The researchers grouped the societies into ten clusters and employed this clustering in their analysis of a variety of cultural dimensions, one being a temporal perception labeled Future Orientation. Future Orientation in the Globe study is the same as Hall's Future Orientation, which corresponds to the Long Term Orientation of Hofstede.

Cultures with Low Future Orientation, or High Present Orientation, are able to enjoy the moment, be spontaneous, free of future anxieties. They may be incapable or unwilling to plan a sequence of actions to accomplish a desired goal and may not recognize signals that current behavior will negatively affect the realization of their goals. High Future Orientation is described as having a capability and willingness to imagine future possibilities, develop future goals and strategies for reaching these goals.

Future Orientation is summarized by saying that the Future Oriented person has the capacity to maintain control and so enrich their lives, while the Present Oriented person looks to simplify his or her life and rely more on others. Future Orientation is important to this research in that multiple authors have mentioned it as a difference between cultures, which suggests that it is a relatively important difference between cultures and thus, a possible cause of communication problems in dispersed teams.

Another time-based difference depicted in the Globe study is that of some cultures being more clock-based (scheduled start and end times) with other cultures being event-based (time organized around an event). Clock-based time is common to North

American and Northern European/Anglo cultures while event-based time is common to Latin American, Native American, and Southern European cultures. Globalization is bringing clock- and event-based cultures into more contact with each other, creating a possibility of clashes because of their different temporal approaches to organizing life. This difference between clock-based and event-based may be shown by people's sense of urgency and their attitude towards being late, both of which have been suggested as differences that are reflected in people's work activities.

2.4.1 National Culture and Temporal Perceptions

It has been shown that there are differences among national cultures that can affect social and business interactions (Hall, 1959, 1969; Hofstede, 1980, 2001). As the global economy continues to expand, individuals from different nations and different cultures are in the situation of working together, most likely in dispersed teams. This increases the possibility of conflict due to differences in national culture by globally interacting business personnel either being unaware of these differences or misinterpreting them. The problems can affect any type of team or interaction but this dissertation is primarily concerned with the impact these differences might have on global software development.

Hall has said that culture is the sum of learned behavior patterns, attitudes, and material objects of a group of people, but also that culture is about communication, how one communicates and in turn interprets the communication of others. Hall states that culture affects or molds the structure of experience through common, unstated events and communication, and that this molding is the basis for judging all other events (Hall, 1969). One's culture, in essence, acts as a filter that directly but unconsciously influences our communication with others and provides a person with the initial criteria

for evaluating others. A person's cultural biases may change over time as the individual interacts with multiple cultures, and builds relationships with a diverse population stemming from many parts of the world, but this change is unlikely to occur for an entire culture. Any culture adapts at a much slower pace taking generations to change.

Much of the work concerning temporal perceptions has been pursued by sociologists, who looked at the "normalcy" of everyday life, exploring the relationship between regular routine patterns and human temporal expectations (Garfinkel, 1967, 1985). Garfinkel argues that our daily cultural experiences with time lead us to judge what is acceptable or not acceptable time behavior, in short what our temporal expectations are. The amount of flexibility a culture allows in what is considered acceptable time behavior is referred to as the *Temporal Rigidity* of the culture. Time related constraints are those that a culture imposes on its population as regular temporal sequences guiding a person's activities. One's expectations gradually develop through experiencing these time related constraints (Zerubavel, 1981). For example, some cultures regularly serve soup before the main course while others do not; therefore, members of each group have different expectations of how a meal should proceed. A *Temporally Rigid* culture would be offended if soup were served in any different order, whereas a *Temporally Flexible* culture would accept some variation in the order in which a meal was served.

One of the consequences of this temporal sequencing is that deviation from the "norm" is described as fast or slow. If a person skips steps, they are described as fast and urged to slow down, while the person who does not respond quickly to a step is described as slow. This *Temporal Urgency*, or more commonly, *Sense of Urgency* becomes an

important factor because of its potential to introduce conflict among team members due to unfulfilled expectations on the part of those with a higher sense of urgency. For example, one culture may expect responses to an email message within an hour and another might feel that responding to email that quickly would not give one time to consider an appropriate response.

Another potential temporal perception difference is the concept of *Standard Temporal Locations*. Temporal locations are culturally shared time slots in which specific types of events are expected to happen; “Banana Time”, mentioned earlier, is one such example (Ancona et al., 2001). Scheduling that invades temporal locations reserved by the larger culture for other activities can become an issue. This can be a factor in the reception of overtime or after hours work by employees, especially in tightly integrated and coordinated work tasks.

It should be noted that scheduling is a predominantly Western behavior that originates from the need of medieval monasteries to schedule a monk’s activities as part of the daily prayer cycle. This cycle was not only to allow required prayers to be accomplished, but also the other tasks that needed to be done for the smooth running of the monastery.

Scheduling, as a governing behavior in the larger society, started with the first industrial / factory efforts to become the norm in industrialized countries and is spreading from such countries as enterprises go global. Scheduling, by its nature, is a *Clock-Based* time perception system and is identified as Monochronic, as opposed to an *Event-Based* time perception system, which is identified as Polychronic. An example of a *Clock-Based* versus *Event-Based* conflict is shown by the anecdote of Korean customers

accusing an Indian outsourcing company of becoming “too American” because they focused too much on documentation and deadlines (Carmel & Agarwal, 2001).

At a simplistic level, monochronic and polychronic refers to an individual's preference for doing one thing at a time versus two or more things simultaneously (Bluedorn & Denhardt, 1988). Beyond this simplistic level, it was found that individuals with polychronic orientation tended to emphasize relationships rather than tasks. Monochronic people tended to emphasize promptness, privacy, and to have short interactions with people.

Organizations and cultures also display this trait in terms of the amount of polychronicity the organization or culture will accept. That is, individuals may vary in polychronicity, but within the norms of a culture. Organizations may also vary in polychronicity in that some have rigidly set hours for employees to work, while others may have flexible work times.

2.4.2 Time Perceptions and Business

It is important to understand time perceptions both at the individual and corporate level because there are implications for teams as Western companies and attitudes spread, due to globalization. One implication concerning monochronic and polychronic people is that dispersed teams are integrated, requiring flexibility, not only on the part of the individual, but also on the part of the company in how it approaches scheduling, deadlines and the need for overtime.

It is also important because of the commonly heard complaint that there is not enough time to do what needs to be done, that there does not seem to be enough time for all that has to be done, much less for what one desires to do. Literature has suggested that the pace of life has accelerated (Blount & Janicik, 2001; Robinson & Godbey, 1997; Stalk Jr. & Hout, 1990), that people report more time stress and that an experience of time famine is growing (Perlow, 1999). According to the Wall Street Journal, a full night's sleep has become the executive's "ultimate status symbol" (Jeffrey, 1999).

Time has become a primary driver of business because today's business innovation is time-based competition; aggressive companies using responsiveness to gain a competitive advantage (Stalk Jr. & Hout, 1990). Time-based competition is one of the drivers behind the 24/7 concept, to have all of the hours of the day available for business employees to use, that is, a natural lead in to globally dispersed teams.

Note that the 24/7 concept and the drivers behind this concept are about business processes. Within Business and Information Systems programs in colleges, there are courses in business process redesign that use software to model the process in order to examine the model for possible places where time is "wasted" (El Sawy, 2001).

The goal is such that all "wasted" time must be found and eliminated, making the process more efficient and by implication, people more productive. This, as stated, is all about the processes of the business; there is no consideration for people's temporal perception differences among the groups of people involved in this analysis. As a process, it forces people into a single mold that may very well be a source of the aforementioned uneven successes of globally dispersed work.

If organizations looking to reduce the “wasted” time in their processes, through their planning and scheduling, do not take into account the employees’ perceptions of these changes, it can appear to those employees that they do not have enough time to complete the scheduled work, and this lack of time will mean having to use one’s private time to accomplish the assigned task.

2.4.3 Private Time

The temporal aspects of privacy and people’s perceptions of privacy and role commitments have been examined primarily within Sociology. The concept of *private time* is based on the separation of one’s life into a public sphere and a private sphere, (Zerubavel, 1979). This temporal structuring is essential to regulating a person’s social accessibility, where social in this context refers to the variety of interactive roles that a person has in his or her life.

In a modern person’s life, an individual typically has the role of an employee, a spouse, a father/mother, a friend and so on. A person usually engages in their roles at different times which helps to keep the temporal claims of one role from interfering with the claims of another. For example, while a man may be a father, during working hours he is most likely engaging in his employee role, which means that normally he would be inaccessible to his family.

This structuring usually is done through a relatively rigid temporal scheduling, that while rigid, allows exceptions. An exception could involve calling someone later than would be considered acceptable to visit that person. It would be acceptable to call a friend later than you would an acquaintance or stranger. Even when calling a friend, one

would preface the call with “sorry to bother you at this hour...” in recognition that one is intruding on another’s private time which is most likely dedicated to the family role.

It should be noted that Zerubavel considers private time as a relative concept, that the notions of accessibility and inaccessibility are relative. A person is never completely inaccessible; a person is inaccessible or accessible, relative to someone else. During the workday, while one may be having private time and be generally inaccessible to family, friends and possibly and co-workers, one would be accessible to one’s boss. Others may be allowed to intrude but they would be considered disruptive and possibly only allowed if it is an emergency.

Because private time is relative, it can be viewed as a continuum. The continuum is between private time and public time and one’s social accessibility is a proportion between those two constructs (Zerubavel, 1976). This continuum is then linked to that of the spatial aspects of social accessibility or the continuum between “intimate distance” and “public distance” (Hall, 1969).

Zerubavel builds further upon these spatial aspects and wants to view time from the perspective of territoriality, defining private time as a “non-spatial territory of the self” (Zerubavel, 1979). This view implies that the social accessibility of private time can be violated just as the spatial aspects of accessibility can. Note that private time does not imply leisure time; instead, private time is the time that one is socially inaccessible to some group of designated persons. There can be private time during working hours, that is time set apart in which one would not normally be disturbed, unless a situation arose that permitted disturbance (Perlow, 1999).

In dispersed teams, people may deal with the pressure to respond to others and create private time at work by having a gatekeeper. Traditionally, a gatekeeper was a secretary, but today with the advent of multiple technologies for contact, private time may be a do not disturb status on one's IM, set for specific times of the day, for example. However, one may also establish private time with respect to asynchronous communication, through the use of *Time Relocation*. Time relocation is taking advantage of the nature of asynchronous communication by responding at a later, more convenient time (Rutowski, Saunders, Vogel, & van Genuchten, 2007). The use of e-mail allows the person to cut himself off: not to be interrupted, allowing time for interpretation and reflection. To the individual, it has the benefit of allowing them to complete the task they were working on.

The software engineering process requires periods of uninterrupted time and other periods of interaction (Perlow, 1999). Multiple people interviewed during Perlow's dissertation research mentioned that their work was often disrupted by constant instant messaging and that they had to set the do not disturb status. In a sample log presented by Perlow, it was possible to see how often the individual was interrupted and what portion of the interruption was considered of value to that individual. The log suggests that Zerubavel's notion of private time being relative is accurate and that interruptions are evaluated on the basis of their value to the individual.

There are other implications to using what would be private time for work related activities, especially meetings. Large time zone differences mean that one group may have to extend their day either by starting early or staying late. If the extension is great enough then those people may desire to have the meeting from home or may have to have

meetings at home because of transportation limitations. As such, the facilities at home may not have the same capability as those at work or may even involve extra cost to the individual, such as having to pay for high bandwidth internet connections. It is possible that such facilities are not available at the home forcing people to be at the office irrespective of the very late or very early hours.

Attendance at meetings appears as a problem when one is coordinating meetings between those individuals just starting their day and those ending it. Employees who are just starting their day may not attend while those ending their day may rush to have the meeting over with (Suprateek Sarker & Sahay, 2004). Off hours meetings and their impact on both the individuals involved and the businesses that employ them are therefore issues that need to be taken into consideration when establishing dispersed teams.

The preceding sections have discussed teams and issues involving teams, both co-located and dispersed. Some of the issues raised involve differences in cultural perceptions. Measuring differences in perceptions can be difficult, therefore, a technique from marketing, Gap Analysis, will be used to obtain these measurements.

2.5 Gap Analysis

The term gap analysis has a variety of meanings within the literature, depending on the author's intentions and their field. Gap analysis has been used in Strategic Planning as a method to determine where a company, department, or city currently is in their capabilities and where they desire to be (Cade, 2003; Saunders & Yusuf, 2004; Stevens, 2003). Here, the gap helps to determine priorities, to show where the focus should be,

and where resources should be directed. An example of this use is a self-diagnostic questionnaire developed to help ISO 9001:1994 businesses identify how they compare to ISO 9001:2000 standards ("QA Snapshot," 2006).

Gap analysis has been used to focus training, for instance, on determining an organization's leadership development needs (Malloch, 2001). The Air Force's Financial Management section used gap analysis for just such a purpose (Schafer, 2004). The identification of gaps in knowledge and or accessibility to that knowledge has been described as gap analysis (Karbhari et al., 2003).

Within the area of Business Process Reengineering (BPR), gap analysis is referred to as Business Process Gap Analysis, (BPGA) (Jaun & Ou-Yang, 2004). Within BPR, gap analysis is used in two ways; the first is to compare the company against a series of best practice benchmarks to determine where improvement can be made. The second use is when BPGA is used as part of the actual BPR effort to compare the selected Best Practices against those built into an Enterprise Resource Planning (ERP) system. Many BPR systems are configurable allowing them to support a variety of Best Practices so that BPGA is used to configure or fine-tune the configuration of the ERP system.

Gap analysis has been used to examine the quality of various internet search engines (Wang, Xie, & Goh, 1999). These types of gap analyses can be summarized as discovering the "gap" between a current state and a desired state.

The research in this dissertation focuses on the use of gap analysis as it was used in the field of Marketing, a use that is similar to and the pre-cursor of, some of the above-described uses. In the 1980's, the marketing field was in the middle of what is described as the quality movement and, as such, was trying to determine how to measure quality of

service. A model of service quality that involved surveys and statistical analysis was proposed, of which it was claimed, lent flexibility in its use while being more scientifically rigorous (Parasuraman et al., 1985).

Parasuraman et al. state that few had attempted to define a model of service quality because of the difficulties in defining and measuring the construct. Service quality is difficult to measure because it is an intangible; it is about performance and not objects. In general, service quality is a perception that results in a comparison between expectations of the consumer and the actual performance received. Parasuraman et al. also state that the perception is not one-sided; while the consumer is obviously one side, the provider of the service also has perceptions of what they supplied or intended to supply, and so becomes the other side that must be investigated.

Their initial investigation involved focus groups and, based on the analysis of the findings of these groups, arrived at several key questions:

- What do managers of service firms perceive to be the key attributes of service quality?
- What do consumers perceive to be the key attributes of service quality?
- Do differences exist between the perceptions of consumers and managers?

From the above listed questions, one realizes that both halves of the situation must be examined; if the perceptions are not aligned, then one side, the provider could be providing services that the other (the consumer) does not want.

Five gaps were identified:

- Consumer expectation – management perception gap (gap 1). The gap between what management thinks consumers expect and what consumers expect.
- Management perception – service specification gap (gap 2). The gap between what management wants to provide and what they can actually provide.

- Service quality specifications – service delivery gap (gap 3). The gap between what is supposed to be provided and what actually was provided. This is not consumer oriented but based on what the “manual” says is to be done.
- Service delivery – external communications gap (gap 4). The gap caused by what advertising said should be expected and what was actually provided.
- Expected service – perceived service gap (gap 5). The gap between what the consumer expected and what the consumer received.

In these identified gaps, only the first gap deals exclusively with perceptions; what the consumer’s expectation was and what management thought it was. The others all involve some form of a performance evaluation.

A few years after Parasuraman et al. published their paper, it was noted that in practice, no one had taken a dyadic view of service quality, that is, from the perspectives of both the client and the provider (S. W. Brown & Swartz, 1989). It was contended that a simpler model was more appropriate for evaluating professional services. Three gaps were proposed:

Gap 1 - between client expectations and client experiences.

Gap 2 - between client expectations and provider perceptions of those expectations.

Gap 3 - between client experiences and provider perception of those experiences.

They conducted a survey involving physicians and clients to test their model. Each physician received a questionnaire exactly like the one the client received, with the exception of the instructions presented in the introduction, demographic, and classification questions. The physicians were instructed to answer as they thought the client would. To test the hypotheses, the gaps were calculated as the difference between each client’s score for an item and the physician’s score for the same item (S. W. Brown & Swartz, 1989).

What is important is not their results, but the implications of their work. They state that gap analysis is a straightforward and appropriate way to identify inconsistencies between provider and client perceptions. The use of this information allows for the formulation of strategies and tactics to overcome these inconsistencies to ensure consistent expectations and experiences. The Brown and Swartz study gaps depended on people's experience. They did not look at perceptions, as did Parasuraman and then, Headley and Choi, whose work is discussed next.

In general, the main driver of gap analysis within marketing was the realization that since customers have perceptions about what is offered, and the providers have perceptions about what a customer wants, a significant gap between these perceptions would jeopardize service quality and organizational success.

Others investigating gap analysis wanted to show statistical validity existed in this approach (Headley & Choi, 1992). Headley and Choi felt that using gap analysis in a non-standardized, customer centered service arena required a systematic approach using standard statistical control techniques as the key to measuring and thus, understanding service quality issues. Underlying this approach is an understanding that human perceptions are the appropriate data to collect, but that measuring them is difficult because they have to be measured from two differing but compatible perspectives, which can be done by surveying both the customer and the provider using identical questions. This was done by Brown and Swartz.

Headley and Choi created such a survey by asking customers a series of statements about key aspects of a fitness center and then asked the employees to answer the same question but to respond as they felt the customer would respond. In analyzing

the results, they used a t-test against the group means, however, the unequal size of the groups caused problems, and therefore, there was a lack of significant results. Headley and Choi state that in spite of the lack of significant results, there is value in the use of gap analysis because it can identify problem areas and most importantly, it is focused on the customer. In this case, the gap is between what the customer actually answered and what the employees thought the customers would say, resulting in a gap solely of perceptions.

Within this vein another use of this approach was an evaluation of service within the context of a police department (Bland, 1997). Part of that effort was to assess what the public felt was important for the police to be doing compared to what the police department thought was important to the public. The intent was to identify any mismatches and once identified, address those mismatches.

The preceding section suggests a tactic, gap analysis, which based on uses described in the research literature lends itself to discovering the differences in an individual's perception about a topic. The format is relatively flexible and easy to use. Any identification of a gap allows for altering the expectations of the two sides to bring them more into line with each other. This could be important in a cross-national setting where the diversity of perceptions may cause problems in communication and coordination as mentioned earlier. It has been suggested that gap analysis may be useful in discovering country to country differences and therefore strategies to address these differences (Kettinger, Lee, & Lee, 1995). This leads to a methodological question of how to apply this technique in a particular circumstance.

This research measures the gap as suggested by Parasuraman, and then Headley and Choi; persons in group A are asked questions about their beliefs on a series of statements. Then they are asked what they think the beliefs of persons in group B are for the same series of statements. The gap is then the difference between their beliefs and what they feel are the others' beliefs, providing a measure of the difference (or gap) in perception. This gap is believed to influence attributions made by Person A about Person B and vice versa – attributions, which may affect dispersed team members' communication and understanding of each other.

2.6 Summary

In the preceding sections, it has been shown that there are problems in dispersed teams, which can affect a team's performance and satisfaction, and which are compounded by geographical, temporal, and cultural differences. Anecdotal evidence tends to support this with reports of high turn-over, late delivery of projects and resulting software not meeting customer's requirements.

The literature suggests that these problems are due to a variety of causes including:

- the team's dependency on technology for communication
- complex tasks that require significant collaboration
- the lack of social clues which would normally facilitate communication
- the problems of coordination when time zone differences are eight hours or more apart
- a lack of knowledge about cultural, group and organizational norms

The literature also suggests that there are cultural issues related to a group's orientation to time, whether the group is present or future oriented, and whether they are clock- or event-based with respect to schedules and deadlines. For this research, four temporal perceptions that may affect a virtual team's performance were defined.

This research was motivated to look at culture and its effect on teams, by the realization that little has been done in the area of temporal perceptions and their impact on globally dispersed teams. It has been said that companies have a mode of working that is potentially at odds with local cultures (Trompenaars & Hampden-Turner, 1998). In essence, it is not known how these perceptions affect team performance, communication, and coordination, which this dissertation examines.

The examination of literature concerning why teams do not work was performed to provide a broader understanding of team problems as a preparatory base for the interview work carried out in this dissertation.

Next, there was an examination of why virtual teams do not work which then related these issues to temporal perception, e.g., a person's natural choice of which temporal structure to be constrained by, when.

Finally, research was presented on the methodology that is used for capturing cultural perceptions in the dissertation. Support was given for why this method was applied to the dissertation problem.

CHAPTER 3

PILOT STUDY

3.1 Introduction

This Chapter reviews the pilot studies, interviews, and analysis which lead to the development and validity testing of the survey used in this research. The pilot studies were performed to investigate the viability of looking at temporal perceptions as a factor in dispersed team performance. They constituted the initial step of this research, that is, the construction of an instrument to measure perceptions pertaining to time.

Although the literature review identified possible temporal perceptual differences observed through ethnographic studies of individuals, predominately in Western Society, few attempts have been made to distinguish and measure those differences. Additionally, the literature discusses problem areas, but again, without a systematic investigation of the area of global software development in the context of temporal perceptions. The literature suggests that there are cultural differences in temporal perception and that these differences may show themselves as differences in attitudes and behaviors. Ethnographic evidence also suggests this.

The areas mentioned in the literature are lateness, both attitude and behavioral, punctuality, a sense of urgency, and temporal rigidity. Lateness attitude may be the same as punctuality but the researchers felt there might be an attitude about being late and a realization that one must be punctual. Thus, it was decided to start with both measures and to determine if they were the same or not.

As there were no validated questionnaires which explored this area of temporal perceptions, (only ethnographic studies of people's use of time), the researcher, along with several others on the research team, brainstormed possible questions related to time, attitudes, and behaviors, which would address these areas. As an initial test, the questions were administered to a series of colleagues to check the meaning of the questions and the answers given. As part of this initial test, the colleagues were then questioned about problems they may have experienced personally on teams. Additionally, as some of these people were foreign born and raised, they were encouraged to give examples of their own perceptions of cultural differences concerning time. These initial interviews resulted in the modification of the wording of the questions. The resulting pilot survey was administered to student teams during the summer session at the New Jersey Institute of Technology (NJIT). After the pilots were run, a correlation matrix was developed to aid in the examination and evaluation of the questions used. Items were then put together using questions that correlated via the correlation matrix, but with a critical eye towards sense-making of the combinations. Next, Cronbach's Alphas were calculated for the combined questions as a check on the reliability evaluation, and these groups were then cast into constructs for a later set of pilots.

3.2 Description Of Pilot Studies

The pilot studies consisted of a web-based survey to facilitate delivery of the survey to any internet-supported location around the globe. Since the intended subject population for the actual survey was located in multiple locations around the globe, it was decided to

use the same delivery mechanism for the pilot studies in an effort to ensure availability and ease of use.

This particular survey was designed to support two separate but related dissertation studies. The studies were interested in the same respondent pool and were combined fully utilizing the respondents. The survey consisted of several sections: a description of the survey's purpose, respondents' demographic information, questions for this research effort, and then the final section containing the questions for the other research effort.

3.3 The Survey

The questionnaire was first designed to be piloted by students who were working in teams and who were co-located. The primary reason for the student pilot study was to verify that the constructs chosen were reliable, that they represented valid constructs, to establish the relationships between the constructs, and to gain insight into the length of time involved in completing the questionnaire.

A listing of the original items organized by construct is given in Appendix B. A discussion of the original potential constructs and the items thought to be related, as well as those suggested by literature and anecdotal evidence follows.

3.3.1 Future Orientation Construct

The questions used in the Future Orientation construct were the following:

- In my culture, the accepted norm is to:
Plan for the Future versus Accept the Status Quo (reverse coded)
- In my culture, people place more emphasis on:
Solving Current problems versus Planning for the Future

- I believe that the accepted norm in my culture should be to:
Plan for the future versus Accept the Status Quo (Reverse coded)
- In my culture we believe that people who are successful should:
Solve Current problems versus Plan for the Future

These four items are from the Globe study and are matched questions in which one is asking about the accepted norm and the other is asking what the person thinks it *should be*.

Future orientation is a measure of the balance between current work that must be done and a belief that some of the current work prepares one for the future (Hall, 1969, 1983; House et al., 2004). For example, someone with high future orientation would be willing to spend time learning a new skill as part of his or her current work so that the new skill would be available in the future. Similarly, high future oriented people are willing to double check the work done so that problems with inaccurate work do not occur in the future. Future Orientation as a temporal construct was examined in the Globe Study (House et al., 2004). As Future Orientation is a temporal perception, it attracted the researchers' attention, and the Globe Study was the source of the four questions used to measure "Future Orientation".

Cultural differences in Future Orientation are likely to have the following impact on dispersed teams. That portion of the team that is high on Future Orientation is more likely to exhibit the following two behaviors. First, they are likely to make decisions about tasks that may make doing the current task longer but which will help them perform future tasks in shorter times either because of the development of a skill set or the creation of more efficient technology support. Second, they are also likely to work very hard at their job in order to impress distant team members in hopes that this good

impression will lead to promotion and the assignment of richer, more complex tasks. This can lead to conflict in the short run, because the counterpart members of the dispersed team will be focused on getting the current task done as quickly as possible and perceive the slowdown as incompetence. In addition, over the long run, the hard work of the future-oriented team members may go unnoticed creating a sense of futility and frustration with what will appear to these members to be dead-end positions with little future.

The majority of questions in the following sections use a seven point Likert scale with the end point labels being, Strongly Disagree versus Strongly Agree. If the scale labels differ, it is noted.

3.3.2 Lateness Attitude Construct

The questions used in the Lateness Attitude construct were the following:

- In our team, we believe it is best to have an exact time for a meeting
- In our team, we believe it is always okay to be late if you call and let others know you will be late
- In our team, we believe that a meeting should end on time
- In our team, we believe that just because a team leader says that work has to be done by time X, it does not mean it really has to be done by that time

Lateness Attitude is a measure of how acceptable personal late behavior is and the also how acceptable the late behavior of others is. It is based on anecdotal and ethnographic evidence, which shows that in some cultures, it is socially acceptable to be late, while in others it is not. These questions determine if there is a difference between what is acceptable in one culture versus another on this factor.

Cultural differences in Lateness Attitude are likely to make it difficult to arrange meetings and meet deadlines. If one set of team members come from a culture where the deadline means that the work needs to be completed within two to three days of the set deadline, this could create consternation for their distant team members who believe that deadlines are best met a day or so before the set time in order to prepare for unseen problems. Attributions of laziness and carelessness from one part of the team to the other are likely to be made if these events occur. However, it is also likely that corporate culture or team leader culture may prevail in all of these situations with team members quickly adjusting to meet these requirements. A more subtle difference in lateness attitude that may not be removed and may cause difficulties could be the range of excuses for work not being completed on time. Although the excuses may be legitimate, a culture which has a more relaxed Lateness Attitude may be more likely to use them rather than working overtime to meet a deadline. This, too, can create negative attributions from one side of the team towards the other distant side.

3.3.3 Lateness Behavior Construct

The questions used in the Lateness Behavior construct were the following:

- In our team, we believe if we arrive late to a meeting 10 minutes after it starts, we are: Very Late versus Not Late at All
- In our team, we believe if we arrive late to a meeting 1 hour after it starts, we are: Very Late versus Not Late at All
- In our team, we believe if we complete a project 1 day late, we are: Very Late versus Not Late at All
- In our team, we believe if we complete a project 1 week late, we are: Very Late versus Not Late at All
- In our team, we believe it is okay to be one or two days late with a deadline

- In our team, we believe it is never okay to be more than a few minutes late for a meeting

Lateness Behavior is a measure of the actual behavior of someone in terms of how late they are in different circumstances. This measure is to determine if there is a difference between one's belief and one's behavior. Lateness Attitude is a concept that is embedded in one's personality, based in part, on how one was raised. As one grows, through observation and social constraints, one learns socially acceptable lateness behavior that is guided by these social constraints, possibly resulting in one's behavior differing from one's attitude. In an organizational setting, an individual's behavior may be constrained more than in a social setting, and therefore, may differ even more from one's beliefs. It was thought that this construct would be useful to help determine whether one's actions are aligned with one's beliefs.

The arguments made for potential problems that a difference in Lateness Attitude, apply equally well here for the presence of cultural differences in Lateness Behavior.

3.3.4 Punctuality Construct

The questions used in the Punctuality construct were the following:

- People on our team believe that it is better to do the work right rather than on time
- People on our team are almost never late for a meeting
- People on our team would rather be early than late
- People on our team rarely miss deadlines
- People on our team are always late for meetings
- When people on our team have work to turn in, they always ask for a time extension

- People on our team will always stay up to finish things if we have an important deadline
- People on our team always keep people waiting for them
- People on our team always plan their work so that it is done one or two days before it is due
- In our team we believe that if we have a scheduled conference call, it is important to call in precisely on time

Punctuality is the concept that if people are always on time, they are never late. Therefore, these questions determine one's tendency to arrive for meetings, etc. at or before the agreed upon start-time. The Punctuality construct is based on a differentiation between being late (lateness behavior) and being on time. The purpose behind those questions is to address the cultures that are perceived to be extremely punctual, because these cultures may respond differently from other cultures in a way that would not be discovered by asking questions concerning lateness behavior. It may be that punctuality represents the extremes of lateness behavior, but it also may define a cultural response to time in which the person feels that any lateness on his or her part is culturally rude to others not simply a convenient agreement for working together efficiently.

Thus, differences in Punctuality between non co-located team members may affect communication and trust in a more severe manner than lateness behavior because violations in expected punctuality will be perceived as a direct insult.

3.3.5 Sense of Urgency Construct

The questions used in the Punctuality construct were the following:

- People on our team know that they are not going to get everything done on time
- People on our team believe it is okay to sometimes miss a deadline
- People on our team believe if they do not work hard and get things done on time, they will not succeed

Sense of Urgency is the degree to which people feel that something has to be done, and that the world is very fast paced requiring people to constantly keep busy and keep moving. These questions determine one's perception that things need to be accomplished quickly.

Sense of Urgency was included in this study because of its potential impact on communication and coordination. It was thought that people with a high sense of urgency would take the actions necessary to complete the task at hand. This could mean staying up late or arriving early, in order to talk to remote team members. People with a high sense of urgency may be viewed by others as workaholics and tiresome because of their continued urging for all to hurry or they may be viewed as saints who are always making sure that assigned work is done on time.

Cultural differences in a sense of urgency may cause team members to make different decisions about conflicting time events. For example, if a relative such as an aunt or uncle dies in country A which has a low sense of urgency, the team member is likely to decide to attend the funeral which is in a distant city. In country B, because the relative is not an immediate family member and because that team member has a higher sense of urgency, the decision is made to not attend the funeral. As with Lateness Behavior, these differing decisions can cause negative attributions between the cultures.

But, a difference in sense of urgency can affect the attributions of those from cultures with a low sense of time urgency. It may be difficult for members of this culture to see what the rush is or the pressure to get done is since they know from previous tasks that they are well within the constraints of meeting the project's deadlines. The high sense of urgency individuals from the other culture may be constantly asking them what the status of a project is and be a continual source of irritation. This, too, will affect trust and team member satisfaction.

3.3.6 Temporal Rigidity Construct

The questions used in the Temporal Rigidity construct were the following:

- People on our team will always stay later to finish things if we have an important deadline
- People on our team think it is important to meet deadlines
- People on our team prefer meetings to follow an agenda
- People on our team think people should be ready when they say they will be ready
- People on our team get upset when others do not get their part of the work done on time
- People on our team feel it is okay if a meeting is suddenly rescheduled
- People on our team believe that a team leader who keeps changing due dates is very frustrating
- People on our team get upset when the plan is not followed
- In our team, we believe that the assigned duties in our organization are too rigid.

Temporal Rigidity is a measure of how willing a person or group of people are to change or adapt to new schedules. For example, can a meeting that regularly occurred on Tuesday be suddenly moved to Thursday? A temporally rigid person may very well be

able to make the Thursday meeting with no schedule adjustments but will not like this change in the schedule simply because it is a change. Such a person wants time to be structured and ordered, and not readily changed. A temporally rigid person will also like to have his or her personal life completely scheduled even for events that are often relatively ad hoc, e.g., getting together with friends. These questions measuring Temporal Rigidity, in short, determine one's tendency to be flexible with schedule changes.

Cultural differences in Temporal Rigidity may also have an impact on team performance and other team variables. For example, if a manager from a temporally flexible culture constantly changes schedules and deadlines, the temporally rigid culture working on the project will begin to think that this person is disorganized and not a good manager as opposed to someone for whom schedule adjustments is common. In contrast, a temporally rigid culture might impose schedules on a temporally flexible culture in cases where the conformation to schedules does not seem necessary. This may make the flexible time culture members view the rigid time culture members as over-controlling and not able to give them the flexibility they need to do their tasks, especially in an environment which is constantly changing because of the culture's tendency to be comfortable with change. Thus, cultural differences in this variable may cause dissatisfaction, a lack of trust and a feeling that communication is not working between the temporally distant parts of the team.

The Temporal Rigidity concept has been mentioned in the literature but has not been developed into a construct and, as with Lateness and Punctuality, is also being included to determine if this construct is a unique discriminating value between cultures.

3.4 Procedure

The researchers contacted several instructors who were teaching classes involving project teams during the Spring and Summer of 2006 at NJIT and at Monmouth University, both technical universities in New Jersey, in the United States. The purpose of the research and survey was explained to these instructors and they generously allowed a presentation by the researchers to their classes.

During the presentation, one of the researchers gave a general description of the purpose of the survey and how the students were to gain access to the survey. Participation in the survey was totally voluntary. An incentive for all those who completed the survey was an entry in a random drawing for \$50.00 cash. The researchers obtained a list of all student email addresses from the instructors and then emailed those students the web link to the survey.

3.5 Population

The population for the pilot study were students at NJIT and Monmouth University enrolled in a variety of courses requiring students to form a team to work on an assigned project. The demographic information for the participants in the two rounds of the administered survey are described in Table 3.1.

Table 3.1 Student Demographics

| | Round 1 | Round 2 |
|------------------------------------|---------|---------|
| Number of Students | 48 | 34 |
| Males | 32 | NA |
| Female | 16 | NA |
| Undergraduate | 45 | 0 |
| Graduate | 3 | 34 |
| Age 21 – 25 | 65% | 40% |
| 26 – 30 | 25% | 25% |
| 31 – 35 | 0 | 17.5% |
| 35 and over | 10% | 17.5% |
| GPA 2.0 - 3.0 | 12 | 2 |
| 3.0 - 4.0 | 36 | 32 |
| Team size | 3-5 | 5-6 |
| No. of team members responding – 1 | 16 | 5 |
| 2 | 10 | 1 |
| 3 | 4 | 4 |
| 4 or more | 0 | 4 |

The teams in round one were involved in a semester-long software development project during the spring term. The survey was administered near the end of the semester after the teams had worked together for about three months. The courses the teams were drawn from were face-to-face classes, with the teams having a face-to-face meeting at least once a week.

All students were co-located but coordinated their work on the teams with varying amounts of *virtualness*, (virtualness is the degree that the members have face-to-face contact versus using other types of media, such as e-mail or computer-mediated communication (Dubé & Paré, 2004).) For the pilot, virtualness meant that while the students had computer-based communication tools, which supported both synchronous and asynchronous communication, the way these students actually communicated was a personal or team decision and not controlled by the researchers.

The students in round two were taking a two-month summer course and their project consisted of writing a report after analyzing an industry case study. These teams also stayed together for the length of the course. The survey was administered after the first case study finished, approximately one month into the course. These students were enrolled in online courses. Only two of the teams in this course met face-to-face.

3.6 Data Collection

The survey was administered through Zoomerang™, a web-survey company, which allowed access to the survey using a web link. This link was sent to each of the students in the participating classes. The respondent results were downloaded as a comma separated variable file and then imported into a Microsoft Excel worksheet.

As mentioned earlier, the pilot was conducted in two rounds, with the first being administered followed by an analysis of the responses captured. This process was to ensure that the respondents understood the questions and to gauge the length of time it would take to complete the survey. The researchers were concerned that completion of a long survey would be problematic as noted by other researchers and the managers of the corporate teams that were to be surveyed in the actual study. The criteria set by these managers was that the survey could not take more than 15 minutes to complete but, that a 10 minute completion time was preferred.

Based on round 1 of the pilot study, it was felt that the number of questions being asked was too large, and that reducing the number of questions would make the survey more focused and increase the likelihood of it being completed by our target software development teams. Additionally, as part of the initial evaluation, there was also some

fine-tuning of the survey questions in response to concerns raised in follow-up interviews.

The second round of survey administration was similar to the first, in that the survey was web-based and the link was sent to all students in the participating classes. As before, the respondent data was stored at the survey company's hosting site, and then downloaded by a researcher after the close of the survey (Table 3.1 presents the respondent demographics).

Since the two surveys had a different total number of questions plus dissimilar questions for some of the constructs, the results could not be completely merged into one combined file without reordering the questions and omitting some of them. This was performed in MS Excel and resulted in a combined MS Excel worksheet. This worksheet was used to run preliminary descriptive statistics on the question results and to load the data into an SPSS v13 statistical package for further analysis.

3.7 Interviews

3.7.1 Face Validity Interviews

After the survey was constructed, but before the pilot was conducted, seven people were contacted to take the survey on paper and then spend time with the researcher going over each question and their interpretation of it. This was done as a check for misunderstandings or vagueness concerning the questions. These interviews led to valuable insights into the question meanings and resulted in wording changes, which are mentioned in the section on evaluation of the questions.

From these interviews, certain insights were gained on cultural differences as perceived by students when working with other cultures on school projects. One such insight was that some (also expressed as many) undergraduates do not take course projects seriously, with the comment being, “it is just a course”. Others took it very seriously and were frustrated by this attitude on the part of some team members. In one example, a student said that when she managed the project, she had different deadlines for different people. Those that tended to hand in things late or at the last minute were given a deadline a day or two early, depending on what their deliverable was. Another observed that Indian and Chinese students were obsessive about grades and always tried to define exactly what they had to do to get what grade. Rather than try simply to do their best, they wanted to put out just enough effort to ensure the grade they desired and no more. This was described as being very calculating and not working for the good of the team.

3.7.2 Project Team Interviews – Following Survey Administration

After the survey was closed, an email was sent to the students of the various teams who had taken the survey, requesting they participate in an interview. The interviews were conducted with the intent of gaining a greater depth of understanding of the dynamics of the teams. Only two teams responded and agreed to be interviewed. Additionally, not all members of the teams participated in the interviews, three of five from Team A and three of four from Team B. Given the limited response, it cannot be said that these interviews are representative of the subject teams; they solely provide richer detail to help understand team dynamics. The interviews were conducted at the convenience of the subjects in a lab and videotaped.

Five members comprised team A, whose project was program development. The team received the highest score for their project and was considered one of the best teams. Each member was interviewed separately and asked about the organization of the team, team decision-making, how deadlines were created and met, and the interaction/communication of the members. This team's participants included two people from the United States (one white and one African-American), two people from the Caribbean (one Cuban and one from the Dominican Republic, who had resided in the U.S. for some time), and one Korean, who had resided in the U.S. for 11 years. The white American, the Dominican and the Korean agreed to be interviewed. The white American was the project leader and had been selected for that role by the Instructor, based in part, on the person's experience in the software industry and experience as a project leader. That person then selected the other team members based on personal experience with most of the people. The instructor assigned the final member, the African-American, to the team. The breakdown of the roles of the team was as follows:

- Project leader: White American
- Lead programmer: Cuban
- Second programmer: Korean
- Tester/ documentation: Dominican
- Second tester: African-American

The project leader, lead programmer, and second tester worked full time, while the tester/ documentation person was a mother of two small children. These members were taking at least two, and in most cases, more courses at the time of the team project.

The second programmer was a full time student with six courses and no other known responsibilities.

It was apparent by the end of the interviews that the project leader and tester felt there was a division among the members of the team. They thought three members, project leader, lead programmer and tester, took the project very seriously and put extra effort toward producing the best product. The remaining two, second programmer and second tester, were not thought by the first three to be serious about the project. This was based, in part, on a statement by the second programmer saying, “Let’s go for the ‘C’ and once we have that, go for a ‘B’”. Additionally, the second tester would leave as early as possible from any meeting and turn in work just before the deadline, usually only after much prompting.

Project deadlines were decided by the project sponsor and the instructor and not by the team members. Team members had some latitude in what was to be delivered for a given deadline, although only after negotiation with the sponsor. In general, the three members of the team tried to review all work before it was due, but having the second programmer and second tester turn in their work just before the deadline often stymied this, by not allowing time to review their work.

At one point, this became a serious concern of the project leader with respect to the second programmer. The project leader was concerned whether the second programmer could actually do the programming, in part because the work was always handed in just at the deadline, and because the code often had problems running on other member’s computers. According to the project leader, the second programmer claimed that he was the better programmer and should have been given more to do. During his

own interview, the second programmer claimed that his part of the project always worked, and that the problem was due to the server software. He also claimed he usually turned in his work a day before it was due.

Therefore, there was a difference in *perception* of the capabilities and actions of the second programmer and the rest of the team. In a subsequent discussion with the project sponsor, the sponsor stated that the code of the second programmer was the better of the two programmers, it being clearer, better constructed, and better documented. The server code written by the lead programmer, correspondingly, was not as good, and it was felt this was due to a lack of experience with server software.

The tester felt that some of the differences among team members were due to cultural differences, in that the second programmer was very quiet and reluctant to communicate, rarely looking at e-mail and never calling. The project leader felt that the differences were due to personality differences and how seriously the person took the course. The second programmer admitted that he was a loner, had a phone phobia and felt that there was little need for much communication. He stated that his part of the project was specified by the requirements, once he gave the interface specifications to the lead programmer; that was all that was needed.

It should be noted that in actual software development, the process is rarely as straightforward as the second programmer stated. There is usually a need for interaction between individuals due to changing specifications and the need to clarify understandings. It should also be noted that while the second programmer said he had a phone phobia, his English was poor and he stated a preference for face-to-face communication because it allowed him to see peoples' faces and body language. This

reluctance to use the phone could be due to his lack of ability to process English properly on the phone.

Meetings outside of class time were difficult to schedule due to the individuals' schedules. The tester said that only about 40% of the time was spent in face-to-face meetings and those meetings tended to be long, occurring towards the end of the project. About 60% of communication was through WebCT™, phone calls, and email. The tester would have preferred several shorter meetings during the week rather than one long meeting on Saturday, or even shorter meetings on Saturday, as the Tester had family obligations on this day. The project leader commented that people felt they would have done better if this had been a job because they would have had much more time together for face-to-face meetings.

This feeling was reinforced by the example of the second tester always wanting an agenda for the meetings and a strict adherence to the planned schedule. As soon as the scheduled time for the meeting passed, the second tester would excuse himself and leave. Similarly, the second programmer expressed that this was just a course and not a job. In a job, he would expect to spend more time on the programming to ensure the quality of the code because the code would be commercial software. He felt he had to manage his time well and not spend too much time on one project because he was also taking five other courses. This attitude was a direct misunderstanding of the course's intent. The course intent is to provide students with the real world experience of producing a software product for a company that intended to use the product internally.

The project leader's overall leadership style was one of negotiation and motivation. Tasks were not assigned arbitrarily, but within each role, the members of the team were asked who wished to take on what and then were given the freedom to do the task as they saw fit, within the guidelines of the specifications. Tasks outside of their function, such as documentation and presentation creation, were divided up among the members by asking who wanted to do what part and then requiring these tasks to be done early enough to have all of the parts integrated.

One of the course requirements was the participation by all members in documentation, presentation creation, and delivery. The project leader commented that the second tester pushed the deadline and often delivered only when prompted by multiple pleading emails. The project leader realized that he had limited authority, as they were all students. This came to a head early on when the second tester took offense at one prompting email, with the public comment that this was not a job and the project leader was not their boss. The project leader treated this as a personality conflict, nothing more.

In summary, there was no clear statement of cultural differences by the interviewees, except for the comment that the second programmer was Korean and seemed very reserved. As noted earlier, the second programmer stated he was a loner, and had a phone phobia, did not have a cell phone, did not like to use the phone, and often would not even look at e-mail for days. He also stated that he preferred having face-to-face meetings, as this allowed him to observe other's expressions. A potentially telling comment expressed by the second programmer was that, even though he had been in the United States for eleven years, he did not consider himself American but Korean

and that Americans did not work as hard as Koreans and Indians. This cannot be definitely attributed to a cultural difference, as it could easily be a personality trait since a few moments later, he expressed the opinion that everyone on his team worked very hard and it was reflected in the high grade the team received.

Another comment from the second programmer, however, did indicate a potential cultural difference. The second programmer said that where he was from, everything was very hierarchical, you were told what to do, how to do it, and when to do it. He felt this was true everywhere. It was thought by the researchers that this adherence to the authority of the hierarchy represented a misunderstanding of the culture in which he now resides.

This misunderstanding could have been the cause of the second programmer's failure to turn in his code early enough to be reviewed and integrated. He was abdicating to the authority of the project leader to set the appropriate deadline that would allow review and integration. In this case, this abdication to authority resulted in differing temporal perceptions about deadlines among team members. It is not known by the researchers if this is an accurate description of the Korean culture, in general, or if it represents the particular circumstance of one person.

An observation concerning the tester/documentation person is that in person she was very casual and described herself as laid back. Her attitude, she said at one point, was that things would get done and that she could have done more on the project. She contradicted this attitude when she said that she did not miss her deadlines and would put in the time needed to do her part and help the team. This was shown, in part, by her accommodating the need for long face-to-face meetings even though it conflicted with

family obligations. This suggests a difference in her “lateness attitude” verses her “lateness behavior.”

The second team was involved in a project for a graduate software engineering practicum. On this team, three of the four team members were Americans with industry experience ranging from 2-3 years (second programmer) to approximately 9 years (project leader). The fourth member (third programmer) was Turkish and inexperienced in software engineering. This person was fairly active in his participation in the project, but was reserved in talking about his participation because he knew, and said, that he was very junior and would defer to the others in most matters. The project leader stated that he felt this member showed some possible cultural difference, that of being reserved, but felt most of the difference in attitude was not due to culture as much as it was due to inexperience.

The breakdown of the team was:

- Project leader: white American
- Lead programmer: white American
- Second programmer: white American
- Third programmer: Turkish

These are not formal titles that the team recognized, but are given here to help with the identification of individuals for this discussion.

This team worked on a development effort in which all members wrote code; however, the lead and second programmers did most of the design and coding, especially the most difficult code. The project leader did some coding, but was primarily involved in setting the standards and processes after discussion with the other team members. The

project entailed working with other teams which were remotely located and required coordination effort between those teams.

An event early in the formation of this team, was an assertion of independence by one member, the lead programmer, who was always late to meetings. His work product was on time and of very high quality, but his adherence to meeting times was lacking. The lead programmer stated this was his way of showing his independence. The project leader recognized and accepted this behavior because he felt that ten or fifteen minutes late, due to traffic and parking problems, was normal.

An early incident in the project resulted in the project leader establishing a standard of having a person call when one was going to arrive late. In this particular incident, the lead programmer was very late and had not called. When he finally arrived, the project leader spoke to the team about being professional and respecting other member's time. Further, the project leader stated that if he could arrive on time coming from Pennsylvania, the rest of the team could get there on time also. It was decided that if a problem arose in traveling to the team's meetings, the protocol would be to call and let the rest of the team know about the late arrival. The project leader then said the rest of the meeting was a bit awkward, but the standard was adhered to thereafter.

The lead programmer was still late, only ten or fifteen minutes, and when he was going to be later, he did call. In fact, there was a time when the project leader was not able to participate on the project because of personal responsibilities. The lead programmer stepped in, performed the project leader role as well as his own, without any reluctance, with the comment to the project leader, "you worry about your family and what you need to do, we can handle everything here."

Additionally, the project leader was a former member of the Air Force, and based on his training, believed that an effective team was one where each member could do the job of the person above and the one below their level; he felt all team members needed to work closely, but independently. By this he meant that they established a practice of constantly reviewing each other's work to ensure quality and effectiveness, not with the attitude of, "I am better than you are", but "many eyes can see more things".

Initially, this team had many face-to-face meetings. At the halfway point in the project the team's meetings had changed to selected members getting together to discuss and look at selected parts of the code. The project leader felt, by this point, that the team had "jelled" and was able to work in close alignment without conflicts; they became remote teams within a team.

One interesting point during the project leader's interview was that he focused on describing the actions of the team with stories about the actions of the lead programmer or himself, not the other members. When talking about the team, he usually talked about himself and the lead programmer. Although he felt that the second programmer was very competent, he was not quite at the level of the lead programmer, and the third programmer was too junior.

In discussing the third programmer, the project leader stated he felt he needed to spend a lot of time trying to tailor tasks the third programmer could accomplish to gain confidence, acting somewhat as a mentor to the third programmer. The project leader stated that he regretted not performing as much mentoring, as he would have liked. The project leader did note that the third programmer was able to get an internship with the

project sponsor based on the level of work that the third programmer was able to do by the end of the project, and he, the project leader, was very happy about this.

The project leader felt the frequent intense meetings held at the beginning of the project made a difference in what the team was able to accomplish and was the key to the success of the project.

During his interview, the third programmer mentioned he was Turkish, but had spent his early life in Germany and upon returning to Turkey, attended schools for German students. In that respect, he felt he was more German than Turkish. The overall tone of his interview was one of being very happy to have been on the team; he learned a lot and everyone treated him as a valuable contributing member of the team. He also stated there were no cultural problems between him and the other members.

The third programmer echoed much of what was said by the project leader, but added two observations. First, he felt one of the reasons this team succeeded while others in the class did not was the following. Before the team decided on task timings and deadlines, each person would read all supporting documentation and was fully prepared to discuss the task during the face-to-face meeting. During the meeting, everyone would discuss the task in terms of the requirements, how the piece fit in with existing modules and the implications for current work and future possibilities. The discussion ended when everyone understood what was required. Then the tasks and deadlines would be established and assigned.

Being the most junior, the third programmer felt he was a contributing member whose opinion was sought and listened to. He also felt that working on the team was a tremendous learning experience for him, and that the others were happy to help him.

Second, he felt that the team was highly professional, took their tasks seriously, and strove for the highest quality even though the work they did was a school project. In fact, he said the team treated the project as if it was their job, while other project teams he had been on in his academic career did not, but treated it as if it was “just” a school project. He described his behavior on those teams as following the group attitude. When the team did not take the project seriously, he did not also. Since the current team took the project very seriously, he did also.

The interview with the lead programmer was similar to the project leader but went into more of the motivation behind his actions. The lead programmer stated he felt he could have been the project leader but did not want that position after meeting with the person who became the project leader. He realized from that meeting that project leader had a presence about him which allowed him to command respect from the other team members and from other teams on the project. In spite of this, the lead programmer felt that he was late for the meetings because he is always late for meetings; this is just who he is.

Most of the time the lead programmer was not very late. However, there was one instance, early on, when the lead programmer was very late to a meeting, over an hour, causing the project leader to “blow up”, as the lead programmer put it. The blow up was not expressed by the project leader shouting, but rather by a very calm talk about professionalism and courtesy to the other members of the team. The lead programmer said he still came late, but only five to ten minutes late, and would call if he was going to be later than this.

The lead programmer also mentioned that the project leader enforced adherence to deadlines, by making it known that if someone did not get his work done, he, the project leader, would do it for him. This would have been embarrassing if it happened to a team member, but it never did.

The lead programmer discussed the period of time when, due to family and business commitments, the project leader was not able to participate in any meetings. The lead programmer's expression of casualness about arriving late to meetings was then put aside. He stepped up and took over the project leader's job, attending meetings, as necessary, as the interim project leader, and making all the necessary decisions. When the project leader returned, the lead programmer stepped aside and the project leader smoothly re-assumed his role.

Several observations arose during this team's interviews lending support to the constructs of lateness attitude, lateness behavior and sense of urgency: First, time coordination was difficult because the majority of the members worked full time. In addition, the project leader had to travel approximately two hours from Pennsylvania to attend meetings. Initially, they met after class, and at least once per week. After the team jelled, the meetings continued but decreased in frequency.

Eventually, the meetings were composed of the team members who were working on related components and were used to solidify the details of that subproject. When these meetings involved the project leader, they took place in a location that was closer to him. In this respect, the team extended their driving time to lower the project leader's. Second, the project leader felt, at the start of the project, that face-to-face meetings were the most efficient way to discuss and solidify the direction taken with any task. Later in

the project, these face-to-face meetings were determined to be less necessary because the project was at a point that required mostly heads down coding. It was said that much of the communication was done by phone because one could have immediate feedback during such a conversation.

To summarize relevant findings from the interviews; there were differences in communication styles, some of which may be personal variations and some which may be related to culture. The Korean student stated that in his country, it was the leader's responsibility to set appropriate dates and that his job was just to meet them. There was no need for any discussion. The rest of the team members were unaware of this and thought that this individual was not working with the rest of the team. They questioned his ability, even though it was found later that his code was the better of the two programmers. Language may also have been a factor in the Korean individual's reluctance to communicate, in that it was noted that his English was poor.

There was a certain amount of temporal rigidity displayed by one individual, the second tester, who left as soon as the scheduled time for the meetings was over. This interpretation is a supposition as the second tester was not available for an interview.

The first team did have problems with communication and coordination, which is not uncommon for student teams especially those that have little if any work experience. On the other hand, the second team had little communication or coordination problems after a "jelling" period. Most of the members of this team had work experience, some of it extensive, which could be seen in the organization of the team and their activities. The major cultural difference observed by the team leader was deference to the more senior or experienced team members by one member. This difference is not of interest for this

research, but is important to note. The second team also was more homogeneous in its make-up in terms of culture - three of the four team members were American. The fourth was middle-Eastern, but raised and schooled in a western culture, Germany. He had also been a part of the American culture for a number of years in his role as a student. The only difference, as mentioned earlier, was his deference to the more experienced team members. He only participated in the planning discussions through the active encouragement of the team lead. The impression received from the interviews was that this individual would not have participated otherwise. There was, however, no evidence of temporal perception differences between this person and the other team members.

Overall, the student interviews provided limited evidence of temporal perceptions impacting communication or trust, but some evidence that communication quality impacted individual trust and possibly satisfaction. However, all members of the two teams were not meeting virtually and were living and working in an American culture. Both of these factors may have mitigated any temporal perception differences.

With this background from the interviews, the pilot study data is looked at in detail in the next section.

3.8 Pilot Result Analysis

In this section, the questions are examined to determine if the items actually form reliable constructs. To this end, Cronbach's Alphas were performed on each set of questions forming the initial constructs. The results are shown in Table 3.2 below.

Table 3.2 Results of the Cronbach's Alpha Tests

| Construct | Alpha | Number of Items |
|--------------------|--------|-----------------|
| Future Orientation | 0.686 | 4 |
| Lateness Attitude | 0.066 | 5 |
| Lateness Behavior | 0.503 | 6 |
| Punctuality | 0.281 | 10 |
| Sense of Urgency | -0.239 | 3 |
| Temporal Rigidity | 0.488 | 9 |

Because of these disappointing results, a correlation matrix of the results was generated and each potential construct was given a working definition to help focus the construct's intent. Each question was then evaluated based on the correlation matrix and how well it fit the working definition of a particular construct. If a question did not correlate well or did not fit the working definition closely, it was then evaluated in terms of which other construct it could potentially support.

This evaluation is presented in the order of the original working constructs to provide consistency in this evaluation process.

3.8.1 Future Orientation

As these questions were taken from the Globe study, the questions themselves were not assigned to another construct. An evaluation instead was made of the appropriateness of the questions for the intended population, in light of the working definition. As a result, the following question was removed because this study is not interested in what the person thinks the culture *SHOULD* be.

- I believe that the accepted norm in the Culture I was raised in should be to:
Plan for the Future versus Accept the Status Quo

The evaluation did point out that the questions were not appropriately worded for team-based responses. In particular, because all team members resided in the United States, it was ambiguous what was meant by “In my culture”. The questions were reworded to provide answers that reflected how the individual responding felt was the perception of his or her team. The questions were also re-worded to reflect this focus and to use strongly disagree to strongly agree as the value labels consistently throughout the survey. These questions would also fit the respondents in global software development teams since each portion of the team would actively be in a country with a distinct culture. The original questions were:

- In my culture, the accepted norm is to:
Plan for the Future versus Accept the Status Quo (reverse coded)
- In my culture, people place more emphasis on:
Solving Current problems versus Planning for the Future
- In my culture we believe that people who are successful should:
Solve Current problems versus Plan for the Future

The re-worded questions are:

- In my team, the accepted norm is to solve day-to-day problems as they arise
- Members of my team place more emphasis on solving current problems
- Members of my team spend significant time anticipating future problems we might encounter

3.8.2 Lateness Attitude

In looking at this definition and the questions overall, it was realized that Lateness Attitude was about the degree of lateness. This was confirmed in the follow-up interviews with people, when asked for definitions of the terms. Being only a little late

for a meeting was thought to be in the range of five to ten minutes. One person expressed the feeling that she did not want to be sitting alone waiting for others and so was always five or ten minutes late to a meeting. These questions were of a vaguer nature than some of the lateness behavior questions, which had definite timeframes. This realization helped in the evaluation of the questions and their grouping.

The questions were evaluated as follows:

- In our team we believe it is best to have an exact time for a meeting (face-to-face or online, for example)

This question reflects Temporal Rigidity than Lateness Attitude. The question was reclassified as a Temporal Rigidity question.

- In our team we believe it is always okay to be late if you call and let others know you will be late

This question is actually how socially attuned a person is to the generally accepted behavioral rules, but for purposes of the re-evaluation, it continued to be classified as Lateness Attitude.

- In our team we believe that a meeting (face-to-face or online, for example) should end on time

This question was also classified as a Temporal Rigidity question.

- In our team we believe that just because a team leader says that work has to be done by time X, it does not mean it really has to be done by that time

It was decided that this was not a good question in that it mixes how one feels about the team leader with whether a deadline will be met. Therefore, it was removed.

- In our team we believe that we work hard every day so if something is not completed on time, it is because an unrealistic schedule has been set

This question is a strongly value-laden question that is more a measure of the team's work ethic. It was therefore removed.

3.8.3 Lateness Behavior

Lateness Behavior is a measure of the actual behavior of someone in terms of how late he or she is in different situations, for example, an actual factual amount of time. The questions were evaluated as follows:

- In our team we believe if we arrive late to a meeting (face-to-face or online, for example) 10 minutes after it starts, we are:

This question is not about behavior but a perception so it was thought of as a potential Lateness Attitude question. The period of ten minutes is within socially acceptable limits based on the follow-up interviews. Therefore, it was re-classified as Lateness Attitude

- In our team we believe if we arrive late to a meeting (face-to-face or online, for example) 1 hour after it starts, we are:

From the interviews, meetings seemed to have three separate ranges of lateness: socially acceptable or mild, of five to ten minutes; one hour or more is severely late; and the time in-between, is medium late, and is acceptable or not based on the reason why the person is late.

However, these classifications are based on an Anglo perception (Globe study terminology). These perceptions can differ based on the culture as shown in this example: an American agriculturalist in a Latin American country wanted to meet his counterpart and eventually did arrange a meeting (Hall, 1959). The result was that the American was kept waiting for over 45 minutes, which was unacceptable to the American; however, Hall tells us that 45 minutes was just the beginning of the waiting scale in that country. This question therefore, was re-classified as Lateness Attitude.

- In our team we believe if we complete a project 1 day late, we are:

This question is similar to being ten minutes late to a meeting. One day was considered socially acceptable for a deadline, and was re-classified as Lateness Attitude.

- In our team we believe if we complete a project 1 week late, we are:

This question is similar to being late to a meeting by one hour; and was re-classified as Lateness Attitude.

- In our team we believe it is okay to be one or two days late with a deadline:

This question fits the middle ground, not socially acceptable and not severely late. Nevertheless, it fits the classification of Lateness Attitude.

- In our team we believe it is never okay to be more than a few minutes late for a meeting (face-to-face or online, for example):

This question is more about Lateness Attitude than behavior and was re-classified as such, though it was decided to change the wording due to information gathered in the follow-up interviews. In these interviews, people had a hard time with the phrase “never okay” and felt it was awkward. It was suggested that it be changed to:

- In our team, it is okay to be a few minutes late for a meeting (face-to-face or online, for example).

The suggestion was taken and the wording changed.

3.8.4 Punctuality

Punctuality was a difficult construct in that it was difficult to see how this was different from Lateness Behavior. Therefore, it was eliminated as a construct. Although punctuality was eliminated as a construct, the questions originally assigned to it were evaluated to see if they were appropriate within the context of another construct.

- People on our team believe that it is better to do the work right rather than on time

This question presents a problem because it is another value-laden question that is likely to cause a response bias through its use of the word “right.” Therefore, this question was removed.

- People on our team are almost never late for a meeting (face-to-face or online, for example)

This question is about behavior and the reporting of that behavior, and was re-classified as Lateness Behavior.

- People on our team would rather be early than late

This question is not about behavior, but an attitude towards lateness. In fact, it is not as much about being late as a comparison between early and late behaviors. It was felt this comparison could reflect an attitude towards lateness and the question was therefore re-classified as Lateness Attitude.

- People on our team rarely miss deadlines

This is an actual behavior and was re-classified as Lateness Behavior.

- People on our team are always late for meetings (face-to-face or online, for example):

This is Lateness Behavior, but respondents reported that the wording “always late” made the question difficult to answer. The question was therefore changed to: People on our team are never late for a meeting.

- When people on our team have work to turn in, they always ask for a time extension:

This question was re-classified as Lateness Behavior. It was also decided that the question would be clearer if it was written to be reverse coded.

- People on our team will always stay up to finish things if we have an important deadline:

This question again presented a problem in that its value-laden use of the words “important deadline” would cause a response bias. The question was removed.

- People on our team always keep people waiting for them

Similar to an earlier question, this wording was considered non-neutral because of “always.” In trying to reword the question in a way that generated a more socially acceptable answer, it was felt that the question would potentially lose its focus. It was therefore decided to keep the wording but to reverse code the question.

- People on our team always plan their work so that it is done one or two days before it is due

This question presented a problem in that it did not fit into any of the categories that were being used. It was removed.

- In our team we believe that if we have a scheduled conference call, it is important to call in precisely on time

This question is not Lateness Behavior and does not fit well into the Lateness Attitude construct, therefore, it was re-classified as Temporal Rigidity.

3.8.5 Sense of Urgency

Sense of Urgency is a measure of the degree to which people feel something has to be done, and their feeling that the world is very fast paced, requiring people to constantly keep busy and keep moving. In the business world, anecdotal evidence suggests this concept is related to a willingness to spend personal time on task completion by staying after working hours if necessary.

- People on our team know that they are not going to get everything done on time

Upon review, this question was thought of as representing casualness about being late, but it was hard to arrive at a satisfactory definition of what this concept would be. As such, the question was removed.

- People on our team believe it is okay to sometimes miss a deadline

This question was viewed as an acceptable question about one's Sense of Urgency but the wording was thought to be unclear. As such, it was changed to: People on the local team are not too concerned about missing a few deadlines.

- People on our team believe if they do not work hard and get things done on time, they will not succeed

Similarly, this question did not represent a Sense of Urgency, but another attitude, which was described as company oriented, realistic, and success-oriented. Given the lack of a definition that effectively matched the constructs under consideration, it was removed.

3.8.6 Temporal Rigidity

The term Temporal Rigidity indicates an inflexibility which manifests itself in an ordering, which is always followed (Zerubavel, 1981). The working definition that was arrived at was a measure of how willing a person or group of people are to change or to adapt to new schedules. For example, can a meeting which regularly occurs on Tuesday be moved to Thursday? A temporally rigid person would not like this change in schedule. Such a person wants time to be structured, ordered, and not readily changed.

The questions were evaluated as follows:

- People on our team will always stay late to finish things if we have an important deadline

This question is identical to one within the punctuality construct and so was removed.

- People on our team think it is important to meet deadlines

Upon review, it was felt that this question was similar in intent to Lateness Attitude. It was re-classified as Lateness Attitude.

- People on our team prefer meetings (face-to-face or online, for example) to follow an agenda

It was decided that this question was not necessarily about time, though it could be. It was further suggested that this did represent rigidity in the use of the agenda to hold the meeting to a schedule. As such, it was classified as Temporal Rigidity.

- People on our team think people should be ready when they say they will be ready

This question presented a dilemma in that it could be about time, but it was suggested that the item could be more a social commentary on keeping one's promises. Given this alternative meaning, it was removed.

- People on our team get upset when others do not get their part of the work done on time

This question does not represent a Temporal Rigidity attitude but an attitude towards others who break commitments. The question was removed.

- People on our team feel it is okay if a meeting (face-to-face or online, for example) is suddenly rescheduled

During the follow-up interviews, people gave a variety of reasons of why it might be fine for a meeting to be rescheduled. Two examples were that there were too many meetings and so no one minded one less, and second, that meetings were felt to be a waste of time. Because there could be multiple interpretations of this question, it was removed.

- People on our team believe that a team leader who keeps changing due dates is very frustrating

This question is about the team members' attitudes towards the team leader and not directly about time, and so it was removed.

- People on our team get upset when the plan is not followed

This question does not even mention time, therefore, it was removed.

- In our team we believe that the assigned duties in my organization are too rigid

As with the previous question, this item does not deal with time and it was removed.

To this point, the discussion has been concerned with temporal perception constructs without any discussion of how the possible impacts of temporal perception differences will be assessed. Since it is the ultimate performance of software development teams that is of concern, e.g., how good the product is that is delivered and how quickly was it produced, variables from the literature which have been found to be highly related to team performance are likely candidates to look at. Also, the literature review in the previous chapter suggested that temporal perception differences are likely to affect such variables. These constructs, validated by other researchers and shown to be related to team performance are now described.

3.9 Additional Constructs

The premise of this research is that differences in temporal perceptions among cultures will affect these additional constructs; however, the applicability of questions to the constructs in this research context needed to be tested. A list of the proposed constructs and their supporting questions follow.

3.9.1 Job Motivation

- I feel bad and unhappy when I discover that I have performed poorly on this project
- My opinion of myself goes up when I do my project work well
- I feel a great sense of personal satisfaction when I have done a good job on this project

The Job Motivation construct was taken from earlier research concerning the development of a work performance instrument (Hackman & Oldham, 1975).

3.9.2 Job Satisfaction

- I would be very happy to work on future projects managed similarly to this project
- I would be very happy to work with my team on future projects
- I would rather work on other projects than this project

This construct was from early pilot studies performed by fellow researcher, Dr. Suling Zhang, within this joint survey effort. These questions were found to load significantly on a single factor in a validity checking factor analysis and scored Cronbach Alpha's higher than 0.8 when checked for reliability (Zhang, 2007).

3.9.3 Team Communication Quality

- In general, communicating with members of my team is effortless
- Members of my team communicate well with each other
- My team members find it difficult to communicate problems to each other

This construct was adapted from work concerning communication and trust in virtual teams (Jarvenpaa & Leidner, 1998).

3.9.4 Individual Communication Quality

- I can convey complex work ideas to members of my team
- In general, members of my team always understand me when I communicate
- My communication with my team could be better

This construct was developed as part of the joint research by Egan and Zhang and was validated by card sorting, which is discussed in detail later in this chapter.

3.9.5 Team Coordination Quality

- Coordinating team members is not a problem
- My team members have some confusion about who is responsible for what
- My team members work well together to achieve team goals

This construct was developed as part of the joint research by Egan and Zhang and was validated by card sorting, discussed in detail later.

While some of these constructs come from the literature, their wording was adapted to meet the context of the teams being surveyed. Therefore, they still needed to be validated. One way to do so is to conduct the survey on a large enough population and then run a factor analysis to see if the questions load only on one factor indicating

that each set of questions is discriminable from the others. Another way is to measure the face validity by having experts check the questions. A third way is to interview a subset of subjects on the meaning of the questions and their answers. The respondent population was too small to run a factor analysis. However, face validity was checked with experts and content validity was checked with a subset of students and with members of the populations to which the survey was to be distributed. Reliability was checked with Cronbach's alpha measures, but, because of the major changes to the temporal perception questions and their low reliability scores, an additional validity and reliability check was conducted, card sorting. This is described in the next section.

3.10 Construct Validation – Card Sorting

In an effort to ensure that the statements being asked load on the intended constructs, a card sorting procedure was performed (Moore & Benbasat, 1991). It was decided to also include the validated constructs derived from the literature, mentioned in Chapter 3.9, in the card sorting process as a further check on their validity.

Categories were created for each of the intended constructs and written on a set of cards.

- Temporal Rigidity
- Future Orientation, referred to as Long-Term Orientation on the card
- Temporal Urgency referred to as Sense of Urgency on the card
- Lateness Attitude
- Lateness Behavior
- Job Motivation

- Job Satisfaction
- Team Communication Quality
- Individual Communication Quality
- Team Coordination Quality

There was no “other” category so as to force the people to fit the statement to one of the categories.

The survey statements were written on cards with their initial order determined by their location in the pilot surveys. Three other question sets were created with differing presentation orders for the statements. Initially, no definitions or examples were presented for each category and each person was told, “In these questions you are working with your team and another team on the same project”, to set the context of the situation. The subjects selected were native U.S. English speakers. English speakers from other countries were not selected to eliminate any variances in English usage.

The lack of information about the meaning of each category immediately presented problems to the subjects, who expressed frustration. It was decided to create an example of each category. Thereafter the subjects were given the descriptions at the start of the procedure, and could refer to them throughout the procedure. An additional change was made to express category titles in common English rather than use terminology from the literature. This was done because early testing showed that some of the category titles were not understandable to the general population. The categories and examples follow:

- Rigid about Time Usage, instead of Temporal Rigidity
Mary moves to the next item on the agenda when the time is up

- Long-term Orientation, instead of Future Orientation
Bob learned that programming language because he thought he might need it some day
- Sense of Urgency
Carol works overtime to make sure the work is done on time
- Attitude towards being late, instead of Lateness Attitude
Since John is always late, there is no need to rush
- Lateness behavior
John is always late
- Job Motivation
John works harder because of the personal internal rewards he gets
- Job Satisfaction
John is very content with work
- Team Communication
John sends email to Mary, Carol and Bob
- Individual Communication
John talks to Mary on the telephone
- Team Coordination
John lays out the task for Mary and Carol to do on the project

During the first two sorts after the subjects were given the examples, it was noticed that statements of Short-term orientation were not being placed in the Long-term Orientation category. Overall, the subjects had a problem placing these statements. Several subjects who had performed the card sorting were contacted and asked about their understanding of each of the categories. The researchers discovered literalness was occurring; that is, the subjects said that since the category was long-term orientation any task that was short-term did not belong in the category. As such, the category was changed to Short/Long-term Orientation.

An initial review was conducted after 14 subjects had been processed. The results are shown in Table 3.3. TR1 means question number 1 for Temporal Rigidity and TR2 is question number 2 for this construct. The other questions are coded similarly.

Table 3.3 Card Sorting Results

| Item | T R | F O | SU | L A | L B | Job Mot | Job Sat | Team Comm | Ind Comm | Team Coord | % Corr |
|---------------|-----------|----------|----------|-----------|-----------|------------|------------|--------------|-------------|---------------|-----------|
| TR1 | 6 | 1 | | | | | | 1 | | 6 | 42.9 |
| TR2 | 13 | | 1 | | | | | | | | 92.9 |
| TR3 | 10 | | 1 | | | | | 1 | | 2 | 71.4 |
| FO1 | | 8 | 4 | | | | | | | 2 | 57.1 |
| FO2 | | 8 | | 1 | | | | 1 | | 4 | 57.1 |
| FO3 | | 7 | 5 | | | | | | | 2 | 50.0 |
| SU1 | 2 | | 7 | 3 | 2 | | | | | | 50.0 |
| SU2 | 2 | | 5 | 1 | 1 | | | 1 | | 4 | 35.7 |
| SU3 | 2 | | 9 | 2 | 1 | | | | | | 64.3 |
| LA1 | | | | 11 | 3 | | | | | | 78.6 |
| LA2 | | | 3 | 8 | 3 | | | | | | 57.1 |
| LA3 | | | 1 | 11 | 2 | | | | | | 78.6 |
| LB1 | 1 | | 1 | 7 | 5 | | | | | | 35.7 |
| LB2 | 1 | | | | 12 | | | | | | 85.7 |
| LB3 | 1 | | | 1 | 12 | | | | | | 85.7 |
| Mot1 | | | | | | 3 | 11 | | | | 21.4 |
| Mot2 | | | | | | 5 | 9 | | | | 35.7 |
| Mot3 | | | | | | 4 | 10 | | | | 28.6 |
| SAT1 | | 1 | | | | 6 | 7 | | 3 | 3 | 50.0 |
| SAT2 | | | | | | 5 | 3 | | 1 | | 21.4 |
| SAT3 | | | | | | 5 | 8 | | | | 57.1 |
| Team Comm1 | | | | | | | | 9 | 5 | | 64.3 |
| Team Comm2 | | | | | | 1 | | 10 | 3 | | 71.4 |
| Team Comm3 | | | | | | | | 10 | 3 | 1 | 71.4 |
| Ind Comm1 | | | | | | | | 3 | 11 | | 78.6 |
| Ind Comm2 | | | | | | | | 3 | 11 | | 78.6 |
| Ind Comm3 | | | | | | | | 3 | 11 | | 78.6 |
| Team Coord1 | | | | | | | 1 | 3 | 1 | 9 | 64.3 |
| Team Coord2 | | | | | | | | 4 | 1 | 9 | 64.3 |
| Team Coord3 | | | | | | | | 2 | | 12 | 85.7 |

In general, many statements loaded as expected, but several proved problematic. Within the Temporal Rigidity category, statement TR1, “Members of my team prefer meetings to follow an agenda” was often placed in the Team Coordination category. After discussion, with other researchers about this placement, it was realized that this was an appropriate placement based on the wording. To ensure that the question was viewed as a Temporal Rigidity statement, it was changed to move the focus of the question from agendas, to meetings exceeding their time frames. The new statement became “Members of my team get upset when meetings run past their end time”, reinforcing the concept of rigidity about time. In subsequent runs of the sorting task, the question was placed properly.

Similarly, from the Sense of Urgency category, statement SU2, “My team members are constantly concerned about the team’s progress” was placed in multiple categories, with only 5 of the 14 placing the statement in the Sense of Urgency category. The largest category for placement of these items was Team Coordination. Discussion among the researchers focused on the phrase, “the team” as giving the statement a sense of coordination, which was confirmed by questioning some of the subjects. The statement was changed to: “My team members are constantly concerned about progress.” This change improved the placement, but not as much as was hoped. The statement still was not placed consistently in Sense of Urgency category, with high variability as to where it was placed.

Similarly, from the Lateness Behavior category statement LB1, “My team members would rather be early than late”, was placed very heavily into the Lateness Attitude category and it was felt that the wording, “would rather be”, made this an

attitude statement not a behavior statement. The wording was changed to clarify that this was a behavior: “My team members are more often early than late”. Unfortunately, in subsequent sorts the placement did not improve.

In reviewing the Future Orientation statements, a decision was made to not change those statements as they did load at greater than 50% and were based on the Globe study (House et al., 2004).

The statements in the Job Motivation and Job Satisfaction categories presented another problem in that a large number of people considered the Job Motivation statements to be related to satisfaction and often, but not as consistently so, regarded the Job Satisfaction statements as motivation. The placement of the satisfaction statements were not as consistent as the placement of the motivation statements. The implication of this exchange of categories will be discussed later.

Team Communication and Individual Communication were another set of categories individuals had trouble placing. In retrospective questioning, it was discovered that the subjects were focusing on the phrase ‘members’. For example, the first statement: “In general, communication with members of the other team is effortless”. Second: “Members of my team and the other team communicate well with each other” and third: “My team members find it difficult to communicate problems to the other team”.

The subjects understood the use of members to mean individuals communicating, not an overall team level communication. Though there were some placement problems, both categories loaded with 70% or better on each statement and the researchers’ initial conclusion was to keep these statements and their respective constructs.

Team Coordination also loaded with somewhat mixed results, with TCO1 and TCO2 loading at 60% and 65% respectively and TCO3 loading at 80%. When not placed in Team Coordination, the first two generally were placed in the Team Communication category. During retrospective questioning, several subjects mentioned that coordination is really a matter of communication, which would account for this placement, however that does present a problem for this research.

3.11 Revision of the Survey

Having revised the statements based on the results of the card sorting, an actual survey was constructed to test the time it took to complete the survey and placement of questions in the survey (those questions that formed constructs had to be separated by enough intervening questions so that respondents answered the question anew without memory of what they answered on a related question). The results were disappointing in that the two subjects took 20.5 and 21.5 minutes to complete the survey and said that they were rushing a bit to do so.

This time was too long and therefore unacceptable for a survey that was to be distributed to company personnel. The managers in the company that was to be surveyed had said that the survey could not be any more than 15 minutes at most, and that ten minutes was preferable. A meeting was held to re-think the questions, with the goal of reducing the number and complexity of the questions. After protracted discussions, it was decided that a simplification of the two research models was required and, as part of this simplification, the questions would reflect an individual's attitudes rather than the team's attitudes. This simplification had three primary benefits:

- Analysis at the individual level would allow the elimination of a significant number of (team level) questions
- Analysis at the individual level would allow simpler wording of the statements
- Analysis at the individual level would increase the respondent numbers

It was therefore decided that the following changes would be made to simplify and reduce the number of questions, while simplifying the models:

- Lateness Behavior was eliminated: card sorting showed that this category had multiple problems.
- Team Coordination Quality: is a team level construct and was eliminated.
- Job Satisfaction: the statements were variable in their loading and were eliminated.
- Job Motivation was loading more as satisfaction so the statements were kept but re-assigned to Individual Satisfaction, while Job Motivation was eliminated as a construct.
- Team Coordination Quality: this is a team level construct and was eliminated.
- Individual Trust: this construct, which was in the original joint pilot and loaded well, was re-introduced. It was felt that the low Cronbach's alphas that occurred in the student pilots were a result of testing this highly validated construct from the literature on students. Thus, although trust was not tested with card sorting and did load well on the student pilots, its history suggested we continue to use the variable because of its relative importance to dispersed team performance.

The statements for *Individual Trust* are:

- If I had my way, I would not let my other members have any influence over issues that are important to the project
- I really wish I had a good way to oversee the work of the other members on this project
- I would be comfortable giving members of my team tasks critical to this project

A new construct, *Individual Temporal Disruption* was added to accommodate the intent to study subjects around the globe and capture disruptions due to time zone separation. This construct was developed from literature on public and private time and

the concept that disruptions may be violations of private time (Perlow, 1999; Zerubavel, 1979). This is the one construct that was used in this study that is formative. It was formed by putting together statements that reflected common situations that case studies documented about the time zone difficulties of running dispersed teams.

The statements for Individual Temporal Disruption are:

- I frequently have to adjust my work schedule to coordinate with my team
- Personal events in my life are missed because I need to be available to communicate with my team
- Working with my team has made me change my eating and sleeping times.

The questions on the survey, up to this point, have been written for distribution to student teams who are not dispersed. Because the distribution of the survey to global software development teams will involve identifying parts of the team that are not co-located, the survey questions had to be changed to reflect what were defined as remote and local teams. In essence, the local team was that part of the distributed team that was co-located with the respondent answering the questions in the survey. The remote team was defined to be that part of the distributed team that was totally located in one other location. It was understood that a distributed team might be distributed across more than two locations, but for the sake of the questionnaire, the respondent was asked to choose one remote team and respond to questions with only that remote team in mind. Thus, the questions were adapted as follows.

- I frequently have to adjust my work schedule to coordinate with my team
became
- I frequently have to adjust my work schedule to coordinate with my remote team.
and

- Members of my team place more emphasis on solving current problems than focusing on future problems.

Became

- Members of my *local team* place more emphasis on solving current problems than focusing on future problems.

plus

- Members of my *remote team* place more emphasis on solving current problems than focusing on future problems.

The last two questions are duplicated in order to calculate the cultural difference between the two parts of the dispersed team.

3.12 Summary

As a result of the pilots and the evaluations of the questions a new instrument consisting of the final set of constructs and questions was developed. These final constructs are presented in the next Chapter, in the form of formal hypotheses to be researched.

CHAPTER 4

RESEARCH HYPOTHESES

4.1 Introduction

From the literature review in Chapter 2, it has been shown that virtual/dispersed teams perform less effectively; part of this can be attributed to communication and coordination difficulties. Some of the communication and coordination difficulties were determined to be directly related to increased temporal distances (and corresponding physical distance), while some of the difficulties were shown to be related to general cultural differences which prevent some team members from understanding the needs, language, societal constraints, etc., of other team members.

Contributing variables were hypothesized and questions developed that would measure these variables. Gap Analysis was selected as a methodology to measure cultural differences that might have impacts on dispersed team performance. To be able to use Gap Analysis, the survey created to measure the contributing variables must ask two similar questions, one which captures the cultural perspective of the team of the respondent and the cultural perspective this person has of the distant team. Gap Analysis then looks at the difference or gap between the two responses to these similar questions as a cultural difference. Whether this difference has an impact on the performance of the dispersed team is then examined by looking at the correlations between the differences and other variables used in the survey that were considered relevant.

Chapter 3 discussed the pilot studies which tested the questions designed to measure the variables posited as likely to be affected by temporal cultural differences. These variables were drawn from the arguments put forward in the literature review in Chapter 2. From the pilot studies' evaluation, a series of constructs and their supporting questions were created to measure the proposed variables. As the initial pilots and subsequent card sorting efforts progressed, some of the original guiding constructs were dropped and others added.

To summarize, this research primarily examines one cultural difference, temporal perceptions, which have not previously been quantified and measured on a group of respondents. The literature review noted that individuals have different temporal perceptions and orientations towards the concept of time leading to different behaviors associated with time-related decisions; for example, how hard someone will work to meet a well-defined deadline. The literature has also demonstrated that individuals have differing perceptions of time, which are a result of the influences of national culture and of various groups and organizations to which they belong. It had not been shown if these cultural temporal differences affect virtual team coordination and communication, although ethnographic and anecdotal evidence suggested that they do.

4.2 Research Objective

Therefore, this research:

- Identifies and validates a set of temporal cultural perceptions that may differ due to national culture.
- Measures these national cultural temporal perceptions.

- Posits a set of relationships between national cultural temporal perception differences variables that are likely to affect a dispersed team's performance.
- Builds a correlation model to express the relationships posited between temporal cultural differences and variables that are likely to affect dispersed team performance.

Figure 4.1 depicts the relationships proposed between temporal cultural perception differences and relevant dispersed team variables. As discussed in the literature review, differences in cultural temporal perceptions are likely to affect both the trust between remote team members and their perceived quality of communication. The quality of communication is proposed to impact both trust and member satisfaction. From research on local teams, trust is known to affect team member satisfaction so that this relationship is also shown. Team performance is not shown as a variable, primarily because it is difficult to get good measures of team performance, but it is known that trust and satisfaction are positively correlated with team performance from other studies. Finally, another variable was introduced into the model because of anecdotal reports of extreme disruption of personal lives through off hour meetings between dispersed team members. This variable, called temporal disruption is expected to be directly correlated to temporal distance and to have a strong effect on individual satisfaction.

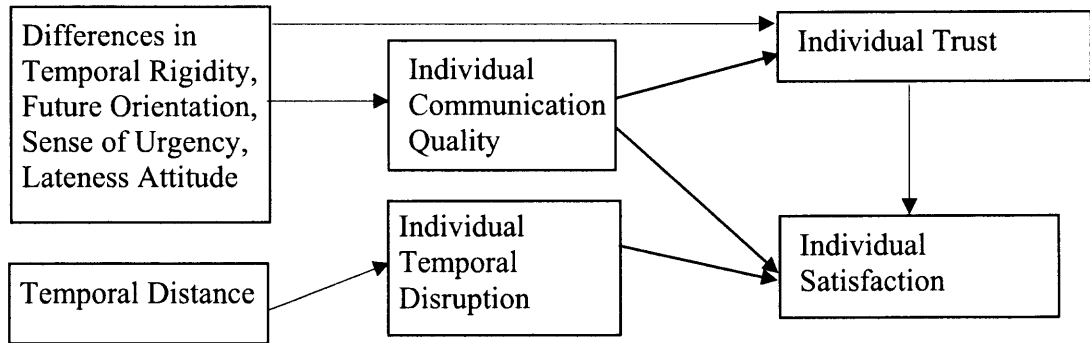


Figure 4.1 Initial Research Model.

4.3 Research Questions

The overall guiding research question for this dissertation is:

- How much do time differences affect a dispersed team's performance?

These time differences are both differences in the way time is perceived by different cultures and also differences in the way work time is arranged amongst the team members, e.g., meetings scheduled at 10 PM to accommodate distant team members working hours.

The following set of time constructs were used to test this question: (1) Temporal Rigidity (2) Future Orientation, (3) Sense of Urgency, (4) Lateness Attitude and (5) Temporal Disruption. The first four constructs were believed to impact Individual Communication Quality and Individual Trust. Individual Communication Quality will in turn affect Individual Satisfaction and Individual Trust. Temporal Disruption was believed to impact Individual Satisfaction directly. It was also hypothesized that Individual Trust would affect Individual Satisfaction. These constructs were used to test

the correlation model shown in Figure 4.1, which represents the hypotheses drawn from the research question presented.

The above research model was based on the belief that temporal differences are expected to cause disagreements and misunderstandings. These misunderstandings would occur in an individual's communication and because of the need to communicate synchronously, create potential disruptions of the individual's schedule and personal life.

Disagreements would then arise due to a difference in team members' understandings of expected temporal behavior. When the expected behavior did not occur, the individual's understanding would have been violated; team members may bring up this perceived violation, though they may not, attributing the violation to negative causes (Cramton, 2002; Mortensen & Hinds, 2002). Such violations and possible negative attributions, would lead to further difficulties in communication and further disruptions.

The final construct, Temporal Disruption was included, in part, to get a quantitative measure of the perception of personal temporal disruption among various portions of a dispersed team but also to ascertain what kind of impact this disruption had on a team member's satisfaction.

4.4 Research Constructs

The following sections provide working definitions of the final constructs and the items which support these constructs. The items form the basis for the surveys of this research effort. There are two different subject populations for this research; the first population

was comprised of globally dispersed development teams within a global development company. This company will be referred to as CmpyA in the discussion of this research.

CmpyA respondents were in a situation where their teams are comprised of both local and remote members. For these respondents the questionnaire was organized into four parts: the first part gathered demographic and team information, the second part asked temporal perception related questions about their beliefs concerning the local team, the third part asked the same questions, slightly re-phrased, about their beliefs concerning the remote team, and the fourth part asked questions concerning the non-temporal constructs as well as the one construct measuring the perception of temporal disruption. The questions in the second and third parts were analyzed using Gap Analysis at the individual level.

The second population was comprised of student project teams which were co-located, requiring a slight modification to their questions. This questionnaire was also presented in four parts: the first part gathered demographic information, the second part asked them to answer temporal related questions from their own beliefs and perceptions, while the third part, asked them the same question, but instructed the respondents to answer the questions based on how they believe the rest of the team reacted to time. The fourth part asks questions concerning the non-temporal constructs.

As with CmpyA respondents, the analysis was performed using Gap Analysis at the individual level. The fourth part of both surveys is a series of questions which gather data for the additional constructs of Individual Communication Quality, Individual Temporal Disruption, Individual Satisfaction and Individual Trust.

The actual surveys appear in Appendix C, (corporate), and Appendix D (student), while Appendix E is a listing of the questions solely of concern to this research, which are organized under the construct they represent.

Within the two surveys, the items are grouped as follows:

- Demographic items: corporate #2 – #12, student #2 - #5
- ‘Gap’ items: corporate #13 – #36, student #6 - #29
- Additional construct items: corporate #37 – #51, student #30 – #41

For the gap analysis to be performed, two related sets of items are asked. The first set asked the individual about their local perception or belief while the second set asked the individual about their perception of the beliefs of the remote location. It was not possible to capture a matched set of people, that is, what members in one part of a team think of their non co-located counterpart because of the anonymity requirements of the research and the voluntary nature of the subject participation. Thus, the survey only captures gaps in terms of an individual’s own perceptions of the team.

A summary of the working definitions of the constructs and actual item numbers within each survey follows. For each construct, the first three items are local and the next three are remote, this was accomplished by changing the word *local* to *remote*. The gap is then the difference in responses to the matched items, e.g. using a Lateness Attitude item:

- My ***local team*** members believe it is okay to be a few minutes late for a meeting
- My ***remote team*** members believe it is okay to be a few minutes late for a meeting

If the response to the first item was a six and the response to the second, matching item was a three, the gap would be three.

4.4.1 Future Orientation Construct

Corporate: 14, 17, 22, 26, 29, 34. Student: 7, 10, 15, 19, 22, 27

- Members of my **local** team place more emphasis on solving current problems than focusing on future problems (reverse coded)
- Members of my **local** team plan for future problems we might encounter
- In my **local** team, the accepted norm is to solve day-to-day problems as opposed to anticipating them before they arise (reverse coded)

Future Orientation is a measure of the balance between current work which must be done and a belief that some current work prepares one for the future. For example, someone with high Future Orientation would be willing to spend time on learning a skill as part of their current work so that the skill would be available in the future. Similarly, work could be double-checked now so that problems with inaccurate work do not occur in the future.

People that are Future Oriented want to lay out plans and set interim goals for achieving those plans while present oriented people will focus on current problems. Present oriented people may feel that the future oriented people are not good team members because they are not concerned with the current urgent problems. They may also interpret the future oriented individual's planning as applying to today's problem, thus viewing these plans, and the generators of those plans as unrealistic.

4.4.2 Lateness Attitude Construct

Corporate: 13, 18, 23, 25, 30, 35. Student: 6, 11, 16, 18, 23, 28

- My **local team** members believe it is okay to be a few minutes late for a meeting
- Members of my **local team** are not too concerned about missing a few deadlines

- My *local team* members believe it is okay to be one or two days late with a deadline

Lateness Attitude is a measure of how acceptable personal late behavior is and how acceptable other's late behavior is. It cannot be measured by comparing ten minutes late to one hour late, because these values mean different things to different people. However, it can be measured by asking someone how personally acceptable it is for him or her to be late, how acceptable it is for the team to be late with its work and how acceptable it is for other members of the team to be late.

4.4.3 Sense of Urgency Construct

Corporate: 15, 20, 24, 27, 32, 36. Student: 8, 13, 17, 20, 25, 29

- Members of my *local team* get very nervous if we start to fall behind
- My *local team* members are constantly concerned about progress
- People on my *local team* are always insisting that we have to hurry

Sense of Urgency is a measure of the degree to which people feel that something has to be done now; that the world is very fast paced requiring people to constantly keep busy and keep moving. For example, if you are in New York City, people walk fast to get from point A to point B. If you are in Savannah, Georgia, people walk much slower to get from point A to point B.

People with a higher Sense of Urgency may get upset with "slower moving" people in a teleconference. They may multitask which could be considered rude by other participants or they may cut off slower speakers and even take over the conversation if they feel the meeting is going too slow. This behavior may be viewed negatively by

individuals of other cultures, thereby making it difficult to build a coherent working team.

Additionally, people with a lesser Sense of Urgency may wish to discuss every detail of every issue in a teleconference session, exasperating the higher urgency individual's patience even more. Lower Sense of Urgency people will feel unfairly pressured by higher Sense of Urgency people, and think that such people are rude and do not pay attention to important social conventions.

4.4.4 Temporal Rigidity Construct

Corporate: 16, 19, 21, 28, 31, 33. Student: 9, 12, 14, 21, 24, 26

- Members of my *local team* get upset when meetings run past their end time
- People on my *local team* get upset when meeting times keep being changed
- My *local team* members want precise detailed schedules for everything

Temporal Rigidity is a measure of how willing a person or group of people are to change or to adapt to new schedules. For example, can a meeting that regularly occurred on Tuesday, be moved to Thursday? A temporally rigid person will not like this change in schedule. Such a person wants time to be structured, ordered, and not readily changed. This construct is about a person's flexibility concerning temporal changes.

4.4.5 Individual Communication Quality

Corporate: 40, 44, 50. Student: 32, 35, 41

- I can convey complex work ideas to members of the *remote team*
- In general, members of the *remote team* always understand me when I communicate
- My work communication with the *remote team* could be better (reverse coded)

Individual Communication Quality is about how well the individual communicates with other members of the team (Cramton & Webber, 2003).

4.4.6 Individual Temporal Disruption

Corporate: 41, 46, 49. Student: 33, 37, 40

- I frequently have to adjust my work schedule to coordinate with the *remote team*
- Personal events in my life are missed because I need to be available to communicate with the *remote team*
- Working with a *remote team* has made me change my eating and sleeping times

This construct deals with the adjustments an individual is required to make due to working with a remote team. It is also about violation to one's private time and the feelings that those violations generate (Hall, 1969, 1983; Perlow, 1999; Rutowski et al., 2007; Zerubavel, 1976, 1979).

4.4.7 Individual Satisfaction

Corporate: 37, 45, 48. Student: 30, 36, 39

- I feel bad and unhappy when I discover that I have performed poorly on this project
- My opinion of myself goes up when I do my project work well
- I feel a great sense of personal satisfaction when I have done a good job on this project

This construct reflects the concept that an individual's performance on a task is influenced by the satisfaction the person is deriving from performing the task, the sense of doing something well. These items are drawn from a validated set of questions reported in the literature (Hackman & Oldham, 1975).

4.4.8 Individual Trust

Corporate: 39, 43, 47. Student: 31, 34, 38

- If I had my way, I would not let *remote team* members have any influence over issues that are important to the project (reverse coded)
- I really wish I had a good way to oversee the work of the *remote team* members on this project (reverse coded)
- I would be comfortable giving members of the *remote team* tasks critical to this project

This construct is about how individuals trust other members of the team in terms of performing tasks and the quality of that performance. It has been shown that trust is an important concept in team performance and individual satisfaction (Lewicki, McAllister, & Bies, 1998). Trust has been shown to be a significant factor that affects performance when teams are dispersed (Handy, 1995; Jarvenpaa et al., 1998; Jarvenpaa & Leidner, 1998).

4.5 Hypotheses

Based on the literature review, pilot study, interviews, and card sorting, the resulting hypotheses are:

Overall Research Question: How much do time differences affect a dispersed team's performance?

RQ1: Do differences in cultural time perceptions among members of a virtual team impact individual communication quality?

- H1a: The Local versus Remote gap in perceived Future Orientation will be negatively correlated with Individual Communication Quality.
- H1b: The Local versus Remote gap in perceived Sense of Urgency Orientation will be negatively correlated with Individual Communication Quality.

- H1c: The Local versus Remote gap in perceived Temporal Rigidity will be negatively correlated with Individual Communication Quality.
- H1d: The Local versus Remote gap in perceived Lateness Attitude will be negatively correlated with Individual Communication Quality

RQ2: Do differences in cultural time perceptions among members of a virtual team impact Individual Trust?

- H2a: The Local versus Remote gap in perceived Future Orientation will be negatively correlated with Individual Trust.
- H2b: The Local versus Remote gap in perceived Sense of Urgency Orientation will be negatively correlated with Individual Trust.
- H2c: The Local versus Remote gap in perceived Temporal Rigidity will be negatively correlated with Individual Trust.
- H2d: The Local versus Remote gap in perceived Lateness Attitude will be negatively correlated with Individual Trust.

RQ3: Does Temporal Distance impact Individual Temporal Disruption?

- H3: Temporal Distance will be positively correlated with Individual Temporal Disruption.

RQ4: Does Individual Communication Quality impact Individual Satisfaction?

- H4: Individual Communication Quality will be positively correlated with Individual Satisfaction.

RQ5: Does Individual Temporal Disruption impact Individual Satisfaction?

- H5: Individual Temporal Disruption will be negatively correlated with Individual Satisfaction.

RQ6: Does Individual Communication Quality impact Individual Trust?

- H6: Individual Communication Quality will be positively correlated with Individual Trust.

RQ7: Does Individual Trust impact Individual Satisfaction?

- H7: Individual Trust will be positively correlated with Individual Satisfaction.

The resulting model with hypotheses is show in Figure 4.2, with the PLS version of the model in Appendix H.

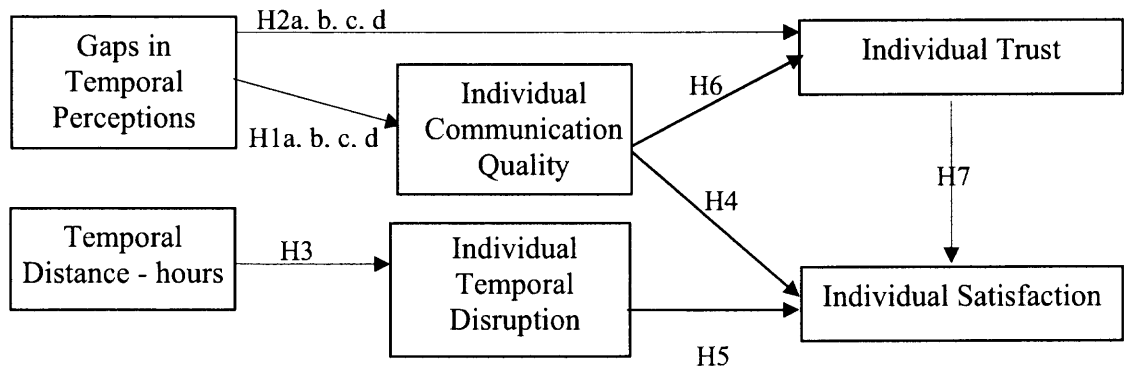


Figure 4.2 Research Model with Hypotheses.

CHAPTER 5

RESEARCH METHOD

5.1 Introduction

The objective of this Chapter is to describe the surveys that were performed to capture data to test the hypothesized research model. The constructs and the resulting survey are the result of the pilot study and reflect the evaluations performed during that study.

This research could be considered a modified form of Action Research in that it involved working with a company, CmpyA, to address an improvement-oriented change in that organization (Davison, Martinsons, & Kock, 2004; Kock, 2004). CmpyA had recognized that it had a series of problems involving its globally dispersed software development efforts. Action Research, which has its roots in social and workplace issues, is commonly used to find solutions to those issues and then plan an intervention to implement those solutions.

While Action Research typically is composed of five stages, *Diagnosing, Action Planning, Action Taking, Evaluating, and Specifying Learning*, this research was solely concerned with the diagnostic stage not only to help corporate management identify possible causes of their problems, but also to extend the knowledge to the Information Systems field of the impact that cultural differences have on the dispersed software development effort.

To this end, CmpyA provided access to their employees with the proviso that the researchers would make presentations to, and discuss with management the findings, that the management might then use those findings to address the problem areas identified.

To begin, a condensed reiteration of the hypotheses is presented, followed by a description of the study population, delivery mechanism, data collection, and a description of the data. To help in the understanding of the process Figure 5.1 is a timeline of the research.

5.2 TimeLine

The intent of this research was to test the idea that among globally dispersed teams, differences in temporal perception would affect Individual Communication Quality, which in turn would affect an Individual's Satisfaction and Trust. The timeline of this effort is shown in Figure 5.1 and described below.

To accomplish this, from January to April 2006, the researchers reviewed the literature for survey questions and upon finding a lack of appropriate questions, brainstormed a series of possible constructs and example definitions of those constructs.

A large set of statement items were created that it was felt tested the constructs. Each item was reviewed and challenged by the researchers to ensure face validity. The items were then presented to Ph.D. students, industry members, and other professors to elicit their thoughts on the appropriateness and wording.

April-May 2006 saw a survey constructed and a first round of testing with students. This round had a series of follow-up interviews conducted with the student respondents to ensure the understandability of the items. Changes resulted primarily to clarify the wording of the items and the instructions.

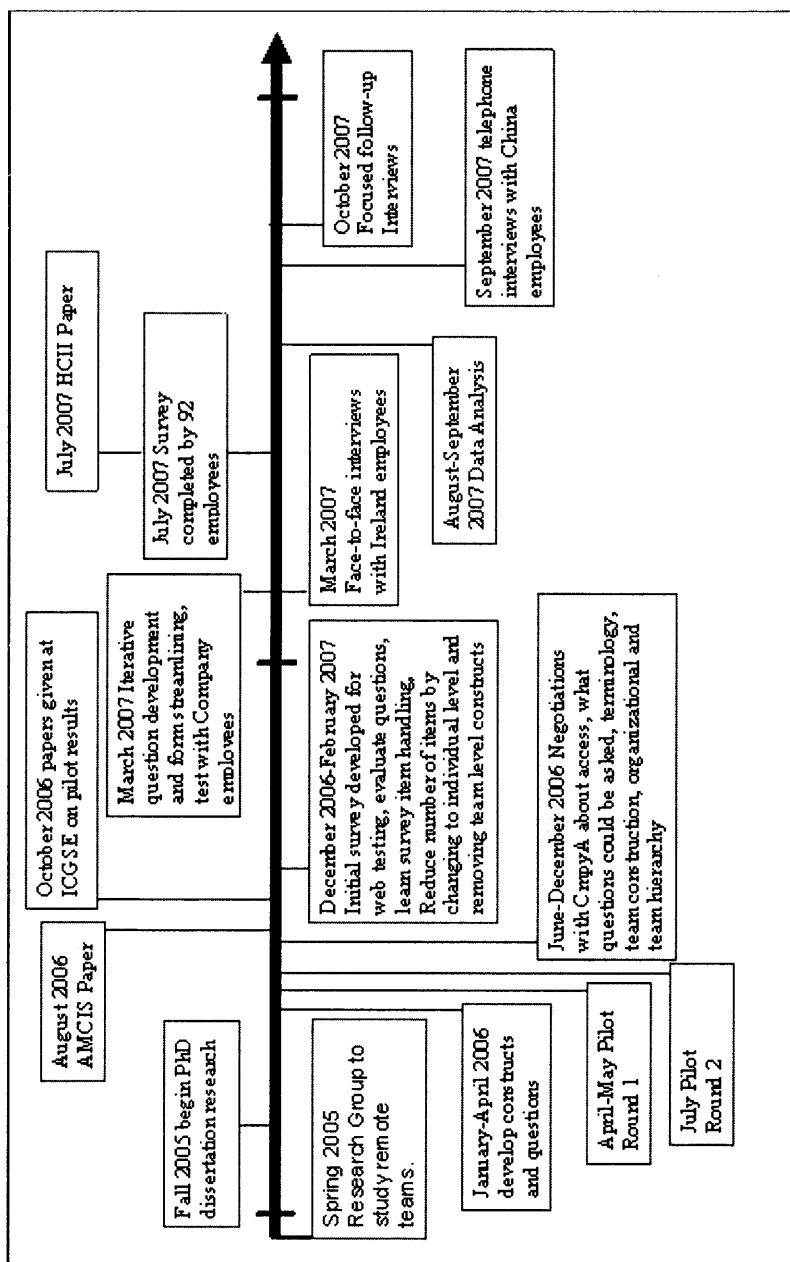


Figure 5.1 Timeline

Based on the understanding gained, the items were refined and another round administered to a set of volunteers during July 2006. Again, follow-up interviews were conducted to elicit respondents' understanding of the items. Preliminary correlations and Cronbach's Alpha's were calculated to reduce the number of items, leaving the most effective and clearest.

At this point, a series of meetings were conducted with CmpyA management to clarify terminology, team construction, and to understand the organizational and team hierarchies. There were also negotiations about issues that were of concern to the company's Human Resources department. Human Resources wanted to ensure that the questions could not be construed as making an evaluation of another's performance, especially team leads. These meetings occupied the second half of 2006 before issues were resolved to the satisfaction of both CmpyA and the researchers.

During October-November 2006, a card sorting procedure was performed to further refine the wording of the items and to select the most effective ones. The result of the card sorting process was a reduced set of items that were fashioned into an online survey, which was taken by a couple of the researchers to obtain timing and ease of use of the web-based survey.

Those results showed that the survey was too long and somewhat complicated, resulting in an effort, beginning in December 2006, to tune the survey through further conversations with CmpyA management. These conversations were an effort to better understand the company operations and processes, to simplify the survey, and to help clarify the instructions to the respondents. Much of this effort was required due to the way CmpyA thinks of teams and their relationship to each other, to team management and project management. The relationships are complex because the project is not composed of simple teams and sub-teams, but is dynamic, where people could be working on different aspects of several projects. These differing aspects could mean that the individuals played several roles including various types of team leads. There were also people who were local management who acted in an HR capacity and others who

acted in a project management capacity. These relationships made the wording of the instructions critical and very difficult to word precisely.

January-February 2007 saw the survey being further tuned by changing items from team level to individual level, reducing the number of constructs examined by eliminating any team level constructs. Several conversations with technical support from the survey company provided insight into how the questions should be presented for maximum efficiency and loading speed. All these changes were incorporated. The final hypotheses for this research are repeated in the next section.

5.3 Hypotheses

The following is a reiteration of the guiding hypotheses from Chapter 4 and provides a summary of the research hypotheses.

- H1a,b,c,d: The Local versus Remote gap in perceived Future Orientation, Sense of Urgency, Temporal Rigidity, Lateness Behavior, will be negatively correlated with Individual Communication Quality.
- H2a,b,c,d: The Local versus Remote gap in perceived Future Orientation, Sense of Urgency, Temporal Rigidity, Lateness Behavior, will be negatively correlated with Individual Trust.
- H3: Temporal Distance will be positively correlated with Individual Temporal Disruption.
- H4: Individual Communication Quality will be positively correlated with Individual Satisfaction.
- H5: Individual Temporal Disruption will be negatively correlated with Individual Satisfaction.
- H6: Individual Communication Quality will be positively correlated with Individual Trust.
- H7: Individual Trust will be positively correlated with Individual Satisfaction.

5.4 The Survey

In March 2007, the result of this effort was a survey that could be completed in ten minutes or less. This was confirmed by having several CmpyA respondents take the survey and report their experiences. These initial respondents were then interviewed to ensure that the questions were understandable and applied to their particular context. Once the results and timings had been confirmed, the CmpyA management allowed the survey to be administered to a selection of company personnel who worked in dispersed teams.

To review, two sets of surveys were created, which are presented in Appendices C and D. The first survey, the survey in Appendix C, was distributed to dispersed work teams in a Fortune 500 company, CmpyA. This survey had two sets of items to determine (1) a person's perception of themselves and (2) how that person perceives a remote team member, for gap analysis.

The second survey, Appendix D, was distributed to students who worked in teams but who were co-located. As with the corporate survey, this version of the survey has two sets of items for analysis by gap analysis. In this survey, the items determine (1) a person's perception of themselves and (2) how that person perceives the rest of their team.

The surveys were administered via the Zoomerang™ web-survey company, allowing access to the survey via web links. The link for the student survey was sent to the students by e-mail from their instructor. Similarly the link for the corporate survey was sent to employees by an e-mail from their managers. CmpyA management was not informed of who had responded, but cooperated by sending a series of follow-up e-mails

encouraging employee participation. The researchers requested CmpyA management to send an e-mail to the potential respondents to elicit their participation in follow-up interviews, with these results discussed in Chapter 6.

5.5 The Interviews

After the survey was released to CmpyA employees, interviews were conducted face-to-face with employees in Ireland in March 2007, by telephone with employees in the USA, and by telephone with employees in China in September 2007, to supplement the survey data, and to help in its interpretation. There were a total of 17 interviews, with individuals from the USA, Ireland, and China. The interview guide used for the first 13 interviews is presented in Appendix F. A second, more focused interview guide, shown in Appendix G, was used for the final four interviews conducted in September 2007. The results of interviews are presented in Chapter 6 and they were used during the evaluation of the data in Chapter 7.

5.6 Population

5.6.1 Student Population

The student population consisted of students who were participating in Information Systems related courses, which required membership on a software development project team. These courses were in the fields of Information Systems, Management Information Systems, and Software Engineering. The instructors were contacted via a blanket e-mail to all instructors in the Information Systems department and the School of Management

of the New Jersey Institute of Technology. It is not known how many actually sent the link to their classes.

The students in these courses were assigned to software teams and worked in a mixed mode of face-to-face and online communication and coordination. While the students could meet face-to-face, this was often difficult due to conflicting schedules, resulting in many of the meetings, coordination efforts, and assignment of responsibilities and duties being done via computer-mediated tools. These teams are considered hybrid teams and not partially distributed or globally dispersed teams, as were the CmpyA teams.

The university the students attend is a public university that is part of the state of New Jersey system. The population, as such, reflects the population of the state of New Jersey. The state is comprised of approximately 8.7 million people, with 63.8% White, 14.5% Black, 7% Asian, 14.9% Hispanic or Latino. Seventeen and one half percent are foreign born and 25.5% are in households where a language other than English is spoken (Census Bureau, Mixed). Student teams are similar to industry teams, in that they have to develop some part of the System Development Life Cycle for a client sponsor.

5.6.2 Company Population

CmpyA respondents are comprised of individuals located in the United States, Ireland, India and China. Depending upon the particular aspect of the project, their participation in the project can be from a few weeks to several months. The team members are selected based on the required skills and availability of the individuals for the expected duration of the project. These members often communicate using computer mediated tools as well as conference calls and IM during over-lapping hours or extended workdays.

The surveys closed in July 2007 with a total of 267 e-mail invitations sent and a total of 62 student respondents, for a response rate of 23%. CmpyA respondents totaled 92, and the corporation informed the researchers that they had sent the link to 120 employees, for a response rate of 76.6%. The demographics of the two populations are presented in Tables 5.1 and 5.2.

There were not enough responses from the student survey to be able to perform any meaningful statistical analysis. Additionally, the two surveys have different sets of items, which did not allow them to be combined. Therefore, only the company data was analyzed.

Table 5.1 CmpyA Demographics

| CmpyA Location | Number |
|----------------|--------|
| Dublin | 20 |
| China | 36 |
| USA | 26 |
| India | 9 |
| Other | 1 |
| Gender | |
| Female | 27 |
| Male | 65 |
| Age | |
| Less than 25 | 4 |
| 26 - 35 | 58 |
| 36 – 45 | 22 |
| 46 – 60 | 8 |
| Over 60 | 0 |

Table 5.2 Student Demographics

| Student | Number |
|---------------|--------|
| Gender | |
| Female | 17 |
| Male | 45 |
| Age | |
| Less than 25 | 36 |
| 26 - 35 | 20 |
| 36 – 45 | 4 |
| 46 – 60 | 2 |
| Over 60 | 0 |
| Birth Country | |
| India | 16 |
| USA | 26 |
| Other | 20 |

Table 5.3 shows the number of CmpyA respondents by local-remote combination. This represents the number of people who resided in one location and were working with a particular other location. For instance, the number of people residing in Ireland who stated that they were working with the remote team in China was three, while the number from Ireland working with the USA was 12.

Table 5.3 Respondents by Local-Remote Combination

| Local/Remote | Not Known | Ireland | China | USA | India |
|--------------|-----------|---------|-------|-----|-------|
| Ireland | 3 | | 3 | 12 | 4 |
| China | 4 | 4 | | 24 | |
| USA | 2 | 19 | | | |
| India | 1 | 3 | 2 | 3 | |

5.6.3 Company Environment Description

CmpyA is a large multi-national corporation with software development as one of its primary businesses. The ‘team’ that participated in the survey was distributed across four countries with the majority of the members in China, Ireland and the United States. A few of the respondents were located in India. The company is a major user of the *Lotus*

Notes software system, including the features of *Domino* and *Sametime*. *Domino* is a series of collaboration tools, which provide email, calendaring, scheduling, centrally managed deployment of software, and integration of web services and software. *Sametime* is an option within the Lotus system, which adds additional communication features of integrated instant messaging, web conferencing, video chats, and Voice over IP. These systems are expandable in their capabilities. CmpyA has taken advantage of this to provide a variety of messaging capabilities tied with databases, which provide change management, source control, and deployment.

The team members have email, which is used extensively. The email system allows one to schedule meetings using the calendars of the intended attendees. The system will automatically add a meeting to a person's calendar if a person responds "accept" to an email notification to join the meeting. Work is also communicated in this manner as notification messages, with links to the requisite information for the assignment. *Sametime* provides instant messaging capabilities, which are extensively used to obtain real-time information as well as ensuring the request does not get lost in the volumes of email. It was stated in the interviews that IM'ing is a major form of exchanging information because of its immediacy.

Telephone conferencing is used for team wide meetings and involves the use of telephone conference rooms, which are located in a variety of locations throughout each of the company's offices. The rooms have a speakerphone located in the center of a conference table. The phone system supports multiple individuals calling in from different sites. The telephone conferences are quite frequent, often daily, and are used to update members on progress status and other related matters. It was commented that

there were not enough conference rooms; inferring a temporal aspect, in that the rooms are all booked for afternoon meetings. These rooms are rarely used for face-to-face meetings.

Scheduled face-to-face meetings are common between one level of management and higher levels. Other face-to-face meetings are of the walk-in type where co-located people go to the person they wish to speak to and ask if they have a moment.

To summarize, this is a highly technical firm, which has organized its globalization around supporting commercial software to provide them with the tools they need to collaborate at a distance. The company has also put into place a set of systems and procedures, which they feel provide them with a competitive edge. However they did not discuss their business processes with the researchers.

5.7 Data Analysis

Commencing in August 2007 the survey results were downloaded by a researcher as a comma separated variable file and then imported into an MS Excel worksheet and organized into a format acceptable to SPSS v13 and SmartPLS™ for analysis. To facilitate this analysis, transformations were performed on various data elements.

- Gender: Female = 1, Male = 2.
- Age: less than 25 = 1
 26-35 = 2
 36-45 = 3
 46-60 = 4
 Over 60 = 5

Several items needed to be reverse coded, which was performed for both the local item and the corresponding remote item:

- Item Future Orientation 01
- Item Future Orientation 03
- Item Individual Communication Quality 03
- Item Individual Trust 01
- Item Individual Trust 02

Missing values were replaced by the mean for that item to allow gaps to be calculated (Cohen & Cohen, 1983). This also allowed the PLS model to be run as it does not work with missing values.

Each construct is comprised of three items with the gap for each item calculated, using item FO1 for illustration, as:

$$FO1 = \text{absolute value of } (FO1\text{-Local} - FO1\text{-Remote}).$$

The result is a numeric value, which represents the difference between the individual's perception of their local value and their perception of the remote value. The gap for each temporal item was calculated similarly. These item gap values become input to the PLS model.

An additional variable was created to represent the temporal distance between team locations; Ireland–USA: six, Ireland-India: six, Ireland-China: six, China-USA: 12, India-USA: 12, China-India: zero.

5.8 Summary

This Chapter presented an overview of the research: the research hypotheses, a description of the survey population, how the survey was conducted and demographic summaries of the respondents. Chapter 6, presents the follow-up interviews performed, which then is followed by the chapter on the data analysis, Chapter 7.

CHAPTER 6

INTERVIEWS

This Chapter presents summaries of the interviews held with selected company members who had previously completed the survey. CmpyA arranged for the interviews by requesting, through a personal solicitation email, individuals who had completed the survey to volunteer for follow-up interviews. Due to the locations of the interviewees, some of the interviews were held face-to-face by a researcher going to their location, Ireland, while others were accomplished via telephone or Skype® Voice over IP connections.

The purpose of the interviews was to supplement the survey data and gather information that may help in the interpretation of such data. The interview guide for these interviews is presented in Appendix F, with statements from these interviewees identified as interviewee 1 to 13. After the initial interviews were completed, a second, smaller set of individuals were selected for a second interview that focused specifically on temporal perceptions. The interview guide for these interviews is presented in Appendix G. Statements from this second set of interviews are identified as Interviewee 2-X in Table 7.1. The second set of interviews consisted of two interviewees from the USA, identified as 2-1, 2-2, and two interviewees from China, identified as 2-3, 2-4.

This chapter first presents statements made during the interviews that support or do not support the hypotheses. A discussion of these statements then follows along with their implications for this research.

6.1 Interview Background

The individuals interviewed normally work in the United States, Ireland, China, and India. Due to their time constraints, the interviews were limited to approximately 30 minutes. Of the 13 initial interviews, two were from the United States, seven from Ireland, three from China, and one from India. The USA and China interviews were held by telephone while the Ireland interviews were face-to-face.

The interviewees were people who worked on a project composed of developers, testers, and configuration specialists. The project is best described as an application enhancement of an existing application to which additional features or bug fixes are being made.

Table 6.1 Statements from Interviews by Research Question

| Research Question | Supported | |
|--|-----------|---|
| | Y | N |
| RQ1 - Do differences in cultural time perceptions among members of a virtual team impact individual communication quality? | | |
| Interviewee 5: | | |
| In system testing cultural issues just do not come up Interpretation: The problem does not exist | | N |
| Interviewee 2-2 | | |
| Of course, there are cultural differences but the employees here are very professional and we work to make sure those are not an issue. The major problem is the consultants at the different locations Interpretation: Exists but they work around it. | | N |
| I found there were less issues working with the Chinese than working with the Indians. Interpretation: There were time problems in working with India, but since the work with them has been cancelled, we now have no issues. | Y | |
| Interviewee 2-3 | | |
| Everyone is very professional and does their job. They always let others know if things are running late. Interpretation: There is no problem because of corporate culture being foremost. | | N |
| Most communication is done through the leads who have daily meetings. | | N |

| | | |
|--|---|---|
| Often the meetings are done at 8AM in USA. But some are done at 8AM China. Usually based on who has the most people that must attend Interpretation: There is no problem because of the way time planning is handled | | |
| How people deal with schedules is individual not cultural. I prefer to have a very detailed schedule and work to that schedule. Others do not, some prefer to make their own estimates. Interpretation: It is not a cultural issue as much as an issue of individual preferences. | | N |
| Everyone is always on time for meetings, often the USA people are a little early Interpretation: No problem because everyone is on time. | | N |
| | | |
| RQ2: Do differences in cultural time perceptions among members of a virtual team impact Individual Trust? | | |
| Interviewee 5: | | |
| Felt that in system testing cultural issues just did not come up Interpretation: The problem does not exist. | | N |
| | | |
| RQ3: Does Temporal Distance impact Individual Temporal Disruption? | | |
| Interviewee 1: | | |
| When we start a project we have a kick-off meeting... being dispersed, we have to find a common time that we can use for this meeting and that is difficult. This means people have to start early or stay late. Interpretation: One group of people is adjusting their daily schedule to fit the meeting times of the other group. Therefore this is a disruption. | Y | |
| Interviewee 3: | | |
| He starts at 7:00AM and leaves the building usually at 6:00 PM and if need be he can get on the computer again when gets home but normally does not because his wife objects. Interpretation: The disruption is that his wife objects to his working at home. | Y | |
| He said he does not mind the hours and does not have kids so there is no problem there. Interpretation: It has no impact on his life at this time. | | N |
| Interviewee 8: | | |
| She stated that time zones were good in some respects because it allowed you to get things done before the remote people come in. This allows her time to come up with any questions that she has. Interpretation: Cannot consider it disruptive if the person feels it is good. The person has turned a potential disruption into a benefit. | | N |
| Broadband access has helped them do their job without staying at work. This is important to her, due to personal reasons. She has to leave at 4:30 PM. With broadband, she can get online at home if she has to. Interpretation: Not disruptive because she has the technology to overcome the problem of access. | | N |

| | | |
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| Interviewee 9: | | |
| In the previous project, they had daily meetings at 7:00 AM (USA time) which she stated was the most convenient time for all parties. This meant that the Ireland team was meeting at 1:00 PM and the India at 7:00 PM. She stated that she got up a little earlier and the India team stayed a little later. This did not appear to be a problem for them. Interpretation: It is not affecting her, therefore her perception is that it is not affecting the remote people. | | N |
| Interviewee 10: | | |
| They would handle time zone differences by alternating which team, China or India, will come in early or stay late. It was not a problem. Interpretation: Developed a work around to alleviate the impact. | | N |
| The issue of time zones presents itself when there is a technical issue that needs to be discussed. This requires that the person in the USA arrive early while Individual 10 stays late so they can talk. Interpretation: Both are affected because they have to change their schedule. | Y | |
| Interviewee 11: | | |
| They do use IM frequently, waiting for the individuals they wish to talk to, to appear online and then pinging them with their questions. Aside: Given that there is a 12 hour time difference between China and the USA, this would require people to stay late at work. Interpretation: People are staying late to make contact. | Y | |
| Interviewee 12: | | |
| This individual felt there was a cultural difference with the USA in how one tolerates overtime. To him the USA does not tolerate it well and will complain about it. Interpretation: This person said they thought there was a difference in tolerating overtime. Overtime implies a temporal disruption because one is changing their schedule to accomplish the task or event. | Y | |
| He also felt that to make this project work someone needs to work overtime and stated that his family is now starting to complain about the amount of overtime and that it was disrupting his sleep. Interpretation: A family complaint and sleep disruption, by implication is a temporal disruption. | Y | |
| He commented that the Koreans and Japanese appear to work a lot of overtime because they always seem to be online, it is as if they work 24 hours and have no personal life. Interpretation: Appears to this person that they are always working. Implies he sees a disruption even if the Koreans and Japanese do not appear to see such a disruption. | Y | |
| He stated that he felt working overtime increases trust because it can be seen like you are working hard. Interpretation: Implies that overtime is disruptive but there is a benefit to doing it | Y | |
| The individual stated that they, the Chinese part of the team, worked very hard on the project because they wanted to become experts and then 'own' | Y | |

| | | |
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| the product. This would allow them to control the work on future releases. Interpretation: Implies that overtime is disruptive but there is a benefit to doing it | | |
| Interviewee 2-2 | | |
| We found out when we went to China that they were not telling us of the problems caused by them staying late. Often they have no way of getting home, or they are bicycling in the dark. In fact, there were times where they stayed and slept at the office because they could not get home. Interpretation: If a person has difficulty getting home or even sleeps in the office this is a disruption. | Y | |
| It appears to me that upper management does not know about this though I suspect that they do not want to know about it. Interpretation: Person implies that the problem exists but is being ignored. | Y | |
| | | |
| RQ4: Does Individual Communication Quality impact Individual Satisfaction? | | |
| Interviewee 1: | | |
| People personalize their IM with a picture and that gives a feeling of knowing that person. Interpretation: Knowing a person gives a sense of connection and increases the sense of satisfaction. | Y | |
| They tend to be waiting for you to log in and as soon as they see you are on, they are IM'ing you. Interpretation: This is a negative impact in that the person is expressing a complaint. | Y | |
| Interviewee 3: | | |
| He has not met any of the remote members that he works with, but feels that he knows them because of the personalization of the IM software. Stated that this makes a difference, that it is a little more personal and that is a positive feature. Interpretation: Person states the effect is positive. | Y | |
| Interviewee 4: | | |
| This results in them having to negotiate the relationship remotely. It is hard to understand cultures remotely and this could be frustrating and damaging to those relationships. Interpretation: Negative impact because of expression of frustration and damage to relationships. | Y | |
| Interviewee 5: | | |
| He stated that he has not met any of the remote people but knows what they look like due to personalization of IM. Stated that you form an idea as to what they are like but sometimes they are different. Interpretation: He is speaking about the need to connect whatever way is necessary to form a relationship, and that features of the communication tool helped. | Y | |
| Communication fell into a pattern of getting your testing done before the developers in the USA came on at 2:00 PM so you could ask any questions | Y | |

| | | |
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| that you may have. The biggest problem, of course, was that they were not available until 2:00 PM. Interpretation: Person clearly states that the limitation to the hours available for communication is a problem, which made him unhappy. | | |
| Interviewee 6: | | |
| Communications issues were related to the remote teams having different aspirations and not being ready for those aspirations. Accents are difficult but manageable if people would be more sensitive. Interpretation: This one is borderline in that the person is expressing a generalized complaint about accents, however, given that this created dissatisfaction in the interviewee, it was judged as a yes. | Y | |
| He stated that not understanding the other cultures could cause communication and coordination problems. A lack of understanding about the China team's attitudes caused a bit of friction that both sides were trying hard to make sure did not happen again. Interpretation: The person clearly states that cultural understanding has an impact. | Y | |
| Interviewee 7: | | |
| He found for his tasks that the written word is easier because of the difficulty of accents. Interpretation: A person wishing for things to be in writing is likely having a problem of communication. | Y | |
| Interviewee 8: | | |
| She stated communication is not a problem but she knows that she talks too fast and has a thick accent and so figures they, the remote members, may have as much problem understanding her as she does them at times. Interpretation: This is about the difficulty of communicating due to accents. | Y | |
| Interviewee 9: | | |
| Communication issues at first were based around the fact that everyone spoke very fast and with the different accents, it was difficult to understand everything being said. In addition, they had a tendency to start talking over each other. Interpretation: This is about the difficulty of communicating due to accents and other communication behavior. | Y | |
| She worked through teleconference calls and then follow-up e-mails at the end of the day so that both (leads) knew what the status of everything was. The emails were an important key to ensuring the communication worked. IM was used during the day for quick questions. Interpretation: The methods used allowed this person to keep track of statuses that were important to her. There is an assumption that if these methods were not available she would not be able to track what was important, thereby decreasing satisfaction. | Y | |
| Interviewee 2-3 | | |
| Some teams have very late meetings, 10 or 11PM China time. People have to stay very late then and may stay at the office. Interpretation: Assumption that having to stay late and potentially overnight | Y | |

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| to accomplish communication will have a negative impact on satisfaction. | | |
| Overtime and late meetings does effect my life but I do not mind Interpretation: Clearly states its not a problem or issue | | N |
| Overtime is sometimes necessary because everything is so interrelated if one side does not meet the schedule, it affects everyone else. We try very hard to meet the deadlines. Interpretation: Assumption that overtime is an issue and will impact satisfaction negatively. | Y | |
| How people handle overtime depends on their boss, some bosses require people to work overtime. Other people who have a family may just leave, saying they will pick it up tomorrow. Most though will work overtime. Interpretation: The assumption is that different leaders view overtime differently, thereby impacting employees, based upon leadership's view of it. | Y | |
| Interviewee 2-3 | | |
| People in other teams are understanding of not meeting deadlines if it is for one of two reasons: 1 – severe illness, self, or family and 2 – crisis in the project that needs to be addressed. We are professionals and trying to do our jobs Interpretation: Statement of professionalism appears to override satisfaction issue. | | N |
| | | |
| RQ5: Does Individual Temporal Disruption impact Individual Satisfaction? | | |
| Interviewee 9: | | |
| This individual uses the 'do not disturb' feature of the IM system to control her access by others. Interpretation: This is the result of the remote locations waiting on IM until the person logs in and then sending messages. The person is using technology to control access to herself, preventing the disruption that would otherwise happen. | | N |
| Interviewee 2-3 | | |
| If the American team does not meet their deadlines, we are not very happy. Interpretation: This is an assumption that if the American team does not meet their deadlines this will result in overtime for the remote team, thereby negatively affecting satisfaction for the remote team. | Y | |
| Overtime is for all no matter what level and the US team puts in overtime as much as we do. (implied fairness) Interpretation: Implies that overtime, and therefore disruption, is not a problem | | N |
| People try to work only eight hours but work the overtime because if they don't, and everyone else is, it does not look good. Interpretation: If you do not look good, there will be an impact most likely during your review. A negative review would affect satisfaction. | | N |
| | | |
| RQ6: Does Individual Communication Quality impact Individual Trust? | | |

| | | |
|--|---|--|
| Interviewee 1 | | |
| <p>It was easier to establish relationships when you had the face-to-face meetings because you got to know the people quicker.</p> <p>Interpretation: Getting to know people quicker allows trust to be established quicker, through building relationships.</p> | Y | |
| <p>It is difficult to establish relations without face-to-face, it can be done but takes longer to build the relation.</p> <p>Interpretation: Getting to know people quicker allows trust to be established quicker, through building relationships.</p> | Y | |
| <p>This individual preferred IM and e-mail to voice because of difficulties in communicating due to accents and because for some of the remote teams, English is not their native language. The person stated that you were not sure that they understood what you said and so he tried to compensate by talking a bit slower and asking them to repeat back what he said, while blaming the need on bad connections.</p> <p>Interpretation: The problems of voice communication results in ambiguity, if you are not sure you are understood, you cannot trust that they will do what needs to be done.</p> | Y | |
| Interviewee 2: | | |
| <p>At first, he found being the lead of a remote team difficult because he could not put a face on the people. He also found that he was usually dealing with just one person and so did not feel that he was in touch with the rest of the team. The person he was dealing with was more comfortable in English than the others.</p> <p>Interpretation: Not being able to communicate easily with the people results in feeling that you do not know them, leading to uncertainty of trust.</p> | Y | |
| <p>Another factor affecting communication is that the company always had meetings at the beginning and the end of a project, where everyone was present. This allowed people to get to know each other and you felt you could trust them. This was important if you did not have any experience working with them. The face-to-face meetings helped because trust takes time and these meetings speeded that time up.</p> <p>Interpretation: The person gave this as an explanation as to the difficulties involved with building relation and with that, trust.</p> | Y | |
| <p>This not being able to trust them at first and being dependent on phone communication causes problems, because normally communication has several layers that you do not have on the phone. Because of this, he has to monitor them very closely to ensure that the tests are being done and done correctly.</p> <p>Interpretation: Phone communication is limiting, thereby requiring close monitoring.</p> | Y | |
| Interviewee 3: | | |
| <p>In terms of the remote teams, he said they had to work hard to maintain a presence with the upper managers.</p> <p>Since they are remote to the true manager, his evaluation of their performance (the individual's guess) is going to be based on their adherence</p> | Y | |

| | | |
|---|---|---|
| to schedules and reports. Interpretation: Not being co-located with the manager results in having to work differently so the manager has a positive view of you. | | |
| He stated that every time you bring on a new team or new person you have problems and sometimes language is one of them. It usually is not serious but you have to concentrate more. Interpretation: The implication was that this is expected and therefore handled. | | N |
| Communication was affected by the lack of face-to-face because you had to negotiate relationships on a remote basis. This was harder and took longer. Interpretation: Getting to know people quicker allows trust to be established quicker. This process is made difficult by being remote. | Y | |
| Interviewee 4: | | |
| (Cost considerations) results in them having to negotiate the relationship remotely. It is hard to understand cultures remotely and this could be frustrating and damaging to those relationships. Interpretation: Getting to know people quicker allows trust to be established quicker. This process is made difficult by being remote. | Y | |
| For example, he said that in India, there was more of a hierarchy and there was a need to focus communication to the right person. Information did not flow that easily from development, to test, and back. Interpretation: The culture authority structure restricted to whom you could talk and get information. Since information is being filtered, it may not be accurate and trusted. | Y | |
| He said that it highlighted our lack of understanding about their culture and that it needed someone with the respect of both sides to act as a go-between. The key is being very clear on how things are going to work, especially reporting. Interpretation: The last sentence is about communication and implies trust building. | Y | |
| Interviewee 7: | | |
| It is hard, he said to build relationships remotely. Building relationships had been easier in that there used to be more travel and that helped because it put a face to the name. Interpretation: Getting to know people face-to-face allows trust to be established quicker. This process is made difficult by being remote. | Y | |
| Interviewee 10: | | |
| The individual stated that the major problem is trying to figure out what the other person is thinking because they may not understand the background of what is being discussed. Interpretation: If one is not sure of the others thoughts or understanding, then one cannot trust them to do what needs to be done. This, then, is a communication issue. | Y | |
| | | |

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|---|--|---|
| RQ7: Does Individual Trust impact Individual Satisfaction? | | |
| <p>With respect to trusting the remote team, she stated that it really isn't an option. You just have to assume that they are doing it correctly because you have too much to do. If you found something that was not done correctly, one would take it up with the lead.</p> <p>Interpretation: While the interviewee stated this with a sigh, there is no direct statement of trust impacting satisfaction.</p> | | N |

6.2 Discussion of the Interviews

Some additional comments were made during the interviews that did not readily fall into the research question categories, but are germane to the overall topic, and are now presented.

Two of the Chinese interviewees mentioned that they felt working that hard would be rewarded in the future by gaining ownership of a project. They thought that it was only right that they be the ones displaced because they were new to the project; especially the Chinese teams who were predominately new employees, and very recent additions to the software testing teams.

Another individual commented that those in the Asian offices worked very long hours, maybe 12 hours or more. It appeared to him that they wanted to prove themselves, which he viewed as good. In conversations with management at the beginning of the research effort, it was mentioned, "India was a problem... that they just did not seem to get it. Management felt that team members needed to work overtime to get things done so that the deadline would be met". One of the managers specifically said that the Indians just did not seem to have a sense of urgency.

One interviewee mentioned that cultures caused coordination problems and gave the example that one could not talk to Israel easily because of their having a day off on Friday and then working on Sunday, limiting the practical week to four days.

Early in the course of the research, it was mentioned that we would not have access to the India team, as they were no longer part of the project. It was implied that this was due to all the problems management in Ireland had had with them. During the course of these conversations, it was stated that the India team felt that they were ready for more advanced work and responsibility but that the people in Ireland did not feel this way. Another manager in Ireland confirmed this opinion during the course of an interview, without being asked by the interviewer. Additional support for this came from one of the USA interviewees. The research questions and their relevant interview statements are discussed next.

From Table 6.1 it is obvious that some of the research questions were supported while others were not supported at all by the interviews. For instance, RQ1 is concerned with whether cultural differences in temporal perceptions affect communication quality. One statement made indicated that in system testing, cultural issues just do not come up; while another statement indicated that there were cultural issues, but that the employees worked very hard to overcome them. In general, the issues that people mentioned concerning communication problems were not differences in temporal perception but issues with English as a second language; that people found it difficult to understand over telephonic connections. They noted that text-based tools were employed to support the verbal exchanges.

The supplemental interviews from the USA and one from China presents evidence that there is a professional culture among these software teams. Interviewees commented that all employees were professionals and did their job; that this is just how it is was done despite the complications a dispersed team created. The concept of a professional culture overriding local/national cultures is interesting and supports the discussion in Carmel about a professional culture existing in Software Development (Carmel, 1999). From the interview comments, this is a possible explanation of why the interviews did not support cultural differences in temporal perception affecting Individual Communication Quality.

RQ2, which is concerned with temporal perceptions and trust, had similar statements as with RQ1. The statements supported some effects due to cultural differences but these had no relationship to temporal perceptions and trust; and therefore, there is no support for cultural differences in temporal perception affecting Individual Trust.

RQ3, which is concerned with differences in temporal distance affecting Individual Temporal Disruption, has many statements, which support this concept. Most of these statements are the result of the need for coordination of meetings and being able to ask/answer questions. In some cases, the person stated that it did not impact them because they had no children or that it was good because it allowed work to be done during the time when there was no overlap.

There was some awareness that in dealing with places such as China and India the time zone difference meant that people were working after normal business hours. One interviewee mentioned alternating meeting times so that it would not always fall on the

Chinese to remain after hours. A supplemental interviewee from the USA mentioned finding out that after hours meetings were potentially very disruptive, as the people in some countries had no way of getting home. The transportation systems in China apparently did not run after a certain time, and in some cases, people stayed overnight at the office. This person also mentioned that the team members in China did not mention this but that it was discovered when USA members went to China.

Comments from one Chinese supplemental interview tend to support the idea that temporal distance is disruptive, but that people accept it as part of their job from the concept of being a professional. Their tasks are highly interrelated and so they feel that they must work during non-work hours to get the tasks done on time. The interviews, therefore, support this research question; differences in temporal distance *do* affect individual temporal disruption.

RQ4 examined the idea that the quality of individual communication will affect an individual's satisfaction. During the interviews, there were statements about personalization of IM being positive because it established a feeling of "knowing" the remote person. They also noted that accents made communication difficult but could be overcome by being sensitive to this problem. Accents and how rapidly people spoke were the most common comments; however, statements saying that it required work to make communication succeed usually followed them.

An additional observation tied temporal distance to communication and satisfaction; stating communication fell into a pattern of getting testing done before the developers in the USA came online so that questions would be ready when they came

online at 2:00 PM. The problem was that they came online at 2:00 PM, (implying that it would have been beneficial if they were on earlier).

In the software industry, much communication revolves around the interaction of the various participants of the development project. Testers need to talk to development, configuration people need to talk to testers, and so on. The ability to talk to the person you need, when you need him or her can make the task proceed more efficiently and possibly affect satisfaction. The inability to communicate with the people you need, can be frustrating and lower one's sense of satisfaction. Overall, the interview statements support the idea that the quality of one's communication was problematic but they did not determine how this affected one's satisfaction.

RQ5 examined the idea that temporal disruption will affect one's satisfaction. This question is based on the concept of social and private time and that violations of this private time are resented (Zerubavel, 1976, 1979). There were limited statements made by interviewee's concerning temporal disruption but this, in part, may be due to limited interviews with people who were temporally displaced by more than six hours. These interviews were with people 12 hours away from people in the USA. Of three such people, only one stated that they had worked with people in the USA, and that person mentioned disruption of their personal life.

As with RQ3, construct RQ5 receives some support from a supplemental interview with a USA team member who mentions that people in China had the difficulty of not being able to get home and had to stay overnight in the office. It can be assumed that the lack of transportation and possibly the need to stay at the office due to the lack of transportation, would affect one's satisfaction, but other factors could also be operational.

It is also apparent that many of these factors are inter-related. While discussing RQ1 and RQ2 it was mentioned that multiple members of the Chinese team displayed a future oriented attitude. Their acceptance of temporal disruption for a future benefit could overcome any dissatisfaction they may otherwise feel. It is important to note that this acceptance is predicated on a realization of that future benefit. If the benefit did not materialize within a reasonable time, this could result in feelings of disruption, which, in turn, would affect satisfaction. In any case, RQ5 was not shown to be supported as the interviewees expressed little dissatisfaction with their work conditions.

RQ6 examined the idea that the quality of one's communication will affect one's trust of others. A few statements provide support for this idea in that a comparison was made of remote communication by IM, email, voice, etc. versus face-to-face communication. Face-to-face communication was considered better because it allowed one to establish relationships quicker. It allowed a remote team member to discover what a person knew and did not know, and it presented a more complete picture of what one did. Management only knew about remote team members by reports which spoke of deadlines and what work was done. The relationship was impersonal, if it could be considered a relationship at all.

Another factor involved in remote communication was the understanding of how communication had to be routed. This requires an understanding of the cultural hierarchy of the remote team. For example, did one talk to the team lead as opposed to talking directly to a team member? In trying to establish remote relationships, an understanding of the hierarchy would mean that one first established a relationship with the local team

lead, and then that person facilitated building relationships with the other remote members. It was mentioned that this process took time and could be frustrating.

The thrust of the interviews was that relationships were important for trust, however the dependence on remote communication made establishing relationships difficult, not impossible, but difficult. The interviews, therefore, provide slight support for the hypothesis that if individual communication quality is low this trust building can be severely impacted.

The final research question, RQ7 examined the idea that individual trust will affect individual satisfaction. While there was little in the interviews, which supported this idea, there was nothing that did not support it. One statement indicated that one did not have a choice, one had to trust the remote team until one found out differently. Other interviewees said that company employees were professionals and that this was what made things work discounting any impact on work satisfaction.

Overall, there was a sense that being a professional in software development leads to an expectation of certain behavior and that this behavior was exhibited. Thus, one did not complain about the dispersed team situation, one made it work. In this then, it is concluded that the interviews do not support this research question.

6.3 Summary of the Interviews

From each interview, it was possible to extract some salient points. In this section, a summary of the common points is presented.

- Large differences in time zones require people to change their schedules and work overtime.
- Overtime or changes in work schedules can affect personal life.

- Languages and accents are difficult, therefore it was suggested by interviewees that training in languages and cultures is important.

There is much in the interviews supporting the idea of people trying to make dispersed collaboration work, but there was also much that repeated what has been discussed in the literature: i.e., that working in dispersed teams is difficult and requires individuals to want to make it work. In fact, the challenge may be interesting and increase a team member's satisfaction.

There is also something additional underlying the interviews, which is the relationship of the various locations to the USA. The USA is the location of the main office. One Chinese interviewee said there was prestige in working directly with the USA. The other locations change their schedules to accommodate them, in some cases through large changes. Although there were only two USA interviews initially, they did hint at a lack of awareness of the disruption caused to India and China by scheduled meetings, e.g. one interviewee stated that 7:00AM USA time was the most convenient time for everyone. A supplemental interviewee was the first to discuss the disruption by aforementioned transportation difficulties. She also stated that there appeared to be an unawareness of this impact at the company.

The USA interviewees scheduled meetings at 7:00AM, earlier than they would normally start their day, but they were able to attend these meetings from their homes. Those in Ireland were able to attend during their workday, but those in India and China could not do this, having to stay late at the office. There was no mention of how long these meetings were, but the assumption is that they were at least one hour long. The meeting then starts at 7:00AM USA time, which is 1:00PM Irish time, but 7:00PM Indian

and Chinese time. This means that for those in India and China the meeting lasts until 8:00PM and then they can go home. This is three hours over a “normal” workday. There was no mention of a sliding start of the day for those in India and China, which implies that they may be working an 11-hour day.

Second, in both the American and Irish interviews, there were statements that India was a problem, as they were not up to the technical level they thought they were and so were pushing for responsibilities they were not ready to assume. The research experienced a lack of respondents and interviewees from India so this idea cannot be explored at this time. At most, there can only be speculation. The management who arranged access to the respondents had said that India was a problem, in that they do not have the sense of urgency that the Irish have. The management also stated that India constantly needed much handholding, as they did not possess the technical skills of their Irish and American counterparts.

Ireland is in a position of being a bridge between the USA and the rest of the world (Holmström, Ó Conchúir, Ågerfalk, & Fitzgerald, 2006). Geographically, few locations are in a position to serve in the same capacity. The statement above that those in India thought they were ready for more responsibility and that management in Ireland did not think so, could be management unconsciously trying to protect their position as the bridge or it could also be a real observation. It is also possible that their communication with India is poor, generating the negative consequences. A much larger number of respondents from India and/or more interviews with Indian team members may shed light on this issue. As such, one aspect of future research will be working with a company, which can provide access to more individuals from India, which may answer

this question. Whether or not these observations are true, it does suggest that managing peoples' expectations is important, especially in the context of management being in a different location than the individuals.

As mentioned during the interviews, the impression that a project manager has about local members may be gained by direct observation, but the impression of remote team members is based on their performance, compared to schedules and standards.

Other observations:

- From the interviews, the Chinese were very future oriented – this led them to accept the difficulties with working with the USA, but this may not work for a long time.
- There was jealousy of the American position in being able to work at home and a feeling that the Americans were less willing to adjust to times which were not convenient for them. This jealousy may affect trust due to a sense of unfairness of the situation. This appeared to be true for Ireland and for China.
- One cultural item not captured was what constitutes working hard? There was a sense that the Chinese and Irish viewed the Americans as lazy. Working from home was suspect, especially to the Chinese sense of working long, not necessarily productive, hours at work. There was no concept of work being done at home.
- There was a difference in what constitutes important events. In India, the birthday of a son overshadows any work or deadline. This is an example of culturally based temporal norms taking over and potentially leading to a lack of trust if not understood.
- People really were trying to make the teams work but underlying tensions existed – differences were noted, but the people were discounting these differences.

Overall, the interviews point to individuals experiencing possible temporal disruptions and there being a difference in attitude towards such disruption. The interviews also suggest that this may be due to a difference in Future Orientation, and possibly Lateness Attitude and Sense of Urgency, although there was little indication of any display of Temporal Rigidity. With the background knowledge of the interviews, the survey data will be examined next.

CHAPTER 7

DATA ANALYSIS

7.1 Introduction

The research model and hypotheses propose that relationships exist between the temporal constructs and Individual Communication Quality and Individual Trust. Additionally, the model proposes that Temporal Distance will affect Individual Temporal Disruption. In turn, Individual Communication Quality will affect Individual Satisfaction and Individual Trust, while Individual Temporal Disruption will affect Individual Satisfaction.

The purpose of this research is to test for those relations using appropriate statistical tests on the data, thereby determining the significance of these relationships. In order to accomplish this task the raw data was coded to facilitate such analysis. To analyze the gaps a new variable was created for each temporal perception construct that represents the gap in the individual's perception of the local team's belief versus their perception of the belief of the remote teams' belief. Once the transformations were performed, data analysis commenced.

To summarize, the survey was administered to two different populations: the first was comprised of individuals from a global software company, CmpyA, which uses globally dispersed development teams, and the second was comprised of students involved in course based team projects, which are culturally diverse, but not geographically dispersed.

To analyze the data, this research used a PLS modeling software, SmartPLS™ v2.0.M3 (Ringle, Wende, & Will, 2007). As mentioned, the number of students respondents was too low to be analyzed by the PLS software, therefore all discussion pertains to the CmpyA respondents.

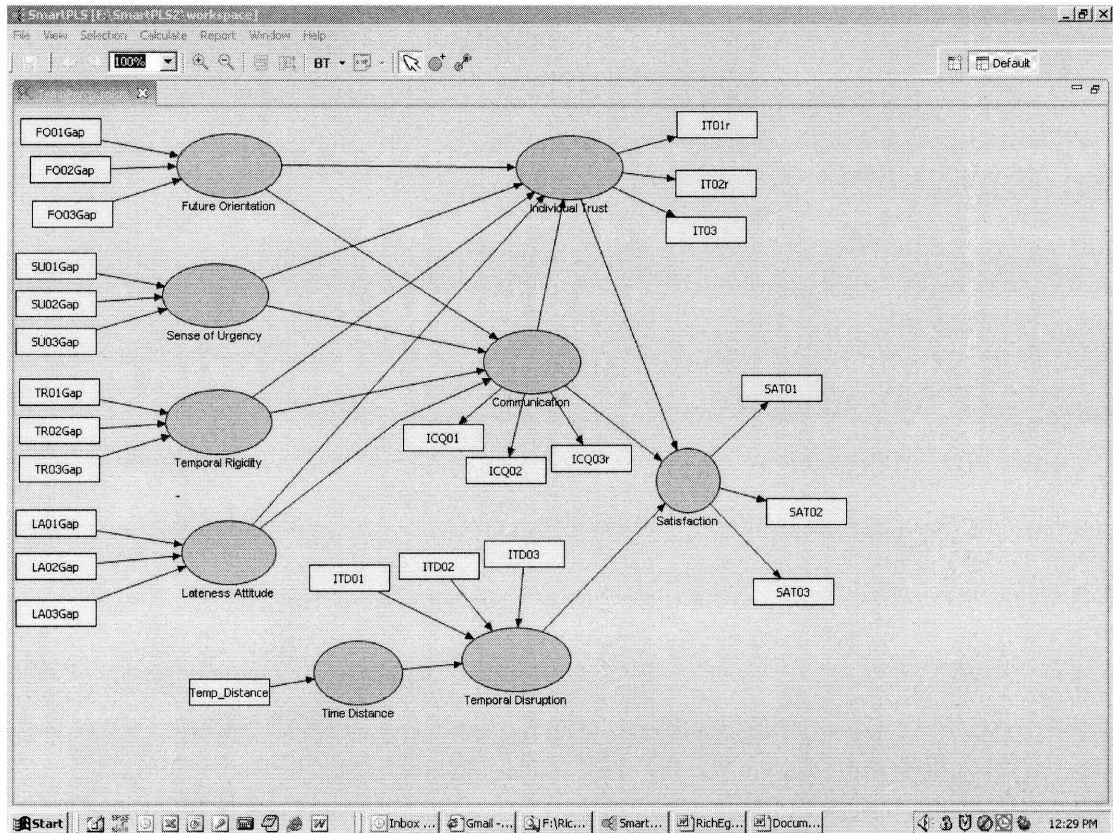


Figure 7.1 PLS Model.

7.2 Reflective and Formative Constructs

The constructs in this research are divided into those which are reflective and those which are formative. A discussion of each and its meaning for this research effort are presented next.

7.2.1 Reflective Constructs

The constructs of Individual Communication Quality, Individual Trust, and Individual Satisfaction are reflective constructs, which are constructs whose items are selected from a universe of possible questions considered interchangeable. In the use of these items, the validity of their measurement is important, therefore, the extent that they actually measure the concept must be addressed.

In this research, several avenues were followed to address the validity of the measures. The first avenue involved selecting measures found in the literature and from existing validated instruments. Many of the questions used are from such surveys, therefore, these items can be considered valid and reliable. Next, the research team, which consisted of two professors and two Ph.D. students, reviewed each question for face validity. The professors had extensive experience in the design and execution of research, including the design of survey instruments. The third avenue was to have three other Ph.D. students and three industry experts take the survey and then be interviewed on their interpretation of the questions, thus improving the face and content validity of the questions. The measures were further validated through a card sorting procedure (Moore & Benbasat, 1991).

As the survey uses self-report items for these constructs, it is possible that the respondents will respond in a more socially desirable manner or in a way, which would put themselves, or their team, in a more positive light. Detailed instructions were provided in the course of the survey to assure respondents that their confidentiality and privacy would not be violated. Additionally, it was made clear that CmpyA would only see aggregated data not individual data. Further ensuring confidentiality, no personal identifying information was gathered.

When using reflective measures in a model, all the measures represent the underlying construct, therefore they are expected to be correlated. If there are high correlations between the items, the items are then interchangeable and dropping an item should not affect the meaning of the construct (Jarvis, MacKenzie, & Podsakoff, 2003; MacKenzie, Podsakoff, & Jarvis, 2005). Reflective construct measurements are validated via standard statistical methods such as Cronbach's Alpha and factor analysis. The validation for these constructs was conducted using SmartPLS™, with the results shown in Table 7.1.

Table 7.1 Reflective Construct Validation Results for CmpyA Data

| | AVE | Communality | Composite Reliability | Cronbach's Alpha |
|----------------------------------|------|-------------|-----------------------|------------------|
| Individual Communication Quality | 0.50 | 0.49 | 0.73 | 0.46 |
| Individual Satisfaction | 0.49 | 0.50 | 0.74 | 0.52 |
| Individual Trust | 0.53 | 0.53 | 0.77 | 0.59 |

The three constructs have alphas less than 0.7, a value that is normally considered minimum for reliability. These low values may be due to there being only three items per construct. Scales which have less than ten items per construct are known to present problems resulting in a low Alpha value (Cortina, 1993). There also have been questions

about the validity of the alphas in that the calculation uses the same weight for all indicators (T. A. Brown, 2006; Chin, 1998). It is suggested that instead the composite reliability of the construct be used and from Table 7.1 it can be seen that the composites are above the 0.7 level. From this, it was concluded that the constructs are reliable. Additionally, it can be seen that the convergent validity and the communality are at the threshold of 0.5 for these constructs.

Table 7.2 Reflective Construct Cross Loadings for CmpyA Data

| | Communication Quality | Satisfaction | Trust |
|-------------------------------------|-----------------------|--------------|-------------|
| Individual Communication Quality 01 | 0.71 | 0.32 | 0.23 |
| Individual Communication Quality 02 | 0.84 | 0.40 | 0.39 |
| Individual Communication Quality 03 | 0.49 | 0.40 | 0.23 |
| Individual Satisfaction 01 | 0.06 | 0.47 | 0.05 |
| Individual Satisfaction 02 | 0.42 | 0.84 | 0.16 |
| Individual Satisfaction 03 | 0.24 | 0.75 | 0.17 |
| Individual Trust 01 | 0.24 | 0.13 | 0.74 |
| Individual Trust 02 | 0.25 | 0.02 | 0.56 |
| Individual Trust 03 | 0.47 | 0.30 | 0.85 |

Table 7.2 presents the cross loadings from which it can be seen that each item loads primarily on its own construct and not as well on the other constructs, demonstrating discriminant validity of the constructs. The other constructs in this research are formative constructs, which are discussed next.

7.2.2 Formative Constructs

The formative constructs in the research are Future Orientation, Lateness Attitude, Sense of Urgency, Temporal Rigidity and Individual Temporal Disruption. These are constructs where the items influence the construct, i.e., the measures cause the construct and in turn, the construct is derived from the measure. In formative constructs individual

items are not expected to be highly correlated nor are they required to be highly correlated (MacKenzie et al., 2005).

Due to this lack of expectation, formative constructs cannot be validated using methods which rely on correlation or covariance, such as Cronbach's Alpha and factor analysis. It has been suggested that only the content validity need be examined for these constructs (Rossiter, 2002). The process followed in their creation assures the content validity of the constructs. This process involved the researchers examining them for face validity, having others review them, including area experts and management from CmpyA, and through a card sorting procedure, all discussed earlier.

7.3 DESCRIPTIVE STATISTICS

7.3.1 Discussion of the Descriptive Statistics

The following paragraphs present and discuss various descriptive statistics, which were generated, on the CmpyA data. This includes correlations, descriptive statistics, and graphs of the distribution of answers for all constructs.

Table 7.3 Correlations for CmpyA Data

| | Future Orientation | Lateness Attitude | Sense of Urgency | Temporal Rigidity | Individual Comm. Quality | Individual Temporal Disruption | Individual Satisfaction | Individual Trust |
|--------------------------------|--------------------|-------------------|------------------|-------------------|--------------------------|--------------------------------|-------------------------|------------------|
| Future Orientation | 1.0 | | | | | | | |
| Lateness Attitude | 0.422** | 1.00 | | | | | | |
| Sense of Urgency | 0.388** | 0.560** | 1.00 | | | | | |
| Temporal Rigidity | 0.235* | 0.325** | 0.186 | 1.00 | | | | |
| Individual Comm. Quality | -0.213* | -0.245* | -0.243* | -0.164 | 1.00 | | | |
| Individual Temporal Disruption | 0.245* | 0.231* | 0.176 | 0.142 | -0.517** | 1.00 | | |
| Individual Satisfaction | 0.036 | 0.059 | 0.149 | -0.013 | 0.263* | -0.165 | 1.00 | |
| Individual Trust | -0.155 | -0.090 | -0.094 | -0.163 | 0.451** | -0.524** | 0.188 | 1.00 |

* Significant at the 0.05 level, ** significant at the 0.01 level

The descriptive statistics presented next, represent the mean of the three items, which comprise the construct across all respondents across each location. For example, Future Orientation has three items, FO1, FO2, and FO3, which are averaged for each respondent and then averaged again by location when a location analysis is conducted. Missing values were replaced by the mean of the item. In Table 7.4, descriptive statistics are shown for each construct including local, remote, and gap values for the temporal constructs. Histograms were created to allow a visual examination of each variable's distribution.

Table 7.4 Descriptive Statistics for CmpyA Data – Future Orientation

| Location | | Future Orientation Local | FO Remote | FO Gap |
|----------|----------------|--------------------------|-----------|---------|
| Ireland | Mean | 4.2727 | 3.9436 | 1.2236 |
| | N | 22 | 22 | 22 |
| | Std. Deviation | 1.23179 | 0.93119 | 1.24401 |
| | Variance | 1.517 | 0.867 | 1.548 |
| | Kurtosis | 0.713 | 1.892 | 5.952 |
| | Skewness | -0.848 | 0.514 | 2.146 |
| | Minimum | 1.0 | 2.0 | 0.0 |
| | Maximum | 6.00 | 6.50 | 5.50 |
| China | Mean | 4.5326 | 4.6054 | 0.7508 |
| | N | 36 | 36 | 36 |
| | Std. Deviation | 1.09714 | 1.02116 | 0.61876 |
| | Variance | 1.204 | 1.043 | 0.383 |
| | Kurtosis | 0.950 | -0.132 | 0.422 |
| | Skewness | -0.591 | 0.336 | 0.661 |
| | Minimum | 1.50 | 2.50 | 0.00 |
| | Maximum | 6.50 | 7.00 | 2.50 |
| USA | Mean | 4.9800 | 4.2954 | 1.0446 |
| | N | 25 | 25 | 25 |
| | Std. Deviation | 1.14091 | 1.27350 | 1.24374 |
| | Variance | 1.302 | 1.622 | 1.547 |
| | Kurtosis | -0.001 | 1.245 | 6.488 |
| | Skewness | -0.633 | -0.781 | 2.367 |
| | Minimum | 2.50 | 1.00 | 0.00 |
| | Maximum | 6.50 | 6.50 | 5.50 |
| India | Mean | 5.3889 | 5.2222 | 0.8333 |
| | N | 9 | 9 | 9 |
| | Std. Deviation | 0.78174 | 1.06393 | 1.00000 |
| | Variance | 0.611 | 1.132 | 1.00 |
| | Kurtosis | -1.340 | -1.015 | 2.103 |
| | Skewness | 0.468 | -0.352 | 1.674 |
| | Minimum | 4.50 | 3.50 | 0.00 |
| | Maximum | 6.50 | 6.50 | 3.00 |
| Total | Mean | 4.6758 | 4.4233 | 0.9518 |
| | N | 92 | 92 | 92 |
| | Std. Deviation | 1.15466 | 1.12462 | 1.01875 |
| | Variance | 1.333 | 1.265 | 1.038 |
| | Kurtosis | 0.592 | 0.490 | 7.516 |
| | Skewness | -0.622 | -0.123 | 2.349 |
| | Minimum | 1.00 | 1.00 | 0.00 |
| | Maximum | 6.50 | 7.00 | 5.50 |

Some general comments concerning the Future Orientation descriptive statistics follow. All locations have local/remote values, which are within one standard deviation of the total mean. This indicates that the locations are responding similarly, which is also apparent in the graph, Figure 7.2 below. There are, though, some differences between the locations. Ireland has a mean value of 4.27 for local, but 3.94 for remote, a difference of 0.33. While not significant by any means, it suggests that Ireland sees itself as more future orientated than its remote partners did. The USA, even more so than Ireland, considers itself more future orientated than its remote partners do. It has a local value of 4.98, and a remote value of 4.29, for a difference of 0.69. These are the established locations, the other locations report to them; therefore, it may be that their longevity has an influence on these members and their view of the future.

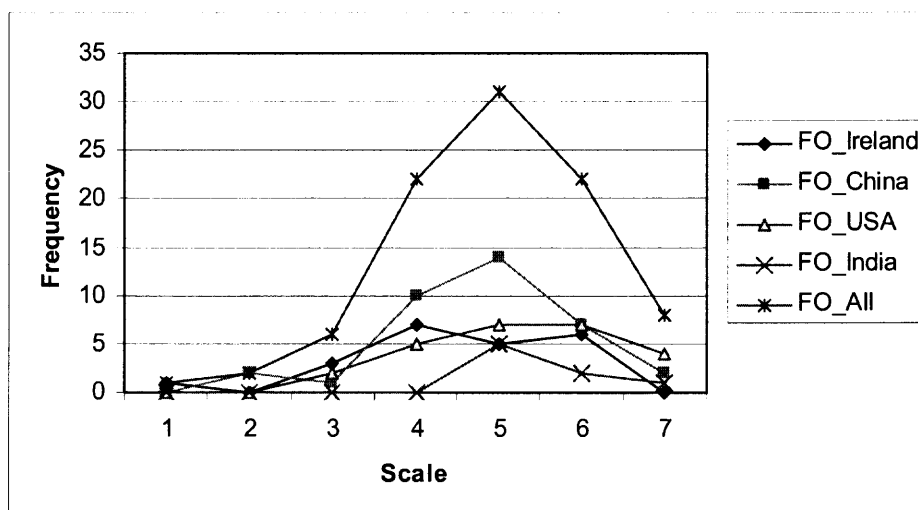


Figure 7.2 Future Orientation Histogram

Table 7.5 Descriptive Statistics for CmpyA Data – Sense of Urgency

| Location | | Sense of Urgency Local | SU Remote | SU Gap |
|----------|----------------|------------------------|-----------|---------|
| Ireland | Mean | 4.7879 | 4.5083 | 1.0326 |
| | N | 22 | 22 | 22 |
| | Std. Deviation | 1.20205 | 0.87015 | 0.76828 |
| | Variance | 1.445 | 0.757 | 0.590 |
| | Kurtosis | -0.936 | -0.945 | -1.424 |
| | Skewness | -0.238 | -0.005 | 0.156 |
| | Minimum | 2.67 | 3.00 | 0.00 |
| | Maximum | 6.67 | 6.00 | 2.33 |
| China | Mean | 5.1904 | 4.9708 | 0.7168 |
| | N | 36 | 36 | 36 |
| | Std. Deviation | 1.02479 | 1.04989 | 0.67083 |
| | Variance | 1.050 | 1.102 | 0.450 |
| | Kurtosis | 0.018 | -0.432 | 0.442 |
| | Skewness | -0.430 | -0.047 | 0.928 |
| | Minimum | 2.67 | 2.67 | 0.00 |
| | Maximum | 7.00 | 7.00 | 2.67 |
| USA | Mean | 5.0133 | 4.3560 | 1.0227 |
| | N | 25 | 25 | 25 |
| | Std. Deviation | 0.92536 | 0.74327 | 0.87276 |
| | Variance | 0.856 | 0.552 | 0.762 |
| | Kurtosis | -0.516 | 0.691 | 0.463 |
| | Skewness | -0.286 | -0.609 | 0.884 |
| | Minimum | 3.00 | 2.67 | 0.00 |
| | Maximum | 6.67 | 5.67 | 3.33 |
| India | Mean | 4.2067 | 4.1852 | 0.7933 |
| | N | 9 | 9 | 9 |
| | Std. Deviation | 1.04428 | 1.17982 | 0.68917 |
| | Variance | 1.091 | 1.392 | 0.475 |
| | Kurtosis | -0.554 | -1.190 | -0.566 |
| | Skewness | 0.611 | -0.158 | 0.720 |
| | Minimum | 3.00 | 2.33 | 0.00 |
| | Maximum | 6.00 | 5.67 | 2.00 |
| Total | Mean | 4.9498 | 4.6163 | 0.8829 |
| | N | 92 | 92 | 92 |
| | Std. Deviation | 1.06959 | 0.97790 | 0.75791 |
| | Variance | 1.144 | 0.956 | 0.574 |
| | Kurtosis | -0.639 | -0.179 | -0.008 |
| | Skewness | -0.283 | 0.031 | 0.758 |
| | Minimum | 2.67 | 2.33 | 0.00 |
| | Maximum | 7.00 | 7.00 | 3.33 |

Some general comments concerning the Sense of Urgency descriptive statistics follow. All locations show local/remote values, which are within one standard deviation of the total mean. This indicates that the locations are mostly responding similarly as can be seen by the graph in Figure 7.3, though there is a difference between the values for India and the other locations. India has the lowest value, 4.20 for local. Ireland is the next lowest at 4.78 for local, followed by the USA and China, with values over 5.0. This is interesting in that it correlates with comments from Ireland management and some USA interviewees that India does not seem to have a Sense of Urgency.

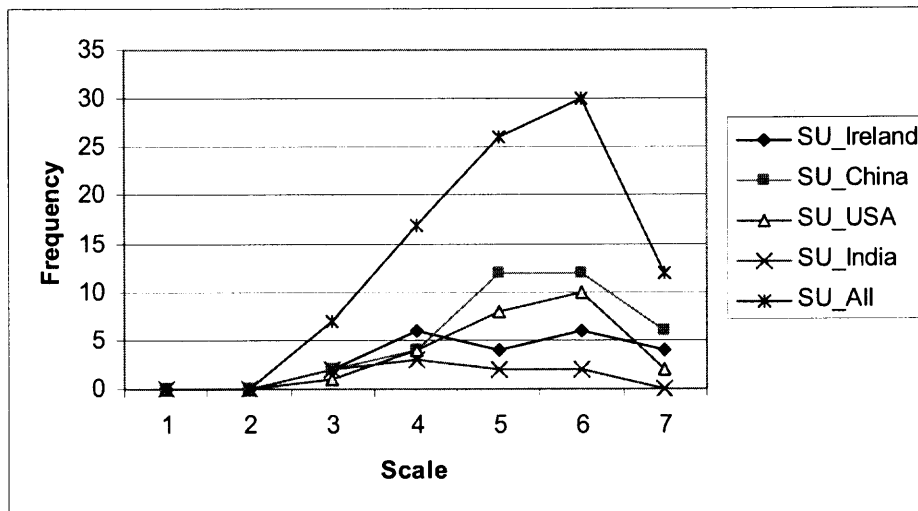


Figure 7.3 Sense of Urgency Histogram

Table 7.6 Descriptive Statistics for CmpyA Data – Temporal Rigidity

| Location | | Temporal Rigidity Local | TR Remote | TR Gap |
|----------|----------------|-------------------------|-----------|---------|
| Ireland | Mean | 4.1591 | 3.8438 | 1.1102 |
| | N | 22 | 22 | 22 |
| | Std. Deviation | 1.53053 | 0.84930 | 0.80339 |
| | Variance | 2.343 | 0.721 | 0.645 |
| | Kurtosis | -0.669 | 5.204 | -0.127 |
| | Skewness | 0.173 | -0.1777 | 0.669 |
| | Minimum | 1.50 | 1.00 | 0.00 |
| | Maximum | 7.00 | 5.00 | 2.92 |
| | | | | |
| China | Mean | 4.2106 | 4.2521 | 1.0323 |
| | N | 36 | 36 | 36 |
| | Std. Deviation | 1.30472 | 0.76937 | 0.76624 |
| | Variance | 1.702 | 0.592 | 0.587 |
| | Kurtosis | -0.538 | 1.765 | 0.341 |
| | Skewness | -0.481 | 0.463 | 0.961 |
| | Minimum | 1.50 | 2.33 | 0.17 |
| | Maximum | 6.00 | 6.33 | 3.00 |
| | | | | |
| USA | Mean | 3.3432 | 3.8988 | 0.8623 |
| | N | 25 | 25 | 25 |
| | Std. Deviation | 1.13306 | 0.88664 | 0.80721 |
| | Variance | 1.284 | 0.786 | 0.652 |
| | Kurtosis | 1.503 | 0.642 | 1.614 |
| | Skewness | 0.541 | 0.398 | 1.360 |
| | Minimum | 1.00 | 2.33 | 0.00 |
| | Maximum | 6.50 | 6.00 | 3.08 |
| | | | | |
| India | Mean | 4.5556 | 4.4530 | 0.9915 |
| | N | 9 | 9 | 9 |
| | Std. Deviation | 0.95015 | 0.93863 | 0.63516 |
| | Variance | 0.903 | 0.881 | 0.403 |
| | Kurtosis | 2.139 | 0.114 | -0.313 |
| | Skewness | 0.641 | -0.685 | 0.330 |
| | Minimum | 3.00 | 2.67 | 0.00 |
| | Maximum | 6.50 | 5.67 | 2.00 |
| | | | | |
| Total | Mean | 3.9963 | 4.0781 | 1.0007 |
| | N | 92 | 92 | 92 |
| | Std. Deviation | 1.33639 | 0.85258 | 0.76853 |
| | Variance | 1.786 | 0.727 | 0.591 |
| | Kurtosis | -0.485 | 1.720 | 0.267 |
| | Skewness | 0.030 | -0.236 | 0.916 |
| | Minimum | 1.00 | 1.00 | 0.00 |
| | Maximum | 7.00 | 6.33 | 3.08 |
| | | | | |

Some general comments concerning the Temporal Rigidity descriptive statistics follow. All locations show local/remote values, which are within one standard deviation of the total mean. Note the anomaly between the US and Ireland in Figure 7.4; in that the curves peak earlier, compared to the other locations. The USA has a mean of 3.34, lower than the other locations, which are 4.15 and higher. The USA has a reputation of being very informal and has a very diverse population, while the other locations have very homogenous populations. Additionally, the USA is the home location of the company, while all others are subordinate to it. All locations are judged by their performance especially their adherence to deadlines. During the interviews, it was mentioned that management could see for themselves what is occurring in the USA, while the other locations are judged by what is contained in reports. As performance is judged, in part, by adherence to deadlines, the other locations may exhibit a greater sense of temporal rigidity because of their distance from the company's headquarters, or this may be a valid cultural difference.

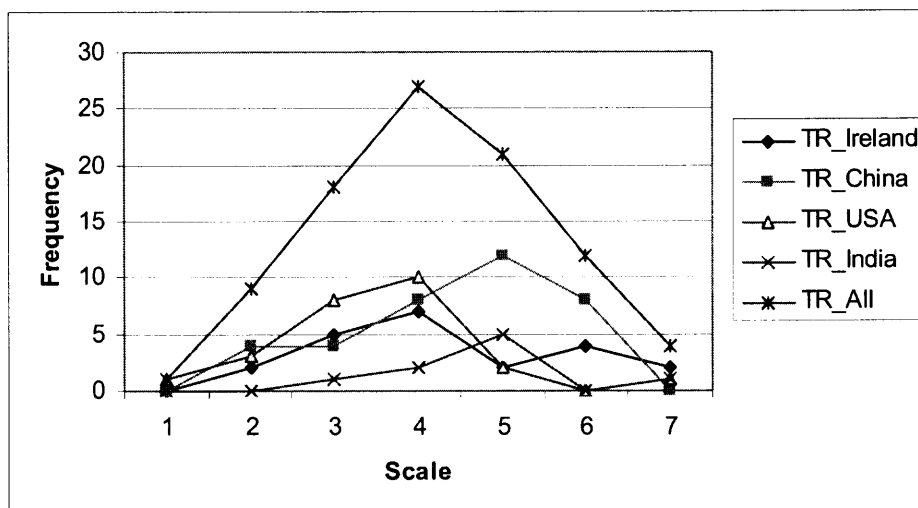


Figure 7.4 Temporal Rigidity Histogram

Table 7.7 Descriptive Statistics for CmpyA Data – Lateness Attitude

| Location | | Lateness Attitude Local | LA Remote | LA Gap |
|----------|----------------|-------------------------|-----------|---------|
| Ireland | Mean | 2.8333 | 3.4205 | 1.1174 |
| | N | 22 | 22 | 22 |
| | Std. Deviation | 1.15355 | 0.96001 | 0.74520 |
| | Variance | 1.331 | 0.922 | 0.555 |
| | Kurtosis | -1.108 | -1.130 | -0.662 |
| | Skewness | 0.034 | -0.378 | 0.073 |
| | Minimum | 1.00 | 1.67 | 0.00 |
| | Maximum | 4.67 | 4.67 | 2.67 |
| | | | | |
| China | Mean | 2.5512 | 2.8460 | 0.8481 |
| | N | 36 | 36 | 36 |
| | Std. Deviation | 1.08209 | 1.11901 | 0.96382 |
| | Variance | 1.171 | 1.252 | 0.929 |
| | Kurtosis | 1.683 | 2.214 | 10.102 |
| | Skewness | 0.970 | 0.992 | 2.842 |
| | Minimum | 1.00 | 1.00 | 0.00 |
| | Maximum | 6.00 | 6.33 | 5.00 |
| | | | | |
| USA | Mean | 3.0071 | 3.3213 | 0.9191 |
| | N | 25 | 25 | 25 |
| | Std. Deviation | 1.23080 | 1.18077 | 0.96458 |
| | Variance | 1.515 | 1.394 | 0.930 |
| | Kurtosis | 1.992 | 1.138 | 2.104 |
| | Skewness | 1.051 | 0.832 | 1.572 |
| | Minimum | 1.00 | 1.33 | 0.00 |
| | Maximum | 6.67 | 6.33 | 3.67 |
| | | | | |
| India | Mean | 1.5752 | 2.5556 | 1.0544 |
| | N | 9 | 9 | 9 |
| | Std. Deviation | 0.58598 | 1.79505 | 1.43614 |
| | Variance | 0.343 | 3.222 | 2.063 |
| | Kurtosis | -1.250 | 1.239 | 0.361 |
| | Skewness | 0.584 | 1.267 | 1.278 |
| | Minimum | 1.00 | 1.00 | 0.00 |
| | Maximum | 2.51 | 6.33 | 3.82 |
| | | | | |
| Total | Mean | 2.6471 | 3.0841 | 0.9520 |
| | N | 92 | 92 | 92 |
| | Std. Deviation | 1.16121 | 1.19922 | 0.96144 |
| | Variance | 1.348 | 1.438 | 0.924 |
| | Kurtosis | 0.849 | 0.528 | 3.738 |
| | Skewness | 0.790 | 0.560 | 1.744 |
| | Minimum | 1.00 | 1.00 | 0.00 |
| | Maximum | 6.67 | 6.33 | 5.00 |
| | | | | |

Some general comments concerning the Lateness Attitude descriptive statistics follow. All locations show local/remote values, which are within one standard deviation of the total mean. In this particular case, lateness attitude reflects that it is okay to be late. Figure 7.5, shows that all the locations are below the scale mid-point of 3.5, indicating that they all perceive it is not okay to be late. Interestingly, India has the lowest mean response, 1.57, which means that being late is least acceptable to them of all the groups. This conflicts with statements by Ireland's management in that they have indicated verbally that India, supposedly does not have a strong sense of urgency, and that they do not understand that there are deadlines which must be met. To reinforce this disconnect, India's remote value is 2.55, indicating that they, India, think others are more lax than they are. A possible explanation is that Ireland's management is not communicating the existence or impact of deadlines well. An alternative explanation is a potential response bias on the part of the Indian respondents who have been criticized for not making deadlines. In any case, the number of respondents is too low to draw a general conclusion.

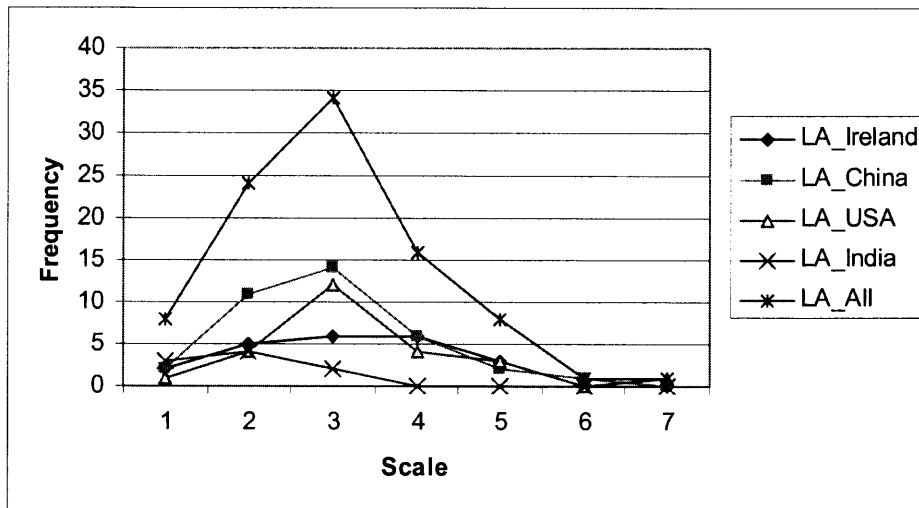


Figure 7.5 Lateness Attitude Histogram

Table 7.8 Descriptive Statistics for CmpyA Data – Other Constructs

| Location | | Ind Comm Qual | Ind Temp Disrp | Ind Sat | Ind Trust |
|----------|----------------|---------------|----------------|---------|-----------|
| Ireland | Mean | 4.61 | 3.80 | 6.06 | 4.75 |
| | N | 22 | 22 | 22 | 22 |
| | Std. Deviation | 1.14 | 1.19 | 0.91 | 1.11 |
| | Variance | 1.30 | 1.44 | 0.91 | 1.11 |
| | Kurtosis | -0.81 | -0.12 | -0.06 | 0.59 |
| | Skewness | -0.16 | 0.47 | -0.87 | -0.35 |
| | Minimum | 2.00 | 1.00 | 4.00 | 2.00 |
| | Maximum | 6.00 | 6.00 | 7.00 | 7.00 |
| China | Mean | 4.29 | 4.16 | 5.8 | 4.06 |
| | N | 36 | 36 | 36 | 36 |
| | Std. Deviation | 0.56 | 1.14 | 0.77 | 0.86 |
| | Variance | 0.31 | 1.29 | 0.59 | 0.74 |
| | Kurtosis | 0.77 | 0.46 | -0.55 | 2.4 |
| | Skewness | -0.64 | -0.43 | -0.67 | 0.17 |
| | Minimum | 2.00 | 1.00 | 4.00 | 1.00 |
| | Maximum | 5.00 | 6.00 | 6.00 | 6.00 |
| USA | Mean | 4.92 | 2.87 | 6.28 | 5.41 |
| | N | 25 | 25 | 25 | 25 |
| | Std. Deviation | 1.10 | 1.60 | 0.59 | 1.21 |
| | Variance | 1.22 | 2.58 | 0.35 | 1.46 |
| | Kurtosis | 0.83 | -0.19 | -0.09 | 1.08 |
| | Skewness | -0.34 | 0.62 | -0.58 | -1.01 |
| | Minimum | 2.00 | 1.00 | 5.00 | 2.00 |
| | Maximum | 7.00 | 6.00 | 7.00 | 7.00 |
| India | Mean | 4.61 | 3.33 | 6.33 | 4.21 |
| | N | 9 | 9 | 9 | 9 |
| | Std. Deviation | 0.85 | 1.82 | 0.41 | 0.59 |
| | Variance | 0.73 | 3.33 | 0.17 | 0.35 |
| | Kurtosis | 0.49 | -0.20 | -0.43 | 0.93 |
| | Skewness | -1.36 | 0.41 | 0.01 | -1.30 |
| | Minimum | 3.00 | 1.00 | 5.00 | 3.00 |
| | Maximum | 5.00 | 6.00 | 7.00 | 4.00 |
| Total | Mean | 4.57 | 3.64 | 6.05 | 4.61 |
| | N | 92 | 92 | 92 | 92 |
| | Std. Deviation | 0.93 | 1.44 | 0.754 | 1.14 |
| | Variance | 0.87 | 2.08 | 0.57 | 1.30 |
| | Kurtosis | 0.40 | -0.47 | 0.16 | -0.08 |
| | Skewness | 0.030 | -0.09 | -0.84 | 0.07 |
| | Minimum | 2.00 | 1.00 | 4.00 | 1.00 |
| | Maximum | 7.00 | 6.00 | 7.00 | 7.00 |

Some general comments concerning the Individual Communication Quality descriptive statistics follow. In Table 7.8: all locations show values which are within one standard deviation of the total mean. The Individual Communication Quality location curves are similar, Figure 7.6, with the possible exception of China, shows a slight flattening at responses 4 and 5, instead of peaking solely at 4. The mean for China is also slightly lower, 4.29, indicating a lower quality of communication. This aligns with statements from the Chinese interviewees that communication is difficult, in part, due to language and in part due to temporal distance. Overall, the responses suggest that all locations are similar in their perception of communication quality, and the shape suggests that they are neutral to satisfied with the communication.

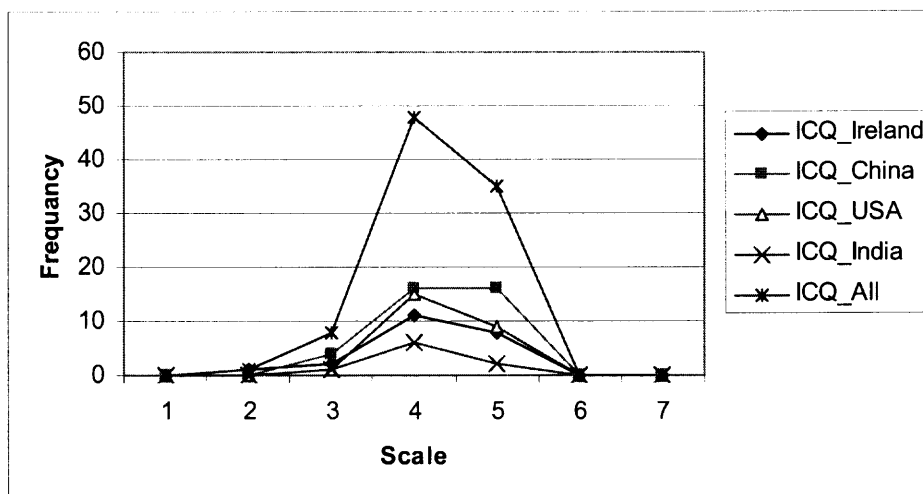


Figure 7.6 Individual Communication Quality Histogram

Some general comments concerning the Individual Temporal Disruption descriptive statistics follow. In Table 7.8: all locations show values that are within one standard deviation of the total mean. For the Temporal Disruption construct, a higher response value indicates more temporal disruption. Figure 7.7, indicates that all respondents are experiencing some disruption, with a peaking at 5. The descriptive statistics have the total mean at 3.64, with the USA experiencing the least disruption at 2.87 and China the most, at 4.15. Logically this makes sense, in that much of the disruption is due to remote teams coordinating with the USA, and to a lesser extent with Ireland. The Chinese respondents reported coordinating with the USA in their tasks, meaning they have the largest temporal distance, and potentially will have the most disruption to their schedules.

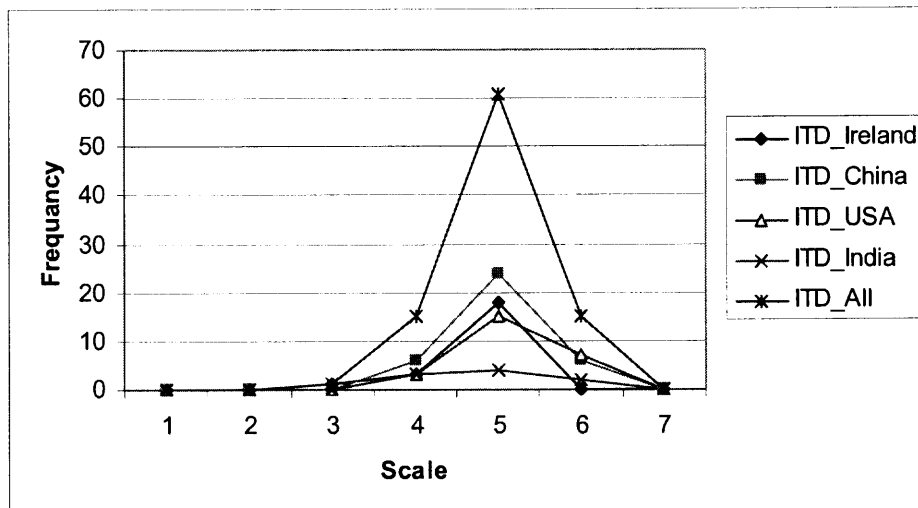


Figure 7.7 Individual Temporal Disruption Histogram

Some general comments concerning the Individual Satisfaction descriptive statistics follow. In Table 7.8: all locations show values, which are within one standard deviation of the total mean. In this case, the total mean for all locations is 6.06. The histogram in Figure 7.7 also indicates a skew to the right. The Skewness statistic is -

0.844 with a standard error of 0.251. As one desires the statistic to be around zero to determine if the results are significantly skewed, one compares the Skewness statistic to twice the standard error (J. D. Brown, 1996). With a standard error of 0.251, it is apparent that the Skewness statistic exceeds 0.502, therefore, it is considered significantly skewed. The Kurtosis statistic, 0.161, though is well within one standard error, 0.498, indicating the data is “peaky”, but not significantly so.

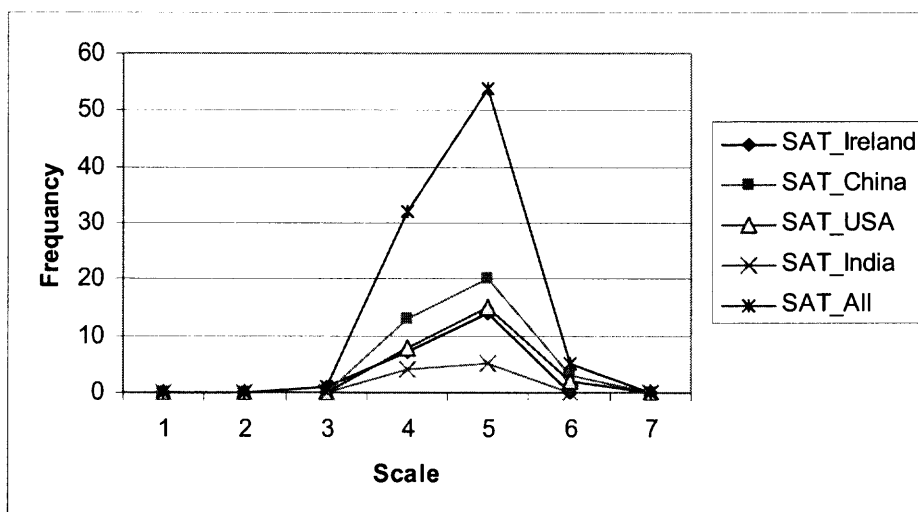


Figure 7.8 Individual Satisfaction Histogram

When the data is skewed, log, and/or, square root transformations are performed in an effort to “normalize” the data. For the Satisfaction data, log and square root transformations were performed with the results shown in Table 7.9.

Table 7.9 Descriptive Statistics – Individual Satisfaction Transformed

| | Mean | Standard Deviation | Skewness | Skewness Std Error | Kurtosis | Kurtosis Std Error |
|----------------------------|-------|--------------------|----------|--------------------|----------|--------------------|
| Satisfaction | 6.050 | 0.754 | -0.844 | 0.251 | 0.161 | 0.498 |
| Log Transformation | 0.259 | 0.164 | 0.107 | 0.251 | -0.705 | 0.498 |
| Square Root Transformation | 1.371 | 0.262 | 0.474 | 0.251 | -0.410 | 0.498 |

Both the log and square root transformations improve the Skewness statistic but degrade the Kurtosis statistic. While this is not desirable, the more important statistic is Skewness, and therefore, the log transform values were used in a second run of the PLS model, discussed later. It may be said that the skewed results are to be expected. The survey respondents knew that the survey had approval of management and although were reassured that no individual data would be released, it would not be unreasonable to see inflation of the satisfaction responses. An alternative explanation, which must be seriously considered, is that the results are skewed because the employees work for a very prestigious company in the software industry and one of the largest companies in the world. This prestige would reflect positively on all of the employees. One could also say that the employees in Ireland and the USA are long-standing employees, and therefore, they would be more satisfied, due to their longevity. The average length of employment for Ireland is 7.2 years and 10.0 years for the USA. By contrast, it is 3.0 years for China and 3.4 for India. However, this explanation does not hold because the total mean is 6.05 with a standard deviation of 0.75. China having the lowest satisfaction mean, 5.81, is well within that one standard deviation. The other location means are Ireland, 6.06, USA, 6.28 and India, 6.32. Overall, there appears to be several plausible explanations for high satisfaction scores, including that the results are actually reflective of what the respondents think. The final graph to be discussed is for the Individual Trust construct.

Some general comments concerning the Individual Trust descriptive statistics follow. All locations show values which are within one standard deviation of the total mean, which is 4.60 with a standard deviation of 1.14. The descriptive data, Table 7.4, reports a skewness statistic of 0.072, which is considered near zero. The Kurtosis

statistic is -0.075 indicating a normal distribution. Overall, this suggests that there is a sense of trust among the various locations, but that it is not strong.

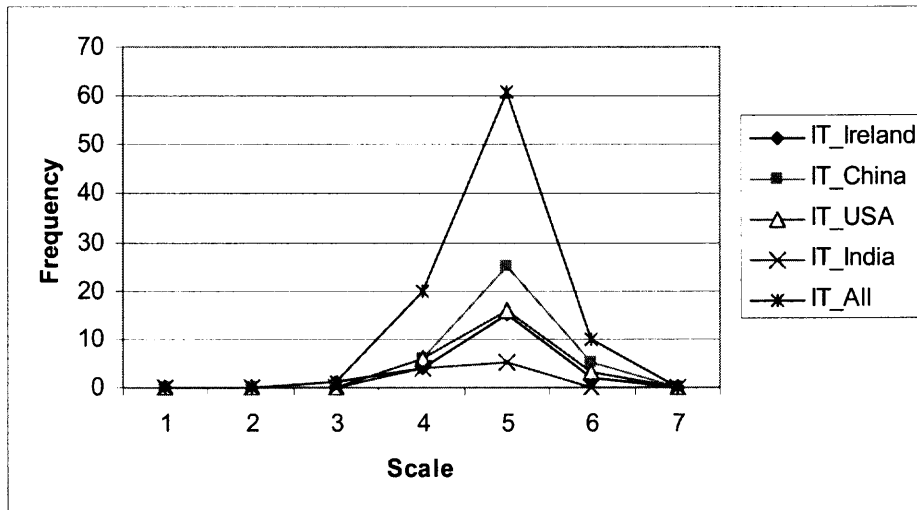


Figure 7.9 Individual Trust Histogram

7.3.2 Future Orientation Comparison

Given the Future Orientation questions were based on the Globe study, (House et al., 2004), it is appropriate to compare the results from this study to those reported in the Globe study, (table 13.5 page 304).

Table 7.10 Globe Study Comparison – Future Orientation

| Country | Globe Study | Total Standard Deviation | This research | Total Standard Deviation |
|---------|-------------|--------------------------|---------------|--------------------------|
| Ireland | 3.98 | 0.46 | 4.27 | 1.15 |
| China | 3.75 | | 4.53 | |
| USA | 4.15 | | 4.98 | |
| India | 4.19 | | 5.39 | |

In both this research and the Globe study a higher value indicates a greater future orientation. The range in the globe study was 2.88 (Russia) to 5.07 (Singapore) with a standard deviation of 0.46.

The discussion within the Globe study indicate that Confucian societies, Asian, were not significantly different from the Western societies in that there was a mix of the two types of societies within each of four bands. The locations of concern, Ireland, China, USA and India, were distributed across the first three bands. Additionally, the four societies of concern are within one standard deviation of each other in the Globe study as they are within this research, with India being at the limit of the standard deviation, in this research.

This suggests that the findings of this research are not significantly different from those of the Globe study and that the populations are comparable. The scores collected in the CmpyA survey also reflect a more highly educated population given their positions in software development and their employment at a prestigious global company. These people are likely to be more future oriented.

7.4 PLS Model Assessment

SmartPLS™ software utilizing Partial Least Squares modeling was used for data analysis. It was decided to use PLS as it allows for the inclusion of reflective and formative constructs within the model and in addition, PLS is distribution-free and therefore does not require the distribution to be normal or its variance to be homogeneous (Chin, 1998).

The inputs to the model for the temporal constructs are the gap calculations, while for the other constructs they are the individual items that make up that construct.

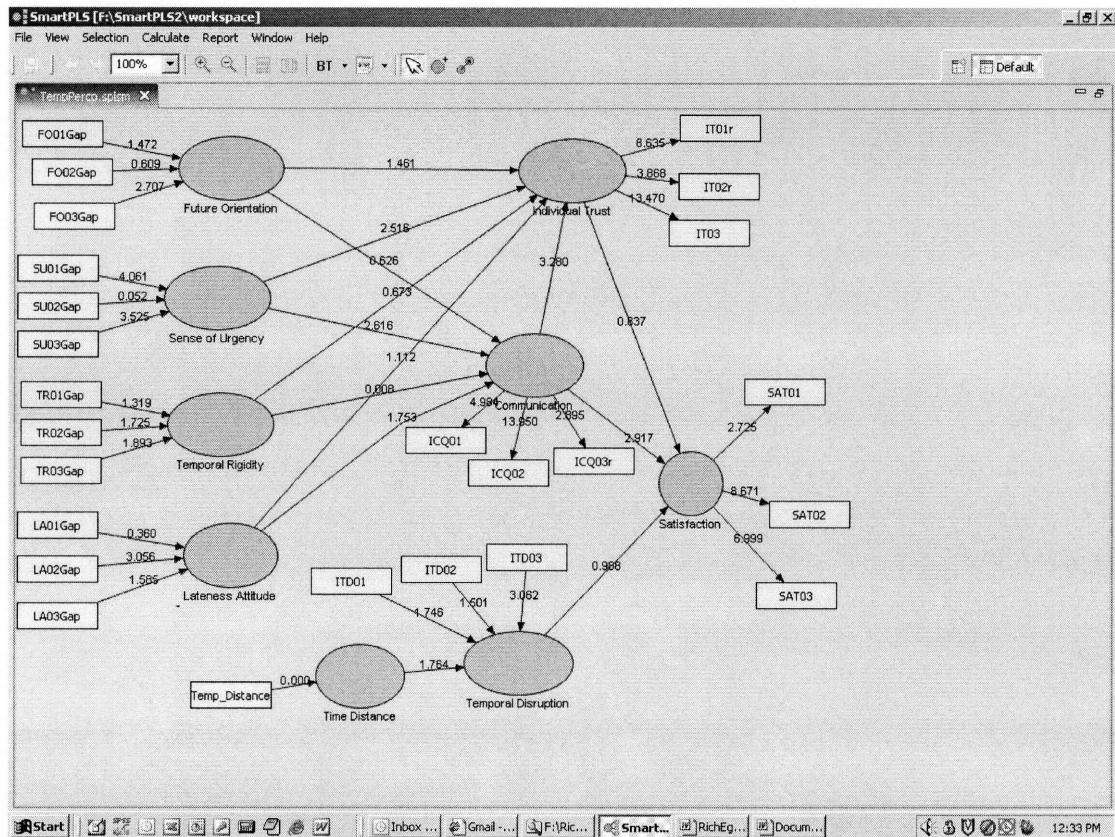


Figure 7.10 PLS Model Showing T-Statistics.

Table 7.11 presents the results of the PLS model shown in Figure 7.10 for each of the relationships being investigated. The t-statistics shown are the result of bootstrapping with 500 samples.

Table 7.11 PLS Modeling Results for CmpyA Data

| Hypothesis | Path Coefficient | t-statistic | Supported |
|---|------------------|-----------------|-----------|
| H1a Future Orientation – Individual Communication Quality | -0.048 | 0.626 | N |
| H1b Sense of Urgency - Individual Communication Quality | -0.293 | 2.616 ** | Y |
| H1c Temporal Rigidity - Individual Communication Quality | -0.001 | 0.008 | N |
| H1d Lateness Attitude - Individual Communication Quality | -0.195 | 1.753 * | Y |
| H2a Future Orientation – Individual Trust | -0.155 | 1.461 | N |
| H2b Sense of Urgency - Individual Trust | -0.288 | 2.516 ** | Y |
| H2c Temporal Rigidity - Individual Trust | -0.057 | 0.673 | N |
| H2d Lateness Attitude - Individual Trust | 0.129 | 1.112 | N |
| H3 Temporal Distance – Individual Temporal Disruption | 0.178 | 1.764 * | Y |
| H4 Individual Communication Quality - Individual Satisfaction | 0.321 | 2.917 ** | Y |
| <i>H4 Using Transformed Satisfaction Data</i> | <i>-0.313</i> | <i>2.740**</i> | <i>Y</i> |
| H5 Individual Temporal Disruption - Individual Satisfaction | -0.086 | 0.988 | N |
| <i>H5 Using Transformed Satisfaction Data</i> | <i>0.046</i> | <i>1.285</i> | <i>N</i> |
| H6 Individual Communication Quality - Individual Trust | 0.357 | 3.280 ** | Y |
| H7 Individual Trust - Individual Satisfaction | 0.075 | 0.837 | N |
| <i>H7 Using Transformed Satisfaction Data</i> | <i>-0.119</i> | <i>0.547</i> | <i>N</i> |

* $p < 0.05$, ** $P < 0.01$

From the table it can be seen that the use of the log transform Satisfaction data for H4, H5 and H7, *in italics*, did not change the results of the PLS model, and therefore the transformed data was dropped from further consideration.

7.4.1 Hypothesis 1

The H1 constructs predict the various temporal perceptions will be negatively correlated with Individual Communication Quality. Table 7.11 shows that the H1 path coefficients are negative indicating a negative impact, which supports the direction of the hypotheses. The table also shows that two of these hypotheses are supported, while two are not. These results are discussed next.

H1a predicts differences in the gap amongst team member responses in perceived Future Orientation will be negatively correlated with Individual Communication Quality. This was not supported by the t-statistic, 0.626, at the 0.05 level, and therefore, this hypothesis is rejected. Likewise, while a few of the interviewees mentioned future oriented types of behavior, there was no mention of any connection of future oriented perceptions and communication quality.

H1b predicts differences in the gap amongst team member responses in perceived Sense of Urgency will be negatively correlated with Individual Communication Quality. The significant t-statistic, 2.616, shows that this hypothesis is supported. This means that an individual's attitude towards being late does affect their perception of communication quality with others.

Utilizing the interviews, this perception may be based on whether or not the person perceives a reaction to their sense of urgency, i.e., does the remote person respond appropriately when it is expressed that the situation is urgent. The interviews also suggest that a culture of professionalism may be operating here. Comments from interviewees in the USA and China all mentioned that the employees were professionals and did their jobs. These comments suggest that this professional attitude had a stronger

influence on their perceptions than differences in the cultures did. This finding needs to be investigated further. This hypothesis was supported by the descriptive data, discussed earlier, with all locations responding similarly.

H1c predicts differences in the gap amongst team member responses in perceived Temporal Rigidity will be negatively correlated with Individual Communication Quality. This was not supported by the t-statistic, 0.008, at the $p < 0.05$ level, and therefore this hypothesis is rejected. Although, there was no expression of temporal rigidity among the individuals in the interviews, it had been suggested by one researcher that this may be tied to people working in the software development profession, therefore, being aware of the need for flexibility. There was one comment during the interviews that noted how people dealt with schedules was individual and not cultural. It has also been suggested that the cultures tested are not known to be highly rigid in their temporal activities, and therefore, such rigidity would not be expected to show among these groups. Overall, it can only be said that no significant relationship was found between Individual Temporal Rigidity and Individual Communication Quality.

H1d predicts that differences in the gap amongst team member responses in perceived Lateness Attitude will be negatively correlated with Individual Communication Quality. The t-statistic, 1.753, shows that this hypothesis is supported. This means that an individual's attitude towards being late does affect their perception of communication quality with others.

It was expressed within the interviews and in conversations with project management that certain teams do not have a sense of urgency, which seemed to affect their attitude towards deadlines. Frustration was expressed, which suggests that there

would be an effect on one's perception of communication quality. Similar to the Sense of Urgency construct, this construct reflects the inability of a local team member to successfully communicate to the remote team member their perception about the importance or irrelevance of missing a deadline.

The team that was mentioned as the example is located in India. There were few respondents from India and only one interviewee. The mean of descriptive data for India, though, does suggest that the Indian team members thought of themselves as being less tolerant of being late than any of the other locations. While not significantly different this information does support the concept, that lateness attitude is not being communicated successfully. Interviewees from the USA and China, when discussing each other, expressed a sense of professionalism and one of people working very hard to meet their deadlines in the interests of acting as professionals. As mentioned earlier, this suggests a professional culture overriding local culture. What is actually happening, therefore, requires more investigation before arriving at a trustworthy explanation.

7.4.2 Hypothesis 2

The H2 constructs predict that the various temporal perceptions will be negatively correlated with Individual Trust. Table 7.5 shows that the H2 path coefficients are negative, indicating a negative impact, which supports the direction of the hypotheses, with one exception, H2d Lateness Attitude. The path coefficient of Lateness Attitude is positive, although the results were not significant. Only one of the hypotheses, Sense of Urgency, was supported.

H2a predicts differences in the gap amongst team member responses in perceived Future Orientation will be negatively correlated with Individual Trust. This was not

supported by the t-statistic, 1.461, at the $p < 0.05$ level, and therefore this hypothesis is rejected.

Individuals from one location, China, expressed a Future Oriented attitude during the interviews. Those individuals indicated that they hoped to gain ownership of a product by working hard now. Individuals in the Western locations viewed this behavior as being an astute understanding that they were judged by their work product, as they were remote to their actual bosses who determined their evaluations and raises, etc. However they viewed this behavior as standard and not necessarily deserving of ownership.

H2b predicts differences in the gap amongst team member responses in perceived Sense of Urgency will be negatively correlated with Individual Trust. The t-statistic, 2.516, shows that this hypothesis is supported. This can be interpreted as the perception that if the remote individual understands my Sense of Urgency then I can trust him to do what is necessary to get the work done. This is related to H1b in that, if a team member feels that he or she cannot convey a Sense of Urgency to a team member then that person cannot be trusted to do what is necessary to get the work done in a timely fashion.

The interviews suggested that this Sense of Urgency may be due to a culture of professionalism rather than a local or national culture. As mentioned earlier, this needs to be investigated further before being accepted as a valid explanation.

H2c predicts differences in the gap amongst team member responses in perceived Temporal Rigidity will be negatively correlated with Individual Trust. This was not supported by the t-statistic, 1.112, at the $p < 0.05$ level, so this hypothesis is rejected. As

mentioned when discussing H1c, there was no mention of any attitude that could be considered to be Temporal Rigidity among the interviewees.

There was mention that everyone was always on time for meetings and that how individuals handled project schedules was individual, not cultural. It has been suggested that Temporal Rigidity was not a prevalent characteristic of the countries being examined. If this is true, then appropriate countries need to be identified and the survey administered there to establish if such a difference can be measured.

H2d predicts differences in the gap amongst team member responses in perceived Lateness Attitude will be negatively correlated with Individual Trust. The t-statistic, 0.673, shows that this hypothesis is rejected. Additionally, the path coefficient was positive, when it was expected to be negative. It was mentioned during the interviews that when new people were brought into the project, you had to trust them because you could not get your work done otherwise. It may be that this quick trust is causing the reversal of the direction. It is intended to examine this possibility in future research.

7.4.3 Hypothesis 3

H3 predicts Temporal Distance will be positively correlated with Individual Temporal Disruption. From Table 7.5 it can be seen that this hypothesis is supported within the model, as the path coefficients are positive, indicating a positive impact and significant by the t-statistic, 1.764, at the $p < 0.05$ level.

This construct demonstrates that differences in time zones do affect the perception of Temporal Disruption, possibly due to the lack of overlap or a restricted overlap of working hours amongst the team members, making coordination of efforts and communication more difficult. This disruption results in a violation of an individual's

private time. However, as expressed in the interviews, team members may be willing to overlook this disruption, for a future benefit.

It is also important to note that this disruption was primarily for respondents from one country, China, and only when working with the USA, 12 hours apart. It was expressed that it was prestigious to work with individuals in the corporate home country, which obviously would not be felt by those in the home country. This is another possible reason to overlook any experience of disruption.

The supplemental interviews supported the idea that some members in the USA and China recognized the large temporal disruptions that were caused in China and alternated meeting times to mitigate these disruptions. It was stated by one individual that the majority of people at the meetings were from the USA, and therefore, most meetings were held at a time convenient to the majority of attendees. The key to understanding this is a realization that disruptions exist as a normal part of the work environment.

From a two supplemental interviews, it would appear that the disruptions were acceptable as part of work. They were perceived as fair, as it affected employees at all levels and all locations.

7.4.4 Hypothesis 4

H4 predicts that Individual Communication Quality will be positively correlated with Individual Satisfaction. From Table 7.5 it can be seen that this hypothesis is supported within the model, as the path coefficients are positive, and the t-statistic, 2.917, is significant at the $p < 0.05$ level.

This shows that the perceived communication quality is an important factor in an individual's satisfaction. As mentioned earlier, a Sense of Urgency affected Individual Communication Quality and Individual Trust, while Lateness Attitude affected Individual Communication Quality. In a dispersed situation, communication is key to the success of a project. If a person does not perceive good communication quality, it is likely that they will not be satisfied. The interviews support this contention in that everyone realized that distant communication was difficult and worked hard at making it succeed.

7.4.5 Hypothesis 5

H5 predicts that Individual Temporal Disruption will be negatively correlated with Individual Satisfaction. From Table 7.5 it can be seen that this is supported within the model, as the path coefficients are negative, indicating a negative impact. The t-statistic, 0.988, however is not significant, and thus, this hypothesis is rejected.

This result was somewhat surprising at first, but two factors may be important to understanding this result. The people in Ireland had an overlap with China and the USA, which could reduce their feelings of Temporal Disruption. When China or India had to deal with the USA, often they were the ones that were displaced. The people in the USA structured meetings so they could conduct them from home by starting a bit earlier.

The interviewees in the USA expressed that this arrangement was the best arrangement. This was at odds with opinions expressed by one Chinese interviewee, in that the overtime was upsetting his wife and starting to disrupt his sleep. It is also at odds with comments from two of the supplemental interviews from the USA, Interviewees 2-2 and 2-3. In these interviews, it was expressed that having meetings after business hours presented logistic problems for the Chinese. People in China could have a problem

getting home at the late hour. Additionally, it was expressed that working at home was something done by the higher-level people in China, not usually at the team member level because of the lack of resources supporting such work.

A Chinese interviewee also expressed that they, the Chinese, were the new people, and it was only right that they were the ones who were displaced. That there was Temporal Disruption may have been considered a short-term inconvenience out-weighed by other factors such as an orientation towards future benefits. In interview 2-3, the Chinese individual said that the US members worked hard because whenever they emailed them, they received responses quickly, no matter what the time was. These explanations, though, only deal with the amount of disruption and not the relationship with satisfaction. The basic premise is that Temporal Disruption would negatively affect satisfaction, so in that respect these explanations show that the disruption is being counteracted by other factors. Therefore, it suggests that the degree of Temporal Disruption by itself is a poor indicator of satisfaction.

7.4.6 Hypothesis 6

H6 predicts Individual Communication Quality will be positively correlated with Individual Trust. From Table 7.5 it can be seen that this is supported within the model, as the path coefficients are positive, indicating a positive impact. The t-statistic, 3.280, is significant at the $p < 0.05$ level, indicating that the hypothesis is supported.

The explanation for this finding is similar to that concerning Individual Communication Quality and Individual Satisfaction. If the communication is perceived to be of high quality it arguably can be said that the individual is conveying whatever information they need to, satisfactorily, with the remote side. There is a presumption that

successful communication builds trust, which would be proved over time by the successful completion of task. Conversely, poor communication would suggest that one is not able to communicate with the remote side successfully, and would damage any relationship, which might exist.

7.4.7 Hypothesis 7

H7 predicts Individual Trust will be positively correlated with Individual Satisfaction. From Table 7.5 it can be seen that the direction is supported within the model, as the path coefficients are positive, indicating a positive impact. The t-statistic, 0.837, is not significant, indicating that the hypothesis is not supported. A possible explanation is that while one would suppose that if there is trust there should be satisfaction, the business reality is that there has to be trust to get the work done and only the absence of trust would affect satisfaction; i.e., trust is a necessary, but not sufficient, condition for satisfaction.

CHAPTER 8

DISCUSSION OF RESULTS AND POST HOC ANALYSIS

This chapter discusses and integrates the information from the interviews presented in Chapter 6 and the data analysis presented in Chapter 7. It also presents a series of Post Hoc analysis on the data collected in the survey. A chapter listing of the contributions of this research and potential future research follows.

8.1 Results

The discussion in this section will start with the PLS results obtained from the data and supplemented by the interviews.

8.1.1 PLS Model

This research created and tested several constructs to measure temporal perception, that is, Future Orientation, Lateness Attitude, Sense of Urgency and Temporal Rigidity. These concepts are originally from Sociology, and were later adopted and examined further in other fields. They are mentioned in the work of Hall, Hofstede, Perlow and Zerubavel (Hall, 1959, 1969; Hofstede, 1980; Perlow, 1999; Zerubavel, 1976, 1981).

A survey that used these constructs was created and administered, the resulting data of which was analyzed with SmartPLS™ modeling software. The resulting structural equation model with the beta loadings is shown in Figure 8.1 while the model with the T-statistics is shown in Figure 8.2.

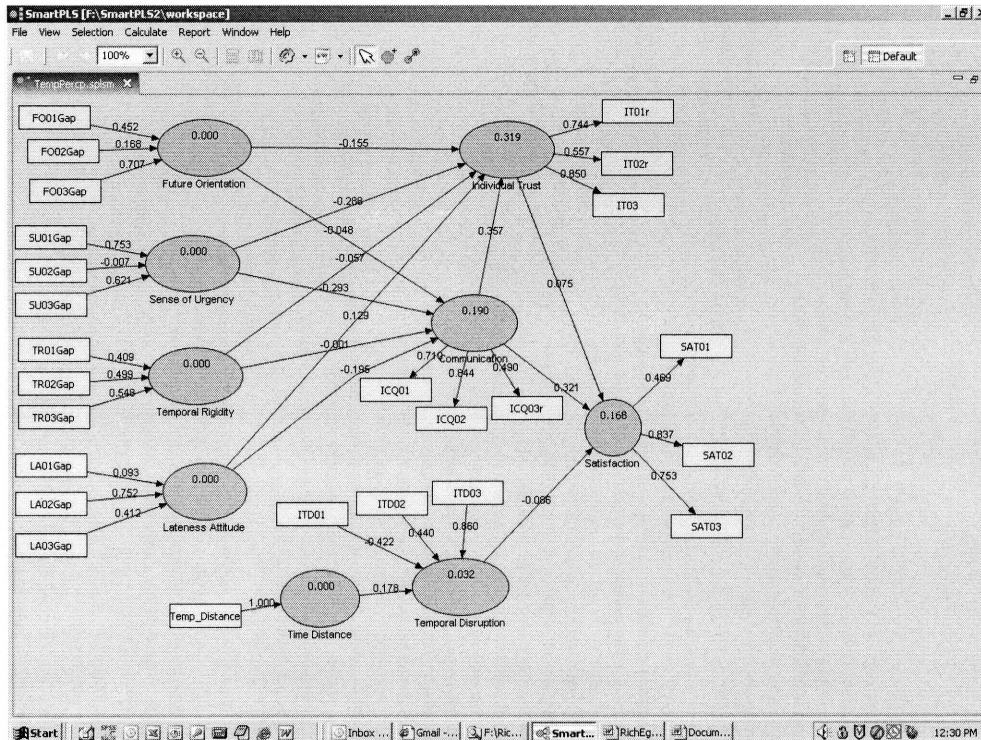


Figure 8.1 PLS Model Showing Beta Loadings.

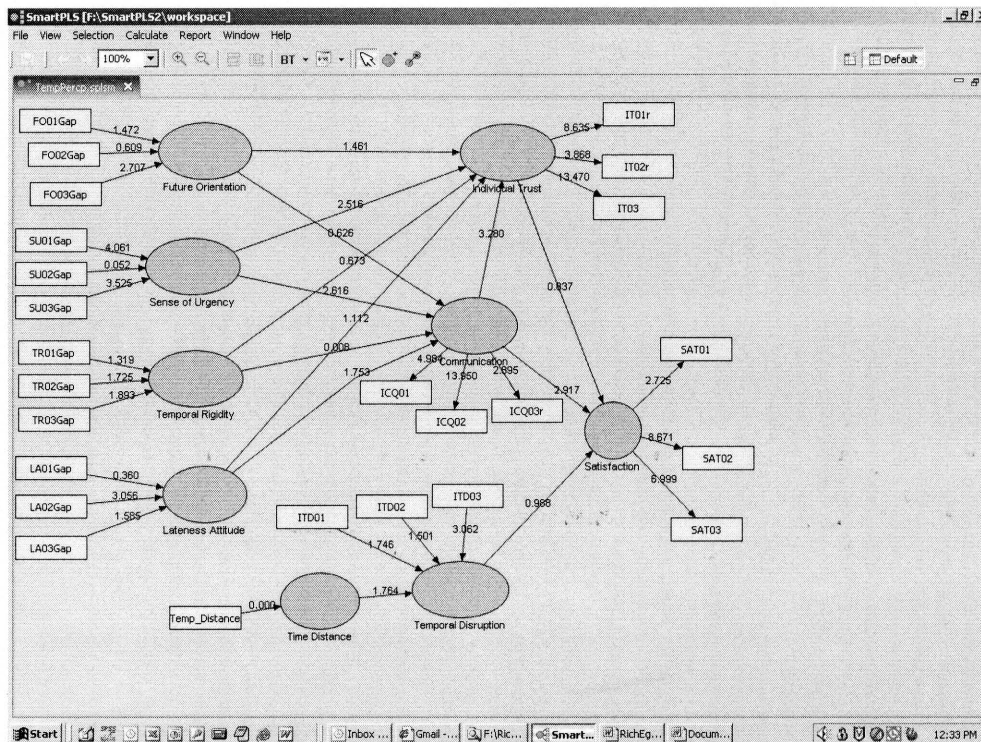


Figure 8.2 PLS Model Showing T-Statistics.

The PLS analysis found that two of the temporal perceptions, Sense of Urgency and Lateness Attitude, in three hypotheses, were supported:

- H1a: The Local verses Remote gap in perceived Future Orientation will be negatively correlated with Individual Communication Quality - **Not Supported**
- H1b: The Local verses Remote gap in perceived Sense of Urgency differences affect Individual Communication Quality - **Supported**
- H1c: The Local verses Remote gap in perceived Temporal Rigidity will be negatively correlated with Individual Communication Quality - **Not Supported**
- H1d: The Local verses Remote gap in perceived Lateness Attitude differences affect Individual Communication Quality – **Supported**
- H2a: The Local verses Remote gap in perceived Future Orientation will be negatively correlated with Individual Trust - **Not Supported**
- H2b: The Local verses Remote gap in perceived Sense of Urgency Orientation will be negatively correlated with Individual Trust - **Supported**
- H2c: The Local verses Remote gap in perceived Temporal Rigidity will be negatively correlated with Individual Trust - **Not Supported**
- H2d: The Local verses Remote gap in perceived Lateness Attitude will be negatively correlated with Individual Trust - **Not Supported**

These results provide support for the use of the Sociological concepts of Sense of Urgency and Lateness Attitude, within the Information Systems field and provide the additional benefit of a survey for other researchers to explore these constructs further.

On the other hand, the relationships proposed for the constructs of Future Orientation and Temporal Rigidity were not supported. This may be due to several reasons; *First*, the temporal cultural differences for these measures may not be as large as those of Sense of Urgency or lateness attitude; *Second*, differences in future orientation or temporal rigidity may not have much impact in the work context of the teams, that is, the variables proposed in the relationships; and *Third*, differences in temporal rigidity and

future orientation may have been subsumed or overridden by the work culture in which the respondents were embedded. The first of these possibilities, that temporal rigidity and future orientation may not be that different between the cultures surveyed has support from a post hoc analysis on what is referred to as the gap magnitude in this chapter. The inter-country gaps are lower for these two measures than for the other measures but *Ns* are too low and uneven to conduct statistical tests on these values. For the second proposition, it is easy to see how a focus on meeting deadlines and on worrying about how productive one is meets the work context of the teams. Many team members felt they were continually under terrific time constraints. It is harder to see how being more future oriented or more temporally rigid would become a communication or trust issue in this driven environment. However, there is not enough evidence to suggest that this explanation is valid. The third proposition has support from the interviews. Comments from a number of interviewees suggested that they focused on being professionals in their work and ignoring cultural differences. It should also be noted that the beta weights on the significant relations found between lateness attitude and trust and temporal urgency with trust and communication quality were low. Thus, although the cultural difference influence on these values exists, other influences that were not looked at are larger.

It has also been suggested that the temporal differences being measured across cultures are simply individual differences and not at all reflective of cultural differences. In the case of the Future Orientation construct, the Globe study (House et al., 2004) a large number of respondents were surveyed to find significant differences between cultures for this construct. The variance within a subject population compared to that across country populations could be compared for the other temporal constructs but *Ns*

are too low for this comparison. However, with a larger sample size, this analysis can be done to verify that these cultural differences do exist.

In addition to the temporal perceptions, the PLS model also examined the hypotheses concerning Individual Communication Quality, Individual Temporal Disruption, Individual Satisfaction, and Individual Trust:

- H3: Temporal Distance will be positively correlated with Individual Temporal Disruption - **Supported**
- H4: Individual Communication Quality will be positively correlated with Individual Satisfaction – **Supported**
- H5: Individual Temporal Disruption will be negatively correlated with Individual Satisfaction - **Not Supported**
- H6: Individual Communication Quality will be positively correlated with Individual Trust – **Supported**
- H7: Individual Trust will be positively correlated with Individual Satisfaction - **Not Supported**

As projected, Temporal Distance between teams, H3, is a factor in the Temporal Disruption one perceives, as it forces a displacement of a normal working schedule and is a violation of Zerubavel's concept of one's private time (Zerubavel, 1979). The distance was coded as the number of hours that separated local and remote team members. Through the interviews, it was found that individuals were aware of this disruption, and although they may have complained about it, they were willing to endure it for a variety of reasons: the benefits of working with the USA and a possible future benefit. Surprisingly, the coefficients for this effect are not large although as much as an entire scale point between sites was shown in a team's perception of its temporal disruption. Thus, although the temporal distance from the USA to China is equivalent to the temporal distance from China to the USA, team members in the USA did not perceive as

much temporal disruption. This is explained through the follow-up interviews which found that hours were adjusted to benefit those in the home country of the corporate headquarters and also that those who resided in some countries had a country-wide infrastructure that better supported off working hours work. If USA respondents had been excluded from the analysis, the beta weights would have likely been much higher. Therefore, it is argued that it is not simply the temporal distance but how the temporal distance is managed that impacts employee Temporal Disruption.

The responses to the Temporal Disruption construct also lend support to the existence and importance of private time, which has been mentioned in the Information Systems literature (Carmel, 1999; Carmel & Agarwal, 2001; Perlow, 1999). Second, it has a benefit to industry in raising awareness of the effect that unmanaged Temporal Distance has on its employees. Interviews found that the respondents were balancing the disruption experienced against a perceived benefit. It is argued that if this benefit does not materialize at some time in the future, then the individuals' sense of work satisfaction may be seriously impacted. Therefore, a company should be aware of the temporal disruptions temporal distance causes and either work to alleviate these problems or provide a reward structure for employees willing to experience these disruptions. In particular, knowing that these disruptions exist and not hearing complaints about them from employees suggests that a company begin a dialogue with team members who are affected and be open and realistic in their discussions with these employees about future possibilities. Not having these open discussions could have a positive short-term benefit but very negative long-term effects.

Hypothesis H4, which stated that the perceived Individual Quality of Communication was positively correlated to a measure of how much an individual was satisfied with his or her performance on the team was supported. The path coefficient for this relationship was 0.32 indicating a reasonable but not spectacular impact of Communication Quality. Since the Individual Satisfaction construct measured how personally satisfied an individual was with what they felt was good job performance, this construct may have only partially captured overall work satisfaction. A formative construct that measured satisfaction with a variety of work environment variables might have been a better construct to use for this measure, especially since the argument for this relationship in the model is that of difficulties in communicating work related information affecting one's overall happiness with the job. Interviewees often indicated that the temporally distant communication was difficult and required significant effort to make it work. Thus, there is an indication of frustration with the amount of effort required to engage in communication, which also lends support to this hypothesis.

Hypothesis H5 indicates that Temporal Disruption is negatively correlated with Individual Satisfaction, which was not supported. Similar to the argument made for the lower than expected correlation for Hypothesis H5, the measure for Individual Satisfaction had questions in it such as: "I feel a great sense of personal satisfaction when I have done a good job on this project." Hypothesis H5 was based on Zerubavel's concept of private time and violations of that time (Zerubavel, 1976, 1979), but it is not clear that such disruptions would transfer to feelings of personal job satisfaction. The construct for Individual Satisfaction needs to be rethought in future research, as indicated earlier. The interview results provided another possible explanation as to why this

hypothesis was not supported. One interviewee stated that the need for after hours meetings was disruptive and that his wife was starting to complain, however another interviewee explained that as new people on the project, they had to expect to be the ones whose schedules were displaced. None of the interviews indicated extreme dissatisfaction with the disruptions. There were other reasons they gave for being satisfied with their work. These included working for a prestigious company and being regarded as an important part of this company's work.

Hypothesis H6 indicated that Individual Communication Quality was positively correlated with Individual Trust and was supported. The coefficient for this relationship was 0.36, which is reasonable but not dramatic. It is likely that multiple other variables not measured also are a support to an individual's trust of their remote team members. Hypothesis H6 is also supported by the interviews. An oft repeated statement in the research literature is that team members need to build relationships with each other in order to establish trust. The only available means for building these relationships in the distributed teams was through electronic connections. If these did not work well, relationship building became problematic.

This necessity to maintain relationships through communication channels was initially demonstrated in the pilot study interviews with the team that had the non-communicative Korean student whose work was not trusted by his team members. This result also supports the literature on attribution, task context, team conflict, and trust, (Armstrong & Cole, 2002; Cramton, 2001, 2002; Hinds & Bailey, 2000; Hinds & Kiesler, 1995; Nardi & Whittaker, 2002; O'Hara-Devereaux & Johansen, 1994). The practical implication for industry from H6 is that enhanced communication tools and practices are

needed to facilitate the building and maintaining of relationships, which, in turn, helps to build trust among team members.

For future researchers the measures of cultural temporal perception differences are prime candidates for investigation. Although Future Orientation and Temporal Rigidity did not show significant relations to the variables hypothesized, they might show these relations in other culture combinations or be relevant because of their moderating influence on other important team variables.

The number of company respondents, while adequate for PLS, is lower than desirable. Since the effects, as indicated by the path coefficients, are small even for those hypotheses found to be significant, it may be that significance may not have been found in the other constructs due to the small N (Goodhue, Lewis, & Thompson, 2006). Additional respondents are needed to prove or disprove this possibility and would have the additional benefit of providing a larger N for other exploratory analyses.

Another possible explanation must be considered for the results found in the model; there is a possibility that a 'culture' within the software development field has developed, guiding members' actions more strongly than their native culture. It was mentioned during the interviews that the team members were professionals; that is, they ignored cultural issues and organized their thoughts and beliefs around a pseudo culture that supported getting the job at hand done.

It is known that technical employees work in an environment where they need to discuss problems and integrate solutions, which requires continuous communication involving lateral coordination, something which is not necessarily found in production, administrative, and bureaucratic work (Hinds & Kiesler, 1995). Hinds and Kessler state

that lateral communication is not only fostered by the nature of the work, but also by the way these workers have been trained and organized. This tight lateral communication may create a narrowly defined subculture of communication with its own rules and behaviors.

The interviews suggest that the participants do view their work as a profession, a recognition that is similar to that given to artisans from medieval times to the current day. This raises a question, which must be asked; has the software development profession developed a culture that takes precedence over the individual's national culture? Carmel initially raised this question (Carmel, 1999) and it is raised again by this research. If this overriding subculture is in evidence, it might explain the small coefficients found in the hypotheses. Alternatively, it may be that the cultural differences selected to be investigated are not a major issue to the effective operation of global teams.

To summarize the discussion to this point, it has been shown that cultural differences in Lateness Attitude and Temporal Urgency are negatively correlated with Individual Communication and Trust but the effect size of these relationships is small. In addition, it was found that Temporal Distance does increase Temporal Disruption but that much of that increase can be mitigated with considered management of the disruption. Since some of the above discussion was based on how the temporal culture differences varied from country to country, the next section compares the sizes of the differences in what is referred to as a Gap Magnitude analysis.

8.2 Post Hoc Analysis

This section contains the analysis of hypotheses that were not made prior to the distribution of the survey, but which are of interest to explore in future research based on the results suggested by the outcomes of this work. These analyses include the exploration of other possible relationships between the variables captured in the study and an investigation of the temporal cultural differences between each team site involved in the study. The first analysis presented is the investigation of possible other variable relationships through an extension of the original PLS model.

8.2.1 Extension of PLS Model

While it was not proposed in the original research, it was suggested by a dissertation committee member that the relationship between Individual Temporal Disruption and Individual Communication Quality might be interesting to look at. The hypothesis for this relationship is: Temporal Disruption is negatively correlated with Individual Communication Quality. The literature supports this hypothesis noting that working across time zones is difficult in terms of communication and coordination (Carmel, 2006; Carmel & Agarwal, 2001).

This literature does not address the issue of Temporal Disruption impacting Communication Quality, but Perlow's work on Time Famine discusses the need for the employees in her study to "come in early, stay late and work weekends in order to ensure "quiet time" when they can work uninterrupted" (Perlow, 1999). Temporal Disruption, being an extension of Zerubavel's private time violations is the reverse of Perlow's statement. Perlow's people used their private time to gain quiet time that they did not have during work hours. Temporal Disruption, in this research, forces team members to

use their private time for work related communication, not quiet time. This additional relationship is shown in Figure 8.3.

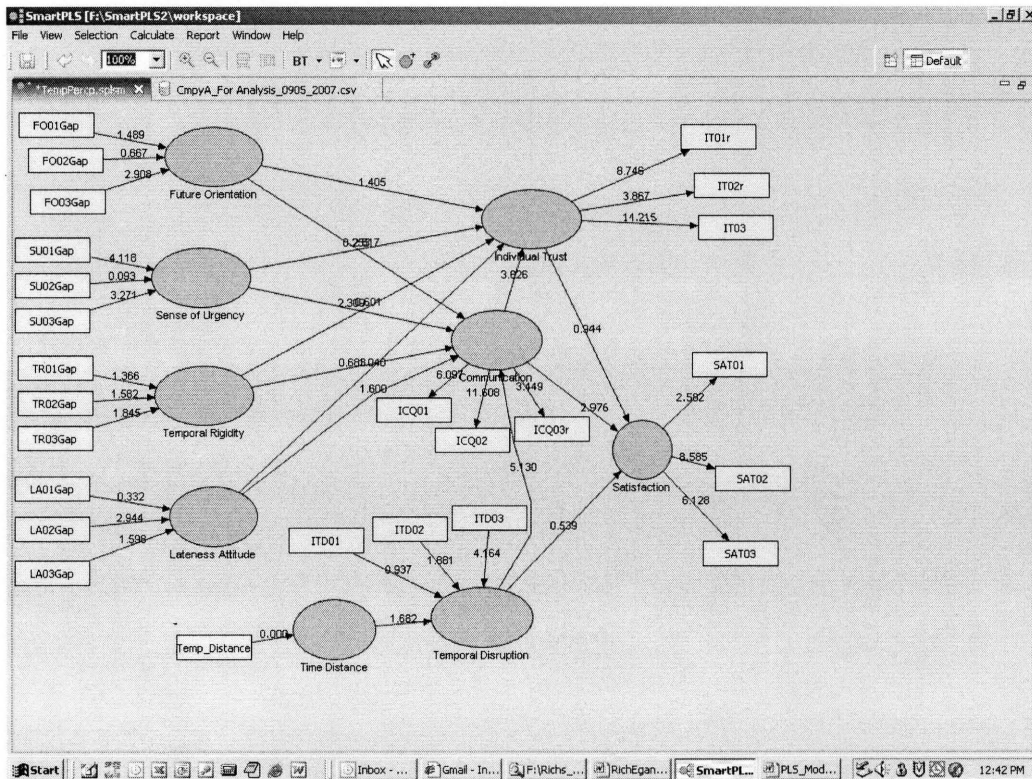


Figure 8.3 PLS Model Extended.

Adding this relationship to the PLS model resulted in a loading of -0.452 and a t-statistic of 5.030, which is significant at the $p < 0.05$ level. This could be explained by the large disruption caused by the teams' synchronous communication requirements. Note that the loading for this effect is stronger than the other ones found in the model. Also note that because Communication Quality impacts Satisfaction and Trust, and no direct impact of Temporal Disruption on Satisfaction was found, this finding suggests that Communication Quality is a possible mediating variable between Temporal Disruption and Satisfaction. These results suggest that the original proposed model needs to be adjusted in future studies.

8.2.2 Gap Analysis

Now that the model has been partially validated, Gap Analysis will be used to further explore the data. The primary use of Gap Analysis in research is to identify possible problem areas by examining perceptual differences (gaps) of an item of interest between two sets of respondents.

The gap measured in this research is a team member's perception of the local team beliefs about time and the same individual's perception of the remote team's beliefs about time, with the local and remote teams representing different countries. Thus, a gap between people in different countries is interpreted as indicating that temporal perception differences exist between these two cultures. The size of the gap indicates how much of a difference there is. The following section looks at the gaps found for different country-to-country comparisons. It should be noted that because of the nature of team member distributions in the teams analyzed, the country-to-country comparisons are done with only a small number of individuals, making any generalizations from this analysis inadvisable.

8.2.3 Compare Means and the Gap Magnitude

A Compare Means Analysis is an Independent-Samples t-Test that allows the comparison of two groups of data. This was applied to the gaps that were calculated between the belief about local location and the belief about the remote location. For the Gap Analysis, the *absolute value* of the gap, and *not* the direction, is important. The CmpyA respondents were used for this analysis, with missing data replaced by the mean value for that item, resulting in all gap measures having an N of 92.

The first test performed was a Compare Means Analysis, for a single level grouping based on work location to examine the means, standard deviation, minimum, and maximum values, of the various countries represented. The results were examined to see if there were visible differences in the way the locations responded. The examination did not show any unusual responses in that the means were within a standard deviation of each other, as previously mentioned during the descriptive statistics section.

A second Compare Means Analysis was then performed using two levels, Local work location and Remote work location. This analysis was performed to discover if there was a significant difference in the way the groups responded to the temporal perception construct items by examining the absolute value of the calculated gap for each of these constructs. Table 8.1 shows the mean gaps for Future Orientation.

Table 8.1 Future Orientation Gap Means by Location

| Local/Remote | Ireland | China | USA | India |
|--------------|---------|-------|-------|-------|
| Ireland | | 0.89 | 0.31 | -0.42 |
| China | -0.08 | -0.42 | -0.36 | |
| USA | 0.0 | | 1.67 | |
| India | -0.11 | -0.67 | 0.11 | |

The data in Table 8.1 shows the gap in average scores based on location. Two entries need to be explained. The entry for China-China and USA-USA is based on the respondents stating that they were located in China (or in the USA) and that their remote team was also in China (or the USA). These numbers are included for comparison. If large mean gaps are found within a country, then perhaps the assumption that the gaps are a cultural difference is wrong. However, the numbers that formed these within country gaps are low so that this assumption cannot be examined with the data at hand.

The values in Table 8.1 can be looked at from two different viewpoints: the first as the gap in perception that an individual working in Ireland has between his or her personal beliefs about the local team and his or her beliefs about team members working in China. For this example, the gap is 0.89. The gap can be viewed from the opposite direction, as the gap in perception that an individual working in China has between his or her personal beliefs about the local team and his or her beliefs about team members working in Ireland. This gap in this case is -0.08. It is clear that these perceptions are not aligned with each other and possibly, could be a source of misunderstanding.

Given that there is a difference in measured perception depending on the location from which the gap is viewed, it was decided that an aid to understanding this gap needed to be created. Therefore, a measure called Gap Magnitude was created, which is calculated as:

Gap Magnitude = Absolute value (Local Work Location – Remote Work Location).

The maximum possible value for the gap magnitude is six, ($1 - 7 = -6$ or $7 - 1 = 6$). A Gap Magnitude value of zero means no gap exists in the individual's perception of the two teams, while a gap equal to the maximum of six represents the individual's perception of the local and remote teams is very different. How one uses this measure is explored next.

The basic premise of Gap Analysis is that gaps are a difference in perception, which could indicate a problem. The literature mentions that a small gap is most likely due to normal variations in responses. Gaps of other sizes are considered differences in perceptions, and this misalignment of perceptions could be an indication of a problem. The use of Gap Analysis in the literature has been oriented towards practitioners working

with a firm to uncover problems, potential or existing. However, the literature does not give an analysis of what a gap of different sizes might mean.

The Gap Magnitude calculations for Future Orientation, based on the data in Table 8.1, are shown in Table 8.2. The Gap Magnitude for the Ireland-China for example is $[0.89 - (-0.08)] = 0.97$.

Table 8.2 Future Orientation Gap Magnitude by Location

| Local/Remote | Gap Magnitude |
|---------------|---------------|
| Ireland-China | 0.97 |
| Ireland-USA | 0.31 |
| Ireland-India | 0.31 |
| USA-China | 0.36 |

The Gap Magnitudes for these country pairs are all relatively low. The Gap Magnitude between Ireland and the USA, is similar to that of USA-China, while the Gap Magnitude between Ireland and China is much higher, 0.97. This suggests that the Chinese and the Americans have similar perceptions of each others beliefs in Future Orientation, whereas the perceptions of Ireland and the China are not in agreement.

The USA and Ireland are both Western-Anglo nations that share the same heritage so it is unclear why such a difference exists. One possible explanation is that the US represents the home country of the corporation, and therefore, is held in higher esteem than Ireland by the Chinese, but this explanation does not work when it is noted that most of the difference from Table 8.1 is in the Ireland-China cell, 0.89, not the China-Ireland cell, -0.08.

Another possible explanation is that team members from the USA would have most likely worked with and possibly grown up with, people from a larger number of different cultures. Even though Ireland has acted as a bridge between the USA and the

rest of the world for a number of years, Ireland is still a fairly homogenous country. Only in the last ten years has Ireland's population been changed by large immigration. Thus individuals in Ireland may be less familiar with multiple cultures than their American counterparts. This is a question to explore further through additional interviews. The next construct examined is Lateness Attitude.

Table 8.3 Lateness Attitude Gap Means by Location

| Local/Remote | Ireland | China | USA | India |
|--------------|---------|-------|-------|-------|
| Ireland | | -0.22 | -0.97 | -0.42 |
| China | -0.33 | -0.08 | -0.38 | |
| USA | 0.16 | | -1.67 | |
| India | -2.28 | 0.17 | -0.44 | |

Table 8.4 Lateness Attitude Gap Magnitude by Location

| Local/Remote | Gap Magnitude |
|---------------|---------------|
| Ireland-China | 0.11 |
| Ireland-USA | 1.13 |
| Ireland-India | 1.86 |
| USA-China | 0.38 |

In Tables 8.3 and 8.4, the Gap Magnitude values are also relatively low but the Ireland-India combination, stands out at 1.86. This indicates a source of concern especially since it aligns with a stated problem by Ireland Management that finally led to the non-assignment of work tasks by Ireland to personnel in India. What is striking is that most of the contribution to the Gap Magnitude is from the Indian side. The Indians perceive themselves as having better attitudes towards project deadlines than the Irish. Note in Table 8.3 that a low score implies that the particular team location believes that other team has a more lax attitude towards lateness. This looks to be a universal issue as most scores are negative.

The Ireland-USA Gap Magnitude of 1.13 is also of concern, as it is much higher than the remaining two locations. The caveat, that India had only nine respondents applies, but the USA had 25 respondents and Ireland had 30, therefore the size of the Gap Magnitude suggests a difference in the way Ireland and the USA perceive each others perception of lateness. Again, much of the difference is from the Irish point of view, that is, a Gap Mean of 0.97, in Table 8.3. This perceptual difference is inline with statements from the Irish interviewees about the Americans.

Upper Management on most projects reside in the USA. Therefore, Ireland may be in the position of the remote worker who needs to work harder and be early rather than on time in order to be seen in a positive light by a distant management. The Gap Magnitude size suggests that this difference in Lateness Attitude should be investigated as a potential problem across locations, as all remote locations are confronted with this reality. The next construct examined is Sense of Urgency, with the results shown in Tables 8.5 and 8.6.

Table 8.5 Sense of Urgency Gap Means by Location

| Local/Remote | Ireland | China | USA | India |
|--------------|---------|-------|-------|-------|
| Ireland | | 0.0 | 0.58 | 1.08 |
| China | -0.33 | -0.08 | 0.76 | |
| USA | 0.70 | | 1.00 | |
| India | 0.00 | 0.08 | -0.33 | |

Table 8.6 Sense of Urgency Gap Magnitude by Location

| Local/Remote | Gap Magnitude |
|---------------|---------------|
| Ireland-China | 0.33 |
| Ireland-USA | 0.12 |
| Ireland-India | 1.08 |
| USA-China | 0.76 |

The Gap Magnitudes in Table 8.6, are fairly low except for the Ireland-India Gap Magnitude which is 1.08. Given the size of this difference compared to the other values, further investigation of possible alignment problems is needed with respect to the Ireland-India team. Again, this result matches the statements by the Irish management that the India team did not sense the urgent needs of the project. The cause of this high Gap Magnitude is an Irish perception difference and not an Indian perception difference. Note that a high positive score in Table 8.5 means that the local team thinks that they are more temporally urgent than the remote team. When this gap is compared to the gap in Lateness Attitude, there is a conflict. The Indians perceive the Irish as being more lax with deadlines, yet the Irish perceive the Indians as not recognizing the urgency of meeting deadlines. As indicated earlier, the number of respondents from India was low and thus, this conflicting result suggests that these conflicting results not be taken too seriously. The next construct examined is Temporal Rigidity.

Table 8.7 Temporal Rigidity Gap Means by Location

| Local/Remote | Ireland | China | USA | India |
|--------------|---------|-------|-------|-------|
| Ireland | | 0.00 | -0.08 | 0.19 |
| China | 0.17 | 0.08 | 0.34 | |
| USA | 0.02 | | -0.58 | |
| India | 0.86 | 0.50 | -0.67 | |

Table 8.8 Temporal Rigidity Gap Magnitude by Location

| Local/Remote | Gap Magnitude |
|---------------|---------------|
| Ireland-China | 0.17 |
| Ireland-USA | 0.10 |
| Ireland-India | 0.67 |
| USA-China | 0.34 |

The Temporal Rigidity Gap Magnitudes (shown in Table 8.8) are again low with the Ireland-India Gap Magnitude being double the others. Unlike Lateness Attitude, it is India's perception of Ireland that makes the Gap Magnitude larger. India sees the Irish as less temporally rigid than the Indian team members. Note that a high positive score in Table 8.7 implies that the local team sees the remote team as less temporally rigid than they themselves are. This matches the Lateness Attitude differences. India sees the Irish as having a more lax attitude towards deadlines and also not being as temporally rigid, as the Indians. Again, it is not clear how much can be read into these differences because of an N of 9 for the Indian site. What is clear with the Temporal Rigidity Gap Magnitudes is that the perceptions of Temporal Rigidity from one culture to the other do not show large differences.

In conclusion, the Gap Magnitude provided a set of differences between countries that was unexpected. In some cases, the perceptions were off by as much as two scale points. It was not always clear from either the interviews or the survey exactly what the cause of these differences were. The differences in perception between India and Ireland were the largest, and our discussions with the Irish indicated a cultural problem in working with India. It was not possible to get more than one interview with an Indian employee and this employee was working in Finland not India. There are two caveats that must be considered in interpreting these results: there were only nine respondents from India. Therefore, these results may not be representative of the larger population from India. Second, before the survey was delivered to the subjects, Irish Management stated that there would not be participation by the India team. It was indicated that that team was dropped due to performance issues. Although the interpretation of the larger

Gap Magnitudes found in the Irish – Indian local/remote team perceptions has not been possible because of the lack of interview data from the Indian team, the knowledge that a problem existed in this relationship and the anomalies shown in the Gap Magnitude analysis suggest that this analysis is sensitive enough to suggest problems. Because the largest gaps were in Sense of Urgency and Lateness Behavior, it also suggests that these constructs might be of future use in assessing team cultural problems.

While this particular use of Gap Analysis is new and will require further investigation, it is felt that this straightforward analysis might be a useful tool for managers of globally dispersed teams. The support from the interviews suggest that the gaps are real, and using Gap Analysis in this manner may be useful for companies to identify problems before they become serious. However, more work needs to be performed to help determine what the size of the Gap Magnitudes actually mean, before this technique can become useful.

Summarizing, while the results are not conclusive as they are based on data from one company, they do suggest that Gap Magnitudes may be useful for practitioners and companies as a means of discovering problems among dispersed teams and addressing them early. This could positively impact companies as they endeavor to reduce turnover and training costs.

8.2.2 One Way ANOVA for Non-Gap Variables

A one way ANOVA was performed on the non-temporal constructs using work location as the categorizing variable. An assumption of the ANOVA is that there is homogeneity of variance among the sample population. This was tested using the Levene Statistic. Homogeneity of variance is considered to exist when the significance value is greater

than 0.05. Table 8.9 presents the results of the Levene Statistic from which it can be seen that Individual Communication Quality, and Individual Satisfaction, do not have a value greater than 0.05 and so are not likely to have evenly distributed variance. When the Levene Statistic is not significant, the next step is to examine the Welch and Brown-Forsythe test results, presented in Table 8.10.

Table 8.9 Homogeneity of Variances

| | Levene Statistic | Significance |
|----------------------------------|------------------|--------------|
| Individual Communication Quality | 3.592 | .008 |
| Individual Temporal Disruption | 2.310 | .060 |
| Individual Satisfaction | 2.863 | .025 |
| Individual Trust | 1.946 | .106 |

Table 8.10 Further Tests for Homogeneity of Variances

| | | Statistic | Sig. |
|----------------------------------|----------------|-----------|-------|
| Individual Communication Quality | Welch | 4.624 | 0.004 |
| | Brown-Forsythe | 2.690 | 0.039 |
| Individual Temporal Disruption | Welch | 3.006 | 0.029 |
| | Brown-Forsythe | 3.159 | 0.021 |
| Individual Satisfaction | Welch | 2.298 | 0.073 |
| | Brown-Forsythe | 1.676 | 0.160 |
| Individual Trust | Welch | 6.533 | 0.0 |
| | Brown-Forsythe | 8.133 | 0.0 |

From Table 8.10 it can be seen that Individual Satisfaction is not significant at the 0.05 level and therefore violates the homogeneity of variances assumption, while Individual Communication Quality is significant. This means that it was not possible to use the Multiple Comparisons Table for Individual Satisfaction, but it is possible for the other constructs. The ANOVA results are presented in Table 8.11.

Table 8.11 ANOVA Results

| | F | Sig. |
|----------------------------------|-------|-------|
| Individual Communication Quality | 2.934 | 0.023 |
| Individual Temporal Disruption | 3.278 | 0.013 |
| Individual Satisfaction | 1.234 | 0.299 |
| Individual Trust | 7.462 | 0.000 |

Table 8.11 shows that the F value for Individual Satisfaction is not significant, confirming that the Tukey HSD results should not be used for further evaluation. The Tukey HSD test compares groups to determine if there is a difference in one group's responses compared to another group's. The Tukey HSD results are shown in Tables 8.12 – 8.14 below. An * indicates the mean difference is significant at the 0.05 level.

Table 8.12 Tukey HSD Results for Individual Communication Quality

| Local | Remote | Mean Difference | Sig. |
|---------|---------|-----------------|-------|
| Ireland | China | 0.31746 | .777 |
| | USA | -.32738 | .806 |
| | India | .08466 | 1.000 |
| China | Ireland | -.31746 | .777 |
| | USA | -.64484 | .110 |
| | India | -.23280 | .971 |
| USA | Ireland | .327387 | .806 |
| | China | .64484 | .110 |
| | India | .41204 | .827 |
| India | Ireland | -.08466 | 1.000 |
| | China | .23280 | .971 |
| | USA | -.41204 | .827 |

Table 8.13 Tukey HSD Results for Individual Temporal Disruption

| Local | Remote | Mean Difference | Sig. |
|---------|---------|------------------|------|
| Ireland | China | -.34278 | .914 |
| | USA | .95508 | .187 |
| | India | .46741 | .932 |
| China | Ireland | .34278 | .914 |
| | USA | 1.29786* | .009 |
| | India | .81019 | .589 |
| USA | Ireland | -.95508 | .187 |
| | China | -1.29786* | .009 |
| | India | -.48767 | .917 |
| India | Ireland | -.46741 | .932 |
| | China | -.81019 | .589 |
| | USA | .48767 | .917 |

Table 8.14 Tukey HSD Results for Individual Trust

| Local | Remote | Mean Difference | Sig. |
|---------|---------|------------------|------|
| Ireland | China | .62247 | .251 |
| | USA | -.87753 | .068 |
| | India | .43266 | .868 |
| China | Ireland | -.62247 | .251 |
| | USA | -1.50000* | .000 |
| | India | -.18981 | .991 |
| USA | Ireland | .87753 | .068 |
| | China | 1.50000* | .000 |
| | India | 1.31019* | .028 |
| India | Ireland | -.43266 | .868 |
| | China | .18981 | .991 |
| | USA | -1.31019* | .028 |

From the multiple comparison tests, it can be seen that some of the groups are responding significantly different from others for the Individual Temporal Disruption and Individual Trust constructs. The results indicate that China and the USA differ in their response to Individual Temporal Disruption, Table 8.13, as the two groups furthest apart in time distance. The USA-India combination normally would be considered temporally distant but there are only two respondents with the USA-India combination.

That there is a difference in response between China and the USA makes sense based on the interviews, in that the USA is not significantly changing their work schedule. What change there is, is most likely mitigated by the fact that they are working from home and not the office. China, on the other hand is changing their schedule by extending their workday, possibly by several hours. There was mention in the interviews that, on occasion, some of the China members stayed overnight due to problems getting home.

Considering Individual Trust, as shown in Table 8.14, the results point to a significant difference in the groups from China and the USA again, but it also shows a significant difference between the USA and India. These results are harder to explain with the mean for USA being 5.5 with a standard deviation of 1.26, while for China the mean is 4.0 with a standard deviation of .90. The American team trusts the Chinese team more than the Chinese team trusts the American team. Since the American team is also the home of corporate management, this may reflect some of the difference. Another reason, suggested by an interviewee, was that the Chinese team was very new and that in the past, the Chinese team had been formed and disbanded, then formed and disbanded again. This happened several times, whenever there was a perceived need to cut back on expenses. This history could be influencing the Chinese team's overall level of trust with the USA.

In general the Trust values for all non-American respondents are lower than the American respondents; Ireland is 4.6, with a standard deviation of 1.3, while India is 4.2 with a standard deviation of 0.59, suggesting that the Americans trust others more than they are trusted in return.

These results are also interesting in that there is a pattern of differences found by the Gap Magnitudes between Ireland and India that are not reflected in the Tukey tests. The Gap Magnitudes are in line with the Irish Management perceptions that show there is a difference of perception, but the two groups are not significantly different in their responses based on the Tukey Tests. Again, Gap Analysis and Gap Magnitudes are to help identify potential problem areas that may arise because of cultural differences, hopefully before the problems become serious. The Tukey tests compared variables that may have been influenced by cultural differences but which may not show significance in this influence because of multiple possible reasons for these values, e.g., the shutdown and restart of Chinese teams. Thus, the gap analyses, in addition to showing that cultural variables have an impact on other team variables, also can identify team differences that may be an underlying source of team problems

CHAPTER 9

CONTRIBUTIONS AND FUTURE RESEARCH

9.1 Introduction

The intent of this research was to test the proposition that among globally dispersed teams, differences in temporal perception would affect the team's communication exchanges, which in turn would affect a team member's satisfaction and trust in their remote team members. The research also looked at the effect of temporal distance and what types of disruption it had on team member's personal lives because of the need to schedule synchronous communication at non-work times. To accomplish this test, a survey was created and administered to respondents at a large global software development company. Data was collected and analyzed, through the use of SmartPLS™ software and post hoc analyses performed on the temporal perception differences. It was found that the temporal perception differences of Temporal Urgency and Lateness Attitude did have a moderate impact on team member Trust and Satisfaction. It was also found that Temporal Distances, as they increased, led to increases in Temporal Disruption, but that this was a one-sided impact with the corporate host site not experiencing the disruptions of its off-shored team members. Finally, the Temporal Disruption was not found to affect team member satisfaction, in part because team members viewed the distributed team arrangement as a positive opportunity for their future. This research has contributions to both industry practitioners and academia in that it was performed using actual company subjects involved in real world software development.

9.2 Contributions

Given that the data was collected from the field rather than via a laboratory study or a study on university students, it provides a basis for understanding work at other companies engaged in globally dispersed development. For industry practitioners this research has shown quantitatively, that work across time zones can impact individuals trust and satisfaction if work practices do not account for differences in individual temporal perceptions and if such work practices create temporal disruptions without appropriate compensation for individuals whose personal lives are disrupted. The discussion of the results, presented and handled alternate explanations for the results where possible and also noted that only moderate effect sizes were found, possibly because (as was found in the interviews) team members worked hard to counter these problems in order to make the global collaboration work. What was clear in all of the research carried out in this dissertation, was both the difficulties team members encountered in attempting to make the global teams work and their willingness and extended efforts to counter the problems encountered.

An overall recommendation to management stems from the findings herein and that is to use the findings of this research to set management practices in place that will counter the difficulties global software development team members are encountering. This should be done to avoid a possible down-the-road impact of the workloads and problems that distributed teams are seen to grapple with. These management practices should include meeting adjustments that help teams share the temporal disruption load, the creation of a reward structure for team members forced to carry heavy loads of personal temporal disruption, team combinations that better match temporal cultural

differences, the establishment of protocols for connectivity (frequency and times of synchronous communications) and the training of employees in cross cultural communication skills.

The contributions of this work for the research community are as follows. This study quantitatively investigated an area mentioned in Sociology and ethnographic studies in Information Systems: cultural differences in temporal perception and its impact on communication, trust and satisfaction. This research proposed a model, created and validated a survey instrument to test the proposed model and captured data from distributed global teams to test the model. Important parts of the model were found to be significant. This work, thus, provides a springboard for further exploration of these areas.

The findings also support the argument of the existence of a professional culture of software development. This is important because it appears to partially counteract the negative impacts of globally dispersed work. An awareness of this variable's moderating effect must be considered when conducting this type of research in the future.

In summary, the contributions of this research are:

- The creation and testing of constructs measuring temporal perceptions through a new instrument.
- The finding that temporal perception differences affect the quality of a distributed team's communication.
- The finding that temporal perception differences affect the team variables of trust and satisfaction by their impact on the quality of communication.
- An expansion of the use of Gap Analysis, the creation of a measure to quantify "gaps" and help in their interpretation.
- The demonstration that temporal distances are positively correlated with temporal disruption.

- The finding that temporal disruption is, in part, caused by unequal distribution of this disruption across team sites.
- The finding that a software engineering subculture ameliorated the impact of distributed work

9.3 Future Research

This section presents potential future possibilities arising from the multiple unanswered questions that were uncovered in this research.

9.3.1 Additional Subjects

One of the key problems with the study that formed this dissertation is the "just" acceptable number of respondents obtained for the survey. A second problem is that of distributing the survey to only one company. During the course of this research, eight additional software development companies that use dispersed teams were contacted about the possibility of the survey being performed in their companies. Although the researchers often felt they were on the verge of launching another survey and rounds of interviews in a new company, the vagaries of business often made people too busy to continue to follow-up with the research team. Conversations are continuing with two of these companies, who have expressed a desire to move forward, with a possible start date sometime 2008.

The process of preparing the surveys for these companies would be similar to that of the pilots. Initial interviews with several individuals would be held to gain an understanding of the team structures and terminology to ensure the wording of the instructions was clear and matched the team's management structure. A small survey

pilot of five to ten people to ensure that the survey was on track will follow these interviews.

Now that the research team, of which this dissertation is a part, has publications and thus, credibility in this area, it has become easier to encourage companies to work with the investigative group. The two companies that have expressed interest in our research are very aware that they have problems with their dispersed groups and have a desire to determine the causes of these problems. The companies have approached the researchers after hearing presentations of their work and early findings. The researchers' finding a portion of their problems may be associated with project leadership and also with cultural differences in temporal perceptions was of interest to those companies.

Having additional sites to provide replications and contrasts of the single case presented in this dissertation would greatly aid in establishing a firmer foundation for which findings are generalizable under what circumstances.

Among the research team members, there is the realization that the temporal differences are only one facet of cultural differences and there is a desire to explore other possible cultural differences with the intent of creating a more comprehensive instrument to help companies identify and correct such problems.

9.3.2 Gap Magnitude

The use of Gap Magnitudes will be explored in future survey efforts. First, it will be important to demonstrate that the gaps measured are representative of cultural, not individual differences. Following this, efforts will be made to identify gaps that could be problem areas for management especially in the assignment of personnel to a distributed team. Finally, the gaps will need to be related to distributed team performance problems.

To facilitate the exploration and development of Gap Magnitude measures, it is proposed that a scale be created in cooperation with management to aid them in quantifying their perception of distributed team problems.

A simple scale of 0 to 10 is being considered, with 0 indicating that there is no problem and 10 indicating that the problem is so serious it is stopping the team from working effectively. The scale will be created and tested during management interviews with one company and then refined with interviews at additional companies.

In summary, the future intention of the researcher is to refine the survey and the Gap Magnitude measure into an instrument that will help management identify problem areas in their globally dispersed software development teams. It is intended to create a richer and more rigorously tested model of factors that affect the success of globally dispersed teams.

It was suggested at a conference where an early portion of this work was presented, that these impacts would be experienced by any dispersed effort that required different cultures to communicate and coordinate, not just software development. From that suggestion, it would be an interesting possibility to expand the research direction to encompass an expansion of the types of teams to derive generic and/or area specific scales.

Given the rapid move to the global economy and globally dispersed teams, the validation of global team performance measurement tools to uncover dispersed team problems can serve to support this globalization and ensure efficiency and increased productivity.

APPENDIX A
PILOT SURVEY - STUDENT

Below is the pilot survey as presented to students.

**Temporal Perception and Leadership Role Questionnaire
(Student Version)**

Please the following general questions about your background:

1. Gender:
☐ Female
☐ Male
2. What is your approximate age:
☐ Less than 20
☐ 21-25
☐ 26-30
☐ 31-35
☐ Over 35
3. What is your native language? _____
4. What country were you born in? _____
5. How long did you live there? _____ years
6. What country do you live in now? _____
7. How long have you lived there? _____ years
8. What country were you primarily raised in?
☐ same as country born in
Other _____
How long did you live there? _____ years
9. What is your current educational level?
☐ Undergraduate
☐ Graduate
☐ Ph.D.
☐ No College Degree

10. What is your classification if you are an undergraduate?
- ☐ Freshman
 - ☐ Sophomore
 - ☐ Junior
 - ☐ Senior
11. What is your current major? _____
12. What was your last degree in? _____
13. Are you full-time student?
- ☐ Yes
 - ☐ No
14. If you have a job, is your current job related to your major?
- ☐ Yes
 - ☐ No
15. How many years of experiences do you have related to current project you are working on? _____ years
16. What is your average GPA?
- ☐ more than or equal to 1.0, but less than 2.0
 - ☐ more than or equal to 2.0, but less than 3.0
 - ☐ more than or equal to 3.0, but less than 4.0
 - ☐ 4.0

Please answer this part of the questionnaire (Q17-89) based on the current project that you are working on.

17. Please fill in the following Table about the project you are currently working on.

| Project Name | Project team leader's name | Total no. of Team Members | Your task or role in the project |
|--|--|--|----------------------------------|
| How long you've been in this project-no. of days | Expected duration of the project-no. of days | Percentage of completion of this project | |
| | | _____ % | |

The following question (18-22) will ask you about the project you currently work on and the project team.

18. How challenging is the project compared to other projects which you have worked on?

| | | | | | | |
|------------------------------|---|---|---|---|---|--------------------------|
| Not challenging at all | | | | | | Extremely challenging |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

19. How important is this project to your team compared to other projects and assignments?

| | | | | | | |
|------------------|---|---|---|---|---|-------------------|
| Extremely low | | | | | | Extremely high |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

20. How important is this project to yourself compared to other projects and assignments?

| | | | | | | |
|------------------|---|---|---|---|---|-------------------|
| Extremely low | | | | | | Extremely high |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

21. To what extent do the team members have to work together to get project tasks accomplished?

| | | | | | | |
|----------------|---|---|---|---|---|--------------|
| Very Little | | | | | | Very much |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

22. To what extent do the team members have to share work materials to get the project done?

| | | | | | | | | |
|-------------|---|---|---|---|---|---|--|-----------|
| Very Little | | | | | | | | Very much |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | | |

The following question 23 will ask your opinions about how much responsibility and decision-making flexibility the team leader gives you in the project you work on. Please answer these questions based on your experience in the current project you are working on. You can select from a continuum of 1-7 to indicate how much decision-making authority the leader delegates to the team. Or you can select option 8 to indicate that the team leader is not permitted to do the delegation or it is not at his/her discretion about who should make the decision.

23. How much are the team able to.....?

schedule the team's work?

| | | | | | | | | |
|------------|---|---|---|---|---|---|------------|--|
| Not at all | | | | | | | completely | <i>the team leader is not permitted to delegate in this.</i> |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 8 |

determine its own corrective actions when performance objectives are not met?

| | | | | | | | | |
|------------|---|---|---|---|---|---|------------|--|
| Not at all | | | | | | | completely | <i>The team leader is not permitted to delegate in this.</i> |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 8 |

set team's goals?

| | | | | | | | | |
|------------|---|---|---|---|---|---|------------|--|
| Not at all | | | | | | | completely | <i>The team leader is not permitted to delegate in this.</i> |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 8 |

decide discretionary expenditures, e.g. travel?

| | | | | | | | | |
|------------|---|---|---|---|---|---|------------|--|
| Not at all | | | | | | | completely | <i>The team leader is not permitted to delegate in this.</i> |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 8 |

determine its own quality assurance procedures?

| | | | | | | | | |
|------------|---|---|---|---|---|---|------------|--|
| Not at all | | | | | | | completely | <i>The team leader is not permitted to delegate in this.</i> |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 8 |

select members for the team?

| | | | | | | | | |
|------------|---|---|---|---|---|---|------------|--|
| Not at all | | | | | | | completely | <i>The team leader is not permitted to delegate in this.</i> |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 8 |

| | |
|---|------------|
| set team's objectives? | |
| Not at all | completely |
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |
| 7 | 8 |
| The team leader is not permitted to delegate in this. | |
| | |
| send team members for additional training? | |
| Not at all | completely |
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |
| 7 | 8 |
| The team leader is not permitted to delegate in this. | |
| | |
| select the tools they will use in their work? | |
| Not at all | completely |
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |
| 7 | 8 |
| The team leader is not permitted to delegate in this. | |
| | |
| assign work to team members according to their expertise? | |
| Not at all | completely |
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |
| 7 | 8 |
| The team leader is not permitted to delegate in this. | |
| | |
| remove members from the team? | |
| Not at all | completely |
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |
| 7 | 8 |
| The team leader is not permitted to delegate in this. | |
| | |
| determine its operating procedures and work instructions? | |
| Not at all | completely |
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |
| 7 | 8 |
| The team leader is not permitted to delegate in this. | |
| | |
| evaluate the quality of the team's work? | |
| Not at all | completely |
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |
| 7 | 8 |
| The team leader is not permitted to delegate in this. | |

The following statements are descriptions about the team you are working on for this current project. For each of the statements, please indicate how strongly you agree or disagree with it.

24. The team is motivated to take on additional responsibilities if needed to finish the project.

| | | | | | | | |
|-------------------|---|---|---|---|---|---|----------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

25. The team does not wait passively for the leader to give instructions.

Strongly
Disagree

Strongly
Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

26. The team works to a high standard.

Strongly
Disagree

Strongly
Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

27. The team has a clear sense of its goals and objectives.

Strongly
Disagree

Strongly
Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

28. The team is confident in its ability to achieve its objectives.

Strongly
Disagree

Strongly
Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

29. The team members work hard to fulfill their responsibilities and obligations in the team.

Strongly
Disagree

Strongly
Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

30. The team leader doesn't have to constantly urge the team to get the job done.

Strongly
Disagree

Strongly
Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

31. The team understands the job requirements.

Strongly
Disagree

Strongly
Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

32. The team can work on its own without much external help from people not in the team.

Strongly
Disagree

Strongly
Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|-------------------|
| 33. The team enjoys its work. | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 34. All members of the team accept the team's goals. | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 35. Team members hold each other accountable for deviating from agreed plans and standards. | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 36. Team members willingly listen to each other's ideas. | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 37. The team has clear expectations of each member's contribution. | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 38. Everyone's perspective is listened to and acknowledged | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 39. The team has the necessary knowledge and skills about using the communication tools and technologies of the team. | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 40. Opinions are expressed freely within the team | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 41. Coordination with remote team members is not a problem. | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | |
|--|---|---|---|---|---|----------------|--|
| 42. The team benefits from having many different attitudes, skills or personalities. | | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree | The team doesn't have many different attitudes, skills or personalities. |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

| | | | | | | | |
|--|---|---|---|---|---|---|----------------|
| 43. The team is committed to the team's goals. | | | | | | | Strongly Agree |
| Strongly Disagree | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

| | | | | | | | |
|--|---|---|---|---|---|---|----------------|
| 44. The team works out disagreements in a healthy way. | | | | | | | Strongly Agree |
| Strongly Disagree | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

| | | | | | | | |
|--|---|---|---|---|---|---|----------------|
| 45. The team can effectively communicate even in a distributed environment | | | | | | | Strongly Agree |
| Strongly Disagree | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

| | | | | | | | |
|--|---|---|---|---|---|---|----------------|
| 46. The team is able to put together concerted action to achieve team goals. | | | | | | | Strongly Agree |
| Strongly Disagree | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

| | | | | | | | |
|--|---|---|---|---|---|----------------|--|
| 47. Coordination to meet performance goals is excellent. | | | | | | Strongly Agree | |
| Strongly Disagree | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

| | | | | | | | |
|--|---|---|---|---|---|---|----------------|
| 48. Teams members are helpful and supportive of each other | | | | | | | Strongly Agree |
| Strongly Disagree | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

| | | | | | | | |
|---|---|---|---|---|---|---|----------------|
| 49. The team members willingly collaborate with each other. | | | | | | | Strongly Agree |
| Strongly Disagree | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

| | | | | | | |
|--|---|---|---|---|---|-------------------|
| 50. The team is good at sharing knowledge among team members | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 51. The team directs its time and effort at what is important | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 52. The team is qualified for its assigned task. | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 53. The team keeps track of its progress towards meeting performance goals. | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 54. The team continuously improves how they interact with each other | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 55. The team links performance goals to daily work. | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 56. The team adapts to exploit new opportunities. | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 57. The team has the necessary job expertise and knowledge. | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 58. The team is able to adapt and to work effectively within a variety of situations | | | | | | |
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

59. Team members have done similar work in the past.

Strongly
Disagree

Strongly
Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

The following questions ask you about communications between team members in the current project you are working on. Please answer these questions based on your experience in this project team.

60. What percentage of the time does the team spend weekly on computer-mediated communication? _____%

61. How often does the team meet Face-to-Face?

Once every _____ day(s)

The following statements are descriptions about the team leader of this current project you are working on. For each of the statements, please indicate how strongly you agree or disagree with it.

I will be happy to have this team leader in future projects.

Strongly
Disagree

Strongly
Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

62. I am satisfied with the way the leader leads this team

Strongly
Disagree

Strongly
Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

63. I enjoy working with this leader.

Strongly
Disagree

Strongly
Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

The following questions ask you to compare this current project team to other teams. In relations to other comparable project teams you have served on or observed, how does this project team rate on each of the following?

64. The efficiency of team operations.

Extremely
Low

Extremely
High

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

65. The amount of work the team produces.

| | | | | | | |
|------------------|---|---|---|---|---|-------------------|
| Extremely Low | | | | | | Extremely High |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

66. The team's adherence to schedules

| | | | | | | |
|------------------|---|---|---|---|---|-------------------|
| Extremely Low | | | | | | Extremely High |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

67. The team's adherence to budgets.

| | | | | | | |
|------------------|---|---|---|---|---|-------------------|
| Extremely Low | | | | | | Extremely High |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

68. The quality of work the team produces

| | | | | | | |
|------------------|---|---|---|---|---|-------------------|
| Extremely Low | | | | | | Extremely High |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

69. The accomplishment of preset goals

| | | | | | | |
|------------------|---|---|---|---|---|-------------------|
| Extremely Low | | | | | | Extremely High |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

The following questions ask you about your opinion about the project team. Please answer these questions based on your experiences in the team.

A mature team exhibits high level of independence, competency, motivation, and activeness. Judging from this criterion, how mature would you think your team is?

| | | | | | | |
|------------------|---|---|---|---|---|----------------|
| Very immature | | | | | | Very mature |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

70. If I had my way, I would not let the other team members have any influence over issues that are important to the project.

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

71. I really wish I had a good way to oversee the work of the other team members on the project.

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

72. I would be comfortable giving the other team members a task or problem that was critical to the project, even if I could not monitor them.

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

For this section please answer these questions based on your belief of what is true within your society (that which you grew up in or identify yourself with) and your current organization.

In this society, the accepted norm is to:

| | | | | | | | |
|------------------------|---|---|---|---|---|---|--------------------------|
| Plan for the future | | | | | | | Accept the status Quo |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

In this society, people place more emphasis on:

| | | | | | | | |
|--------------------------------|---|---|---|---|---|---|-------------------------------|
| Solving Current problems | | | | | | | Planning for the future |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

I believe that the accepted norm in this society should be to:

| | | | | | | | |
|------------------------|---|---|---|---|---|---|--------------------------|
| Plan for the future | | | | | | | Accept the status Quo |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

I believe that people who are successful should:

| | | | | | | | |
|--------------------------------|---|---|---|---|---|---|-------------------------------|
| Solving Current problems | | | | | | | Planning for the future |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

The way to be successful in this organization is to:

| | | | | | | | |
|------------|---|---|---|---|---|---|---------------------------------|
| Plan ahead | | | | | | | Take events as they occur |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

In this organization, the accepted norm is to:

| | | | | | | | |
|------------------------|---|---|---|---|---|---|--------------------------|
| Plan for the future | | | | | | | Accept the status Quo |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

In this organization, the accepted norm should be to:

| | | | | | | | |
|------------------------|---|---|---|---|---|---|--------------------------|
| Plan for the future | | | | | | | Accept the status Quo |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

In this organization, people should:

| | | | | | | | |
|-------------------------------------|---|---|---|---|---|---|------------------------|
| Worry about current crisis | | | | | | | Plan for the future |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

In this section please answer each question based in a project team that you are in for one of your classes

In our team we believe it is never okay to be more than a few minutes late for a meeting at work:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

People on our team will always stay later at work to finish things if we have an important deadline:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

People on our team believe that a team lead who keep changing work schedules is very frustrating:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

In our team we believe that a meeting should end on time:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

People on our team rarely miss deadlines:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

People on our team accept that they are not going to get everything done on time:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

People on our team get upset when the plan is not followed:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

On our team we believe if we complete a project 1 week late, we are:

| | | | | | | |
|-----------|---|---|---|---|---|--------------------|
| Very Late | | | | | | Not at all late |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

On our team we believe it is best to have an exact time for a meeting:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

People on our team believe it is okay to sometimes miss deadline:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

People on our team think it is important to meet deadlines:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

On our team we believe if we complete a project 1 day late, we are:

| | | | | | | |
|-----------|---|---|---|---|---|--------------------|
| Very Late | | | | | | Not at all late |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

On our team we believe that deadlines for completing tasks are very important in our organization:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

On our team we believe it is okay to be one or two days late with a deadline:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

People on our team believe that it is better to do the work right rather than on time:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

In our team we believe if we arrive late to a work meeting 10 minutes after it starts, we are:

| | | | | | | | |
|-----------|---|---|---|---|---|---|--------------------|
| Very Late | | | | | | | Not at all late |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

People on our team always plan their work so that it is done one or two days before it is due:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

On our team we believe that just because a manager says that work has to be done by time X does not mean it really has to be done by that time:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

People on our team believe if they do not work hard and get things done on time, they will not succeed:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

In our team we believe that we work hard every day so if something is not completed on time, it is because an unrealistic schedule has been set:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

In our team we believe it is always okay to be late if you call and let others know you will be late:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

On my team we believe that if we have a scheduled conference call, it is important to call in precisely on time:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

People on our team are always late for meetings at work:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

On our team we believe that the work times in my organization are too rigid:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

People on our team would rather be early than late:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

On our team we believe if we arrive late to a work meeting 1 hour after it starts, we are:
Very Late

| | | | | | | |
|---|---|---|---|---|---|--------------------|
| | | | | | | Not at all late |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

People on our team will always stay later at work to finish things if we have an important deadline:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

People on our team prefer meetings to follow an agenda:

| | | | | | | |
|----------------------|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

People on our team always keep people waiting for them:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

People on our team are almost never late for a meeting:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

People on our team think people should be ready when they say they will be ready:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

People on our team feel it is okay if a meeting is suddenly rescheduled:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

People on our team get upset when others do not get their part of the work done on time:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

When People on our team have work to turn in, they always ask for a time extension:

| | | | | | | | |
|----------------------|---|---|---|---|---|---|-------------------|
| Strongly Disagree | | | | | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

APPENDIX B

PILOT STUDY QUESTIONS ORGANIZED BY CONSTRUCT

Each construct is listed with their associated items from the pilot study.

FUTURE ORIENTATION

- In my culture, the accepted norm is to (reverse code):
Plan for the future - Accept the status quo
- In my culture, people place more emphasis on:
Solving Current problems - Planning for the future
- I believe that the accepted norm in my culture should be to:
Plan for the future - Accept the status quo
- In my culture we believe that people who are successful should:
Solve Current problems - Plan for the future

LATENESS ATTITUDE

End point labels are Strongly Disagree to Strongly Agree

- In our team we believe it is best to have an exact time for a meeting:
- In our team we believe it is always okay to be late if you call and let others know you will be late:
- In our team we believe that a meeting should end on time:
- In our team we believe that just because a team leader says that work has to be done by time X, it does not mean it really has to be done by that time:
- In our team we believe that we work hard every day so if something is not completed on time, it is because an unrealistic schedule has been set:

LATENESS BEHAVIOR

End point labels are Very Late to Not Late at All

- In our team we believe if we arrive late to a meeting 10 minutes after it starts, we are:

- In our team we believe if we arrive late to a meeting 1 hour after it starts, we are:
- In our team we believe if we complete a project 1 day late, we are:
- In our team we believe if we complete a project 1 week late, we are:
- In our team we believe it is okay to be one or two days late with a deadline:
Strongly Disagree vs. Strongly Agree
- In our team we believe it is never okay to be more than a few minutes late for a meeting: Strongly Disagree vs. Strongly Agree

PUNCTUALITY

End point labels are Strongly Disagree to Strongly Agree

- People on our team believe that it is better to do the work right rather than on time:
- People on our team are almost never late for a meeting:
- People on our team would rather be early than late:
- People on our team rarely miss deadlines:
- People on our team are always late for meetings:
- When people on our team have work to turn in, they always ask for a time extension:
- People on our team will always stay up to finish things if we have an important deadline:
- People on our team always keep people waiting for them:
- People on our team always plan their work so that it is done one or two days before it is due:
- In our team we believe that if we have a scheduled conference call, it is important to call in precisely on time:

SENSE OF URGENCY

End point labels are Strongly Disagree to Strongly Agree

- People on our team know that they are not going to get everything done on time:
- People on our team believe it is okay to sometimes miss a deadline:
- People on our team believe if they do not work hard and get things done on time, they will not succeed:

TEMPORAL RIGIDITY

End point labels are Strongly Disagree to Strongly Agree

- People on our team will always stay later to finish things if we have an important deadline:
- People on our team think it is important to meet deadlines:
- People on our team prefer meetings to follow an agenda:
- People on our team think people should be ready when they say they will be ready:
- People on our team get upset when others do not get their part of the work done on time:
- People on our team feel it is okay if a meeting is suddenly rescheduled:
- People on our team believe that a team leader who keeps changing due dates is very frustrating:
- People on our team get upset when the plan is not followed:
- In our team we believe that the assigned duties in my organization are too rigid:

APPENDIX C

SURVEY FOR CORPORATE RESPONDENTS

The survey as present to the Company respondents is shown here.

Team Communication, Coordination and Temporal Perception Feedback Form

This feedback form is designed to obtain information on team communication and coordination and team member perceptions of time issues associated distributed teams. All of your answers will be kept completely confidential and only summary results from this study will be presented to your organization.

This form was created by researchers from Monmouth University and the New Jersey Institute of Technology in the USA. The study has been approved by both universities' Human Subject Review Boards who have examined the study to ensure that it follows international rules established for the protection of participants involved in research. If you wish to contact the individuals responsible for the study, they are:

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Instructions

Please do not think about your answers for a long time but rather give us your immediate reaction to the question being asked. This feedback form should take you a maximum of fifteen minutes to complete. If you find a question you cannot answer because it does not fit your situation, please go on to the next question.

Thank you in advance for taking the time to give us feedback.

1. Do you wish to continue? Yes / No

Part I – General Information

Please provide answers to the following general questions about your background:

2. What is your sex?
☐ Female
☐ Male
3. What is your age?
☐ Less than 25
☐ 26-35
☐ 36-45
☐ 46-60
☐ Over 60
4. Where were you born? (COUNTRY) _____
5. Please indicate the location where you work? (*drop down list of possible labs*)
6. How long have you worked for your current employer? (in YEARS) _____

In the questions that follow, we use the word **team** to be a small collection of people that you know and work most closely with to do your current work. . Your **local team** is that part of the team that is in the same country you are located in. Your **remote team** is that part of the team that is in another country. If your team is split between more than two countries, choose the team in the country you work most closely with as your **remote team** and answer the questions only for that team.

7. What is the name of your **local team** (e.g., Dublin SVT Team)?

8. What is the name of the **remote team** you picked (e.g., China SVT Team)?

9. Where does your **remote team** work? (*we want a drop down list of possible labs*)
10. How many people are on your **local team**? _____
11. How long has your **local team** been in place? (in YEARS) _____
12. Are you (*drop down list - the manager of the local team? the technical leader of the local team? a member of the local team?*)

Part IIa – Local Team Questions

Please answer the following questions by how you think your *local team* members would answer the question.

| | | | | | | |
|--|---|---|---------|---|---|-------------------|
| 13. Members of my <i>local team</i> are not too concerned about missing a few deadlines. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|---|---|---|---------|---|---|-------------------|
| 14. Members of my <i>local team</i> place more emphasis on solving current problems than focusing on future problems. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|--|---|---|---------|---|---|-------------------|
| 15. Members of my <i>local team</i> get very nervous if we start to fall behind. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|---|---|---|---------|---|---|-------------------|
| 16. People on my <i>local team</i> get upset when meeting times keep being changed. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|--|---|---|---------|---|---|-------------------|
| 17. Members of my <i>local team</i> plan for future problems we might encounter. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|---|---|---|---------|---|---|-------------------|
| 18. <i>My local team</i> members believe it is okay to be a few minutes late for a meeting. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|--|---|---|---------|---|---|-------------------|
| 19. Members of my <i>local team</i> get upset when meetings run past their end time. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|---|---|---|---------|---|---|-------------------|
| 20. My <i>local team</i> members are constantly concerned about progress. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|--|---|---|---------|---|---|-------------------|
| 21. My <i>local team</i> members want precise detailed schedules for everything. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|--|---|---|---------|---|---|-------------------|
| 22. In my <i>local team</i> , the accepted norm is to solve day-to-day problems as opposed to anticipating them before they arise. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|---|---|---|---------|---|---|-------------------|
| 23. My <i>local team</i> members believe it is okay to be one or two days late with a deadline. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|--|---|---|---------|---|---|-------------------|
| 24. People on my <i>local team</i> are always insisting that we have to hurry. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Part IIb – Remote Team Questions

In the following questions, please select a response that you feel best represents the *remote team's* beliefs and behaviors. Remember that your *remote team* is the one in the other country that you interact the most with.

| | | | | | | |
|--|---|---|---------|---|---|-------------------|
| 25. Members of the <i>remote team</i> are not too concerned about missing a few deadlines. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|---|---|---|---------|---|---|-------------------|
| 26. Members of the <i>remote team</i> place more emphasis on solving current problems than focusing on future problems. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|--|---|---|---------|---|---|-------------------|
| 27. Members of the <i>remote team</i> get very nervous if they start to fall behind. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | |
|--|---|---|---------|---|---|-------------------|
| 28. People on the <i>remote team</i> get upset when meeting times keep being changed. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 29. Members of the <i>remote team</i> plan for future problems they might encounter. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 30. <i>Remote team</i> members believe it is okay to be a few minutes late for a meeting. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 31. Members of the <i>remote team</i> get upset when meetings run past their end time. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 32. The <i>remote team</i> members are constantly concerned about progress. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 33. <i>Remote team</i> members want precise detailed schedules for everything. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 34. In the <i>remote team</i> , the accepted norm is to solve day-to-day problems as opposed to anticipating them before they arise. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 35. <i>Remote team</i> members believe it is okay to be one or two days late with a deadline. | | | | | | |
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

36. People on the **remote team** are always insisting that they have to hurry.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Part III – Individual and Team Level Perceptions

The following statements are descriptions about your experience in the current project you are working on. Please indicate how strongly you agree or disagree with the statement by selecting the number that best represents your opinion.

37. I feel bad and unhappy when I discover that I have performed poorly on this project.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

38. I would be very happy to work on future projects that are managed similar to this project.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

39. If I had my way, I would not let **remote team** members have any influence over issues that are important to the project

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

40. I can convey complex work ideas to members of the **remote team**.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

41. I frequently have to adjust my work schedule to coordinate with the **remote team**.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

42. I am very dissatisfied with the way this project is managed.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

43. I really wish I had a good way to oversee the work of the *remote team* members on this project.

| | | | | | | | |
|----------------------|---|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

44. In general, members of the *remote team* always understand me when I communicate.

| | | | | | | | |
|----------------------|---|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

45. My opinion of myself goes up when I do my project work well.

| | | | | | | | |
|----------------------|---|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

46. Working with a *remote team* has made me change my eating and sleeping times

| | | | | | | | |
|----------------------|---|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

47. I would be comfortable giving members of my *remote team* tasks critical to this project.

| | | | | | | | |
|----------------------|---|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

48. I feel a great sense of personal satisfaction when I have done a good job on this project.

| | | | | | | | |
|----------------------|---|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

49. Personal events in my life are missed because I need to be available to communicate with the *remote team*.

| | | | | | | | |
|----------------------|---|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

50. My work communication with the *remote team* could be better.

| | | | | | | | |
|----------------------|---|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

51. I am very happy with the way my *local team* is managed.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

52. In the current project you are working on, how much is your *local team* able to:

| | Not at all | | | | | | Com- pletely | N/A |
|---|---------------|---|---|---|---|---|-----------------|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| Set your team's goals? | | | | | | | | |
| Decide your team's discretionary expenditures, e.g. travel? | | | | | | | | |
| Schedule your team's work? | | | | | | | | |
| Recruit members for your team? | | | | | | | | |
| Dismiss members from your team? | | | | | | | | |

53. In the current project you are working on, how much is your *local team* able to:

| | Not at all | | | | | | Com- pletely | N/A |
|---|---------------|---|---|---|---|---|-----------------|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| Select the tools your team will use in project work? | | | | | | | | |
| Set your team's operating procedures and work instructions e.g. which methodology to use? | | | | | | | | |
| Decide your team's tools and procedures for communication and collaboration, e.g. email? | | | | | | | | |
| Assign work to team members according to their expertise? | | | | | | | | |

54. In the current project you are working on, how much is your *local team* able to:

| | Not at all | | | | | | Com- pletely | N/A |
|---|---------------|---|---|---|---|---|-----------------|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| Set its own corrective actions when performance objectives are not met? | | | | | | | | |
| Set the team's own procedures concerning quality assurance? | | | | | | | | |
| Evaluate the quality of the team's work? | | | | | | | | |

55. How would you rate your **local team** on the following items?

| | Very weak | | | | | | Very strong |
|---|-----------|---|---|---|---|---|-------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Ability to get work done in timely fashion | | | | | | | |
| Ability to collaborate with other teams | | | | | | | |
| Team members' ability to collaborate among themselves | | | | | | | |
| Technical expertise needed for this project | | | | | | | |
| Knowledge of organizational practices | | | | | | | |
| Knowledge of systems for information sharing and collaboration | | | | | | | |
| Problem-solving skills | | | | | | | |
| The overall competency of the team to perform team tasks (exclude yourself in this reply) | | | | | | | |

The following statements are descriptions about your experiences in working in distributed teams. Please select your answer from the pulldown menus or indicate how strongly you agree or disagree with the statement by selecting the number that best represents your opinion.

56. In order to communicate adequately, it is best to distribute teams across fewer than ___ location(s) (*pulldown menu with options from 2-5*)

57. Coordination problems do not really become a serious issue until teams are distributed across more than ___ countries (*pulldown menu with options from 1-4*)

58. Cultural differences between team members make it very hard for us to communicate with teams in other countries..

| | | | | | | |
|-------------------|---|---|---------|---|---|----------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

59. Language differences do not cause difficulties in our communication and collaboration with the remote team.

| | | | | | | |
|-------------------|---|---|---------|---|---|----------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

60. A project can be better done by teams from the same location than teams from different locations.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

61. It is much more difficult to meet a deadline when the team work is distributed.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

62. A key problem we have with communicating with distant team members is the small amount of overlap between the times we are at work

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

63. I believe that management tries hard to correct problems that occur in one project so that they do not re-occur in the next project.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

64. Communication and coordination problems always seem to be difficult challenges on global projects.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

We thank you very much for the time and effort you have put into answering our questions. Your feedback will help us enormously

APPENDIX D

SURVEY FOR STUDENT RESPONDENTS

The survey, as presented to students is shown here. This survey was presented during the Spring term of 2007.

This feedback form is designed to obtain information on communication and perceptions of time issues associated with teams. All of your answers will be kept completely confidential and only summary results from this study will be presented to your instructor.

The following is the official consent form from the University.

You are under no obligation to participate in this study. To assure the New Jersey Institute of Technology that we have made this freedom of choice clear to you, we are asking you to read the following consent form and then click on YES below if you agree to be a part of this study.

NEW JERSEY INSTITUTE OF TECHNOLOGY RESEARCH STUDY CONSENT

STUDY: An Investigation of Cultural Differences in Software Development in Virtual Teams

RESEARCH STUDY: I have been asked to participate in a research study under the direction of Professors Marilyn Tremaine and Allen Milewski and one of their students.

PURPOSE: The purpose of this research is to investigate the impact of cultural differences in time orientation on the performance and satisfaction of software development teams.

DURATION: My participation in this study will last for approximately 10 minutes.

PROCEDURES: I have been told that, I will be completing a web-based survey which will ask about personal time management behavior and attitudes. Some of this will be personal, i.e. it will ask me how I make use of my time.

None of this information will be disclosed to my instructors in any manner that would personally identify me with my responses.

The data is being collected and stored on a secure server at New Jersey Institute of Technology, located in New Jersey, USA.

PARTICIPANTS: I will be one of about 200 participants to participate in this study.

EXCLUSIONS: You cannot participate in this study if you are less than 18 years of age. If so please click **NO** on the 'Do you wish to continue' button below and end your participation.

RISKS/DISCOMFORTS: I have been told that there should be no risks for the subjects because of the data collection setup which will preserve subject's anonymity and privacy. There may be risks or discomfort unknown yet.

I understand that I am not covered by NJIT's insurance policy for any injury or loss I might sustain in the course of participating in the study.

CONFIDENTIALITY: I understand confidential is not the same as anonymous. Confidential means that my name will not be disclosed if there exists a documented linkage between my identity and my responses as recorded in the research records. Every effort will be made to maintain the confidentiality of my answers. I also understand that as an online participant in this research, there is always the risk of intrusion by outside agents (i.e. Hacking) and, therefore the possibility of being identified exists. If the findings from the study are published, I will not be identified by name. My identity will remain confidential unless disclosure is required by law.

PAYMENT FOR PARTICIPATION: I have been told that I will receive NO compensation for my participation in this study.

RIGHT TO REFUSE OR WITHDRAW: I understand that my participation is voluntary and I may refuse to participate, or may discontinue my participation at any time with no adverse consequence.

INDIVIDUALS TO CONTACT: If I have any questions about my treatment or research procedures, I understand that I should contact the principal investigator at:

Dr. Marilyn Tremaine
GITC 4404, NJIT
(973) 596 5284
tremaine@njit.edu

Dr. Allen Milewski
Monmouth University
Howard Hall, B-11
Monmouth, NJ
(732) 571-7578
amilewsk@monmouth.edu

If I have any addition questions about my rights as a research subject, I may contact:
Dawn Hall Apgar, PhD, IRB Chair

NJIT
 (973) 642-7616
 dawn.apgar@njit.edu

1. Do you wish to continue? Yes / No

Instructions

Please do not think about your answers for a long time but rather give us your immediate reaction to the question being asked. This feedback form should take you a maximum of ten minutes to complete. If you find a question you cannot answer because it does not fit your situation, please go on to the next question.

Thank you in advance for taking the time to fill out this survey.

Part I – General Information

Please provide answers to the following general questions about your background:

2. What is your sex?

☐ Female

☐ Male

3. What is your age?

☐ Less than 25

☐ 26-35

☐ 36-45

☐ 46-60

☐ Over 60

4. What is your native language? (THE ONE YOU ARE MOST PROFICIENT IN)

5. Where were you born? (COUNTRY)_____

The following questions ask about ***your beliefs*** and then about ***your class team***

Please answer the questions on this page by what ***you*** think the answer should be.

6. I am not too concerned about missing a few deadlines.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

7. I place more emphasis on solving current problems than focusing on future problems.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

8. I get very nervous if we start to fall behind.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

9. I get upset when meeting times keep being changed.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

10. I plan for future problems we might encounter.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

11. I believe it is okay to be a few minutes late for a meeting.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

12. I get upset when meetings run past their end time.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

13. I am constantly concerned about progress.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

14. I want precise detailed schedules for everything.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

15. My norm is to solve problems when they appear as opposed to anticipating them before they arise.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

16. I believe it is okay to be one or two days late with a deadline.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

17. I am always insisting that we have to hurry.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Please answer the questions on this page by how you think *your team members* would answer the question.

18. Members of my *team* are not too concerned about missing a few deadlines.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

19. Members of my *team* place more emphasis on solving current problems than focusing on future problems.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

20. Members of my *team* get very nervous if they start to fall behind.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

21. Members of my *team* get upset when meeting times keep being changed.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

22. Members of my *team* plan for future problems they might encounter.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

23. My **team** members believe it is okay to be a few minutes late for a meeting.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

24. Members of my **team** get upset when meetings run past their end time.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

25. My **team** members are constantly concerned about progress.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

26. My **team** members want precise detailed schedules for everything.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

27. In my **team**, the accepted norm is to solve problems when they appear as opposed to anticipating them before they arise.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

28. My **team** members believe it is okay to be one or two days late with a deadline.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

29. Members of my **team** are always insisting that they have to hurry.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

The following statements are descriptions about your experience working on your team project. Please indicate how strongly you agree or disagree with the statement by selecting the number that best represents your opinion.

30. I feel bad and very unhappy when I discover that I have performed poorly on this project.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

31. If I had my way, I would not let other team members have any influence over issues that are important to the project

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

32. I can convey complex work ideas to other members of the team.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

33. I frequently have to adjust my work and school schedule to coordinate with the other team members..

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

34. I really wish I had a good way to oversee the work of the other team members on this project.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

35. In general, other members of the team always understand me when I communicate.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

36. My opinion of myself goes up when I do my project work well.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

37. Working with other team members has made me change my eating and sleeping times

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

38. I would be comfortable giving other members of my team tasks critical to this project.

| | | | | | | |
|----------------------|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

39. I feel a great sense of personal satisfaction when I have done a good job on this project.

| | | | | | | | |
|----------------------|---|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

40. Personal events in my life are missed because I need to be available to communicate with other team members.

| | | | | | | | |
|----------------------|---|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

41. My work communication with other team members could be better.

| | | | | | | | |
|----------------------|---|---|---|---------|---|---|-------------------|
| Strongly Disagree | | | | Neutral | | | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

Thank You!

Thank you very much for your time and effort in completing this feedback form. Your responses will help us better understand how to organize and manage work teams.

If you are interested in our results, please click the yes box and enter your e-mail address in the box below.

APPENDIX E

SURVEY QUESTIONS ORGANIZED BY CONSTRUCT

Constructs marked with * are jointly shared with another NJIT dissertation using the same questionnaire (Zhang, 2007)

FUTURE ORIENTATION CONSTRUCT

Corporate: 14, 17, 22 26, 29, 34. Student: 7, 10, 15, 19, 22, 27

The questions for the Future Orientation construct are:

- Members of my **local** team place more emphasis on solving current problems than focusing on future problems.
- Members of my **local** team plan for future problems we might encounter
- In my **local** team, the accepted norm is to solve day-to-day problems as opposed to anticipating them before they arise (reverse coded)

The above questions reflect wording that would be used in a local/distant team setup, with remote replacing the word local. A slightly different wording is needed for student teams, which are only local, this wording follows:

- I place more emphasis on solving current problems than focusing on future problems.
- I plan for future problems we might encounter
- My norm is to solve problems when they appear as opposed to anticipating them before they arise.

LATENESS ATTITUDE CONSTRUCT

Corporate: 13, 18, 23, 25, 30, 35. Student: 6, 11, 16, 18, 23, 28

The questions for the Lateness Attitude construct are:

- My **local team** members believe it is okay to be a few minutes late for a meeting.

- Members of my *local team* are not too concerned about missing a few deadlines.
- My *local team* members believe it is okay to be one or two days late with a deadline.

SENSE OF URGENCY CONSTRUCT

Corporate: 15, 20, 24, 27, 32, 36. Student: 8, 13, 17, 20, 25, 29

The questions for the Sense of Urgency construct are:

- Members of my *local team* get very nervous if we start to fall behind.
- My *local team* members are constantly concerned about progress.
- People on my *local team* are always insisting that we have to hurry.

TEMPORAL RIGIDITY CONSTRUCT

Corporate: 16, 19, 21, 28, 31, 33. Student: 9, 12, 14, 21, 24, 26

The questions for the Temporal Rigidity construct are:

- Members of my *local team* get upset when meetings run past their end time.
- People on my *local team* get upset when meeting times keep being changed.
- My *local team* members want precise detailed schedules for everything.

INDIVIDUAL COMMUNICATION QUALITY *

Corporate: 40, 44, 50. Student: 32, 35, 41

The questions for the Individual Communication Quality construct are:

- I can convey complex work ideas to members of the *remote team*.
- There In general, members of the *remote team* always understand me when I communicate.
- My work communication with the *remote team* could be better.

INDIVIDUAL TEMPORAL DISRUPTION

Corporate: 41, 46, 49. Student: 33, 37, 40

- I frequently have to adjust my work schedule to coordinate with the *remote team*.
- Personal events in my life are missed because I need to be available to communicate with the *remote team*
- Working with a *remote team* has made me change my eating and sleeping times.

INDIVIDUAL SATISFACTION *

Corporate: 37, 45, 48. Student: 30, 36, 39

- I feel bad and unhappy when I discover that I have performed poorly on this project.
- My opinion of myself goes up when I do my project work well.
- I feel a great sense of personal satisfaction when I have done a good job on this project.

INDIVIDUAL TRUST *

Corporate: 39, 43, 47. Student: 31, 34, 38

- If I had my way, I would not let *remote team* members have any influence over issues that are important to the project
- I really wish I had a good way to oversee the work of the *remote team* members on this project.
- I would be comfortable giving members of the *remote team* tasks critical to this project

APPENDIX F

CORPORATE INTERVIEW GUIDE

This appendix presents the corporate interview guide. The interviews were semi-structured and the interviewees were encouraged to fully discuss their thoughts and related topics.

1. Opening questions and background questions:

What do you do?

Do you work on multiple projects at the same time? Or only one?

Tell me about your work in this project?

How many people do you work with?

Where are they located?

Have the members been meeting face-to-face before?

Do you know all the persons personally (face-to-face)?

2. Leadership and Delegation

How are the decisions made in your team?

Probe questions: What if the team disagrees with the decision?

Do you think the teams are treated differently in the project?

How do you feel about the way decisions are made?

Can you give an example?

Do you feel your team members have enough participation in the decision-making process?

If you were the project manager, would you do anything different?

3. Team competence

What do your team do in this project?

How well do you think your team is doing in the project?

How about the other teams?

Do you think everybody contributes/ is able to contribute equally?

4. Communication and trust

How do you communicate with people at different countries?

What happens?

How well do you think the other teams understand your English?

5. Motivation and Satisfaction

Do you ever have to do something that is not assigned to you?

Did you just jump at it and carry extra workload?

Can you give an example?

Do other people do this?

Why do you think they do it?
 What are things you like the best about this project?
 Can you give an example?
 What are the things you do not like about this project?

6. Coordination

Is it difficult to coordinate activities with people in those other countries?
 Why?
 What do you think can be done to help?

7. Time related issue

How many hours ahead are they?
 How do you shift your work to fit their schedule?
 Do people stick to the schedules you agreed on?
 Is what your local team think about is what the remote team think?
 What do you think the difference between you and people at the remote countries are because the different ways you see the world?
 Did the differences affect project deadline and schedule?
 Can you give an example? Are the remote team people always on time?
 What are the excuses of not getting something done?
 What excuses are acceptable and what are not?

8. Questions to manager

How do you run a team?
 What do you do when you see two teams compete?
 How do you evaluate people's performance on the project?
 Do you have any difficulty dealing with some team members?
 How do you deal with it?

9. Questions on team meeting

How do you characterize the process and structure of the team meetings?
 When you have the synchronous meeting with the remote team, how are they like?
 Are the meetings productive?
 Can you tell me what you accomplished?
 Can you give an example?
 Are they ever unproductive?
 Can you give an example?
 Do you use any documents in the meeting?
 What kind of documents?
 Do you have meeting with the remote team?
 How do you compare the meeting run locally and the telephone meetings meeting?
 After the project ends, do you still have contact to former members?
 Do these contacts help you in future projects?

APPENDIX G

TEMPORAL PERCEPTION INTERVIEW GUIDE

The interview guide that was used in the follow-up interviews specifically looking at temporal perceptions is present here.

Hello, my name is Rich Egan. I am a doctoral student at the New Jersey Institute of Technology. A part of my doctoral research is on how different people respond to deadlines and to time pressures. Would it be okay if I asked you a few questions about your work and the time pressures associated with your work? It will only take about 20 minutes. Also, be assured that all of the response you give to my questions are completely confidential as is required by international research laws. Do you mind if I record this interview electronically. I do this because I cannot take notes fast enough and do not want to miss any of your valuable insights.

First, I need to ask you some very general questions about your job.

1. What is your full name?
2. How long have you been working for the company?
3. What is your position in the company?
4. How long have you had this position?
5. Can you describe in general, what work you do for your company?
6. Do you work regularly with other people in other countries or at other sites?
7. Where are these sites?
8. How many people do you work with locally and how many do you work with remotely (approximate number at each site)?
9. Are you now working primarily with one of the remote sites? Which one?
10. Can you describe your daily or weekly communication with this site, that is,
 - a. What type of communication medium do you use?
 - b. How many times a week do you use it?
 - c. About how many exchanges do you have?
 - d. What is the nature of these exchanges, e.g. what do you communicate about?

- e. What makes these communications go smoothly?
- f. Are there any difficulties with these communications?
- g. If so, what are they?

I would like you to think of some recent work with unknown difficulties that your local team worked on with the remote site...

1. Can you describe the work in general, i.e.,
 - a. how hard it was
 - b. how much time you thought you had to do the work,
 - c. how evenly divided between sites it was,
2. What was the role you and your local team members played in this work?
3. What was the role the remote team members played in this work?
4. How important did your local team feel that it was to start on the work as soon as possible?
5. Do you think the remote team felt this way also? Why or why not?
6. How important was it for your local team to meet the work deadline?
7. Did you think this importance was shared by the remote team?

Think of a project you worked on in which your team felt it could not meet a deadline.

1. Was the work modified in any way to help meet the deadline?
2. Were members of your local team happy with the changes that were made?
3. Were members of the remote team you were working with happy with the changes that were made?
4. Is there a time when either your local or your remote team made changes to work processes or work completion times that at least some people were not happy with?
5. Can you describe these changes and what happened?

Now let's discuss a little about work pressure in general.

1. Do you or members of your local team work overtime to get work done?
2. Can you describe some of these instances, when they happen, how long they last?

3. Do members of the remote team you work with also work overtime?
4. Do you think that they work as much as your local team?
5. On average, who works more, local team members or remote team members?
6. Why do you think they work more?
7. What benefits do you think will come to you or your local team members from putting in these longer hours?
8. What benefits do you think your remote team members believe they will get from putting in longer hours?

Thank you very much for your time. You have been most helpful. Would it be okay if I contact you again, if I need to clarify anything from this interview?

APPENDIX H

RESEARCH MODEL

The following figures are the research model as created in the SmartPLS™ software. The First is the model itself, Figure H.1, the second is the model showing the loadings, Figure H.2 and the third, Figure H.3 is the model showing the t-stats as a result of running the bootstrap procedure.

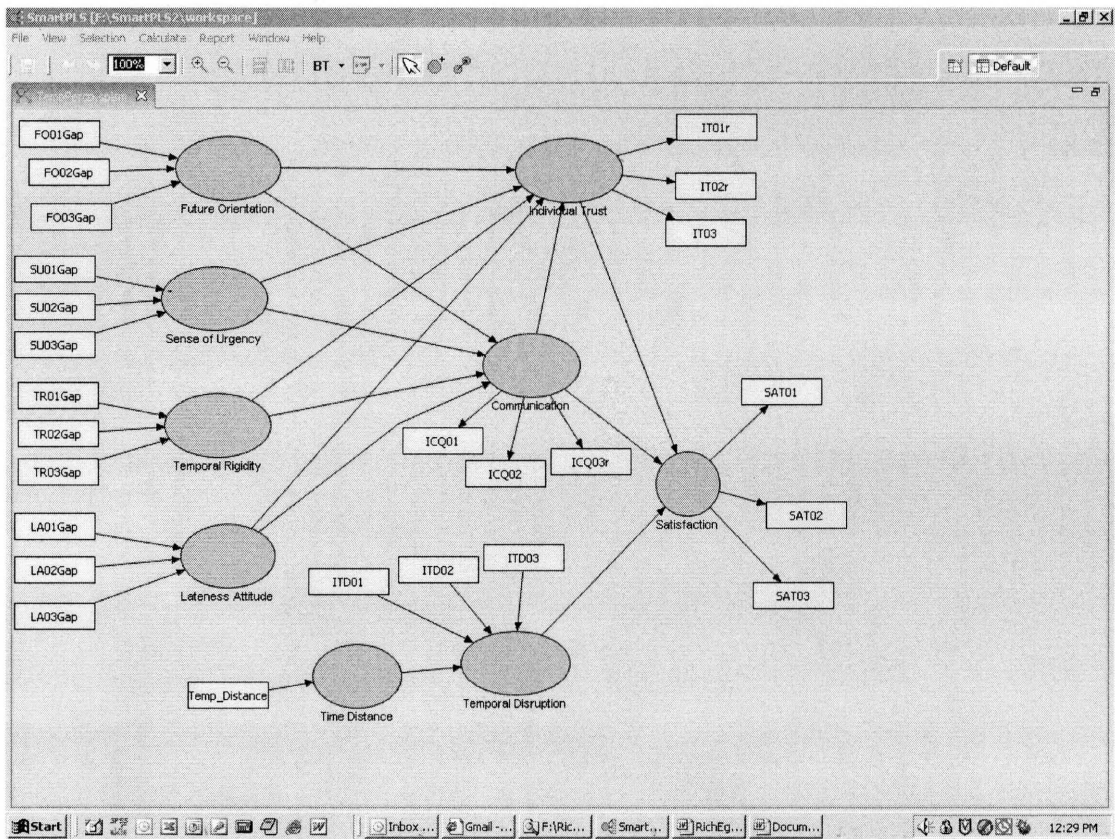


Figure H.1 Research Model.

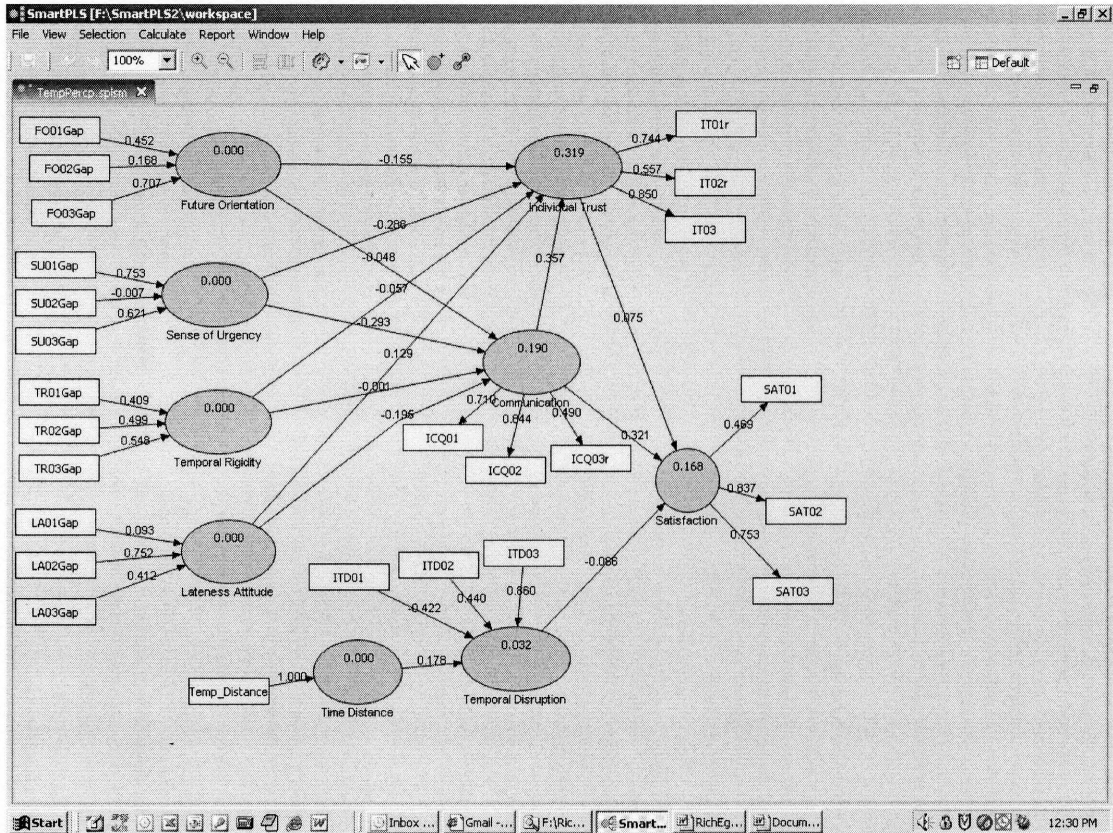


Figure H.2 Research Model With Loadings.

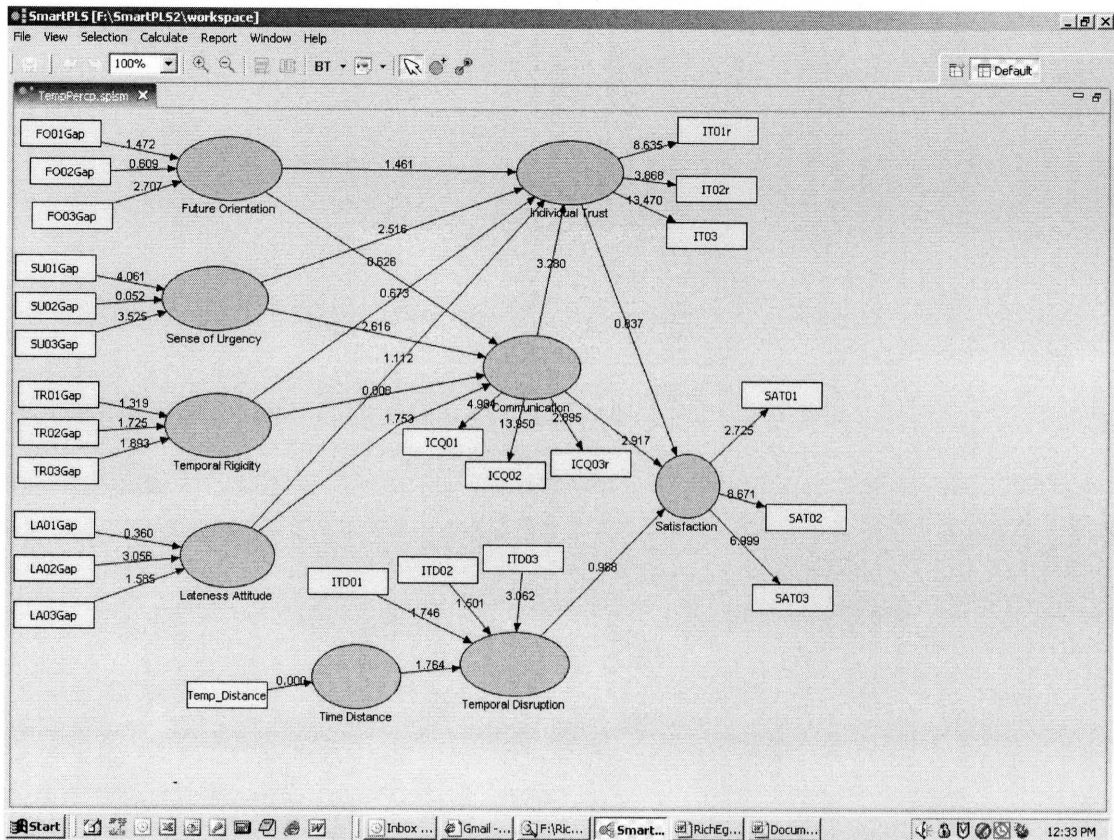


Figure H.3 Research Model With T-Statistics.

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